

# Research at the Bulgarian Academy of Sciences

A Report by the 2009 Science Review Committee

*Volume 1 of 5*



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## Acknowledgements

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### **European Science Foundation (ESF)**

The European Science Foundation (ESF) was established in 1974 to provide a common platform for its Member Organisations to advance European research collaboration and explore new directions for research. It is an independent organisation, owned by 80 Member Organisations, which are research funding organisations and research performing organisations, academies and learned societies from 30 countries. ESF promotes collaboration in research itself, in funding of research and in science policy activities at the European level.

### **ALLEA (All European Academies)**

ALLEA (All European Academies) is the European Federation of National Academies of Sciences and Humanities whose 53 Member Academies in 40 countries are self-governing communities of scientists and scholars. It was founded in 1994 to promote the exchange of information and experience between Academies; to offer European science and society advice from its Member Academies; and to promote excellence and high ethical standards in science and scholarship.

The Review Committee wishes to thank all the people who have contributed to the planning and execution of this evaluation exercise including the preparation of the reports. Our special thanks are due to the members of staff of the BAS Institutes who prepared the Self-Evaluation Reports, thus providing the data without which an evaluation such as this would not be possible. We also owe our gratitude and respect to those whom we met during our site visits and interviews for their frank and open attitude that has helped us greatly in understanding the environment and context in which they operate. We applaud the BAS leadership for its consistent support and its encouragement in applying strict international quality standards to this evaluation, even though the conditions for research in Bulgaria are comparatively difficult. Our understanding is that our findings will be used for the purpose for which they are intended: to improve the quality and impact of research in Bulgaria and we are looking forward to the results.

Finally, our work could not have been done without the support of the staff of ESF and ALLEA. Our special thanks go to Dr. Astrid Lunkes, Dr. Bernard Avril, Dr. Farzam Ranjbaran and Dr. Rüdiger Klein as scientific secretaries of the panels. Dr. Klein and Dr. Ranjbaran also acted as secretaries of the Review Monitoring Committee and coordinated its activities including support to the preparation of the final reports.

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**Part II: Expert Panels' Reports**

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- Volume 3 of 5: Panel 2 Report  
*Biological Sciences*
- Volume 4 of 5: Panel 3 Report  
*Earth Sciences*
- Volume 5 of 5: Panel 4 Report  
*Social Sciences, Humanities*

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# Foreword

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The European Science Foundation (ESF) and the European Federation of National Academies of Sciences and Humanities (ALLEA: All European Academies) jointly deliver herewith the report emanating from their 2009 evaluation of the research units of the Bulgarian Academy of Sciences.

ESF and ALLEA were commissioned in early 2009 to embark on the first comprehensive, international, scientific evaluation of the 69 institutes, centres, laboratories and other relevant facilities of the Bulgarian Academy of Sciences (BAS). These research units are engaged in fundamental and applied research in practically all fields of knowledge.

BAS decided to measure its position as the premier research performing organisation in the country against the standards of international scientific competitiveness. ESF and ALLEA agreed to conduct this exercise as part of their common commitment to promotion of the European Research Area. Both organisations play key roles in Europe-wide activities towards identification and implementation of best practices in scientific peer review and evaluations. Over the last few years, ESF has been offering its support as evaluating agency to research programmes throughout the continent. ALLEA and its Member Academies are engaged in meta-evaluations and in developing a new European Evaluation Protocol (EEP) for institutional evaluations.

Forty leading researchers from Academies, research performing organisations and universities in 17 countries, working in four panels, committed themselves to the assessment of the quality of the research of BAS. A meaningful benchmarking across all fields became possible thanks to a well-guided process that was monitored by an overarching interdisciplinary Review Monitoring Committee. It is our pleasure to thank and congratulate the Chair of the Committee, past ESF President Dr. Reinder van Duinen, for having steered this complex enterprise to its successful completion in a masterly manner. We wish to extend our gratitude to the Vice-Chairs of the Review Monitoring Committee, and the Chairs and Members of the Panels of Experts for their commitment and valuable contribution to the advancement of Bulgarian science, and thereby to European science at large.

ESF and ALLEA are committed to the principle that for institutional evaluations a robust peer review mechanism is needed to develop among fellow scientists a better sense of their future options. The review process was designed in such a way that the data and analyses it required would stimulate the research units to act on recommendations. Proposals are made for further improving performance, and it is hoped that the exercise will enable research units to contribute to joint strategy development in BAS and perhaps even across research organisations in the country.

We trust that the follow-up to this evaluation will be as inclusive and collaborative as its execution was. ESF and ALLEA are happy to accompany BAS, critically and constructively, in what will inevitably be a lengthy process of renewal and rejuvenation: it is essential to create better conditions for young researchers; it is necessary to improve access to European networks for all fields of research; it is crucial for BAS to be prepared for the new ways of doing top-class European science, supported through Joint Programming Initiatives and clustering around high-level European Research Infrastructures.

The President of the Bulgarian Academy of Sciences, Professor Nikola Sabotinov, has expressed his commitment to act upon the wide-ranging and challenging recommendations contained in this report. We hope that the relevant Bulgarian authorities and stakeholders will recognise this external international evaluation as a courageous first step by the premier research performing organisation in the country, a step that is aimed at benchmarking and preparing the Bulgarian science landscape for its rightful place in Europe.

**Professor Marja Makarow**  
Chief Executive  
European Science Foundation

**Professor Jüri Engelbrecht**  
President  
European Federation of National Academies  
of Sciences and Humanities



# Part I: Overall Evaluation Report

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# 1. Introduction

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Before you lies the result of the work of the independent, international Science Review Committee, established by the European Science Foundation (ESF) and the European Federation of National Academies of Sciences and Humanities (ALLEA: All European Academies), to review the Institutes of the Bulgarian Academy of Sciences (hereafter: BAS or “the Academy”). The review was carried out at the request of BAS and focused on the five-year period from January 2004 to December 2008. In November 2008, ESF and ALLEA jointly contracted with BAS to conduct the review; the actual work of the review teams was undertaken in the period from May to October 2009.

ESF and ALLEA were chosen as implementing agencies due to their experience and reputation in the field of international scientific evaluation. They were commissioned to conduct an independent scientific review of the achievements of the BAS research units, primarily from the point of view of their international visibility and competitiveness.

BAS has an essential role in the research system in Bulgaria: according to the recent CREST Policy Mix Expert Group report, BAS is “by far the biggest research performer” in the country. Figures provided by BAS indicate that some 20% of the researchers in the country are employed by BAS; for items published by Bulgarian scientific institutions and included in the ISI Web of Science, the share of those involving Institutes and other establishments of the Academy hovers between 50% and 55% for the reporting period<sup>1</sup>. About one-third of publications of university researchers are co-publications with BAS researchers. BAS hosts eight of the 11 national centres of excellence<sup>2</sup>.

This review aimed to establish whether these impressive relative figures correspond, at the level of the BAS research performing units (henceforth referred to as “Institutes”), to scientific quality that compares well internationally. The review aims to facilitate a process for continuously improving and revitalising the scientific performance of the research units of BAS.

For the first time all BAS research performing units have undergone an independent, comprehensive and detailed review of their international standing.

The scope and extent of this review was primarily limited to the Institutes of BAS. While our work may have an impact also on the Academy in general and perhaps, in a wider sense, on the Bulgarian research system as a whole, the Academy itself and its place in the Bulgarian research system was not the subject of this review. Nor has the Review Committee felt it appropri-

ate to comment in general terms on the desirability of maintaining or altering the research and development system in Bulgaria. Such issues have been the subject of other recent external reviews, which, in turn, refrained from looking in detail at BAS or individual universities and may therefore have come to other conclusions than this review<sup>3</sup>.

This review is primarily focused on improving conditions to enable the best possible research to be done in Bulgaria and therefore it does not dwell at length on managerial issues, national science policy and political contingencies.

However, where appropriate and relevant, we did comment on the position of the Institutes in the wider context of research in Bulgaria, Europe or worldwide. Along the same lines, we also commented, where necessary, on the appropriateness of certain activities in the context of the Institutes’ missions or the role they play as part of the overall mission of the Academy. Similarly, the issue of the relations of individual Institutes with universities was addressed where appropriate, but we refrained from general comments on the relation between the Academy and the higher education system in Bulgaria. Since in many ways the potential and real performance of the Institutes depends on the organisational framework and support function that the Academy does or should provide, the range of scrutiny of the review did — when necessary — extend beyond the Institutes’ individual performance. This has given rise to critical assessments of the usefulness of aspects of the central support BAS is providing.

Striving for research excellence and intense interactions with wider science and societal contexts are necessary ingredients of the mission of the Academy. The importance of Academy Institutes as national instruments for enabling and producing top-level research of relevance to Bulgarian society cannot be overstated.

Given that the BAS Institutes play a central role in the Bulgarian research system, it is vital that interactions between the Academy and universities and between the Academy and society at large are intensified.

The Review Committee hopes that the results of this review will provide both the Institutes’ management and the Academy leadership with input and recommendations that could further improve research conditions and performance at the Academy and thereby stimulate the entire research system in Bulgaria. It is hoped that this evaluation will trigger or further strengthen the required reform processes within and across the BAS Institutes.

