

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI



INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL
TRAINING AT THE UNIVERSITY OF HELSINKI 2005–2010

RC-Specific Evaluation of SB&B – Structural Biology & Biophysics Programme

Seppo Saari & Antti Moilanen (Eds.)



Evaluation Panel: Biological, Agricultural and Veterinary Sciences

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Title: International Evaluation of Research and Doctoral Training at the University of Helsinki 2005–2010 : RC-Specific Evaluation of SB&B – Structural Biology & Biophysics Programme	Type of publication: Evaluations
Summary: Researcher Community (RC) was a new concept of the participating unit in the evaluation. Participation in the evaluation was voluntary and the RCs had to choose one of the five characteristic categories to participate. Evaluation of the Researcher Community was based on the answers to the evaluation questions. In addition a list of publications and other activities were provided by the TUHAT system. The CWTS/Leiden University conducted analyses for 80 RCs and the Helsinki University Library for 66 RCs. Panellists, 49 and two special experts in five panels evaluated all the evaluation material as a whole and discussed the feedback for RC-specific reports in the panel meetings in Helsinki. The main part of this report is consisted of the feedback which is published as such in the report. Chapters in the report: 1. Background for the evaluation 2. Evaluation feedback for the Researcher Community 3. List of publications 4. List of activities 5. Bibliometric analyses The level of the RCs' success can be concluded from the written feedback together with the numeric evaluation of four evaluation questions and the category fitness. More conclusions of the success can be drawn based on the University-level report.	
RC-specific information:	
Main scientific field of research: Biological, Agricultural and Veterinary Sciences	RC-specific keywords: bioenergetics, bioinformatics, enzyme catalysis, NMR spectroscopy, protein structure, proteomics, X-ray diffraction
Participation category: 1. Research of the participating community represents the international cutting edge in its field	
RC's responsible person: Wikström, Mårten	
Keywords: Research Evaluation, Meta-evaluation, Doctoral Training, Bibliometric Analyses, Researcher Community	

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Foreword

The evaluation of research and doctoral training is being carried out in the years 2010–2012 and will end in 2012. The steering group appointed by the Rector in January 2010 set the conditions for participating in the evaluation and prepared the Terms of Reference to present the evaluation procedure and criteria. The publications and other scientific activities included in the evaluation covered the years 2005–2010.

The participating unit in the evaluation was defined as a Researcher Community (RC). To obtain a critical mass with university-level impact, the number of members was set to range from 20 to 120. The RCs were required to contain researchers in all stages of their research career, from doctoral students to principal investigators (PIs). All in all, 136 Researcher Communities participated in this voluntary evaluation, 5857 persons in total, of whom 1131 were principal investigators. PIs were allowed to participate in two communities in certain cases, and 72 of them used this opportunity and participated in two RCs.

This evaluation enabled researchers to define RCs from the “bottom up” and across disciplines. The aim of the evaluation was not to assess individual performance but a community with shared aims and researcher-training activities. The RCs were able to choose among five different categories that characterised the status and main aims of their research. The steering group considered the process of applying to participate in the evaluation to be important, which led to the establishment of these categories. In addition, providing a service for the RCs to enable them to benchmark their research at the global level was a main goal of the evaluation.

The data for the evaluation consisted of the RCs’ answers to evaluation questions on supplied e-forms and a compilation extracted from the TUHAT – Research Information System (RIS) on 12 April 2011. The compilation covered scientific and other publications as well as certain areas of scientific activities. During the process, the RCs were asked to check the list of publications and other scientific activities and make corrections if needed. These TUHAT compilations are public and available on the evaluation project sites of each RC in the TUHAT-RIS.

In addition to the e-form and TUHAT compilation, University of Leiden (CWTS) carried out bibliometric analyses from the articles included in the Web of Science (WoS). This was done on University and RC levels. In cases where the publication forums of the RC were clearly not represented by the WoS data, the Library of the University of Helsinki conducted a separate analysis of the publications. This was done for 66 RCs representing the humanities and social sciences.

The evaluation office also carried out an enquiry targeted to the supervisors and PhD candidates about the organisation of doctoral studies at the University of Helsinki. This and other documents describing the University and the Finnish higher education system were provided to the panellists.

The panel feedback for each RC is unique and presented as an entity. The first collective evaluation reports available for the whole panel were prepared in July–August 2011. The reports were accessible to all panel members via the electronic evaluation platform in August. Scoring from 1 to 5 was used to complement written feedback in association with evaluation questions 1–4 (scientific focus and quality, doctoral training, societal impact, cooperation) and in addition to the category evaluating the fitness for participation in the evaluation. Panellists used the international level as a point of comparison in the evaluation. Scoring was not expected to go along with a preset deviation.

Each of the draft reports were discussed and dealt with by the panel in meetings in Helsinki (from 11 September to 13 September or from 18 September to 20 September 2011). In these meetings the panels also examined the deviations among the scores and finalised the draft reports together.

The current RC-specific report deals shortly with the background of the evaluation and the terms of participation. The main evaluation feedback is provided in the evaluation report, organised according to the evaluation questions. The original material provided by the RCs for the panellists has been attached to these documents.

On behalf of the evaluation steering group and office, I sincerely wish to thank you warmly for your participation in this evaluation. The effort you made in submitting the data to TUHAT-RIS is gratefully acknowledged by the University. We wish that you find this panel feedback useful in many ways. The bibliometric profiles may open a new view on your publication forums and provide a perspective for discussion on your choice of forums. We especially hope that this evaluation report will help you in setting the future goals of your research.

Johanna Björkroth
Vice-Rector
Chair of the Steering Group of the Evaluation

Steering Group of the evaluation

Steering group, nominated by the Rector of the University, was responsible for the planning of the evaluation and its implementation having altogether 22 meetings between February 2010 and March 2012.

Chair

Vice-Rector, professor **Johanna Björkroth**

Vice-Chair

Professor **Marja Airaksinen**

Chief Information Specialist, Dr **Maria Forsman**

Professor **Arto Mustajoki**

University Lecturer, Dr **Kirsi Pyhälä**

Director of Strategic Planning and Development, Dr **Ossi Tuomi**

Doctoral candidate, MSocSc **Jussi Vauhkonen**

Panel members

CHAIR

Professor Ary A. Hoffman

Ecological genetics, evolutionary biology,
biodiversity conservation, zoology
University of Melbourne, Australia

VICE-CHAIR

Professor Barbara Koch

Forest Sciences, remote sensing
University of Freiburg, Germany

Professor Per-Anders Hansson

Agricultural engineering, modeling, life cycle
analysis, bioenergy
Swedish University of Agricultural Sciences

Professor Danny Huylebroeck

Developmental biology
Katholieke Universiteit Leuven, Belgium

Professor Jonathan King

Virus assembly, protein folding
Massachusetts Institute of Technology MIT, USA

Professor Hannu J.T. Korhonen

Functional foods, dairy technology, milk hygiene
MTT Agrifood Research Finland

Professor Kristiina Kruus

Microbiological biotechnology, microbiological
enzymes, applied microbiology
VTT Technical Research Centre of Finland

Professor Joakim Lundeberg

Biochemistry, biotechnology, sequencing, genomics
KTH Royal Institute of Technology, Sweden

Professor Dominiek Maes

Veterinary medicine
Ghent University, Belgium

Professor Olli Saastamoinen

Forest economics and policy
University of Eastern Finland

Professor Kai Simons

Biochemistry, molecular biology, cell biology
Max-Planck-Institute of Molecular Cell Biology and
Genetics, Germany

The panel, independently, evaluated all the submitted material and was responsible for the feedback of the RC-specific reports. The panel members were asked to confirm whether they had any conflict of interests with the RCs. If this was the case, the panel members disqualified themselves in discussion and report writing.

Added expertise to the evaluation was contributed by the members from the other panels and by one evaluator outside the panels.

External Expert
Professor Anders Linde
Oral biochemi
Faculty of Odontology
Göteborg University
Sweden

Experts from the Other Panels

Professor Caitlin Buck, from the Panel of Natural Sciences
Professor Ritske Huismans, from the Panel of Natural Sciences
Professor Johanna Ivaska, from the Panel of Medicine, biomedicine and health sciences
Professor Lea Kauppi, from the Panel of Natural Sciences
Professor Holger Stark, from the Panel of Natural Sciences
Professor Peter York, from the Panel of Medicine, biomedicine and health sciences

EVALUATION OFFICE

Dr Seppo Saari, Doc., Senior Adviser in Evaluation, was responsible for the entire evaluation, its planning and implementation and acted as an Editor-in-chief of the reports.

Dr Eeva Sievi, Doc., Adviser, was responsible for the registration and evaluation material compilations for the panellists. She worked in the evaluation office from August 2010 to July 2011.

MSocSc Paula Ranne, Planning Officer, was responsible for organising the panel meetings and all the other practical issues like agreements and fees and editing a part the RC-specific reports. She worked in the evaluation office from March 2011 to January 2012.

Mr Antti Mollanen, Project Secretary, was responsible for editing the reports. He worked in the evaluation office from January 2012 to April 2012.

TUHAT OFFICE

Provision of the publication and other scientific activity data

Mrs Aija Kaitera, Project Manager of TUHAT-RIS served the project ex officio providing the evaluation project with the updated information from TUHAT-RIS. The TUHAT office assisted in mapping the publications with CWTS/University of Leiden.

MA Liisa Ekebom, Assisting Officer, served in TUHAT-RIS updating the publications for the evaluation. She also assisted the UH/Library analyses.

BA Liisa Jäppinen, Assisting Officer, served in TUHAT-RIS updating the publications for the evaluation.

HELSINKI UNIVERSITY LIBRARY

Provision of the publication analyses

Dr Maria Forsman, Chief Information Specialist in the Helsinki University Library, managed with her 10 colleagues the bibliometric analyses in humanities, social sciences and in other fields of sciences where CWTS analyses were not applicable.

Acronyms and abbreviations applied in the report

External competitive funding

AF – Academy of Finland
TEKES - Finnish Funding Agency for Technology and Innovation
EU - European Union
ERC - European Research Council
International and national foundations
FP7/6 etc. /Framework Programmes/Funding of European Commission

Evaluation marks

Outstanding (5)
Excellent (4)
Very Good (3)
Good (2)
Sufficient (1)

Abbreviations of Bibliometric Indicators

P - Number of publications
TCS – Total number of citations
MCS - Number of citations per publication, excluding self-citations
PNC - Percentage of uncited publications
MNCS - Field-normalized number of citations per publication
MNJS - Field-normalized average journal impact
THCP10 - Field-normalized proportion highly cited publications (top 10%)
INT_COV - Internal coverage, the average amount of references covered by the WoS
WoS – Thomson Reuters Web of Science Databases

Participation category

Category 1. The research of the participating community represents the international cutting edge in its field.
Category 2. The research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through.
Category 3. The research of the participating community is distinct from mainstream research, and the special features of the research tradition in the field must be considered in the evaluation.
Category 4. The research of the participating community represents an innovative opening.
Category 5. The research of the participating community has a highly significant societal impact.

Research focus areas of the University of Helsinki

Focus area 1: The basic structure, materials and natural resources of the physical world
Focus area 2: The basic structure of life
Focus area 3: The changing environment – clean water
Focus area 4: The thinking and learning human being
Focus area 5: Welfare and safety
Focus area 6: Clinical research
Focus area 7: Precise reasoning
Focus area 8: Language and culture
Focus area 9: Social justice
Focus area 10: Globalisation and social change

1 Introduction to the Evaluation

1.1 RC-specific evaluation reports

The participants in the evaluation of research and doctoral training were Researcher Communities (hereafter referred to as the RC). The RC refers to the group of researchers who registered together in the evaluation of their research and doctoral training. Preconditions in forming RCs were stated in the Guidelines for the Participating Researcher Communities. The RCs defined themselves whether their compositions should be considered well-established or new.

It is essential to emphasise that the evaluation combines both meta-evaluation¹ and traditional research assessment exercise and its focus is both on the research outcomes and procedures associated with research and doctoral training. The approach to the evaluation is enhancement-led where self-evaluation constituted the main information. The answers to the evaluation questions formed together with the information of publications and other scientific activities an entity that was to be reviewed as a whole.

The present evaluation recognizes and justifies the diversity of research practices and publication traditions. Traditional Research Assessment Exercises do not necessarily value high quality research with low volumes or research distinct from mainstream research. It is challenging to expose the diversity of research to fair comparison. To understand the essence of different research practices and to do justice to their diversity was one of the main challenges of the present evaluation method. Understanding the divergent starting points of the RCs demanded sensitivity from the evaluators.

1.2 Aims and objectives in the evaluation

The aims of the evaluation are as follows:

- to improve the level of research and doctoral training at the University of Helsinki and to raise their international profile in accordance with the University's strategic policies. The improvement of doctoral training should be compared to the University's policy.²
- to enhance the research conducted at the University by taking into account the diversity, originality, multidisciplinary nature, success and field-specificity,
- to recognize the conditions and prerequisites under which excellent, original and high-impact research is carried out,
- to offer the academic community the opportunity to receive topical and versatile international peer feedback,
- to better recognize the University's research potential.
- to exploit the University's TUHAT research information system to enable transparency of publishing activities and in the production of reliable, comparable data.