1. Source: Innovation BG 2009

2. Source: ERAWatch Country Report: Bulgaria, October 2008, p.33

3. CREST expert group report, November 2008; ERAWATCH Analytical Country Report 2008: Bulgaria, October 2008

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Improvement of performance is necessary in the face of increasing international competition for talent and knowledge creation. It is therefore expected that the review will be followed by concrete actions aimed at further reinforcing the strengths and nourishing the talent responsible for the quality of the work conducted in the Institutes so far.

## 1.1 Structure of the Report

This evaluation report is structured under five volumes grouped into two parts. Part I (this Volume 1 of 5) provides an overview of the motivation, scope, structure and implementation of the review and presents the general conclusions and recommendations of the Review Committee. Part II (Volumes 2-5 of 5) presents the four disciplinary assessment reports on individual Institutes grouped under eight divisions and prepared by the four Panels of Experts with recommendations to be acted upon at the respective levels.

While the review was focused on the evaluation of the Institutes, this report contains three levels of recommendations; those directed at Institutes and divisions or sets of divisions that were evaluated by a joint Panel (Part II), and those for the Academy leadership (Part I, Chapter 3). In each case, care has been taken to ensure that recommendations can be acted upon by actors at the respective levels being addressed.

Chapter 2 in Part I describes the structure of the review process and gives a summary of the work plan agreed upon between BAS and ESF/ALLEA. Chapter 2, Section 2 contains the composition of the Review Monitoring Committee (RMC) and of the four international Panels of Experts (PE) that performed the review, examining the documentation provided, conducting site visits, interviewing representatives and researchers of the Institutes and composing the Expert Panel reports. The evaluation protocol — i.e., the structure of the Self-Evaluation Reports (SER), the assessment criteria and the scoring metric used — is explained in Section 2.3.

In Chapter 3 we have summarised the main findings, conclusions and recommendations arising from the Institute evaluations, but pertaining to decisions and actions at the level of the Academy. The Review Committee provides BAS with a number of concrete “actionable” suggestions that emerged as salient in the evaluation reports prepared by all or most panels. Most of these cross-cutting recommendations are therefore also addressed in detail in the Expert Panel reports contained in Part II. This is why the reader may find some degree of repetition in the various sections of our report. Chapter 4 closes Part I of the report.

Part II includes the four separate evaluation reports prepared by the respective Panel of Experts for groups of Institutes under one or more divisions.

The openness and responsiveness of the BAS leadership, its commitment to, and understanding of the requirements of an independent and international review, as well as the professionalism of the scientific and administrative staff of the Academy in assisting ESF and ALLEA in ensuring independence and the highest standards for this evaluation exercise are commendable and herewith acknowledged. The review team members were impressed by the quality of the researchers and staff they met in the Institutes and at the Academy; we all appreciated this review effort as a rewarding exercise.

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## 2. The Review Structure and Process

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In January 2009, BAS, ESF and ALLEA signed a Memorandum of Understanding (MoU), by which the parties agreed to collaborate on implementing a comprehensive scientific evaluation of the Institutes of the Academy. It was agreed that ESF and ALLEA would implement and complete the evaluation by the end of 2009. The evaluation has been commissioned by the leadership of the Academy and was conducted on a cost-recovery basis.

### 2.1 Purpose and Scope of the Review

In a letter dated 13 October 2008, BAS President Professor Nikola Sabotinov invited the ESF Chief Executive, Professor Marja Makarow, and the ALLEA President, Professor Jüri Engelbrecht, to take on the task of conducting a scientific evaluation of the BAS research units (Institutes). Following this request, a meeting was held at the BAS Headquarters in Sofia on 21 November 2008 with participants from ESF and ALLEA to discuss framework conditions and details of the exercise. Participants of this meeting formed the ESF-ALLEA-BAS *ad hoc* Technical Management Committee (TMC). A broad-level agreement was reached on the purpose, format and scope of the review and the roles and responsibilities of the three organisations. Subsequently, a Memorandum of Understanding was prepared and signed by the three parties on 20 January 2009. A work plan was drawn up providing details of the activities, the timeline, and the division of responsibilities between the parties.

According to the articles stipulated in the MoU, the scope of the evaluation was to assess 69 Institutes of the Academy, which are currently grouped in eight scientific divisions; the evaluation was to cover achievements and activities over the five-year period preceding 2009.

The aims of the evaluation as stated in the MoU were:

1. To assess research performance of the BAS Research Units in relation to their mandate and resources;
2. To assess the level of integration of the Research Units of BAS in international scientific cooperation in general and in the European Research Area in particular;
3. To assess the value and the effectiveness of the Research Units of BAS on the national level and their utility for the Bulgarian state and society;
4. To recommend appropriate structural and organisational measures aimed at improving the competitiveness of the Research Units of BAS on national, regional and international levels;

5. To propose new vistas for international cooperation in research and innovation in BAS, particularly with the aim of strengthening and stabilising these activities within the country.

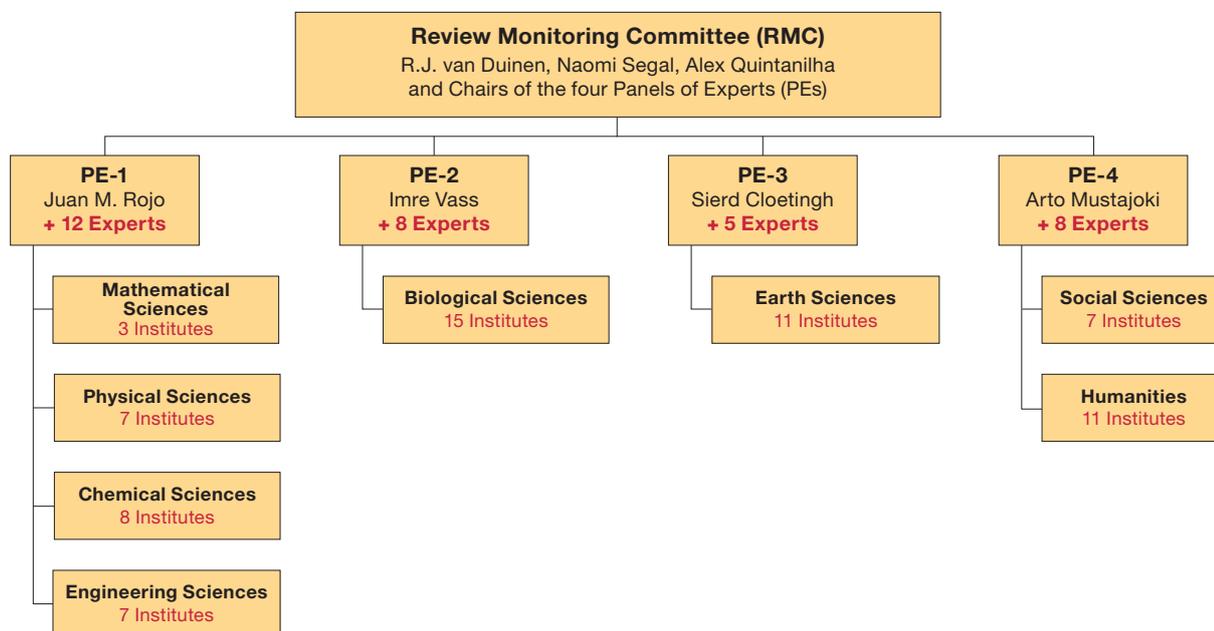
### 2.2 Structure of the Review Committees

The evaluation was conducted by a Science Review Committee of about 40 experts. The process was overseen and governed by the Review Monitoring Committee (RMC) consisting of seven researchers and experienced science policy executives (Figure 1). ESF's past president, Dr. Reinder van Duinen, chaired the RMC. All RMC members have been closely involved with the ESF and ALLEA and its Member Academies in various high-level capacities. Four of the seven members of the RMC were the Chairs of the four Panels of Experts. Two Vice-Chairs assisted the RMC Chair in monitoring the overall evaluation process.

The four different Panels of Experts (PE) each had between five and thirteen members and were assigned to the eight research divisions of BAS (Figure 1). Final deliverables of the four panels to the RMC were expert evaluation reports covering Institute-level assessments and recommendations. The Institute reports also yielded some "horizontal" issues pertaining to an entire division or panel remit or even observed across most Institutes reviewed: these issues and resulting recommendations are summarised in the first, general section of each of the four panel-level reports. The individual Expert Panel reports are provided in Part II of this document.

The RMC was responsible for compiling the final analysis, recommendations, conclusions and a single evaluation report, based on the reports of the Expert Panels and their own analysis and deliberations and pertaining to matters that impact on the research performance of large groups of Institutes and that need to be addressed at the BAS level or more broadly (comprising Part I of this document).

The ESF-ALLEA-BAS *ad hoc* Technical Management Committee (TMC) was responsible for the overall planning and management of the process, including elaborating the details and solving practical problems at various stages of the implementation. Dedicated scientific and administrative staff from ESF and ALLEA provided secretariat support to the four panels and the RMC. BAS staff ensured – with laudable professionalism – timely circulation of relevant documents and correspondence, collections or reports and all logistic aspects of the complex sequence of the site visits across Bulgaria.



**Figure 1:** Overall structure of the BAS Science Review Committee

N.B. All research units – whether they are centres, institutes or laboratories – are referred to as “Institutes” for the purpose of the general sections of this report

### 2.2.1 Composition of the Review Monitoring Committee (RMC)

The name and affiliation of the members of the RMC are listed in the table below.