1.3 Evaluation method

The evaluation can be considered as an enhancement-led evaluation. Instead of ranking, the main aim is to provide useful information for the enhancement of research and doctoral training of the participating RCs. The comparison should take into account each field of science and acknowledge their special character.

¹ The panellists did not read research reports or abstracts but instead, they evaluated answers to the evaluation questions, tables and compilations of publications, other scientific activities, bibliometrics or comparable analyses.

² [Policies on doctoral degrees and other postgraduate degrees at the University of Helsinki.](#)

The comparison produced information about the present status and factors that have lead to success. Also challenges in the operations and outcomes were recognized.

The evaluation approach has been designed to recognize better the significance and specific nature of researcher communities and research areas in the multidisciplinary top-level university. Furthermore, one of the aims of the evaluation is to bring to light those evaluation aspects that differ from the prevalent ones. Thus the views of various fields of research can be described and research arising from various starting points understood better. The doctoral training is integrated into the evaluation as a natural component related to research. Operational processes of doctoral training are being examined in the evaluation.

Five stages of the evaluation method were:

1. Registration – Stage 1
2. Self-evaluation – Stage 2
3. TUHAT³ compilations on publications and other scientific activities⁴
4. External evaluation
5. Public reporting

1.4 Implementation of the external evaluation

Five Evaluation Panels

Five evaluation panels consisted of independent, renowned and highly respected experts. The main domains of the panels are:

1. biological, agricultural and veterinary sciences
2. medicine, biomedicine and health sciences
3. natural sciences
4. humanities
5. social sciences

The University invited 10 renowned scientists to act as chairs or vice-chairs of the five panels based on the suggestions of faculties and independent institutes. Besides leading the work of the panel, an additional role of the chairs was to discuss with other panel chairs in order to adopt a broadly similar approach. The panel chairs and vice-chairs had a pre-meeting on 27 May 2011 in Amsterdam.

The panel compositions were nominated by the Rector of the University 27 April 2011. The participating RCs suggested the panel members. The total number of panel members was 50. The reason for a smaller number of panellists as compared to the previous evaluations was the character of the evaluation as a meta-evaluation. The panellists did not read research reports or abstracts but instead, they evaluated answers to the evaluation questions, tables and compilations of publications, other scientific activities, bibliometrics and comparable analyses.

The panel meetings were held in Helsinki:

- On 11–13 September 2011: (1) biological, agricultural and veterinary sciences, (2) medicine, biomedicine and health sciences and (3) natural sciences.
- On 18–20 September 2011: (4) humanities and (5) social sciences.

³ TUHAT (acronym) of Research Information System (RIS) of the University of Helsinki

⁴ Supervision of thesis, prizes and awards, editorial work and peer reviews, participation in committees, boards and networks and public appearances.

1.5 Evaluation material

The main material in the evaluation was the RCs' self-evaluations that were qualitative in character and allowed the RCs to choose what was important to mention or emphasise and what was left unmentioned.

The present evaluation is exceptional at least in the Finnish context because it is based on both the evaluation documentation (self-evaluation questions, publications and other scientific activities) and the bibliometric reports. All documents were delivered to the panellists for examination.

Traditional bibliometrics can be reasonably done mainly in medicine, biosciences and natural sciences when using the Web of Science database, for example. Bibliometrics, provided by CWTS/The Centre for Science and Technology Studies, University of Leiden, cover only the publications that include WoS identification in the TUHAT-RIS.

Traditional bibliometrics are seldom relevant in humanities and social sciences because the international comparable databases do not store every type of high quality research publications, such as books and monographs and scientific journals in other languages than English. The Helsinki University Library has done analysis to the RCs, if their publications were not well represented in the Web of Science databases (RCs should have at least 50 publications and internal coverage of publications more than 40%) – it meant 58 RCs. The bibliometric material for the evaluation panels was available in June 2011. The RC-specific bibliometric reports are attached at the end of each report.

The panels were provided with the evaluation material and all other necessary background information, such as the basic information about the University of Helsinki and the Finnish higher education system.

Evaluation material

1. Registration documents of the RCs for the background information
2. Self evaluation material – answers to the evaluation questions
3. Publications and other scientific activities based on the TUHAT RIS:
 - 3.1. statistics of publications
 - 3.2. list of publications
 - 3.3. statistics of other scientific activities
 - 3.4. list of other scientific activities
4. Bibliometrics and comparable analyses:
 - 4.1. Analyses of publications based on the verification of TUHAT-RIS publications with the Web of Science publications (CWTS/University of Leiden)
 - 4.2. Publication statistics analysed by the Helsinki University Library - mainly for humanities and social sciences
5. University level survey on doctoral training (August 2011)
6. University level analysis on publications 2005–2010 (August 2011) provided by CWTS/University of Leiden

Background material

University of Helsinki

- [Basic information about the University of the Helsinki](#)
- [The structure of doctoral training at the University of Helsinki](#)
- Previous evaluations of research at the University of Helsinki – links to the reports: [1998](#) and [2005](#)

The Finnish Universities/Research Institutes

- [Finnish University system](#)
- [Evaluation of the Finnish National Innovation System](#)
- [The State and Quality of Scientific Research in Finland. Publication of the Academy of Finland 9/09.](#)

The evaluation panels were provided also with other relevant material on request before the meetings in Helsinki.

1.6 Evaluation questions and material

The participating RCs answered the following evaluation questions which are presented according to the evaluation form. In addition, TUHAT RIS was used to provide the **additional material** as explained. For giving the feedback to the RCs, the panellists received the evaluation feedback form constructed in line with the evaluation questions:

1. Focus and quality of the RC's research

- Description of
 - the RC's research focus.
 - the quality of the RC's research (incl. key research questions and results)
 - the scientific significance of the RC's research in the research field(s)
- Identification of the ways to strengthen the focus and improve the quality of the RC's research

The additional material: TUHAT compilation of the RC's publications, analysis of the RC's publications data (provided by University of Leiden and the Helsinki University Library)

A written feedback from the aspects of: scientific quality, scientific significance, societal impact, innovativeness

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

2. Practises and quality of doctoral training

- Organising of the doctoral training in the RC. Description of the RC's principles for:
 - recruitment and selection of doctoral candidates
 - supervision of doctoral candidates
 - collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes
 - good practises and quality assurance in doctoral training
 - assuring of good career perspectives for the doctoral candidates/fresh doctorates
- Identification of the RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.

The additional material: TUHAT compilation of the RC's other scientific activities/supervision of doctoral dissertations

A written feedback from the aspects of: processes and good practices related to leadership and management

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

3. The societal impact of research and doctoral training

- Description on how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).
- Identification of the ways to strengthen the societal impact of the RC's research and doctoral training.

The additional material: TUHAT compilation of the RC's other scientific activities.

A written feedback from the aspects of: societal impact, national and international collaboration, innovativeness

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

4. International and national (incl. intersectoral) research collaboration and researcher mobility

- Description of
 - the RC's research collaborations and joint doctoral training activities
 - how the RC has promoted researcher mobility
- Identification of the RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.

A written feedback from the aspects of: scientific quality, national and international collaboration

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

5. Operational conditions

- Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).
- Identification of the RC's strengths and challenges related to operational conditions, and the actions planned for their development.

A written feedback from the aspects of: processes and good practices related to leadership and management

- Strengths
- Areas of development
- Other remarks
- Recommendations

6. Leadership and management in the researcher community

- Description of
 - the execution and processes of leadership in the RC
 - how the management-related responsibilities and roles are distributed in the RC
 - how the leadership- and management-related processes support
 - high quality research
 - collaboration between principal investigators and other researchers in the RC
 - the RC's research focus
 - strengthening of the RC's know-how
- Identification of the RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes

7. External competitive funding of the RC

- The RCs were asked to provide information of such external competitive funding, where:
 - the funding decisions have been made during 1.1.2005-31.12.2010, and
 - the administrator of the funding is/has been the University of Helsinki
- On the e-form the RCs were asked to provide:
 - 1) The relevant funding source(s) from a given list (Academy of Finland/Research Council, TEKES/The Finnish Funding Agency for Technology and Innovation, EU, ERC, foundations, other national funding organisations, other international funding organisations), and
 - 2) The total sum of funding which the organisation in question had decided to allocate to the RCs members during 1.1.2005-31.12.2010.

Competitive funding reported in the text is also to be considered when evaluating this point.

A written feedback from the aspects of: scientific quality, scientific significance, societal impact, innovativeness, future significance

- Strengths
- Areas of development
- Other remarks
- Recommendations

8. The RC's strategic action plan for 2011-2013

- RC's description of their future perspectives in relation to research and doctoral training.

A written feedback from the aspects of: scientific quality, scientific significance, societal impact, processes and good practices related to leadership and management, national and international collaboration, innovativeness, future significance

- Strengths
- Areas of development

- Other remarks
- Recommendations

9. Evaluation of the category of the RC in the context of entity of the evaluation material (1-8)

The RC's fitness to the chosen participation category

A written feedback evaluating the RC's fitness to the chosen participation category

- Strengths
- Areas of development
- Other remarks
- Recommendations

Numeric evaluation: OUTSTANDING (5), EXCELLENT (4), VERY GOOD (3), GOOD (2), SUFFICIENT (1)

10. Short description of how the RC members contributed the compilation of the stage 2 material

Comments on the compilation of evaluation material

11. How the UH's focus areas are presented in the RC's research?

Comments if applicable

12. RC-specific main recommendations based on the previous questions 1-11

13. RC-specific conclusions

1.7 Evaluation criteria

The panellists were expected to give evaluative and analytical feedback to each evaluation question according to their aspects in order to describe and justify the quality of the submitted material. In addition, the evaluation feedback was asked to be pointed out the level of the performance according to the following classifications:

- outstanding (5)
- excellent (4)
- very good (3)
- good (2)
- sufficient (1)

Evaluation according to the criteria was to be made with thorough consideration of the entire evaluation material of the RC in question. Finally, in questions 1-4 and 9, the panellists were expected to classify their written feedback into one of the provided levels (the levels included respective descriptions, 'criteria'). Some panels used decimals in marks. The descriptive level was interpreted according to the integers and not rounding up the decimals by the editors.

Description of criteria levels

Question 1 – FOCUS AND QUALITY OF THE RC'S RESEARCH

Classification: Criteria (level of procedures and results)

Outstanding quality of procedures and results (5)

Outstandingly strong research, also from international perspective. Attracts great international interest with a wide impact, including publications in leading journals and/or monographs published by leading international publishing houses. The research has world leading qualities. The research focus, key research questions scientific significance, societal impact and innovativeness are of outstanding quality.

In cases where the research is of a national character and, in the judgement of the evaluators, should remain so, the concepts of "international attention" or "international impact" etc. in the grading criteria above may be replaced by "international comparability".

Operations and procedures are of outstanding quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are in alignment with the documentation. The ambition to develop the community together is of outstanding quality.

Excellent quality of procedures and results (4)

Research of excellent quality. Typically published with great impact, also internationally. Without doubt, the research has a leading position in its field in Finland.

Operations and procedures are of excellent quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of excellent quality.

Very good quality of procedures and results (3)

The research is of such very good quality that it attracts wide national and international attention.

Operations and procedures are of very good quality, transparent and shared in the community. The improvement of research and other efforts are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of very good quality.

Good quality of procedures and results (2)

Good research attracting mainly national attention but possessing international potential, extraordinarily high relevance may motivate good research.

Operations and procedures are of good quality, shared occasionally in the community. The improvement of research and other efforts are occasionally documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of good quality.

Sufficient quality of procedures and results (1)

In some cases the research is insufficient and reports do not gain wide circulation or do not have national or international attention. Research activities should be revised.

Operations and procedures are of sufficient quality, shared occasionally in the community. The improvement of research and other efforts are occasionally documented and operations and practices are to some extent in alignment with the documentation. The ambition to develop the community together is of sufficient quality.

Question 2 – DOCTORAL TRAINING

Question 3 – SOCIETAL IMPACT

Question 4 – COLLABORATION

Classification: Criteria (level of procedures and results)

Outstanding quality of procedures and results (5)

Procedures are of outstanding quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are in alignment with the documentation. The ambition to develop the community together is of outstanding quality. The procedures and results are regularly evaluated and the feedback has an effect on the planning.

Excellent quality of procedures and results (4)

Procedures are of excellent quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of excellent quality. The procedures and outcomes are evaluated and the feedback has an effect on the planning.

Very good quality of procedures and results (3)

Procedures are of very good quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and

management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of very good quality.

Good quality of procedures and results (2)

Procedures are of good quality, shared occasionally in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are documented and operations and practices are to large extent in alignment with the documentation. The ambition to develop the community together is of good quality.

Sufficient quality of procedures and results (1)

Procedures are of sufficient quality, transparent and shared in the community. The practices and quality of doctoral training/societal impact/international and national collaboration/leadership and management are occasionally documented and operations and practices are to some extent in alignment with the documentation. The ambition to develop the community together is of sufficient quality.

Question 9 – CATEGORY

Participation category – fitness for the category chosen

The choice and justification for the chosen category below should be reflected in the RC's responses to the evaluation questions 1–8.

1. *The research of the participating community represents the international cutting edge in its field.*
2. *The research of the participating community is of high quality, but the community in its present composition has yet to achieve strong international recognition or a clear break-through.*
3. *The research of the participating community is distinct from mainstream research, and the special features of the research tradition in the field must be considered in the evaluation.* The research is of high quality and has great significance and impact in its field. However, the generally used research evaluation methods do not necessarily shed sufficient light on the merits of the research.
4. *The research of the participating community represents an innovative opening.* A new opening can be an innovative combination of research fields, or it can be proven to have a special social, national or international demand or other significance. Even if the researcher community in its present composition has yet to obtain proof of international success, its members can produce convincing evidence of the high level of their previous research.
5. *The research of the participating community has a highly significant societal impact.* The participating researcher community is able to justify the high social significance of its research. The research may relate to national legislation, media visibility or participation in social debate, or other activities promoting social development and human welfare. In addition to having societal impact, the research must be of a high standard.

An example of outstanding fitness for category choice (5) ⁵

The RC's representation and argumentation for the chosen category were convincing. The RC recognized its real capacity and apparent outcomes in a wider context to the research communities. The specific character of the RC was well-recognized and well stated in the responses. The RC fitted optimally for the category.

- Outstanding (5)
- Excellent (4)
- Very good (3)
- Good (2)
- Sufficient (1)

The above-mentioned definition of outstanding was only an example in order to assist the panellists in the positioning of the classification. There was no exact definition for the category fitness.

⁵ The panels discussed the category fitness and made the final conclusions of the interpretation of it.

1.8 Timetable of the evaluation

The main timetable of the evaluation:

- | | |
|--|-----------------------|
| 1. Registration | November 2010 |
| 2. Submission of self-evaluation materials | January–February 2011 |
| 3. External peer review | May–September 2011 |
| 4. Published reports | March–April 2012 |
| - University level public report | |
| - RC specific reports | |

The entire evaluation was implemented during the university's strategy period 2010–2012. The preliminary results were available for the planning of the following strategy period in late autumn 2011. The evaluation reports will be published in March/April 2012. More detailed time schedule is published in the University report.

1.9 Evaluation feedback – consensus of the entire panel

The panellists evaluated all the RC-specific material before the meetings in Helsinki and mailed the draft reports to the evaluation office. The latest interim versions were on-line available to all the panellists on the Wiki-sites. In September 2011, in Helsinki the panels discussed the material, revised the first draft reports and decided the final numeric evaluation. After the meetings in Helsinki, the panels continued working and finalised the reports before the end of November 2011. The final RC-specific reports are the consensus of the entire panel.

The evaluation reports were written by the panels independently. During the editing process, the evaluation office requested some clarifications from the panels when necessary. The tone and style in the reports were not harmonized in the editing process. All the reports follow the original texts written by the panels as far as it was possible.

The original evaluation material of the RCs, provided for the panellists is attached at the end of the report. It is essential to notice that the exported lists of publications and other scientific activities depend how the data was stored in the TUHAT-RIS by the RCs.

2 Evaluation feedback

2.1 Focus and quality of the RC's research

- *Description of*
 - *the RC's research focus*
 - *the quality of the RC's research (incl. key research questions and results)*
 - *the scientific significance of the RC's research in the research field(s)*
 - *Identification of the ways to strengthen the focus and improve the quality of the RC's research*
- ASPECTS: Scientific quality, scientific significance, societal impact, innovativeness*

This Institute of Biotechnology (BI) affiliated RC SB&B with ten PIs solves 3D atomic structures of mainly proteins, including important enzymes and receptor and effector proteins, but studies also their action mechanism(s) at that level of resolution. In doing so, it has added an important capacity to the Finnish science (including collaborators from other Centres of Excellence) and its international collaborators to answer specific and – importantly – quantitative questions on a wide range of proteins relevant to medicine and cell biology. The contributions to elucidating the structural biochemistry of the cytochrome c/cytochrome oxidase and related systems are central to modern biochemistry and cell biology. The same is true for projects studying the cytoskeleton.

In Structural Biology and Biophysics, publication in journals like JACS and JMB is a reference point with peers for excellent quality in these fields. Regrettably for workers in these fields, these journals do not have the same impact factors as those in the (bio)medical and certainly the human genetics fields. However, many of the PIs in this RC compensate this effectively by providing results on crucial aspects of studies on important proteins in signaling and cell biology. As a result, many collaborative studies have been published in top journals like PNAS, journals of the Nature series, Molecular Cell and others. On the basis of these successful collaborations (in terms of impact factor of the journal), the need for the future and hence the enduring of infrastructure investment should be made clear to and by the BI as it is the prime player in Finland. Strategic decisions should be made whether they should continue to invest in structural biology and, as part of this, acquire newer and more powerful NMR instruments or – rather, under the new director at the BI – would consider joining and/or collaborating with other infrastructures in other countries. This discussion would then join the other one forwarded in the evaluation material, which is to replace the highly competent senior staff that are capable to engage in multi-disciplinary studies as well, but will shortly retire. Recruitment of international talent may be dependent on the state-of-the-art and hence on the most modern equipment that is available on-campus.

Modern biological and biomedical research absolutely requires support of core structural studies like the ones presented in this RC. If this RC is the major trainer of doctorates in structural biology in Finland (which we believe it is), they are also going to play a central role in supporting future research efforts, which may be in very different areas than the current research of the present principal investigators. The expertise and the instrument park are impressive, however the evaluation material mentions the danger of underinvestment in most recent years, as – for example – >900 MHz NMR instrumentation has already been purchased in other countries including Scandinavia, while this is not the case in Finland and the University of Helsinki (UH) in particular. Therefore, through its general recommendations to the UH, the panel also suggests to consider to separate, budget circuit-wise, the establishment and maintenance of large instrumentation, such as those in the structural biology field, from the formation of the RCs, which should mainly be more thematically driven.

Numeric evaluation: 4 (Excellent)

2.2 Practises and quality of doctoral training

- *Organising of the doctoral training in the RC. Description of the RC's principles for:*
 - *recruitment and selection of doctoral candidates*
 - *supervision of doctoral candidates*
 - *collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes*
 - *good practises and quality assurance in doctoral training*
 - *assuring of good career perspectives for the doctoral candidates/fresh doctorates*
- *Identification of the RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.*
- *Additional material: TUHAT compilation of the RC's other scientific activities/supervision of doctoral dissertations*

ASPECTS: *Processes and good practices related to leadership and management*

The SB&B's fields are out of the mainstream for PhD students as many are attracted to other types of research that are – in their view – closer to (bio)medical research. The PIs of SB&B are aware of this and have taken accurate measures to recruit talented students. These are mainly identified because of the much appreciated teaching commitment in many programs at the UH, including at undergraduate/masters level. PhD students in the various groups belong to different national graduate schools, and stringent comparative criteria are applied to select the best candidates for the funded positions.

The members of this RC have installed an adequate quality mechanism for selecting and monitoring PhD students, and keep a keen eye on having these students involved in projects that span at least two departments/institutes. Regular meetings with the supervising PI and the appointed thesis committee will ensure that progression of the students is closely monitored. The PIs are strongly involved in the various graduate schools and contribute thus significantly to doctoral training. Graduating students are actively encouraged to seek international post-doc training and thus far the trained students have effectively found employment.

The RC needs to continue to develop an organizational plan for recruiting interested and competent students – for example by establishing communication networks with the faculty teaching undergraduate physical chemistry, or materials or computer science, and that are actively recruiting candidates.

Numeric evaluation: 4 (Excellent)

2.3 The societal impact of research and doctoral training

- *Description on how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).*
- *Identification of the ways to strengthen the societal impact of the RC's research and doctoral training.*
- *Additional material: TUHAT compilation of the RC's other scientific activities.*

ASPECTS: *Societal impact, national and international collaboration, innovativeness*

The PhD students, despite their research in specialist fields, are definitely trained with the idea to develop them with interdisciplinary skills, which optimizes their chances on the job market not only in academia but also in industry. Members of the RC have been involved in multiple initiatives towards the lay public and – importantly – young scholars.

The research of this RC has also strong links with industry, and close collaboration with several Finnish companies has had a positive impact on their commercial performance. Thus the versatile expertise of the researchers in this RC is also acknowledged and in demand by the private sector.

Numeric evaluation: 4 (Excellent)

2.4 International and national (incl. intersectoral) research collaboration and researcher mobility

- *Description of*
 - *the RC's research collaborations and joint doctoral training activities*
 - *how the RC has promoted researcher mobility*
- *Identification of the RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.*

ASPECTS: *Scientific quality, national and international collaboration*

Many members of RC SB&B are internationally recognized as important players and prime contributors to the structural biology field. Because of their reputation and their policy to extensively engage in national and international collaborations, this RC can serve as an important node for short to long-term work visits by young scientists from all over the world.

Their track record highlights their ability to provide added value to the Finnish as well as the international research community, and their expertise has been critical for the success of many research groups in a wide range of biological and medical disciplines. The plan is to continue on this successful track, and that indeed is advisable. At the same time, plans to further strengthen the thematic research driven by these research groups themselves should also be considered.

Numeric evaluation: 4 (Excellent)

2.5 Operational conditions

- *Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).*
- *Identification of the RC's strengths and challenges related to operational conditions, and the actions planned for their development.*

ASPECTS: *Processes and good practices related to leadership and management*

This RC is well-equipped. However, it warns for the danger of lagging behind if no long-term strategy is in place to replace key senior scientists that will retire and to purchase/update key heavy equipment, and both of these are also linked (see also section 2.1). The strengths of this RC definitely are its critical mass and its flexibility with regard to entering collaborations with major players in the (bio)medical field, where SB&B can indeed have a large impact and influence many of the projects in that field as well, provided that SB&B is in place.

2.6 Leadership and management in the researcher community

- *Description of*
 - *the execution and processes of leadership in the RC*
 - *how the management-related responsibilities and roles are distributed in the RC*
 - *how the leadership- and management-related processes support*
 - *high quality research*
 - *collaboration between principal investigators and other researchers in the RC*
 - *the RC's research focus*
 - *strengthening of the RC's know-how*
- *Identification of the RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes*

ASPECTS: *Processes and good practices related to leadership and management*

This seems to be a community of workers in the SB&B field that does not need rigid organizational rules or structure(s) to work in or with. The PIs in this RC rather feel that they work in a complementary fashion and have a strong interest in each others' projects and technologies despite their interest in specific macromolecules and/or systems. A discussion on how to connect still more actively with (bio-)medical research should probably take place.

2.7 External competitive funding of the RC

- *The RCs were asked to provide information of such external competitive funding, where:*
 - *the funding decisions have been made during 1.1.2005–31.12.2010, and*
 - *the administrator of the funding is/has been the University of Helsinki*
- *On the e-form the RCs were asked to provide:*
 - 1) *The relevant funding source(s) from a given list (Academy of Finland/Research Council, TEKES/The Finnish Funding Agency for Technology and Innovation, EU, ERC, foundations, other national funding organisations, other international funding organizations), and*
 - 2) *The total sum of funding which the organisation in question had decided to allocate to the RCs members during 1.1.2005–31.12.2010.*

Competitive funding reported in the text is also to be considered when evaluating this point.

ASPECTS: Scientific quality, scientific significance, societal impact, innovativeness and future significance

This RC has been successful in winning competitive external funding from both domestic and international sources. Especially the funding from Biocentrum Finland is substantial. However, in this high-tech field the provided funding, despite the efforts in that respect by the PIs, reveal a problem of underinvestment to a certain degree.

2.8 The RC's strategic action plan for 2011–2013

- *RC's description of their future perspectives in relation to research and doctoral training.*

ASPECTS: Scientific quality, scientific significance, societal Impact, processes and good practices related to leadership and management, national and international collaboration, innovativeness, future significance

It is clear that the discussion on how to proceed with this field within the BI and the UH, perhaps even Finland as a whole, should soon take place. This must eventually lead to solving the danger of underinvestment, which on its turn may hamper the recruitment of younger talent that would replace the highly skilled and internationally known staff that will soon retire.

Since it is clear that this RC has made significant contributions to many academic research projects as well as important contract research for the private sector, there clearly are strong arguments for investments also in the future. However, the panel feels that the RCs should not suit that purpose but rather mainly be thematically/biological question-driven. Commitment to the much needed large infrastructure investments should be made by a more centralized decision body that works with separate budgets than those destined for the RCs.

Given the enormous importance and diversity of proteins, the RC needs to develop a strategic plan, based on a larger view of biological and biomedical research in Finland, where it identifies protein families or classes deserving their attention and thereby complements strengths or needs in other areas.