<b>RMC Chair</b>	<b>Dr. Reinder van Duinen</b>	Former ESF President
<b>RMC Vice-Chair</b>	<b>Professor Alex Quintanilha</b>	Former Chair of ESF Standing Committee for Life, Earth and Environmental Sciences (LESC); Director, Institute for Molecular and Cell Biology, Porto, Portugal
<b>RMC Vice-Chair</b>	<b>Professor Naomi Segal</b>	Member of Core Group of ESF Standing Committee for the Humanities (SCH); Director, Institute of Germanic & Romance Studies, School of Advanced Study, University of London, UK
<b>Panel 1 Chair</b> For: Mathematics Physics, Chemistry, and Engineering	<b>Professor Juan M. Rojo</b>	Former Chair of ESF Standing Committee for Physical and Engineering Sciences (PESC); Professor, Department of Materials Science, Universidad Complutense, Madrid, Spain
<b>Panel 2 Chair</b> For: Biological Sciences	<b>Dr. Imre Vass</b>	Member of the EURYI Biology Panel; Biological Research Center, Plant Biology Institute, Hungarian Academy of Sciences, Szeged, Hungary
<b>Panel 3 Chair</b> For: Earth Sciences	<b>Professor Sierd Cloetingh</b>	Scientific Director, Netherlands Research Centre for Integrated Solid Earth Science; Faculty of Earth and Life Sciences, VU University, Amsterdam; Vice-President, Academia Europaea; Member, Scientific Council, ERC
<b>Panel 4 Chair</b> For: Humanities and Social Sciences	<b>Professor Arto Mustajoki</b>	President of the Finnish Academy of Science and Letters; Former Chair, Research Council “Culture & Society”, Academy of Finland; Department of Slavonic and Baltic Languages and Literatures, University of Helsinki, Finland

Dr. Rüdiger Klein (ALLEA) and Dr. Farzam Ranjbaran (ESF) provided secretarial support to the RMC.

## 2. The Review Structure and Process

### 2.2.2 Composition of the Four Panels of Experts

#### Composition of Panel 1

Panel 1 was responsible for the evaluation of the Institutes under four divisions:

- Mathematics: 3 Institutes
- Physical Sciences: 7 Institutes
- Chemical Sciences: 8 Institutes
- Engineering Sciences: 7 Institutes

The Panel had thirteen scientific members bringing the required expertise for the evaluation of the 25 Institutes within these divisions. The members of the Panel are listed in the table below. Professor Juan M. Rojo chaired the Panel, while secretarial support was provided by ESF staff member, Dr. Farzam Ranjbaran.

**Professor Marcel Arnould**

Institut d'Astronomie et d'Astrophysique,  
Université Libre de Bruxelles, Belgium

**Professor Martin Berggren**

Department of Computing Science,  
Umeå Universitet, Sweden

**Professor Jean Cadet\***

Commissariat à l'Énergie Atomique,  
CEA/Grenoble, France

**Dr. Barbara Camanzi**

Department of Particle Physics,  
Science and Technology Facilities Council, UK

**Professor Henryk Chojnacki**

Institute of Physical and Theoretical Chemistry,  
Faculty of Chemistry, Wrocław Technical University,  
Poland

**Professor João Pedro Conde**

Department of Chemical and Biological Engineering,  
Instituto Superior Técnico, Portugal

**Professor Manfred Husty**

Arbeitsbereich Geometrie und CAD,  
Leopold-Franzens-Universität Innsbruck, Austria

**Professor Laurens Katgerman**

Department of Materials Science and Engineering,  
Delft University of Technology, Netherlands

**Mr. Per Wilhelm Nieuwejaar**

Research Vessel Department, Institute of Marine  
Research, Norway

**Professor Jozef Novak**

Institute of Electrical Engineering,  
Slovak Academy of Sciences, Slovakia

**Professor Antonio Pascoal**

Department of Electrical Engineering,  
Institute for Systems and Robotics, Lisbon, Portugal

**Professor Juan Rojo**

Dpto Física de Materiales, Universidad Complutense  
de Madrid, Spain

**Dr. Jean-Yves Salpin**

CNRS, HDR, Laboratoire Analyse et Modélisation  
pour la Biologie et l'Environnement, Université d'Évry,  
France

**Professor Gábor Speier**

Department of Chemistry, University of Pannonia,  
Hungary

*\* Professor Jean Cadet joined the panel in the beginning but had to discontinue his involvement due to unforeseen events. He started the evaluation process and submitted the first draft of the Institute-level reports for those he had been assigned to but was unable to attend the on-site visits and interviews. Dr. Jean-Yves Salpin joined the panel and continued the work of Professor Cadet after the meeting of the panel in Amsterdam in June.*

#### Composition of Panel 2

Panel 2 was responsible for the evaluation of the Institutes within the Division of Biological Sciences. It had nine members bringing the required expertise for the evaluation of the 15 Institutes in this division. The members of the Panel are listed below. Dr. Imre Vass chaired the Panel while secretarial support was provided by ESF staff member, Dr. Astrid Lunkes.

**Dr. Lucia Altucci**

Dipartimento di Patologia Generale,  
Seconda Università degli Studi di Napoli, Napoli, Italy

**Dr. András Báldi**

Department of Zoology, Hungarian Natural History  
Museum, Budapest, Hungary

**Dr. Josef Bryja**

Institute of Vertebrate Biology, Academy of Sciences  
of the Czech Republic, Konešín, Czech Republic

**Dr. Paolo Cherubini**

WSL Swiss Federal Research Institute,  
Dendro Sciences Unit, Birmensdorf, Switzerland

**Professor Agnès Gruart**

Facultad de Ciencias Experimentales,  
Universidad Pablo de Olavide, Seville, Spain

**Dr. Francesco Loreto\***

Istituto di Biologia Agroambientale e Forestale,  
Consiglio Nazionale delle Ricerche, Umbria, Italy

**Professor Claudine Pique**

Director, Biologie Cellulaire et Interactions Hôtes  
Pathogènes, Institut Cochin INSERM, Paris, France

**Dr. Imre Vass**

Plant Biology Institute, Hungarian Academy  
of Sciences, Szeged, Hungary

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**Professor Veit Witzemann**

Abteilung Zellphysiologie, Max-Planck-Institut für medizinische Forschung, Heidelberg, Germany

*\* Professor Francesco Loreto took part in the panel and attended the Amsterdam meeting but did not participate in the site visits.*

**Composition of Panel 3**

This Panel was responsible for the evaluation of the Institutes within the Earth Sciences Division. It had six scientific members bringing the required expertise for the evaluation of the 11 Institutes. The members of the Panel are given in the table shown below. Professor Sierd Cloetingh chaired the Panel while secretarial support was provided by ESF staff member, Dr. Bernard Avril.

**Professor Jean Bonnin**

Institut de Physique du Globe, Université Louis Pasteur, Strasbourg, France

**Professor Sierd Cloetingh**

Netherlands Research Centre of Integrated Solid Earth Sciences, VU University, Amsterdam, The Netherlands

**Professor Hugo Declair**

Geografisch Instituut, Vrije Universiteit Brussel, Elsene, Belgium

**Professor Gilles Pinay**

School of Geography, Earth and Environmental Sciences, University of Birmingham, UK

**Professor Paul Tréguer**

Institut Universitaire Européen de la Mer, Université de Brest, Plouzané, France

**Professor John Zarnecki**

Planetary and Space Sciences Research Institute, The Open University, UK

**Composition of Panel 4**

Panel 4 was responsible for the evaluation of the 18 research Institutes within the two divisions outlined below:

- Humanities: 11 Institutes
- Social Sciences: 7 Institutes

It had eight members who, in addition to the Chair, brought together the required expertise. All Panel members are listed below. Professor Arto Mustajoki chaired the Panel, while secretarial support was provided by ALLEA staff member, Dr. Rüdiger Klein.

**Professor Andrés Barrera González**

Departamento de Antropología Social, Facultad de Ciencias Políticas y Sociología, Universidad Complutense de Madrid, Spain

**Professor Marie-Janine Calic**

Institute for Eastern and Southeast European History, University of Munich, Germany

**Professor Marc De Mey**

Professor of Cognitive Science, Faculty of Arts and Philosophy, Ghent University; Director of the Institute for Advanced Studies of the Royal Flemish Academy, Belgium

**Professor Monique Florenzano**

Centre d'Économie de la Sorbonne, Université Paris 1 Panthéon-Sorbonne (and CNRS), Paris, France

**Professor emer. Sven Gustavsson**

Professor emer. of Slavic languages, Uppsala University; Royal Swedish Academy of Letters, History and Antiquities, Stockholm, Sweden

**Professor Lise Hannestad**

Department of Classical Archaeology, University of Århus, Århus, Denmark

**Professor Michal Illner**

Department of Local and Regional Studies, Institute of Sociology of the Academy of Sciences of the Czech Republic, Prague, Czech Republic

**Professor Arto Mustajoki**

Department of Slavonic and Baltic Languages and Literatures, University of Helsinki, Finland; Former Chair, Research Council "Culture & Society", Academy of Finland; Former President of the Finnish Academy

**Professor Roman Wieruszewski**

Poznan Human Rights Center and Institute of Legal Studies of Polish Academy of Sciences, Poland

## 2.3 Evaluation Methodology and Protocol

The high-level workflow for implementing the evaluation is shown in Figure 2.