2.9 Evaluation of the category of the RC in the context of entity of the evaluation material (1-8)

The RC's fitness to the chosen participation category.

Category 1. The research of the participating community represents the international cutting edge in its field.

The RC chose category 1 'The research of the participating community represents the international cutting edge in its field'. This is appropriate on the basis of the strong collaborations and the resulting high-impact publications. Also the research contribution of the groups themselves is good. However, it is recommended that the groups themselves would also aim for high level international research in their respective fields. Constant updating of methodologies and techniques is a prerequisite for research falling into this category as is also critical to ensure continued collaboration with world-class biomedical research groups.

Numeric evaluation: 4 (Excellent)

2.10 Short description of how the RC members contributed the compilation of the stage 2 material

The coordinator was clearly the initiator and driving force behind this RC and was provided with help by his colleague PIs when needed.

2.11 How the UH's focus areas are presented in the RC's research

Focus area 2: The basic structure of life

This RC fits perfectly in the UH's focus area 1 'The basic structure, materials and natural resources of the physical world'. In the future, it could increasingly also connect – via strategic project-based and protein family driven choices – with top RCs in focus area 2 'The basic structure of life'.

2.12 RC-specific main recommendations

This RC provides essential top technology. It could concentrate on taking its interest in specific families of proteins still closer to (bio)medical research. In addition, it should be the main actor in the discussion as to whether enduring investment in this large infrastructure is needed, efficiently used on-campus, within the UH, within Finland and beyond, and convince the UH to preserve specific funds for this infrastructure establishment and maintenance. This is not going to be possible on project (and hence either on RC) funding alone.

2.13 RC-specific conclusions

The essential conclusion was already mentioned in section 2.12:

This RC provides essential top technology. It could concentrate on taking its interest in specific families of proteins still closer to (bio)medical research. In addition, it should be the main actor in the discussion as to whether enduring investment in this large infrastructure is needed, efficiently used on-campus, within the UH, within Finland and beyond, and convince the UH to preserve specific funds for this infrastructure establishment and maintenance. This is not going to be possible on project (and hence either on RC) funding alone.

2.14 Preliminary findings in the Panel-specific feedback

See section 2.12 and 2.13:

This RC provides essential top technology and has excellent scientists. They could now concentrate on taking their interest in specific families of proteins still closer to (bio)medical research, in areas where the Finnish science is very strong. In addition, this RC should be the main actor in the discussion as to whether enduring investment in this large infrastructure is needed, efficiently used on-campus, within the UH, within Finland and beyond, and convince the UH to preserve specific funds for this infrastructure establishment and maintenance. This is not going to be possible on project (and hence either on RC) funding alone.

3 Appendices

- A. Original evaluation material
 - a. Registration material – Stage 1
 - b. Answers to evaluation questions – Stage 2
 - c. List of publications
 - d. List of other scientific activities
- B. Bibliometric analyses
 - a. Analysis provided by CWTS/University of Leiden
 - b. Analysis provided by Helsinki University Library (66 RCs)



International evaluation of research and doctoral training
at the University of Helsinki 2005-2010

RC-SPECIFIC MATERIAL FOR THE PEER REVIEW

NAME OF THE RESEARCHER COMMUNITY:

Structural Biology & Biophysics Programme (SB&B)

LEADER OF THE RESEARCHER COMMUNITY:

Professor Mårten Wikström, Institute of Biotechnology

RC-SPECIFIC MATERIAL FOR THE PEER REVIEW:

- Material submitted by the RC at stages 1 and 2 of the evaluation
 - STAGE 1 material: RC's registration form (incl. list of RC participants in an excel table)
 - STAGE 2 material: RC's answers to evaluation questions
- TUHAT compilations of the RC members' publications 1.1.2005-31.12.2010
- TUHAT compilations of the RC members' other scientific activities 1.1.2005-31.12.2010
- Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010 (analysis carried out by CWTS, Leiden University)

NB! Since Web of Science(WoS)-based bibliometrics does not provide representative results for most RCs representing humanities, social sciences and computer sciences, the publications of these RCs will be analyzed by the UH Library (results available by the end of June, 2011)



INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE
UNIVERSITY OF HELSINKI

RC-SPECIFIC STAGE 1 MATERIAL (registration form)

1 RESPONSIBLE PERSON

Name: Wikström, Mårten

E-mail:

Phone: 191 58000

Affiliation: Institute of Biotechnology

Street address: Viikinkaari 1

2 DESCRIPTION OF THE PARTICIPATING RESEARCHER COMMUNITY (RC)

Name of the participating RC (max. 30 characters): Structural Biology & Biophysics Programme

Acronym for the participating RC (max. 10 characters): SB&B

Description of the operational basis in 2005-2010 (eg. research collaboration, joint doctoral training activities) on which the RC was formed (MAX. 2200 characters with spaces): The Institute of Biotechnology is divided into programmes, based broadly on research field. The Structural Biology & Biophysics Programme (SB&B) is centered around physical techniques, such as X-ray diffraction, NMR, FTIR and EPR spectroscopy, advanced protein chemistry/proteomics, and EM microscopy to gain insight into structures of macromolecules and protein cofactors, and time-resolved optical spectroscopy and electrometry, to study dynamics of proteins, electron transfer, and membrane transport. Computational techniques such as molecular dynamics simulations and quantum-chemical (DFT) calculations, as well as advanced bioinformatics methodology for protein structure prediction and analysis complement the experimental approaches.

The SB&B community forms a natural operational entity where the research groups have related interests in a quantitative approach to biological structures and mechanisms on the atomic level. Scientific collaboration within the programme is common, and the wide range of physical techniques represented guarantees an excellent doctoral training environment.

The RC to be evaluated lacks two groups of the SB&B programme, viz. the cryoEM group of Sarah Butcher and the virus research group of Dennis Bamford, who decided to be evaluated in connection with their Finnish Academy Group of Excellence rather than with the SB&B.

3 SCIENTIFIC FIELDS OF THE RC

Main scientific field of the RC's research: biological, agricultural and veterinary sciences

RC's scientific subfield 1: Biochemistry and Molecular Biology

RC's scientific subfield 2: Biophysics



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RC's scientific subfield 3: Biology

RC's scientific subfield 4: Chemistry, Multidisciplinary

Other, if not in the list:

4 RC'S PARTICIPATION CATEGORY

Participation category: 1. Research of the participating community represents the international cutting edge in its field

Justification for the selected participation category (MAX. 2200 characters with spaces): Whilst it is clear that the SB&B groups cannot all be classified as individually belonging to the international cutting edge in their research field, we feel that several groups do belong to this category. However, we also strongly feel that this assessment is to be done by the reviewers rather than by the research communities to be evaluated.

SB&B is by itself a cutting edge multidisciplinary environment of which there are few examples in the world; while there are many out-and-out structural biology factories, there are few that also encompass state-of-the-art biophysics and enzyme mechanism, and few with such a broad span of interests as those represented by the SB&B.

The combination of research themes and methodology ranging from optical and electrometric techniques with microsecond resolution in studies of fundamental membrane transport mechanisms (Verkhovsky, Wikström), via broad range NMR facilities (Annala, Iwai, Permi) and X-ray crystallography (Heikinheimo, Goldman), to cutting edge techniques in bioinformatics approaches to macromolecular structure (Holm), and modern protein chemistry (Kalkkinen, Nyman) in one coherent research unit, is quite unusual also by international standards. It provides the doctoral students in the respective research groups with an exceptional opportunity to learn a broad range of key biophysical techniques within the same facility. Theoretical studies at the SB&B include computer-aided molecular dynamics simulations and quantum-mechanical calculations of protein structures. A thermodynamic approach to describing evolution (Annala) has gained considerable interest internationally.

5 DESCRIPTION OF THE RC'S RESEARCH AND DOCTORAL TRAINING

Public description of the RC's research and doctoral training (MAX. 2200 characters with spaces): The research groups in the SB&B unit carry out multidisciplinary scientific research that may be understood as quantitative biological research at the interface between biology, chemistry and physics. The research is aimed at solving three-dimensional atomic structures of macromolecules, for example enzyme proteins catalysing key reactions in metabolism and transport, or receptor proteins involved in signal transduction, and describing their mechanisms of function at the atomic level and on a real-time basis. Such structural and functional understanding at the atomic level is a prerequisite for developing specific diagnostic and therapeutic methods of identifying and treating various diseases. Insight in biological structures and mechanisms at this level may also help to design biomimetic nanodevices.

Significance of the RC's research and doctoral training for the University of Helsinki (MAX. 2200 characters with spaces): This is the premier place in Finland for scientific research and training in structural



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RC-SPECIFIC STAGE 1 MATERIAL (registration form)

biology and molecular biophysics. We are consistently in demand for collaboration both nationally and internationally.

Keywords: bioenergetics, bioinformatics, enzyme catalysis, NMR spectroscopy, protein structure, proteomics, X-ray diffraction

6 QUALITY OF RC'S RESEARCH AND DOCTORAL TRAINING

Justified estimate of the quality of the RC's research and doctoral training at national and international level during 2005-2010 (MAX. 2200 characters with spaces): The quality of scientific research within the SB&B in the 2005-2010 time period is high as judged from the publication records, and from the high impact this work has made internationally in many of the covered research areas. The doctoral training has been intense under the same period, and the quality has been excellent, based for example on the prizes and awards granted to doctoral students for their theses.

Comments on how the RC's scientific productivity and doctoral training should be evaluated (MAX. 2200 characters with spaces): Meaningful assessment of scientific work must include the elements of quality and novelty in addition to productivity. Whilst productivity can be measured as the number of publications, quality and novelty can strictly speaking be assessed only by professional peer review, i.e. by experts in the same field. Number of citations and journal impact factors can provide overall trends, but can only be used in comparing researchers in the same field of research. For example, many of the fields represented by SB&B are generally much less cited than research in fields with far more scientists, such as cell biology. Site visits by expert reviewers is one of the best methods of assessment and effectively complements review on the basis of written information.

Publishing strategy: All work in SB&B is published in international journals with a peer review system. The trend is to prioritise journals with the highest impact, but a key factor is to ensure that the published work is well exposed to other workers in the same field.

LIST OF RC MEMBERS

NAME OF THE RESEARCHER COMMUNITY:			Structural Biology & Biophysics Programme (SB&B)		
RC-LEADER			M. Wikström		
CATEGORY			1		
	Last name	First name	PI-status (TUHAT- check, lista 16.11.)	Title of research and teaching personnel	Affiliation
1	Wikström	Mårten	x	Professor	Institute of Biotechnology
2	Verkhovsky	Michael	x	Senior researcher	Institute of Biotechnology
3	Iwai	Hideo	x	Senior researcher	Institute of Biotechnology
4	Permi	Perttu	x	Senior researcher	Institute of Biotechnology
5	Holm	Liisa	x	Professor	Institute of Biotechnology
6	Kalkkinen	Nisse	x	Senior researcher	Institute of Biotechnology
7	Nyman	Tuula	x	Senior researcher	Institute of Biotechnology
8	Goldman	Adrian	x	Professor	Institute of Biotechnology
9	Heikinheimo	Pirkko	x	Senior researcher	Institute of Biotechnology
10	Annala	Arto	x	Professor	Institute of Biotechnology
11	Verkhovskaya	Marina		Senior researcher	Institute of Biotechnology
12	Kaila	Ville		Postdoctoral researcher	National Institutes of Health
13	Sharma	Vivek		Doctoral candidate	Institute of Biotechnology
14	Rauhamaäki	Virve		Doctoral candidate	Institute of Biotechnology
15	Belevich	Ilya		Postdoctoral researcher	Institute of Biotechnology
16	Bloch	Dmitri		Postdoctoral researcher	Institute of Biotechnology
17	Volkman	Gerrit		Postdoctoral researcher	Institute of Biotechnology
18	Hellman	Maarit		Postdoctoral researcher	Institute of Biotechnology
19	Pihjalamaa	Tero		Postdoctoral researcher	Institute of Biotechnology
20	Tossavainen	Helena		Postdoctoral researcher	Institute of Biotechnology
21	Hirschberg	Daniel		Postdoctoral researcher	Institute of Biotechnology
22	Korolainen	Minna		Postdoctoral researcher	Institute of Biotechnology
23	Kajander	Tommi		Postdoctoral researcher	Institute of Biotechnology
24	Kellosalo	Juho		Postdoctoral researcher	Institute of Biotechnology
25	Jurvansuu	Jaana		Postdoctoral researcher	Institute of Biotechnology
26	Oksanen	Esko		Postdoctoral researcher	Institute of Biotechnology
27	Leo	Jack		Postdoctoral researcher	Institute of Biotechnology
28	Oemig	Jesper		Doctoral candidate	Institute of Biotechnology
29	Pääkkönen	Kimmo		Postdoctoral researcher	Institute of Biotechnology
30	Aitio	Olli		Doctoral candidate	Institute of Biotechnology
31	Kyburz	Annika		Doctoral candidate	Institute of Biotechnology
32	Mäntylähti	Sampo		Doctoral candidate	Institute of Biotechnology
33	Raulinaitis	Vytas		Doctoral candidate	Institute of Biotechnology
34	Lietzen	Niina		Doctoral candidate	Institute of Biotechnology
35	Miettinen	Juho		Doctoral candidate	Institute of Biotechnology
36	Louhivuori	Martti		Postdoctoral researcher	Institute of Biotechnology
37	Fredriksson	Kai		Postdoctoral researcher	Institute of Biotechnology
38	Johansson	Mikael		Postdoctoral researcher	Dept. of Chemistry
39	Gorbikova	Elena		Postdoctoral researcher	Institute of Biotechnology



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RC-SPECIFIC STAGE 2 MATERIAL

BACKGROUND INFORMATION

Name of the RC's responsible person: Wikström, Mårten

E-mail of the RC's responsible person:

Name and acronym of the participating RC: Structural Biology & Biophysics Program, SB&B

The RC's research represents the following key focus area of UH: 2. Elämän perusrakenne – The basic structure of life

Comments for selecting/not selecting the key focus area: Our work is key to understanding the basic structures and functions of living things; indeed, that is its precise purpose. We wish to particularly emphasise that solving static structures is essential but not sufficient for understanding life, and must be accompanied by an understanding of their dynamics.

1 FOCUS AND QUALITY OF RC'S RESEARCH (MAX. 8800 CHARACTERS WITH SPACES)

- **Description of the RC's research focus, the quality of the RC's research (incl. key research questions and results) and the scientific significance of the RC's research for the research field(s).**

Structural biology and biophysics as the name of the SB&B research community (RC) not only implies focus on biophysical techniques. More importantly, it implies that the individual research subjects, despite the wide variations among different topics within the groups, all nevertheless aim at a fundamental understanding of the structures of biological macromolecules at atomic resolution, and of their function at a time resolution sufficient for mechanistic description. The general research focus is thus quite sharply defined, and independent of whether the major technique used is X-ray crystallography, NMR spectroscopy, laser-induced microsecond absorption spectroscopy, or computer-aided molecular and quantum mechanical calculation and simulation. As a matter of fact, several of these methods are used together in many of our approaches.

The quality and scientific significance of research in the period 2005-2010 is being assessed in this evaluation by independent referees, and we therefore find it awkward to dwell on this. However, we feel that both the quality and significance of our research in this period has been quite reasonable, with articles in Nature, PNAS, etc. In 2000-2005 the coordinator of this RC (Wikström) led one of the national groups of excellence of the Academy of Finland. Moreover, we have collaborated with key members of several of the national groups of excellence (Alitalo, Bamford, Butcher, Lappalainen, Rauvala, Saarma, Sivonen), also resulting in papers published in top-ranked journals.

In this connection we may quote the report by a panel chaired by Professor Tim Hunt on the Institute of Biotechnology (to which this RC belongs) that was part of the previous evaluation of Helsinki university in 2005: "The high rating given to this institute reflects the overall contributions of all the groups, however the panel would like to specifically mention the excellent performance of some groups, notably the "Bioenergetics", "Structure and functions of biological macromolecular complexes" and "Molecular regulation" group. The panel particularly appreciated the high scientific standard and the innovative and challenging aspects of their research lines". And further, "The staff of the Institute is of high international standards and reaches high levels of excellence in the case of the "Bioenergetics", "Structure and functions of biological macromolecular complexes" and "Molecular regulation" groups". Two of the three research groups mentioned are part of the current RC.



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- **Ways to strengthen the focus and improve the quality of the RC's research.**

One avenue is to further stimulate collaboration among the RC's research groups, which is still far from optimal. On the other hand, such collaboration cannot be forced either, but must arise naturally from mutual needs. One way would be to reinstate the SB&B research seminars that were discontinued one year ago due to scarce attendance. Again, it is felt that to make seminar attendance obligatory would not be recommendable (except perhaps for undergraduate and graduate students). Yet, it is the presence of the group PI's at such seminars that makes them worthwhile.

It is not immediately obvious that strengthening the focus would improve the quality of the outcome. To improve the quality of the RC's research requires (1) continued investment in state of the art infrastructure and an end to short-termism in university and governmental support; (2) further recruitment of interdisciplinary researchers, focussing particularly on the emerging area of structural cellular and developmental biology; (3) an expansion of biophysical studies to include more complex targets and longer times; (4)

2 PRACTISES AND QUALITY OF DOCTORAL TRAINING (MAX. 8800 CHARACTERS WITH SPACES)

- How is doctoral training organised in the RC? Description of the RC's principles for recruitment and selection of doctoral candidates, supervision of doctoral candidates, collaboration with faculties, departments/institutes, and potential graduate schools/doctoral programmes, good practises and quality assurance in doctoral training, and assuring good career perspectives for the doctoral candidates/fresh doctorates.

There is no formal mechanism in the RC for recruiting graduate students, as neither the RC nor, indeed, the organisation to which the members of the RC belongs – the Institute of Biotechnology – has the right to grant degrees. Furthermore, the Institute of Biotechnology does not have its own PhD program, but members of the RC belong to various different graduate schools.

There are nonetheless many paths of entrance for doctoral candidates. Many of the best join research groups and perform their master's studies in the research group. They can also apply directly to research groups in the RC, and many of the foreign graduate students enter the RC in this way. However, selection of the graduate students happens particularly when they enter the doctoral programs. All of the doctoral programs in which members of the RC are involved are heavily oversubscribed; there are more students looking for funded places than there are positions available. Consequently, each potential graduate student of our RC is evaluated on entrance to the doctoral program. For instance, in the doctoral program in Informational and Structural Biology, graduate students are evaluated when they apply to join the program by the board of the graduate program (composed of faculty members, an industrial member, and a student representative). They are then re-evaluated more stringently when they apply for a funded position. The acceptance rate for funded positions varies between doctoral programs, but is 10-50%.

Each candidate has a supervisor who is a PI in the RC. All PIs in the RC hold regular group meetings and journal clubs, and the candidates give presentations in these meetings. Each PI also has other formal and informal meetings with the candidates to help them in their experimental and other work. The structure of these interactions obviously depends on each PI.

In addition, each candidate has a thesis committee that meets at least once a year, during which the candidate gives a presentation and describes how research and studies have been proceeding. The thesis committee makes recommendations for changes in research focus and/or course work and, in exceptional circumstances, can recommend that the student does not continue as a candidate, or



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changes advisor. The members of the committee are of course available for the student outside the regular thesis committee meetings.

Members of the RC are, as mentioned above, heavily involved in doctoral programs such as the National Doctoral Programme in Informational and Structural Biology, the Viikki Doctoral Programme in Molecular Biosciences, the Helsinki Graduate Program in Biotechnology and Molecular Biology, the Helsinki Biomedical Graduate School, and the Finnish Graduate School of Neuroscience. In these they contribute as mentors for students, as members of thesis committees, by serving on various doctoral program boards, and by giving courses in upper level (Master's and Doctoral) courses organised by departments and the graduate schools. Each graduate student must be registered in a faculty department in order to graduate, and members of the RC make sure that this happens in an expeditious manner. In addition, graduate students often are involved in interdisciplinary research projects that span two or more departments/institutes (for instance: collaborations between the Institute of Biotechnology, the Neuroscience Center, Department of Biochemistry, Haartman Institute, Department of Physics, Department of Chemistry). This is important in broadening the experience of the candidates.

Good practice and quality assurance in graduate training is maintained by the various internal checks and balances described above.

Assuring good job prospects for doctoral candidates/fresh doctorates is extremely difficult in the current worldwide job market and especially given the almost complete lack of interest in research-based biotechnology in Finnish industry. However, we encourage our candidates/postdoctoral fellows to attend international meetings at least once a year and to present their results at those meetings, thus increasing their exposure and visibility. We try to ensure that they publish at least one highly-ranked paper during their time as a doctoral candidate, and we make sure that they get opportunities to speak to visiting scientists. We also encourage them to go abroad after obtaining their PhD for at least a year. So far, the students from the RC have effectively found employment (>85% employed as postdoctoral fellows, faculty members and research scientists in industry in Finland and abroad), and many have been able to win prestigious fellowships (EMBO fellowships, etc).

- RC's strengths and challenges related to the practises and quality of doctoral training, and the actions planned for their development.

Among the strengths we can include the active graduate schools, which are relatively new in Finland. These schools provide lecture and laboratory training courses aimed at fulfilling the requirements for a PhD degree apart from the scientific research. The possibility of obtaining salary from the grad school in a competitive search is a further asset. For this RC, one challenge is the fact that the Institute cannot grant PhD degrees so that all doctoral training has to be conducted in collaboration with a faculty department. However, this is a positive challenge, because it focuses on the need to recruit good doctoral students via teaching at the faculty departments. Thus, even though members of the RC are exempt from obligatory undergraduate teaching, they nevertheless do it - in part to recruit good graduate students. The major challenge is the tough job market. Doctoral training will be improved by encouraging more interdisciplinary training, so that the students have more potential recruitment options. We encourage outplacement in industry, as well as extended research visits abro



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3 SOCIETAL IMPACT OF RESEARCH AND DOCTORAL TRAINING (MAX. 4400 CHARACTERS WITH SPACES)

- Description of how the RC interacts with and contributes to the society (collaboration with public, private and/or 3rd sector).

We contribute in the form of important basic research, much of which has a biomedical and biotechnological focus. The research has led to numerous patents for different members of the RC. Some PIs are Board members of biotechnology companies (e.g. Orion Pharma) and other biotechnology enterprises in Finland (e.g. Biotie therapies, Glykos Finland Ltd, Ipsat therapies), but also in the Baltic countries (Asla Biotech Ltd). Especially a long-term collaboration with Glykos Finland Ltd., has been very fruitful – during the past five years the NMR laboratory has analyzed nearly 2000 synthetic products made by Glykos Finland Ltd. The turnover of the company is currently 3,6 M€ which has increased over 200% between 2008 and 2009. In addition, we encourage interaction with students at all levels from 6th form college (gymnasium) onwards. Members of the RC have been involved in public debates of science in the society, and in giving lectures for the public understanding of science at the "Science Forum" arranged biannually in Helsinki. The Forum's mandate is to communicate to the curious public the newest, up-to-date research and the elements of a rational world view, and to discuss the possibilities as well as the limits of science more broadly.

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- Ways to strengthen the societal impact of the RC's research and doctoral training.

More outreach as part of Biocenter Finland. Create some work/study programs with various industries, one of which has already been arranged (with research personnel from Nokia).

4 INTERNATIONAL AND NATIONAL (INCL. INTERSECTORAL) RESEARCH COLLABORATION AND RESEARCHER MOBILITY (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the RC's research collaborations and joint doctoral training activities and how the RC has promoted researcher mobility.

The RC has extensive national and international collaborations: to name a few, with all the other universities in Finland (e.g., through Biocenter Finland and in other ways), with Cambridge University, the University of Aarhus, Max Planck Tübingen, Rutgers University, with the ILL and the ESRF in Grenoble, with the NIH in Bethesda, etc. There have been research visits for 1 week to 1 year to these places for training and research; and graduate students and postdoctoral fellows have moved to and from all of these places. We actively recruit students and postdoctoral fellows from abroad (e.g., other EU countries, India, China). Encouraging students to move abroad for their postdoctoral positions is important in their mobility and training. We have hosted several exchange students (Erasmus, Marie Curie, other programs) for doctoral candidates from China, Germany, India, Poland, Russia, Spain. Many of these have gone on to do PhDs here and in other universities in Finland.



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- RC's strengths and challenges related to research collaboration and researcher mobility, and the actions planned for their development.

Our strength has been the wide collaborative network. There are no major challenges that we face except for extending this. We will also work actively to develop multinational graduate programs through the Marie Curie program. These could effectively link the Baltic and other local countries with e.g., training programs in Germany or at the ESRF in France. Such specific interaction programs will encourage researcher mobility by providing a more convenient mechanism. Involvement in panEuropean FP7 ESFRI programs like INSTRUMENT (Goldman, coPI of the Finnish section) is very important.

5 OPERATIONAL CONDITIONS (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the operational conditions in the RC's research environment (e.g. research infrastructure, balance between research and teaching duties).

The research infrastructure is extensive, and includes equipment for protein purification, analysis, crystallisation (3 nanodrop pipettors, LC robot; 2 crystallisation imaging stations), thermofluor analysis of protein folding; analytical scale HPLC for 2-component interaction analysis of e.g., membrane proteins and molecular size determination by static light scattering. Rigakug RU300 rotating anode X-ray generator and RAXIS-IV detector. Dedicated cell culture for eukaryotic (baculovirus/insect cell, human cell) protein expression. Fermentors for bacterial culturing. The NMR laboratory is equipped with four spectrometers, one 500, two 600 and one 800 MHz, with appropriate cryogenically cooled triple-resonance probeheads and a state-of-the-art automatic sample changer. In addition, the NMR laboratory has facilities for protein expression in *E. coli* and cell free, two fplc's for protein purification as well as an isothermal titration calorimeter (ITC). Protein chemistry has state of the art mass spectrometry equipment, and biophysics has time-resolved optical spectroscopy (nanosecond resolution; laser initiation) and electrometry, Fourier transform infrared spectroscopy with attenuated total reflection (ATR) equipment, EPR spectrometer with cryoconsole (liquid helium).