The Panels of Experts conducted assessments of the Institutes within their assigned remits. It had been anticipated that some cross-cutting or "horizontal" issues within and across divisions would be brought to light by the work of the panels. The RMC was to analyse the findings of each panel, to harmonise to a very limited extent the panel-level reports and to extract and synthesise a combined set of higher-level conclusions and recommendations for inclusion in this final report.

The basis for the protocol used for this evaluation was the "Standard Evaluation Protocol" (SEP; version 2003-2009)<sup>4</sup> for institutional evaluations. It has been

4. <http://www.allea.org/Pages/ALL/12/723.html>

## 2. The Review Structure and Process

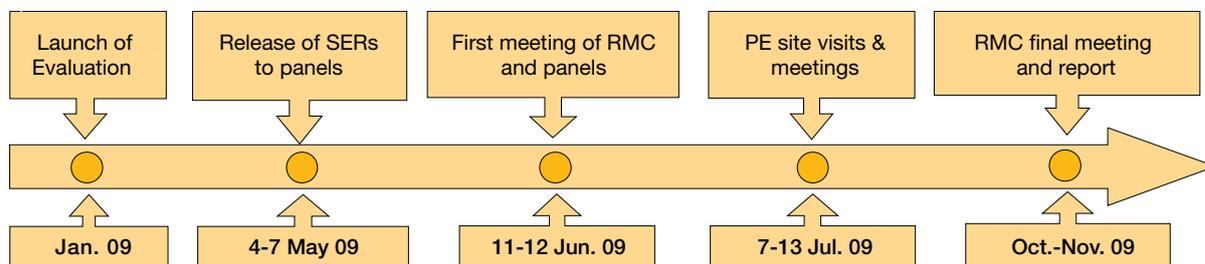


Figure 2: High-level workflow for the evaluation

developed in the Netherlands by the national research council (NWO), the Royal Academy of Arts and Sciences (KNAW) and the national university conference (VSNU). It was jointly agreed upon by ESF, ALLEA and BAS as the basis of the protocol to be used, and subsequently adapted in discussions within the *ad hoc* Technical Management Committee to fit the specific evaluation environment of the BAS Institutes. At its first meeting in June 2009, the Review Monitoring Committee suggested further slight modifications to the SEP, notably some adjustments of criteria and benchmark statements in the scoring system. The modified protocol is presented in the following sections.

Two main components formed the basis for the Institute-level assessments, namely: 1) the very detailed Self-Evaluation Reports (SER) prepared by all BAS Institutes and submitted at the beginning of the process in February 2009, and 2) the on-site visits and interviews by the panels in July 2009.

Every Institute was assigned one Lead Rapporteur (LR), one Co-Rapporteur (CR) and one Cross-Institute Rapporteur (XR) from among the panel members. Formally, a LR was given the responsibility for leading the “vertical” assessment, for the meetings during the site visit and for finalising the Institute-level reports. The CRs were asked to provide additional expertise and assist the LRs; the XRs – typically somewhat removed in terms of scientific expertise and therefore called upon to operate as generalists – were asked specifically to focus on existing and potential cross-Institute synergies and overlaps across the Institutes.

In February and March 2009, the SERs submitted were subjected to a first formal completeness check by the secretaries; they were then dispatched to the panels for an initial review prior to the first plenary meeting of all members of the Review Committee in Amsterdam in June 2009. With very short notice the Institutes were requested to submit amendments to their reports in order to simplify the task of panels in assessing the nature and impact of the very long list of publications reported in the SERs. These reports were all submitted on time for

the meeting of the panels in June. At this meeting, the overall evaluation process was discussed and fine-tuned by the RMC. Then the panels discussed in parallel sessions the Institutes and their SERs. They then compiled a series of panel-specific as well as overarching questions that were subsequently consolidated and sent to the Institutes through BAS. These very substantial sets of additional specific questions were answered admirably by the Institutes in great detail within two weeks.

In early July, each panel spent about one week on site visits to meet with practically all Institutes across the country and interviewed senior, mid-career and junior members of staff. Panels made a particular point of gathering the perspectives and ambitions of young scholars in the Academy system.

During the site visits the four panels conducted their activities slightly differently, depending on specific requirements of the scientific fields covered and of the Institutes visited. For example, Panel 1 chose not to physically visit all 25 Institutes, but representatives of all the Institutes were met and interviewed either at the Institutes or at the BAS Headquarters. All panels made a special effort also to meet, interview and listen to young scholars. These encounters took different forms (e.g., PE-1 and PE-2: separate interviews; PE-3: poster session; PE-4: presentation at the Institutes and cross-Institute cohort meeting).

The LRs drafted the first versions of the Institute-level assessments, based on the SERs submitted, their own investigations and analysis, as well as the input from the other two rapporteurs. The site visits were found to be crucially important as a “reality check”, as they allowed for intense and detailed interaction with numerous researchers, for insights into working conditions and for an overall better assessment of problems and perspectives.

The individual panel reports were prepared by all panels, with the exception of PE-4, mainly while still in Sofia. They were subsequently elaborated through electronic communication. The reports were approved by each panel and/or Panel Chair before being submitted to the

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RMC at the end of September. All reports benefited from the critical reading of the RMC Chair and Vice-Chairs and the further editing by the secretariats.

At their final meeting on 19 October in Frankfurt, the RMC discussed and harmonised as far as possible the four panel-level reports and agreed on the elements to be extracted for the general recommendations and conclusions. Panel-level reports were further fine-tuned in the subsequent weeks.

### 2.3.1 Evaluation Criteria

The evaluation criteria adopted for this exercise were based on the “Standard Evaluation Protocol” for institutional evaluations<sup>5</sup>. It encourages a “*descriptive evaluation that focuses on strengths and weaknesses (s/w) using four evaluation criteria*”, namely quality and productivity, scientific and societal relevance and prospects. For the purposes of this evaluation, it was found that a slight adaptation of the criteria would be useful. The modified criteria adopted for this evaluation were:

- **Quality and Productivity:** *international recognition and innovative potential and scientific output and international standing of the Institutes;*
- **Relevance:** *socio-economic impact;*
- **Prospects:** *vitality, feasibility, management, leadership and future potential/ability of the Institutes to tackle new scientific challenges.*

The evaluation therefore looked at three levels: a) **international** scientific standing; b) **domestic** socio-economic, including cultural, relevance; c) **internal** prospects of the Institutes examined.

### 2.3.2 Evaluation Scores

The scoring metric of the original SEP referred to in the original MoU was also slightly modified for this evaluation. This re-calibration was the result of a careful analysis during the first plenary meeting of the RMC and Expert Panels in June, which took into account the specific nature of the Institutes. An understanding had been reached that some Institutes are not exclusively or primarily devoted to basic research, but fulfil numerous other functions in the service of government agencies and society at large. It was found to be inappropriate to package all these very specific functions in one overall score. As a result, three separate scores are presented:

- **Overall score on quality and productivity combined:** focusing primarily on scientific achievements;
- **Score on relevance, understood as socio-economic impact:** focusing primarily on service, advice

and guidance functions (and including, where appropriate, specific teaching and outreach activities);

- **Score on prospects:** focusing on the scientific vitality and viability, on management and leadership issues, and on the future potential and ability of the Institutes to tackle new scientific challenges.

#### Overall Scores on combined Quality and Productivity (modified statements):

- **“A\*”** for work that is *internationally at the forefront*. The Institute has made a substantial impact in the field and is considered an international leader.
- **“A”** for work that is *internationally competitive*. The Institute has demonstrated important contributions to the field and is considered an international player.
- **“B”** for work that is *internationally visible*. The Institute has made valuable international contributions in the field.
- **“C”** for work that is solid and has added to our understanding and is in principle worthy of continuation. The Institute is *nationally visible*.
- **“D”** for work that is not solid or is a repetition of existing results, or for work that is flawed in the scientific and or technical approaches.

During the plenary meeting in Amsterdam in June the panels developed an additional ranking score for the other two criteria (“*relevance*” and “*prospects*”). The use of such separate scores had not been included in the initial work plan; they were communicated to and accepted by BAS.

The scores adopted for Relevance and Prospects are listed below.

#### Relevance: Socio-economic Impacts:

- A- Highly relevant
- B- Moderately relevant
- C- Not relevant

#### Prospects:

- A- High
- B- Moderate
- C- Low

5. <http://www.allea.org/Pages/ALL/12/723.html>

## 2. The Review Structure and Process

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### 2.3.3 Structure of the Self-Evaluation Reports

The Self-Evaluation Reports requested from the Institutes comprised the following main elements:

#### Section I. Actual situation based on last five years achievements

1. Name, date of establishment and organisational chart of the Unit.
2. Areas of activities and/or mission description.
3. Relation of the research **areas** and topics of the unit with the research policies and programmes approved by the General Assembly of BAS, and with national and/or EU research priorities.
4. **Leadership** – description based on the organisation chart with the names and titles of all leaders elected or appointed (directors, deputy directors, scientific secretaries, heads of **structural units** according to the organisation chart, chairperson of the scientific council, etc.).
5. **Researchers** and other personnel. Analysis of personnel and personnel development in the period 2004-2008. Separate information about young researchers.
6. Formal and informal bilateral and multilateral cooperation and relations with other research establishments (national, regional, international).
7. Organisation of the research process at the unit: team work, individual research activities, seminars, quality control, supervision of junior researchers, institutional planning and reporting, description of the internal procedures of evaluation, etc.
8. Participation of the unit in various educational activities. Analysis covering the period 2004-2008. Critical assessment of these activities. Research training for PhD students considered separately and including a critical analysis of the conditions and quality of this training.
9. Services of particular national importance connected to:
  - A) the operation of national, state and governmental institutions and supporting their functioning;
  - B) various regional initiatives and infrastructures.
10. Overall academic achievements or the reputation of the research unit as illustrated by all data for the period 2004-2008, with special stress on:
  - A) up to five most important scientific achievements;
  - B) up to five most important applied results and/or achievements;
  - C) total number of citations in the period 2004-2008;
  - D) critical assessment of all data.