Fundamentally mostly research; teaching 10-20 hours of lectures/year with typically at least one graduate-level course per year.

- RC's strengths and challenges related to operational conditions, and the actions planned for their development.

A strength is our wide-ranging technology cover. Challenges will be maintaining the state-of-the-art equipment and access to research; the ESFRI program INSTRUMENT is important in this regard. However, simple comparison of EU level research infrastructures underpins alarming declining development taking place in Finland. In general, first class science calls for top-rank scientists, who are expecting the first class research infrastructures and equipment. For instance, all NMR research infrastructures associated with the EU funded FP7 Bio-NMR project (Permi, member of its international evaluation panel) have instrumentation beyond 900 MHz except for Slovenia. Moreover, funding has been granted to purchase an ultra-high field NMR instrument (> 900-1000 MHz) to Estonia, Czech Republic, Norway and Denmark. If no funding for new NMR magnet technology is found, Finland will be among the countries (Bulgaria, Latvia, Lithuania, Romania, and Slovakia) that has NMR instrumentation, which is both out-dated and of dwindling interest to anyone.



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6 LEADERSHIP AND MANAGEMENT IN THE RESEARCHER COMMUNITY (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the execution and processes of leadership in the RC, how the management-related responsibilities and roles are distributed in the RC and how the leadership- and management-related processes support high quality research, collaboration between principal investigators and other researchers in the RC, the RC's research focus and strengthening of the RC's know-how.

Leadership in the RC is very informal, by email and conversation. The group leaders are quite independent in managing the respective groups.

- RC's strengths and challenges related to leadership and management, and the actions planned for developing the processes.

Strength is that the RC has a world-class scientist as its leader currently; our challenge will be in the next five years to replace the world-class scientists who are retiring with others of an equal calibre. This requires a dedicated recruitment process identifying new areas: such areas are structural cellular biology, mechanistic molecular systems biology, imaging at all length and temporal scales; high-throughput methods in structural and mechanistic work; time-resolved spectrometry; mathematical modelling.

7 EXTERNAL COMPETITIVE FUNDING OF THE RC

- Listing of the RCs external competitive funding, where:
 - the funding decisions have been made during 1.1.2005-31.12.2010, and
 - the administrator of the funding is/has been the University of Helsinki
- Academy of Finland (AF) - total amount of funding (in euros) AF has decided to allocate to the RC members during 1.1.2005-31.12.2010: 6970000
- Finnish Funding Agency for Technology and Innovation (TEKES) - total amount of funding (in euros) TEKES has decided to allocate to the RC members during 1.1.2005-31.12.2010: 270000
- European Union (EU) - total amount of funding (in euros) EU has decided to allocate to the RC members during 1.1.2005-31.12.2010: 580000
- European Research Council (ERC) - total amount of funding (in euros) ERC has decided to allocate to the RC members during 1.1.2005-31.12.2010:
- International and national foundations – names of international and national foundations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
 - names of the foundations: e.g. the Sigrid Juselius Foundation
 - total amount of funding (in euros) from the above-mentioned foundations: 1500000
- Other international funding - names of other international funding organizations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
 - names of the funding organizations: Biocentrum Helsinki
 - Biocentrum Finland



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- total amount of funding (in euros) from the above-mentioned funding organizations: 2400000
- Other national funding (incl. EVO funding and Ministry of Education and Culture funded doctoral programme positions) - names of other national funding organizations which have decided to allocate funding to the RC members during 1.1.2005-31.12.2010, and the amount of their funding (in euros).
 - names of the funding organizations:
 - total amount of funding (in euros) from the above-mentioned funding organizations:

8 RC'S STRATEGIC ACTION PLAN FOR 2011–2013 (MAX. 4400 CHARACTERS WITH SPACES)

- Description of the RC's future perspectives in respect to research and doctoral training.

As mentioned above, key action for the next few years must include recruitment of new high-quality group leaders, because several current PI's will be retiring within this time period. Now it is definitively a prime time to renew already 10-15 years old instrumentation and to make indispensable investment in the state-of-the-art technology to secure that voluminous and high-quality research can be carried out in the RC also in the future. In fact, this is sine qua non for the recruitment of top-rank group leaders.

9 SHORT DESCRIPTION OF HOW THE RC MEMBERS HAVE CONTRIBUTED TO THE COMPILATION OF THE STAGE 2 MATERIALS (MAX. 1100 CHARACTERS WITH SPACES).

The material was compiled by the coordinator, with help and due assistance from all PI's in the RC.



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RC-SPECIFIC TUHAT COMPILATIONS OF PUBLICATIONS DATA 2005-2010

SB&B/Wikström

1 Analysis of publications

- Associated person is one of Mårten Wikström ,
Perttu Permi ,
Adrian Goldman ,
Marina Verkhovskaya ,
Pihlajamaa ,
Esko Oksanen ,
Antero Aalto ,
Johansson ,
Michael Verkhovsky ,
Liisa Holm ,
Pirkko Heikinheimo ,
Ville Kaila ,
Dmitry Arnold Bloch ,
Juho Kelloso ,
Jesper S. Oeemig ,
Sampo Juhani Mäntylähti ,
Juho Miettinen ,
Elena Anatoljevna Gorbikova ,
Nisse Kalkkinen ,
Arto Annala ,
Vivek Sharma ,
Maarit Hellman ,
Daniel Hirschberg ,
Jaana Jurvansuu ,
Kimmo Pääkkönen ,
Olli Martti
Vyttautas Raulinaitis ,
Hideo Iwai ,
Tuula Nyman ,
Vive Rauhamäki ,
Tero
Minna Korolainen ,
Niina Lietzen ,
Matti Louhivuori ,
Kai Olavi Fredriksson ,
Mikael

Publication type	Publication year						Total Count 2005 - 2010
	2005	2006	2007	2008	2009	2010	
A1 Refereed journal article	41	47	50	56	58	54	306
A2 Review in scientific journal		3	1	1		1	6
A3 Contribution to book/other compilations (refereed)					2	1	3
A4 Article in conference publication (refereed)	1	3	4	4	1	7	20
B1 Unrefereed journal article				1	1		2
C1 Published scientific monograph					1		1
C2 Edited book, compilation, conference proceeding or special issue of journal			1				1
D1 Article in professional journal	1						1
H1 Patents			1				1



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2 Listing of publications

A1 Refereed journal article

2005

- Alonen, A, Aitio, O, Hakala, K, Luukkanen, L, Finel, M, Kostiaainen, R **2005**, 'Biosynthesis of dobutamine monoglucuronides and glucuronidation of dobutamine by recombinant human UDP-glucuronosyltransferases', **Drug Metabolism and Disposition**, vol 33, no. 5, pp. 657-663.
- Bamford, D, Ravantti, J, Rönholm, G, Laurinavicius, S, Kukkaro, P, Dyll-Smith, M, Somerharju, P, Kalkkinen, N, Bamford, J **2005**, 'Constituents of SH1, a novel lipid-containing virus infecting the halophilic euryarchaeon *Haloarcula hispanica*', **Journal of Virology**, vol 79, pp. 9097-9107.
- Belevich, I, Borisov, VB, Zhang, J, Yang, K, Konstantinov, AA, Gennis, RB, Verkhovsky, MI **2005**, 'Time-resolved electrometric and optical studies on cytochrome bd suggest a mechanism of electron-proton coupling in the di-heme active site', **Proceedings of the National Academy of Sciences of the United States of America**, vol 102, no. 10, pp. 3657-3662.
- Belevich, I, Borisov, VB, Konstantinov, AA, Verkhovsky, MI **2005**, 'Oxygenated complex of cytochrome bd from *Escherichia coli*: stability and photolability', **FEBS Letters**, vol 579, pp. 4567-4570.
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- Halonen, P, Tammenkoski, M, Niiranen, L, Huopalahti, S, Parfenyev, AN, Goldman, A, Baykov, A, Lahti, R **2005**, 'Effects of active site mutations on the metal binding affinity, catalytic competence, and stability of the family II pyrophosphatase from *Bacillus subtilis*', **Biochemistry**, vol 44, pp. 4004-4010.
- Heger, A, Wilton, CA, Sivakumar, A, Holm, L **2005**, 'ADDA: a domain database with global coverage of the protein universe', **Nucleic Acids Research**, vol 33, pp. D188-D191.
- Iwai, H, Forrer, P, Pluckhun, A, al., E **2005**, 'NMR solution structure of the monomeric form of the bacteriophage lambda capsid stabilizing protein gpD', **Journal of Biomolecular NMR**, vol 31, no. 4, pp. 351-356.
- Jaakola, V, Prilusky, J, Sussman, JL, Goldman, A **2005**, 'G protein-coupled receptors show unusual patterns of intrinsic unfolding', **Protein Engineering, Design and Selection**, vol 18, no. 2, pp. 103-110.
- Jaakola, VP, Rehn, M, Moeller, M, Alexiev, U, Goldman, A, Turner, GJ **2005**, 'G-protein-coupled receptor domain overexpression in *Halobacterium salinarum*: Long-range transmembrane interactions in heptahelical membrane proteins', **Proteins: Structure, Function, and Bioinformatics**, vol 60, pp. 412-423.
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- Johansson, MP, Juselius, J **2005**, 'Arsole aromaticity revisited', **Letters in Organic Chemistry**, vol 2, no. 5, pp. 469-474.
- Kankainen, M, Holm, L **2005**, 'POCO: discovery of regulatory patterns from promoters of oppositely expressed gene sets', **Nucleic Acids Research**, vol 33, pp. W427-W431.
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SB&B/Wikström

- Lantto, R, Puolanne, E, Kalkkinen, N, Buchert, J, Autio, K **2005**, 'Enzyme-aided modification of chicken-breast myofibril proteins: effect of laccase and transglutaminase on gelation and thermal stability', **Journal of Agricultural and Food Chemistry**, vol 53, no. 23, pp. 9231-9237.
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Verkhovsky, M, Belevich, I, Bloch, DA, Wikström, M **2006**, 'Elementary steps of proton translocation in the catalytic cycle of cytochrome oxidase', **Biochimica et Biophysica Acta. Bioenergetics**, vol 1757, pp. 401-407.

Wikström, M, Verkhovsky, MI **2006**, 'Towards the mechanism of proton pumping by the haem-copper oxidases', **Biochimica et Biophysica Acta. Bioenergetics**, vol 1757, pp. 1047-1051.

2007

Wikström, M, Verkhovsky, M **2007**, 'Mechanism and energetics of proton translocation by the respiratory heme-copper oxidases', **Biochimica et Biophysica Acta. Bioenergetics**, vol 1767, no. 10, pp. 1200-1214.

2008

Belevich, I, Verkhovsky, MI **2008**, 'Molecular mechanism of proton translocation by cytochrome c oxidase', **Antioxidants & Redox Signaling**, vol 10, no. 1, pp. 1-29.

2010

Volkman, G, Iwai, H **2010**, 'Protein trans-splicing and its use in structural biology: opportunities and limitations', **Molecular bioSystems**, vol 6, no. 11, pp. 2110-2121.

A3 Contribution to book/other compilations (refereed)

2009

Belevich, N, Verkhovskaya, M, Verkhovsky, MI **2009**, 'Electron transfer in respiratory complexes resolved by an ultra-fast freeze-quench approach', **Methods in enzymology**, vol. 456, **Academic Press, New York, NY**, pp. 75-93.

Borisov, VB, Verkhovsky, M **2009**, 'Oxygen as acceptor', **EcoSal Escherichia coli and Salmonella. cellular and molecular biology**, **ASM Press, Washington, D.C.**

2010

Oksanen, E, Goldman, A **2010**, 'X-ray Crystallography', in L Mander, B Liu (eds), **Comprehensive Natural Products Chemistry II**, vol. 9, **Elsevier, Amsterdam**.

A4 Article in conference publication (refereed)



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RC-SPECIFIC TUHAT COMPILATIONS OF PUBLICATIONS DATA 2005-2010

SB&B/Wikström

2005

Borisov, VB, Belevich, IN, Zhang, J, Yang, K, Konstantinov, AA, Gennis, RB, Verkhovsky, MI **2005**, *Substitution of negatively charged Glu445 by uncharged Ala precludes complete two-electron reduction of the heme d/heme b595 binuclear oxygen-reducing site in cytochrome bd oxidase from Escherichia coli*, FEBS Journal 272 Supplement 1 WILEY-BLACKWELL PUBLISHING LTD..

2006

Belevich, I, Wikström, M, Verkhovsky, MI **2006**, *The metastable H state is important for proton pumping by cytochrome c oxidase*, Paper presented at **European Bioenergetic Conference Moscow, RUSSIA, JUL 22-27, 2006, RUSSIA, JUL 22-27, 2006, Moscow, Russia**. 22. - 27. July, 2006. Biochimica et Biophysica Acta. Bioenergetics Supplement ELSEVIER BV.

Bogachev, AV, Bertsova, YV, Bloch, DA, Verkhovsky, MI **2006**, *Thermodynamic properties of the redox centers of Na⁺-translocating NADH: Quinone oxidoreductase*, Biochimica et Biophysica Acta. Bioenergetics 1757 5-6 Supplement 1 ELSEVIER BV.

Verkhovsky, MI **2006**, *Proton translocation by cytochrome c oxidase*, Paper presented at **14th European Bioenergetics Conference**. Biochimica et Biophysica Acta. Bioenergetics 1757 5-6 ELSEVIER BV.

2007

Astikainen, K, Holm, L, Pitkänen, E, Szedmak, S, Rousu, J **2007**, 'Towards structured output prediction of enzyme function (extended abstract)', in **Proceedings of the International Workshop on Machine Learning in Systems Biology 2007, MLSSB'07, September 24-25, 2007, Evry, France: Universite d'Evry-Val d'Essonne 2007**, pp. 27-32.

Bloch, DA, Belevich, I, Belevich, N, Verkhovsky, MI, Wikstrom, M **2007**, *The O(H) to E(H) transition in cytochrome c oxidase: Kinetics and thermodynamics of the catalytic act*, FEBS Journal 274 Suppl. 1 WILEY-BLACKWELL PUBLISHING LTD..

Gorbikova, E, Wikstrom, M, Verkhovsky, MI **2007**, *Proton transfer in cytochrome c oxidase. ATR-FTIR approach*, FEBS Journal 274 WILEY-BLACKWELL PUBLISHING LTD..

Saarela, V, Haapala, M, Pol, J, Kalkkinen, N, Hukka, M, Kolari, K, Ketola, R, Kostiaainen, R, Kotiaho, T, Franssila, S **2007**, 'On-chip liquid chromatography - atmospheric pressure ionization - mass spectrometry', in **Proceedings of μ TAS 2007 Conference : Eleventh International Conference on Miniaturized Systems for Chemistry and Life Sciences**, pp. 1435-1437.

2008

Belevich, I, Siletsky, SA, Jasaitis, A, Konstantinov, AA, Wikstrom, M, Soulimane, T, Verkhovsky, MI **2008**, *Single-turnover of ba(3) oxidase from Thermus thermophilus*, Biochimica et Biophysica Acta. Bioenergetics 1777 Supplement 1 ELSEVIER BV.

Borisov, VB, Belevich, I, Verkhovsky, MI **2008**, *Resolution of a novel catalytic intermediate in cytochrome bd terminal oxidase in real time: A true peroxy species?*, Biochimica et Biophysica Acta. Bioenergetics 1777 ELSEVIER BV.

Gorbikova, EA, Belevich, I, Wikstrom, M, Verkhovsky, MI **2008**, *The role of the cross-linked Tyr in the catalytic cycle of cytochrome c oxidase*, Biochimica et Biophysica Acta. Bioenergetics 1777 Supplement 1 ELSEVIER BV.

Rauhamaki, V, Verkhovsky, MI, Wikstrom, M **2008**, *Oxygen reaction in the cbb(3)-type cytochrome c oxidase from Rhodobacter Sphaeroides*, Biochimica et Biophysica Acta. Bioenergetics 1777 Supplement 1 ELSEVIER BV.

2009

Hasegawa, H, Holm, L **2009**, 'Evaluation of Novel Protein Structure Comparison Algorithms based on Objective Function Rankings', in **Biomedical Engineering and Informatics, 2009. BMEI '09. 2nd International Conference on**, pp. 1438-1443.

2010

Aranko, AS, Oeemig, JS, Volkmann, G, Iwai, H **2010**, *Protein splicing in Cis and Trans: a versatile tool for structural biology and post-translational modulations of protein functions*, Paper presented at **35th Congress of the Federation-of-European-Biochemical-Societies, Gothenburg, Sweden**. 26. June - 01. July, 2010. FEBS Journal 277 Supplement 1 WILEY-BLACKWELL PUBLISHING LTD..

Astikainen, K, Pitkänen, E, Rousu, J, Holm, L, Szedmak, S **2010**, 'Reaction Kernels: Structured Output Prediction Approaches for Novel Enzyme Function', in **Proceedings of the First International Conference on Bioinformatics**, pp. 48-55.

Bloch, DA, Borisov, VB, Verkhovsky, MI **2010**, *Oxygenated heme d in cytochrome bd from Escherichia coli*, Biochimica et Biophysica Acta. Bioenergetics 1797 Supplement 1 ELSEVIER BV.

Bloch, D, Borisov, V, Verkhovsky, M **2010**, *Binding oxygen to heme d in cytochrome bd from Escherichia coli*, Paper presented at **Congress of the Federation-of-European-Biochemical-Societies, Gothenburg, Sweden**. 26. June - 01. July, 2010. FEBS Journal 277 Suppl. 1 WILEY-BLACKWELL PUBLISHING LTD..

Bogachev, AV, Verkhovsky, MI **2010**, *Thermodynamic and kinetic properties of Na⁺-motive NADH: Quinone oxidoreductase*, Biochimica et Biophysica Acta. Bioenergetics 1797 Supplement 1 ELSEVIER BV.

Rintanen, M, Belevich, I, Verkhovsky, MI **2010**, *Potential generation during CO photodissociation from the fully reduced cytochrome c oxidase from Paracoccus denitrificans*, Biochimica et Biophysica Acta. Bioenergetics 1797 Supplement 1 ELSEVIER BV.



INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE
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RC-SPECIFIC TUHAT COMPILATIONS OF PUBLICATIONS DATA 2005-2010

SB&B/Wikström

Verkhovsky, MI **2010**, *Real time recording of the cytochrome oxidase proton pump*,, Biochimica et Biophysica Acta. Bioenergetics 1797 Supplement 1 ELSEVIER BV.

B1 Unrefereed journal article

2008

Wikström, M **2008**, 'How I became a biochemist', **IUBMB Life**, vol 60, no. 6, pp. 414-417.

2009

Salmi, J, Nyman, TA, Nevalainen, OS, Aittokallio, T **2009**, 'Filtering strategies for improving protein identification in high-throughput MS/MS studies', **Proteomics (Weinheim)**, vol 9, pp. 848-860.

C1 Published scientific monograph

2009

Astikainen, K, Holm, LUT, Pitkänen, E, Rousu, J **2009**, *Reaction kernels: predicting enzyme functions you have never seen before*, **Helsingin yliopisto, tietojenkäsittelytieteen laitos, Helsinki**.

C2 Edited book, compilation, conference proceeding or special issue of journal

2007

Vainio, R, Pomoell, J, Luohivuori, M, Louhivuori, M (eds) **2007**, *Proceedings of the XLI Annual Conference of the Finnish Physical Society, March 15-17, 2007, Tallinn, Estonia*, **Report series in physics, no. 267, Multiprint, Helsinki**.

D1 Article in professional journal

2005

Johansson, M, Sundholm, D **2005**, 'Kultaa palleroina', **Tietoyhteys**, vol 8, no. 1, pp. 16-18.

H1 Patents

2007

Sivonen, K, Jokela, J, Wahlsten, M, Permi, P, Doeskeland, SO, Herfindal, L **2007**, *Bioactive cyclic peptide*,..



INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING AT THE UNIVERSITY OF HELSINKI

RC-SPECIFIC TUHAT COMPILATIONS OF OTHER SCIENTIFIC ACTIVITIES 2005-2010

SB&B/Wikström

1 Analysis of activities 2005-2010

- Associated person is one of Mårten Wikström , Michael Verkhovsky , Hideo Iwai ,
Perttu Permi , Liisa Holm , Nisse Kalkkinen , Tuula Nyman ,
Adrian Goldman , Pirkko Heikinheimo , Arto Annala ,
Marina Verkhovskaya , Ville Kaila , Vivek Sharma , Virve Rauhamäki ,
Ilya Belevich , Dmitry Arnold Bloch , Maarit Hellman , Tero
Pihlajamaa , Helena Tossavainen , Daniel Hirschberg , Minna Korolainen ,
Tommi Kajander , Juho Kellomäki , Jaana Jurvansuu ,
Esko Oksanen , Jack Christopher Leo , Jesper S. Oeemig , Kimmo Pääkkönen, Olli Martti
Antero Aitio , Annika Kyburz , Sampo Juhani Mäntylähti , Vytautas Raulinaitis ,
Niina Lietzen , Juho Miettinen , Martti Louhivuori, Kai Olavi Fredriksson, Mikael
Johansson , Elena Anatoljevna Gorbikova ,

Activity type	Count
Supervisor or co-supervisor of doctoral thesis	11
Prizes and awards	2
Editor of research journal	25
Peer review of manuscripts	26
Assessment of candidates for academic posts	4
Membership or other role in review committee	7
Membership or other role in research network	3
Membership or other role in national/international committee, council, board	15
Membership or other role in public Finnish or international organization	7
Membership or other role of body in private company/organisation	2
Participation in interview for written media	9



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SB&B/Wikström

2 Listing of activities 2005-2010

Supervisor or co-supervisor of doctoral thesis

Perttu Permi ,

Supervisor of Doctoral thesis, Perttu Permi, 2007

Supervisor of Doctoral thesis, Perttu Permi, 2008

Adrian Goldman ,

Supervisor of Doctoral thesis, Adrian Goldman, 2005

Supervisor of Doctoral thesis, Adrian Goldman, 2005

Supervisor of Doctoral thesis, Adrian Goldman, 2006

Supervisor of Doctoral thesis, Adrian Goldman, 2008 → ...

Supervisor of Doctoral thesis, Adrian Goldman, 2009

Supervisor of Doctoral thesis, Adrian Goldman, 2009

Supervisor of Doctoral thesis, Adrian Goldman, 2009

Supervisor of Doctoral thesis, Adrian Goldman, 2009

Pirkko Heikinheimo ,

Supervision of doctoral thesis, Pirkko Heikinheimo, 01.01.2006 → 31.12.2006, Germany

Prizes and awards

Mårten Wikström ,

PI, Center of Excellence, Academy of Finland, Mårten Wikström, 2000 → 2005

Hideo Iwai ,

The 2010 FEBS letters young group leader award, Hideo Iwai, 29.06.2010

Editor of research journal

Mårten Wikström ,

Editorial Advisory Board of the journal Biochemistry member, Mårten Wikström, 2002 → ...

Michael Verkhovsky ,

BBA, Michael Verkhovsky, 01.01.2006 → 31.12.2006

FEBS Letters, Michael Verkhovsky, 01.01.2006 → 31.12.2006

Hideo Iwai ,

Applied Microbiology and Biotechnology., Hideo Iwai, 01.01.2006 → 31.12.2006

Biochemistry, Hideo Iwai, 01.01.2006 → 31.12.2006

FEBS letter, Hideo Iwai, 01.01.2006 → 31.12.2006

Journal of the American Chemical Society, Hideo Iwai, 01.01.2006 → 31.12.2006

Magnetic Resonance in Chemistry, Hideo Iwai, 01.01.2006 → 31.12.2006

Acta Biochimica et Biophysica Sinica, Hideo Iwai, 01.01.2007 → 31.12.2007, Taiwan

Applied Microbiology and Biotechnology, Hideo Iwai, 01.01.2007 → 31.12.2007, Germany

FEBS letter, Hideo Iwai, 01.01.2007 → 31.12.2007, Netherlands

Journal of Molecular Biology, Hideo Iwai, 01.01.2007 → 31.12.2007, United States

Perttu Permi ,

Member of editorial board of the open spectroscopy journal, Perttu Permi, 2007 → ...