#### Section II. Strategy and policies for future development

1. Envisaged development of research subjects and plans in the short- and long-term including perspectives for future strengthening of interdisciplinary collaborations within the Academy, at national level and internationally (in Europe and worldwide).
2. Current personnel policy as a basis for personal development policy including both plans for improving postgraduate research training schemes and PhD personnel recruitment.
3. Financial situation. Sources of finance: budget subsidy, additional sources – public, private, international – cash flow and acquired or donated material assets (excluding indirect, in-kind and other types of individual support, e.g., through international bilateral collaboration); strategy and policy for attracting more funding.
4. Critical assessment of the current structure of the research unit and the outlook for its future development.
5. Innovation potential of the research unit – patents, advanced technologies, prototypes, applications, perspectives for strengthening relations with industry and/or other sectors important for the economic development of the country. Critical assessment and future plans.
6. Short view of the perspectives of the unit emphasising its position within the research structure and strategic plans of BAS. Suggestions of what has to be done to meet the expectations of society for the future role of the Academy.

#### Annexes to the Self-Evaluation Report

1. Table of research projects for the period 2004-2008.
2. List of publications of the research scientists under various headings.
3. List of scientific products ready to be implemented in industry.
4. Table of scientific products, inventions and patents produced.
5. Patent-licences registered, including individual patents of scientists of the unit.
6. Information on the regular staff of the unit as on 31 December 2008.
7. Information on the age distribution of the regular staff of the unit.
8. Information on the PhD students in the unit.
9. Tables presenting participation of scientists in the unit in teaching and training.
10. Information on the expert activity of the scientists and the specialists with higher education from the unit.
11. Information on the international activity of the unit.
12. List of scientists from the unit who are members of editorial boards.

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## 2.4 BAS Institutes under Review

The research units (“Institutes”) of BAS are legal entities performing basic and applied research, postgraduate and postdoctoral training. Senior scholars from any scientific organisation in the country are eligible for the positions of director of the research units. They serve for four years.

There are a total number of 69 research units under eight scientific divisions within the Bulgarian Academy of Sciences, as follows:

### I. Mathematical Sciences

1. Institute of Mathematics and Informatics
2. Institute of Mechanics
3. Institute for Parallel Information Processing

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### II. Physical Sciences

1. Institute for Nuclear Research and Nuclear Energy
2. Institute of Solid State Physics
3. Institute of Electronics
4. Institute of Astronomy with National Astronomical Observatory – Rozhen
5. Central Laboratory of Solar Energy and New Energy Sources
6. Central Laboratory for Applied Physics – Plovdiv
7. Central Laboratory of Optical Storage and Processing of Information

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### III. Chemical Sciences

1. Institute of General and Inorganic Chemistry
2. Institute of Organic Chemistry with a Centre of Phyto-Chemistry
3. Institute of Physical Chemistry
4. Institute of Catalysis
5. Institute of Electrochemistry and Energy Systems
6. Institute of Chemical Engineering
7. Institute of Polymers
8. Central Laboratory of Photoprocesses

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### IV. Biological Sciences

1. Institute of Molecular Biology
2. Institute of Neurobiology
3. Institute of Biophysics
4. Institute of Plant Physiology
5. Institute of Genetics
6. Institute of Microbiology
7. Institute of Experimental Morphology and Anthropology with Museum
8. Institute of Experimental Pathology and Parasitology
9. Institute of Biology and Immunology of Reproduction
10. Institute of Botany
11. Institute of Zoology

12. Forest Research Institute
13. Central Laboratory of General Ecology
14. Central Laboratory of Biomedical Engineering
15. National Museum of Natural History

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### V. Earth Sciences

1. National Institute of Meteorology and Hydrology
2. Geological Institute
3. Geophysical Institute
4. Institute of Oceanology
5. Space Research Institute
6. Institute of Water Problems
7. Geographical Institute
8. Central Laboratory for Geodesy
9. Central Laboratory of Mineralogy and Crystallography
10. Institute of Solar-Terrestrial Influences
11. Central Laboratory for Seismic Mechanics and Earthquake Engineering

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### VI. Engineering Sciences

1. Institute of Metal Science
2. Bulgarian Ship Hydrodynamics Centre
3. Institute of Computer and Communication Systems
4. Institute of Information Technologies
5. Institute of Control and System Research
6. Central Laboratory of Mechatronics and Instrumentation
7. Central Laboratory of Physico-Chemical Mechanics

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### VII. Humanities

1. Institute of Bulgarian Language
2. Institute of Literature
3. Institute of History
4. Institute of Thracology
5. Institute of Archaeology with Museum
6. Institute of Balkan Studies
7. Ethnographic Institute with Museum
8. Institute of Art Studies
9. Institute of Folklore Studies
10. Cyrillo Methodian Research Centre
11. Centre for Architectural Studies

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### VIII. Social Sciences

1. Institute of Sociology
2. Institute of Economics
3. Institute of Philosophical Studies
4. Institute of Psychology
5. Institute of Legal Studies
6. Centre for Population Studies
7. Centre for Science Studies and History of Science

### 3. Overall Conclusions and Recommendations

This chapter sets out the main findings, conclusions and recommendations of the Review Committee. The overall distribution of the scores provided to all the Institutes

across the eight divisions for the three criteria of *Quality and Productivity*, *Relevance* and *Prospects* is illustrated in Figures 3, 4 and 5, below.

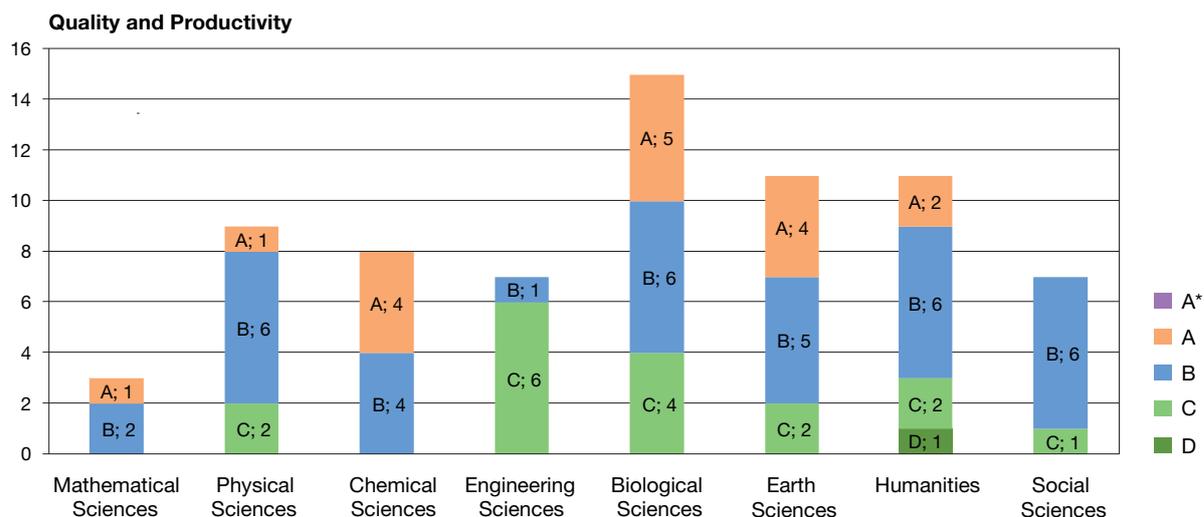


Figure 3: Distribution of scores for *Quality and Productivity* across all eight divisions