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RC-SPECIFIC TUHAT COMPILATIONS OF OTHER SCIENTIFIC ACTIVITIES 2005-2010

SB&B/Wikström

Adrian Goldman ,

Protein Engineering, Design and Selection, Adrian Goldman, 01.01.2003 → ..., United Kingdom

Biochemistry, Adrian Goldman, 01.01.2007 → 31.12.2007

Science, Adrian Goldman, 01.01.2007 → 31.12.2007

Structure, Adrian Goldman, 01.01.2007 → 31.12.2007

Biochemistry, Adrian Goldman, 01.01.2008 → 31.12.2008, United States

PNAS, Adrian Goldman, 01.01.2008 → 31.12.2008, United States

Pirkko Heikinheimo ,

Acta Crystallographica Section D, Biological Crystallography, Pirkko Heikinheimo, 01.01.2008 → 31.12.2008, United Kingdom

FEBS Journal, Pirkko Heikinheimo, 01.01.2008 → 31.12.2008

Journal of Molecular Biology, Pirkko Heikinheimo, 01.01.2008 → 31.12.2008

Arto Annala ,

Journal of the American Chemical Society, Arto Annala, 01.01.2006 → 31.12.2006, United States

Tommi Kajander ,

Acta Crystallographica section F, Tommi Kajander, 01.01.2007 → 31.12.2007

Structure, Tommi Kajander, 01.01.2007 → 31.12.2007

Peer review of manuscripts

Mårten Wikström ,

Biochemistry, Mårten Wikström, 01.01.2006 → 31.12.2006

Journal of Bioenergetics and Biomembranes, Mårten Wikström, 01.01.2006 → 31.12.2006

Biochimica et Biophysica Acta, Mårten Wikström, 01.01.2008 → 31.12.2008

J. Mol Biol., Mårten Wikström, 01.01.2008 → 31.12.2008

PNAS, Mårten Wikström, 01.01.2008 → 31.12.2008

Hideo Iwai ,

Angewandte Chemie International Edition, Hideo Iwai, 02.2010

BMC Biotechnology, Hideo Iwai, 12.2010

ChemBioChem, Hideo Iwai, 02.2010

FEBS Letters, Hideo Iwai, 05.2010

Journal of Bacteriology, Hideo Iwai, 12.2010

Nature Chemical Biology, Hideo Iwai, 02.2010

Protein Science, Hideo Iwai, 03.2010

Protein Science, Hideo Iwai, 05.2010

The Biophysical Journal, Hideo Iwai, 08.2010

Perttu Permi ,

Journal of Magnetic Resonance, Perttu Permi, 01.11.2005 → 30.11.2005, United States

Journal of the American Chemical Society, Perttu Permi, 2005 → 2009

Magnetic resonance in chemistry, Perttu Permi, 01.12.2005 → 31.12.2005, United Kingdom

FEBS Letters, Perttu Permi, 2006 → ...

BMC Microbiology, Perttu Permi, 01.01.2007 → 31.12.2007

Journal of Biomolecular NMR, Perttu Permi, 01.01.2007 → 31.12.2007

BBA - Proteins and Proteomics, Perttu Permi, 2008 → ...



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RC-SPECIFIC TUHAT COMPILATIONS OF OTHER SCIENTIFIC ACTIVITIES 2005-2010

SB&B/Wikström

Current Protein and Peptide Science, Perttu Pergi, 2008 → ...

Biochemistry, Perttu Pergi, 2009 → ...

Journal of Biological Chemistry, Perttu Pergi, 2009 → ...

Adrian Goldman ,

Acta Crystallographica section D, Adrian Goldman, 01.01.2002 → ..., United States

Acta Crystallographica section D, section F, Adrian Goldman, 2004 → ...

Assessment of candidates for academic posts

Adrian Goldman ,

Assessment of candidate for academic post, Adrian Goldman, 2005

Assessment of candidate for academic post, Adrian Goldman, 2007

Assessment of candidate for academic post, Adrian Goldman, 2008

Assessment of candidate for academic post, Adrian Goldman, 2010

Membership or other role in review committee

Perttu Pergi ,

Member of international evaluation panel, Perttu Pergi, 2010 → ...

Adrian Goldman ,

Reviewer of research grant, ERA-NET, Adrian Goldman, 2005 → 2010

Reviewer of research grant, EU, Adrian Goldman, 2005 → 2010

Reviewer of research grant, Israel Research Foundation, Adrian Goldman, 2005 → 2010

Reviewer of research grant, NSF, Adrian Goldman, 2005 → 2010

Reviewer of research grant, Norwegian Research Foundation, Adrian Goldman, 2005 → 2010

Reviewer of research grant, Wellcome Trust, Adrian Goldman, 2005 → 2010

Membership or other role in research network

Mårten Wikström ,

Principal investigator of research group member of Biocentrum Helsinki, Mårten Wikström, 1994 → ...

Perttu Pergi ,

Board member of BF infrastructure network, Perttu Pergi, 2009 → ...

Adrian Goldman ,

Member of Biocentrum Helsinki, Adrian Goldman, 2005 → 2008

Membership or other role in national/international committee, council, board

Mårten Wikström ,

Sigrid Juselius Säätiö, Mårten Wikström, 01.01.2006 → 31.12.2006

Societas Scientiarum Fennica, Mårten Wikström, 01.01.2006 → 31.12.2006

The Royal Swedish Academy of Sciences, Mårten Wikström, 01.01.2006 → 31.12.2006

Adrian Goldman ,

Board member, Informational and Structural Biology Graduate school, Adrian Goldman, 2003 → 2005

Nordic Research Council, Adrian Goldman, 01.01.2007 → 31.12.2007, Norway

Board member of Viikki campus animal experimentation/non-clinical trials ethics committee, Adrian Goldman, 2008 → 2010

Board member, Informational and Structural Biology Graduate school, Adrian Goldman, 2008 → ...



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SB&B/Wikström

Cochair of the structural biology board of Biocenter Finland, Adrian Goldman, 2008 → ...

International Network of Protein Engineering Centres, Adrian Goldman, 01.01.2008 → 31.12.2008

Arto Annila ,

Physics Days 2007, Tallinn 15.-17.3.2007, organizing committee, Arto Annila, 01.01.2006 → 31.12.2006, Finland

Tieteellisten seurojen valtuuskunta, Arto Annila, 01.01.2006 → 31.12.2006

Physics Days 2007, Tallinn 15.-17.3.2007, organizing committee, Arto Annila, 01.01.2007 → 31.12.2007, Finland

Tieteellisten seurain valtuuskunta, Federation of Finnish Learned Societies, julkaisukeskus, Arto Annila, 01.01.2008 → 31.12.2008, Finland

Tommi Kajander ,

Protein Society, European Crystallographic Association, Tommi Kajander, 01.01.2007 → 31.12.2007

Institute of Biotechnology board, Tommi Kajander, 30.06.2010 → ..., Finland

Membership or other role in public Finnish or international organization

Mårten Wikström ,

Societas Scientiarum Fennica member, Mårten Wikström, 1982 → ..., Finland

EMBO member, Mårten Wikström, 1985 → ...

Royal Swedish Academy of Sciences member, Mårten Wikström, 1992 → ...

Biohit Oy, hallitus, Mårten Wikström, 01.01.2006 → 31.12.2006

Academia Europaea member, Mårten Wikström, 2010 → ...

Perttu Permi ,

Board member of Finnish Peptide Society, Perttu Permi, 2008 → 2011

Arto Annila ,

TSV: julkaisukeskuksen johtokunta, Arto Annila, 01.01.2007 → 31.12.2007, Finland

Membership or other role of body in private company/organisation

Esko Oksanen ,

National Graduate School in Informational and Structural Biology, Esko Oksanen, 01.01.2008 → 31.12.2008, Japan

Jack Christopher Leo ,

The Finn-Brit Players Theatrical Association ry, Jack Christopher Leo, 26.01.2008 → 23.01.2009, Germany

Participation in interview for written media

Arto Annila ,

YLEn ykkösen tekniikan ajankohtaisohjelma Radiaattori, toimittaja Sisko Loikkanen, Arto Annila, 01.01.2002 → 31.12.2011, Finland

YLEn ykkösen tekniikan ajankohtaisohjelma Radiaattori, toimittaja Sisko Loikkanen, Arto Annila, 01.01.2002 → 31.12.2011, Finland

Fysiikan täydennyskoulutuskurssi 2003, Arto Annila, 06.06.2003 → 31.12.2011, Denmark

Tieteen päivät 2003, Arto Annila, 09.01.2003 → 31.12.2011, Denmark

Olarin lukio, Arto Annila, 19.09.2007 → 31.12.2011, Finland

Luonnonfilosofian seuran kokous, Arto Annila, 01.01.2008 → 31.12.2011, Finland

Luonnonfilosofian seuran kokous, Arto Annila, 01.04.2008 → 31.12.2011, Finland

<http://www.physorg.com/news137679868.html>, Science news, refereeing the study "Natural selection for least action" in Proc of the Royal Society A vy V. Kaila and A. Annila, Arto Annila, 01.01.2008 → 31.12.2011, Finland

<http://www.physorg.com/news148050302.html>, by Lisa Zyga, Arto Annila, 01.01.2008 → 31.12.2011, Finland



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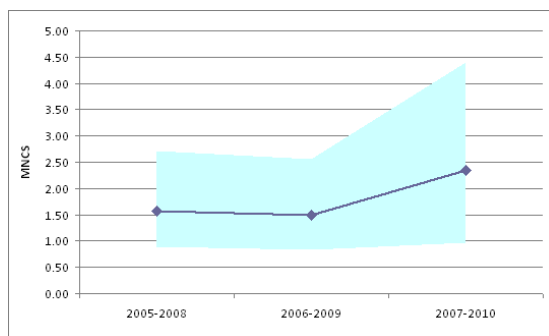
Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010
by CWTS, Leiden University, the Netherlands

Research Group: Wikström M

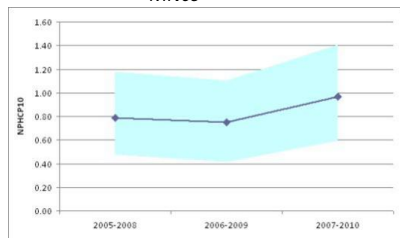
Basic statistics

Number of publications (P)	292
Number of citations (TCS)	2,227
Number of citations per publication (MCS)	7.66
Percentage of uncited publications	21%
Field-normalized number of citations per publication (MNCS)	1.92
Field-normalized average journal impact (MNJS)	1.26
Field-normalized proportion highly cited publications (top 10%)	.79
Internal coverage	.87

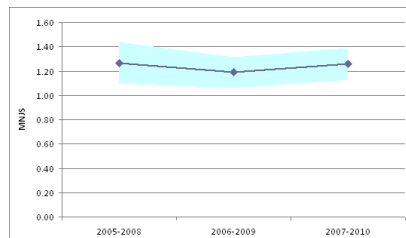
Trend analyses



MNCS

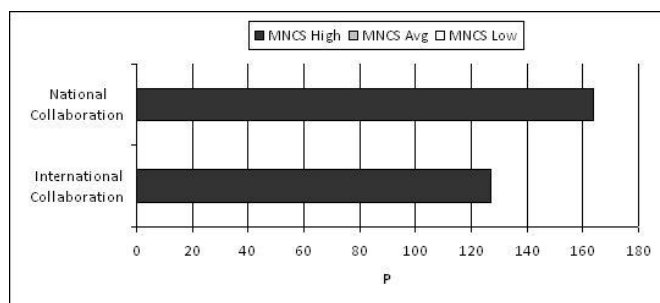


THCP10



MNJS

Collaboration



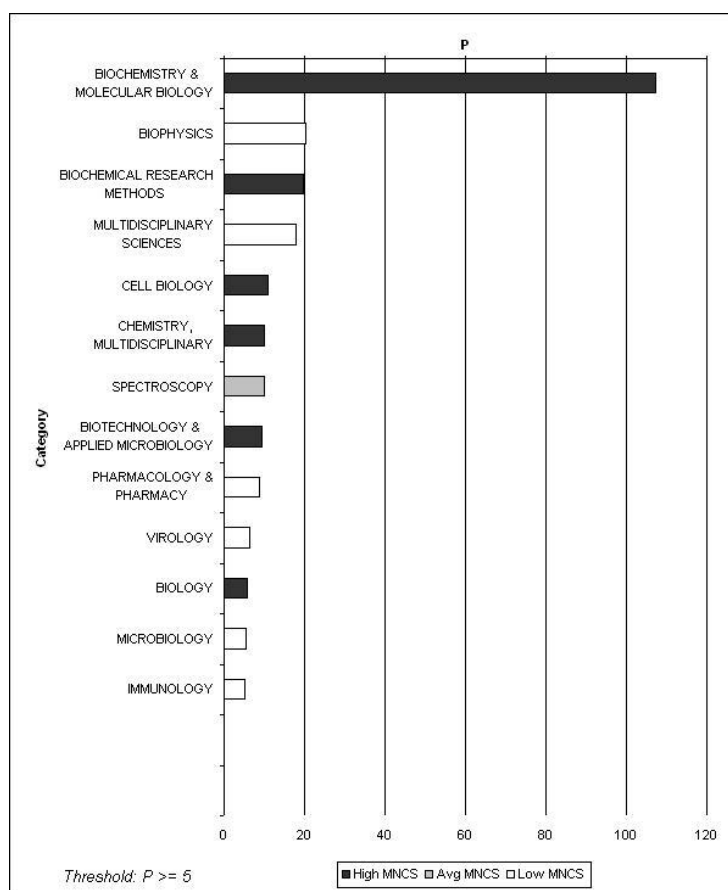
Performance (MNCS) by collaboration type



INTERNATIONAL EVALUATION OF RESEARCH AND DOCTORAL TRAINING
AT THE UNIVERSITY OF HELSINKI

Web of Science(WoS)-based bibliometrics of the RC's publications data 1.1.2005-31.12.2010
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Research profile



University of Helsinki
Administrative Publications 80/25
Evaluations

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