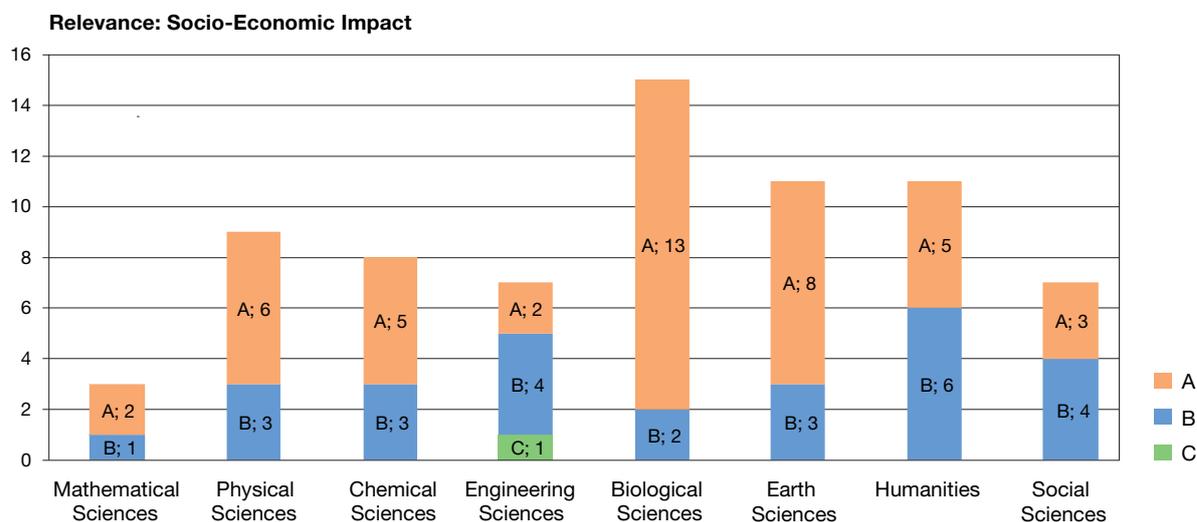


Figure 4: Distribution of scores for *Relevance* across all eight divisions

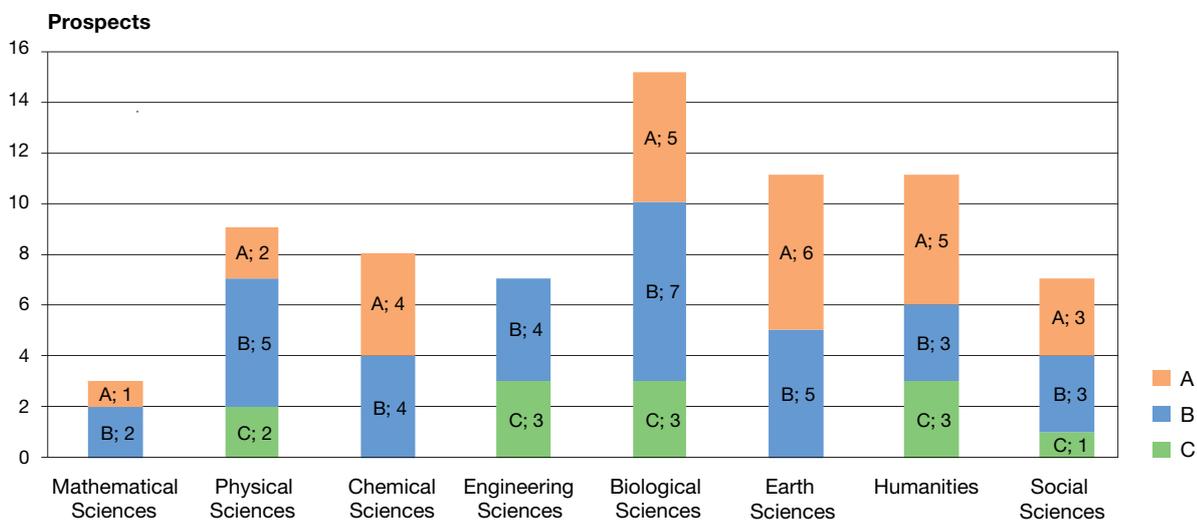


Figure 5: Distribution of scores for *Prospects* across all eight divisions

### 3.1 General Observations

The Review Committee has come to the unambiguous conclusion that the majority of BAS Institutes perform valuable research as judged by international standards. In some cases the panels found research groups that operate at the forefront worldwide. This overall result is regarded by the review team as an impressive achievement, considering the particularly difficult circumstances for research in Bulgaria.

In the Expert Panel reports one finds examples of Institutes that perform remarkably well in international comparison, produce research of the highest societal relevance for Bulgaria and the wider region. Our overall impression is, however, that this relatively good performance results largely from investments in the past and cannot be sustained without a considerable effort on the part of both BAS and the Bulgarian government.

While many improvements are possible and necessary internally, there is no doubt that without a very real commitment to top-level science in Bulgaria, and without concomitant financial support, BAS as the central science producer in the country will not be able to sustain its current national and international position.

The effort required is primarily a matter of providing better funding to BAS. Failing that, the only alternative is a further drastic reorganisation aimed at matching the ambitions and the scope of the research at BAS with the financial resources available.

Presently the organisation seems to be in a “survival mode” where the generation of additional income at the level of Institutes or even working groups takes precedence over the development and implementation of long-term, sound and sustainable research policies and plans, based on identified strengths and opportunities. These current choices may be understandable under the prevailing circumstances, but they are detrimental and cannot be maintained in the long run.

A somewhat comparable trade-off is made at the level of individual scientists who, in many cases, choose to take on a very heavy teaching load, almost equivalent to that of university staff. Needless to say, such efforts consume time and energy that should be devoted to top-level research.

Institutes should be encouraged to develop sustainable research plans and profiles and related funding strategies; researchers should be allowed to focus on research, limit overall teaching hours and pay the necessary attention to postgraduate training.

A few Institutes, due to their remit, have little or no possibility of acquiring additional funding in national or international competitions. For others, there appears to be scope for the generation of additional income through commercialising products, providing services or expert advice that could be more fully exploited. The Academy may need to re-think the position of some Institutes or some of the activities currently undertaken in the Institutes, whose potential might be better served by creating spin-offs which could operate more effectively in a commercial environment. In some cases the

### 3. Overall Conclusions and Recommendations

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possibilities of generating income through patents or by performing services to society also seem underutilised. With the development of better support structures, more opportunities for research funding from international sources, such as the European Commission's Framework Programmes or NSF and NIH in the USA, to name but a few, can be identified and used. Overall, more should be done to support the Institutes in creating competitive consortia, both inside the Academy and with partners outside the Academy.

The Academy should decide, jointly with the Institutes, on the right balance between centralised and decentralised support structures.

The activities of the Institutes which operate under the purview of the Academy show considerable variation, all the way from performing basic research to providing services to industry or government or Bulgarian society more broadly. It seems that this wide range of activities and scope has led to uncertainty with respect to the mission and task of some Institutes. It is important to set this straight, as uncertainty about mission, task and scope can easily lead to inefficiencies, overlap between Institutes and unnecessary internal competition and strife.

What is required is the development of a long-term vision of the aims and objectives of the Institutes, based on their strengths, and of BAS as a whole. The Academy should support the Institutes in developing a mission, based on identified research strengths while aiming at an appropriate balance between basic and applied science.

The Review Committee is aware that it is difficult to develop a meaningful strategy that moves beyond maintaining the status quo in an environment in which science and R&D foresight activities are not practised. The Committee has not found evidence for the effectiveness of the existing problem-oriented councils.

While the relative independence of Institutes is generally beneficial for creative research, such independence should primarily relate to "how" to execute the mission with the required tasks, not on "what" these tasks should be. Along similar lines the review has shed light on the necessity in many instances for better research collaboration between Institutes and, quite often, between BAS Institutes or Institute groupings and university departments. Similarly, decisions on costly equipment acquisition and access to research facilities need to be better coordinated, across BAS and in certain cases nationwide. *Most importantly*, the Academy should put in place a mechanism that would promote and enable research that is innovative and is on emerging topics.

Strategy development at Academy and Institute level should be informed by a collaborative attitude to the development and use of costly research facilities and by an appreciation and support for emerging research areas.

New topics for research often emerge at the boundaries of traditional research disciplines and almost by necessity across the boundaries between Institutes. Rather than focus on structural issues concerning internal organisation, the Academy should be committed to facilitating new lines of research and to the improvement of existing and identified strengths in and across the Institutes.

Given the value of independence, it would be appropriate if the BAS leadership facilitated different forms and platforms of collaboration and synergies, preferably motivated and developed by the Institutes that wish to embark on research in innovative and emerging areas.

The Committee would advise against such changes being brought about through structural measures from the top. The envisaged platforms should be used to discuss, debate and agree on the support for joint research programmes and infrastructural investments; to motivate and implement possible re-alignments of missions and tasks between individual Institutes or groups and, where applicable, to propose mergers between them. These measures could be submitted for final approval by the Board and/or the General Assembly. In order to provide guidance and to secure consistency of the reform process and compliance with the overall strategy, it is recommended that one individual at the level of the Board be assigned the responsibility for the steering of the transformation process in and with the Institutes, with the task of regularly reporting on the progress of new initiatives and reforms to the Academy leadership.

The Expert Panels found several instances of a dominant "inward" look in the Institutes. This also relates to the setting of research agendas which seem in some cases to take insufficient notice of cutting-edge developments in the associated research fields. The panels also found a tendency to publish many papers in in-house journals; publishing in international peer-reviewed journals or conference proceedings is underdeveloped in some fields. In some fields, notably in the Social Sciences and Humanities, publications in Bulgarian are welcome and necessary, as part of the international scientific communication on Bulgaro-centric topics and where the specialised readership can be expected to master the language. However, in a few cases elsewhere the relative prevalence of Bulgarian publications has made it more difficult to apply international standards in judging the quality of the research.

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Given the size and scope of the BAS Institutes the panels found an under-representation of papers published in international journals in some fields and relatively few Bulgarian scientists and scholars on the editorial boards of such journals.

The panels appreciate the need to publish results considered to be of social relevance in Bulgarian; but we also noted that some Institutes maintain their own in-house journals where there seems little or no justification for doing so.

In order to consistently achieve international visibility, a focus on publications in foreign languages is highly advisable. For in-house journals, BAS must enforce quality standards that would allow them to survive in any language environment.

It was not uncommon to find a large number of small projects in which Institutes and individual scientists participate. At the same time, perhaps too many Institutes seem to be making a conscious effort to let themselves be guided by the priorities of the European Commission's Framework Programmes.

The Expert Panels found a general tendency for the research activities of Institutes to be driven by funding opportunities rather than by a self-generated research agenda or plan. While this is understandable in terms of unlocking funding opportunities, it creates a real danger that in the longer run this may lead to a further fragmentation of research activity.

Chasing all funding opportunities means that the number of projects may be far higher than is commensurate with well-focused and well-planned research strategies. Quite possibly, the figures reflect a misunderstanding concerning the nature of this review, a belief that it was essential to report on all activities, however small. At any rate, the phenomenon may point to a necessity of improving the current research leadership provided by Institute management.

One way to deal effectively with the need to develop strategies in line with cutting-edge research could be the creation of an International Science Advisory Council for Institutes or groups of Institutes.

Such a Council could play a role not only in tracking the follow-up of recommendations resulting from this review and providing advice and support to Institute management, but also in discussing opportunities for opening up new lines of research in emerging fields that may extend beyond the borders of the existing Institutes, thereby potentially bringing them together in new and challenging constellations.

We learnt about the current difficulty of attracting and keeping young scientists in the BAS system. It seems that only a comparatively small fraction of students on a PhD track actually make it to the degree and quite often only after an unacceptably long time. We were surprised to find that not enough efforts have been made to resolve this problem. Clearly, BAS alone cannot tackle this fundamental issue, but it must be tackled with urgency. This and other issues related to careers and career perspectives need to be remedied.

### 3.2 Overall Recommendations

From the initial review of the Institutes' Self-Evaluation Reports (SERs) prior to and during the first meeting of the Expert Panels and the RMC in June, several issues recurred in many or even most of the SERs. It was decided to collect these issues from the individual Institute reports and to cluster them in such a way that they can be dealt with, where appropriate, at a more general level. It seemed that collective action on these issues at the level of the Academy would assist the Institutes in dealing with them more effectively.

Upon examining all panel reports prior to and during its October meeting in Frankfurt, the RMC decided on a selection of the most pressing issues facing the Institutes and the Academy on the basis of the Expert Panel reports. The specific and "horizontal" recommendations resulting from this effort are listed in the Section below.

However, before addressing these "horizontal" issues, one particular matter must, in the opinion of the Review Committee, be addressed first and foremost. It concerns the general financial situation of the Academy and, as a direct consequence, of the Institutes. While this is to a large extent beyond the responsibility of the Academy leadership, it is clear that the present funding situation is unsustainable. As suggested earlier, the danger is that the substantial potential value to society inherent within BAS will not be materialised. This is especially the case for the training and development of young researchers who, as the rising generation of scientists, will be the ones most needed to contribute to the development of Bulgaria as a competitive economy in a world that increasingly relies on knowledge generation and dissemination to tackle social and technical issues and to support and stimulate sustainable economic development.

BAS and the Bulgarian government are urged to work together in taking all the steps necessary in order to sustain the young talent currently linked to research institutions in the country; this may involve strengthening the career advice, incentive and mentoring system, reducing bureaucratic hurdles, making research careers more attractive.

## 3. Overall Conclusions and Recommendations

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The Expert Panels were most impressed by the level of professionalism, enthusiasm and commitment of the younger scientific staff members whom they met and interviewed. However, with a few notable exceptions, the Institutes cannot at this stage provide sufficiently attractive career prospects for talented researchers to stay on in the Bulgarian Academy system, largely as a result of lack of funds. This situation is aggravated by the seemingly more attractive salaries paid by the universities, as a result of which many staff members of the Academy Institutes take on a considerable teaching load on top of their required research work in order to augment their income. Some Institutes have successfully overcome these problems and are able to attract excellent young researchers. These examples of best practice should be used to stimulate other Institutes to change their policies.

A continued delay to establishing good working conditions and perspectives for young researchers will risk hampering Bulgaria's transition to a knowledge-based economy. Unique talents will have to be attracted to contribute to the development of Bulgaria as a competitive economy in a world that increasingly relies on knowledge generation and dissemination.

The budgetary flexibility given to universities through which they can reward teaching cannot, currently, be matched by the Academy through performance-related pay.

Another critical element is the need to retain and regain highly specialised, high performing and experienced researchers.

The brain drain of the most creative research talent to the outside world has not been stemmed yet. There are real challenges facing the Academy in creating competitive research environments, but the Review Committee believes creative measures are within reach: for example, attracting and facilitating comfortable returns or "soft-landing" for researchers after a period of conducting successful research abroad or ensuring an earlier engagement of the outstanding talents in key positions of decision making and scientific leadership.

There is no doubt that an improved quality of research in Bulgaria and in the Bulgarian Academy of Sciences in particular should involve better use of existing and identified strengths. This requires better coordination and clearly points to the need to expand joint research programmes cutting across the boundaries of Institutes within the Academy and universities, but also involving partners in the international arena.

Some successful activities in this direction have already been developed; judging by the number of national and international projects that were reported,

but the Review Committee feels that more should be done in this regard. BAS should strive harder to be recognised as an attractive partner in such collaborations. Expanding networking in research requires a flexible and supportive attitude by the Institutes towards their researchers venturing to participate in such national and international collaborations.

Joint research programmes between BAS Institutes and university researchers are likely to be beneficial in providing better links between the research system and society at large, resulting in higher quality advice and policy development. In many fields, BAS Institutes fulfil service functions to government and society, and the science system as a whole will be seen as a valuable and necessary ingredient for the development of Bulgaria.

BAS should stimulate and encourage national and international research collaborations with a view to enhancing the quality and relevance of the research produced and to further establishing its standing.

### 3.3 Specific Recommendations

#### A. Support young researchers

Understanding the needs of young researchers' careers was one of the key concerns in the Expert Panel discussions. Talent and enthusiasm for research and science abound among the young researchers we met, but some panels found a lower than desirable sense of competition and ambition among them. It appears that the scientific perspectives of the few young researchers the Institutes manage to attract are often established from the very beginning of their careers: many of them hold permanent positions even before receiving their PhD degrees. This may have given rise to a lack of clear and explicit drive towards high-achieving and outstanding performance. Some of the panels observed that the young scientists received insufficient encouragement and did not seem to feel entitled to launch independent lines of work or take advantage of the many existing opportunities to spend a postdoctoral period in a foreign laboratory.

Support for young researchers may include providing performance-related opportunities, where better pay is offered for work under non-permanent contracts.

#### A.1. Standardisation and modernisation of human resources policies and strategies

The Review Committee strongly recommends that practices at other European research performing organisations be studied as possible models in order to further modernise and enhance human resources policies and strategies within BAS. The core principles of transparency and fairness are to be exercised consistently and universally in recruiting processes.

- Some aspects needing particular attention are:
- i. standardisation of job profiles;
  - ii. recruitment policies and practices, including equal opportunity and transparency;
  - iii. promotion and remuneration policies and practices (performance-based);
  - iv. retirement policies and practices, including enforcement of replacement upon the incumbent's reaching retirement age, and as part of explicit rejuvenation activities; it might be advantageous to allow senior researchers to keep their non-monetary privileges at an Institute, provided they generate funds themselves;
  - v. BAS is strongly advised to establish a salary system in its Institutes that matches that of the Universities, i.e., to provide equal salaries for scientists of the same rank as in the Universities.

#### **A.2. Standardisation and modernisation of research career development policies and practices**

A crucial requirement for future success in achieving scientific excellence is to ensure that conscious and continuous efforts are made to attract, train, retain and reward young researchers. They should be guided early on towards establishing independent research groups.

Due to currently poor career perspectives, young and talented scientists prefer to go abroad or to leave the Academy's R&D system for well-paid jobs in the private sector. It is urgent to take concrete action.

The establishment of research career development policies and practices should be at the basis of any efforts in this domain. Some Institutes have been more successful than others in recruiting and retaining young researchers and their experience should be shared with others; transferable elements should be applied widely across the BAS system. It is necessary that strategies, policies and practices be defined and applied across all Institutes of the Academy.

As part of a future BAS Strategic Plan, mechanisms must be put in place to ensure that Institutes are not left to fend for themselves. However, an element of competition for the allocation of resources could benefit and reward innovative research.

The practice in other European Academies and research performing organisations should be studied as models in order to identify better practices and policies. Serious efforts should be made to attract more PhD students and early career researchers.

- Some of the elements to be considered are:
- i. campaign for the promotion of scientific careers and postgraduate studies;

- ii. create career development programmes including training;
- iii. encourage PhD dissertations to be written in English and, where necessary, make it a formal requirement for submission that excerpts be made available in English;
- iv. require inclusion of internal and external examiners as members of the PhD defence committees, preferably involving international members;
- v. promote dual PhD work under joint supervisions with European or international groups;
- vi. develop innovative incentives for high-performing PhD students or postdoctoral fellows, e.g., in the form of prizes, or special grants;
- vii. develop platforms for young researchers (PhDs, early postdocs) to exchange experiences and research results across scientific domains (graduate schools);
- viii. establish fast-track paths in the research leadership and internal governance and decision making structures of Institutes;
- ix. effective and strong supervision and mentoring such that high quality PhD degrees are awarded within reasonable periods (clarify mutual responsibilities between universities and BAS supervisors);
- x. creation of digital repository of dissertations completed with support of BAS Institutes;
- xi. clear definition, creation and promotion of competitively awarded postdoctoral fellowships, to be held as prerequisites to occupying more permanent positions;
- xii. encourage foreign postdoctoral applications;
- xiii. facilitate mobility while increasing retention: young scientists should be encouraged to go abroad for postdoctoral work, and the Institutes should attract them back to BAS with special packages ("safe-landing", for example with three-year fellowships plus start-up grants).
- xiv. involve younger researchers – elected by their colleagues – in the Scientific Councils, in order to further revitalise the research environment and decision making processes.

#### **B. Improve the research funding framework**

The current funding scheme makes available to BAS Institutes basic central BAS funding, plus some top-up, in addition to competitive funding for research in line with the priorities set by the National Science Fund, and support from other government agencies.

The Review Committee considers it a step in the right direction that new, larger grants will be made available for small consortia of three or more partner institutions.

### 3. Overall Conclusions and Recommendations

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With these new possibilities, Institutes may begin moving away from fragmented and small-scale research projects into more substantial activities that could have sizable impacts.

Institute strategies should comprise clear measures to support the establishment and implementation of programmes that involve appropriately all the required expertise (available in-house or elsewhere); small-scale individual projects should be discouraged except where the scientific culture or the research topic makes it necessary to operate in that way.

The following recommendations are made towards further facilitating funding of research projects across BAS.

#### **B.1. Incentives for securing external grants**

Researchers and teams who are successful in attracting funding for projects that are in line with the programmes established by the Institutes (or clusters of Institutes) should be rewarded.

#### **B.2. Co-funding scheme to stimulate success in securing external grants**

Many external funding opportunities, especially the EC Framework Programmes, do not fund projects at 100%. This may be a discouraging constraint and should be overcome by central co-funding of successful applications from a central fund.

#### **B.3. Create a Grants Office**

Such an office would:

- i. provide general administrative, financial and legal advice on issues related to grant negotiations and awards;
- ii. raise awareness of existing and emerging funding opportunities at the European level and internationally;
- iii. train and assist the researchers in their applications for other funding opportunities in Europe and elsewhere;
- iv. provide other administrative and legal advice and support on issues related to grant negotiations and management.

#### **B.4. Create a research innovation fund**

Researchers and research teams who are establishing new collaborative arrangements within BAS and with relevant new partners outside BAS in order to tackle new, emerging and innovative fields of research not yet properly contemplated as part of the science profile of their Institutes should be given support.

#### **C. Balance the teaching load and remove the gap between BAS and equivalent university salaries**

Educational activities currently make up much of the workload in almost all the Institutes; in general, the time allotted to teaching has acceptable proportions. However, there are BAS Institutes in which the extramural teaching load is disproportionately high and where teaching seems to be the main activity for some staff, which risks diverting energy and time away from research.

Teaching is often seen as a necessary salary supplement: the salary gaps between BAS and the universities must be eliminated. The budgetary flexibility given to universities through which they can reward teaching cannot, currently, be matched by the Academy through performance-related pay. Generally speaking, a limited amount of teaching should be a requirement for full-time researchers, but for active senior scientists two to three hours of lecturing per week appear to be a reasonable activity to keep contact with university education. This level of teaching should be preferentially focused on research training of graduate students and early-career scientists.

Although staff's personal economic situations may be a strong driver for excessive teaching hours, scientific staff and leaders should maintain a more visible and active presence in the scientific and research activities of their Institutes.

**C.1.** The Review Committee recommends that the Academy introduce clear guidelines and set limits on the acceptable teaching load of their researchers who lecture in universities so that their research activities are not jeopardised.

**C.2.** BAS has to ensure that these restrictions will not create financial stress among their researchers by ensuring that appropriate incentives and financial rewards (performance-related pay) are in place in-house.

#### **D. Set up Technology Transfer Office(s)**

Most universities and research performing organisations have set up offices that are responsible for all matters related to technology transfer, including commercialisation activities, licensing agreements, patent applications: given the emphasis placed by BAS on the appropriate balance between basic and applicable research, it is recommended that:

**D.1.** BAS consider establishing a central office of Technology Transfer;

**D.2.** this office also advise BAS and the Institutes on effective planning and execution of spin-offs into commercial companies;

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**D.3.** the office provide the expertise necessary to update the training of young researchers with relevant insights about knowledge transfer.

## **E. Improve the quality of scientific publishing**

The Expert Panels expressed concerns about three main issues in relation to publications: 1) foreign language publications in “in-house” periodicals that do not all meet international standards; 2) periodical publications in the Bulgarian language that do not meet international standards; 3) production of scholarly monographs, theses, outreach material, editorial and documentary works that are not adequately disseminated and used.

The Review Committee is concerned that the proportion of international publications is too low for some research fields and should be increased. BAS must discourage the production of more articles and papers in poor outlets, and instead actively encourage quality publications.

BAS should rigorously promote and enforce a culture of quality publications over quantity production: quality and international visibility must be increased. On the part of the researchers, achievements in placing specific work more centrally should be reflected in criteria for internal assessments and promotion.

BAS must consciously promote and explicitly encourage the culture of quality publications instead of accommodating the current trends that lead to the production of more articles regardless of international reach and impact. The Review Committee therefore recommends that BAS and its Institutes comprehensively review and streamline their publication culture and policies and consider an overall rationalisation of in-house publishing.

Special attention needs to be given to research publications in Bulgarian (in Social Sciences and Humanities), to scientific publications currently produced in book format, and to publications falling into the category of outreach and dialogue with society. Specifically, we recommend that BAS:

**E.1.** increase the proportion of scientific publications in international journals (included in citation indices; preferably those with “impact factor”), and highly ranked international conference proceedings, etc.;

**E.2.** improve in-house publications – whether in foreign languages or Bulgarian; they should be given a limited (say two-year) maturation period to reach international quality standards. Criteria for this upgrade include, but are not limited to: establishment of an active, international editorial board; timeliness of peri-

odical publications as announced; opening of the journal to unsolicited submissions from scholars in Bulgaria and elsewhere; implementation of a rigorous protocol for peer review of all papers submitted; keywords in English, etc. After this period, BAS should decide to discontinue journals that have been unable to upgrade their performance;

**E.3.** seek advice from other European and non-European research performing organisations on best practice and advice on relevant transition experiences for in-house publications;

**E.4.** make electronically available in full Open Access format all in-house publications (no significant income can be gained anyway, and visibility is unnecessarily reduced); relevant search engines and indices must be enabled to capture their titles and articles;

**E.5.** organise a central Open Access support unit, dealing both with technical and financial implications (including support for publications in international “author-pays” journals);

**E.6.** make accessible doctoral theses and other advanced scientific work leading up to higher research degrees, preferably through a centralised online digital repository (relevant parts, including summary in other international languages, preferably English);

**E.7.** include in the BAS portfolio publications falling into the category of outreach and dialogue with society only when they serve a specific promotional purpose; otherwise, commercial publishers seem to be better placed for such products.

## **F. Encourage organisational flexibility where scientifically beneficial**

Although a certain level of healthy competition between individual groups within the Academy can be beneficial, the Expert Panels observed situations where lack of coordination obstructed synergies, prevented overall coherence and even led to repetition and duplication. A certain number of these instances are described in detail in the Institute reports.

It is necessary to use the scarce resources in such a way that undesirable duplication of research portfolios and activities be avoided. There is also a need for better coordination of purchase and use of expensive equipment and infrastructures for which costs have been found to be disproportionately high for some Institutes. Some of the Institutes were found to be competing with each other in more or less similar research areas, while others were seen to have invested in similar equipment.

BAS has to capitalise on its existing strengths and to mobilise “bottom-up” clustering or groupings of

### 3. Overall Conclusions and Recommendations

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Institutes and sub-units that need to streamline their plans, activities, human resources and infrastructures. This could mean investigator-led merging of activities or even entire Institutes when justified by research programmes, equipment use and staff competencies. We therefore recommended that BAS:

- F.1.** be open to proceeding with a complete review of the underlying organisational structure of the Institutes within all eight divisions;
- F.2.** mobilise and enable investigator-driven competition for synergies and cooperation that capitalise on existing strengths;
- F.3.** formulate centrally some strategic scientific or technological directions that could be used, coupled with incentives, as beacons for facilitating the emergence of the required synergies and elimination of overlaps and restrictive competition;
- F.4.** remain open, at the same time, to the emergence of new fields (indeed, facilitate such emergence), that may challenge existing collaborative structures;
- F.5.** pay attention to the needs of long-term projects, which, if successfully reviewed on a regular basis, should not fall victim to such reorganisations.

#### **G. International Advisory Councils**

The Expert Panels have identified a real need for the establishment of consultative International Advisory Councils within the structure of the BAS scientific governance.

Such councils could operate at the level of each Institute or in support of groups of Institutes, but they may also be established to follow cross-cutting thematic areas where suitable. These councils should advise the Institute leadership and be consulted by BAS when leading positions are to be filled.

It is expected that the establishment and running of these councils will involve non-negligible costs, but it is recommended that, regardless of any other structural changes across divisions or Institutes, constituting such advisory councils should have a high priority.

It is believed that if internationally active, independent scientists can enter into and maintain a close consultative relationship with the scientific mission, strategy and activities of each Institute or group of Institutes, the ensuing added value will easily justify the investments made. The International Advisory Councils must be seen as part of the measures implemented by BAS to keep organisational structures subtle and flexible, capable of adapting to new scientific requirements: for this reason, the composition of the councils should include both specialists and generalists.

In the presence of strong International Advisory Councils, the role and mandate of the existing Scientific Councils as well as their interrelationship with these advisory councils will have to be scrutinised and clearly defined. Such changes could form part of the initial mission and activities of the Councils; therefore full independence of the boards must be maintained from the very beginning and throughout their activity.



