GBB Groningen Biomolecular Sciences and Biotechnology Institute

EES Centre for Ecological and Evolutionary Studies

CBN Centre for Behaviour and Neurosciences

Life Sciences Institutes University of Groningen

Groningen Biomolecular Sciences and Biotechnology Institute (GBB)

Centre for Evolutionary and Ecological Studies (CEES)

Centre for Behaviour and Neurosciences (CBN)

ASSESSMENT OF RESEARCH QUALITY

1998-2004

RuG

Rijksuniversiteit Groningen

Assessment of Research Quality

Life Sciences Institutes University of Groningen

Groningen Biomolecular Sciences and
Biotechnology Institute (GBB)
Centre for Evolutionary and Ecological Studies (CEES)
Centre for Behaviour and Neurosciences (CBN)

1998-2004

University of Groningen

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Assessment of Research Quality

Life Sciences Institutes
University of Groningen
Groningen Biomolecular Sciences and Biotechnology Institute (GBB)
Centre for Evolutionary and Ecological Studies (CEES)
Centre for Behaviour and Neurosciences (CBN)
1998-2004

University of Groningen

Contents

1 General Information

1 1 Introduction

1 1 1 National system for assessing the quality of research

In 2003, the Dutch system for assessing the quality of research underwent a major change. The system of national, external assessments of individual disciplines, coordinated by the office of the Association of Dutch Universities (VSNU), was discontinued. In its place, the Executive Boards of the universities now determine the design and organization of the research quality evaluations. They are bound by the "Standard Evaluation Protocol 2003-2009" (SEP)[1], which is approved not only by VSNU but also by the Netherlands Organization for Scientific Research (NWO), the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Dutch ministry of education and science.

The three main aims of the Standard Evaluation Protocol are improving the quality of research, improving research management and direction and improving accountability, both internal (by the unit to its immediate superiors within the university) and external (by the university to government and society). The SEP is based on two fundaments:

- an external assessment once every six years (by a peer review committee conducting a site visit)
- a self-evaluation once every three years (one in preparation for the external assessment and one intermediate evaluation three years later, the 'mid-term review').

The SEP requires the committee members to evaluate the research institute or school as a whole and the relevant parts of the institute (research programs) individually, on four main criteria, namely:

- Quality (international recognition and innovative potential)
- Productivity (scientific output)
- Relevance (scientific and socio-economic impact)
- Vitality and feasibility (flexibility, management, and leadership)

The most important conclusions of the external assessment committee, the reaction to these by the assessed unit and the final conclusions with regard to the future applied to them by the Executive Board will all be published.
An independent meta committee, set up by the KNAW, NWO and VSNU, will check the design and implementation of the new system by the various institutions and publishes its findings annually.

1 This can be downloaded from: *http://www.qanu.nl/?contentid=144*

The SEP provides a framework to guarantee -as far as possible- comparable procedures and criteria. Within this, it provides room for specific input by the universities. Subsequently, the University of Groningen (RUG) developed the so-called "Protocol for Quality Assurance at the University of Groningen".

The following principles underlie the RUG protocol[2]:

a *There is a close connection with the RUG quality policy*
b *There is a clear division of tasks and responsibilities*
c *The external assessment is transparent, authoritative and is relevant for both internal policy and external accounting*
d *The aim is professionalization and minimal workload for researchers.*

Re a) RUG quality policy with regard to research

The RUG regards quality improvement as the dominant principle in its research policy. A crucial part is played by the peer reviews, external assessments by independent, objective researchers with expertise in the disciplines of the unit to be assessed. The peer reviewers should preferably be recognized international authorities and base their assessment not only on the self-evaluation of the unit but also on actual knowledge of the most important output, where possible supplemented by quantitative and qualitative indicators.

Further, external research assessments should concentrate on:

- providing direct feedback from the peer reviewers on the position of the research, measured against national and international standards for quality, productivity, relevance and vitality;
- assessing both past performance and future expectations, the ambitions and the scientific and social impact of the research;
- evaluating the management and the academic leadership of the unit in relation to the mission and ambitions;
- the context of the research unit, for example how the unit is embedded in the faculty and/or the university as a whole, its national and international context, as well as its disciplinary and interdisciplinary contacts.

Before formal acceptance of the findings of the peer review committee as laid down in the assessment report, the Executive Board of the university will apply the principle of hearing both sides of the case.

Re c) Usefulness

The results of an assessment must be sufficiently informative to serve as the basis for policy decisions. Therefore, the possibility of adding a lower aggregation level – compared to the aggregation level referred to in the SEP – exists. In practice, the aggregation levels of research programs may vary strongly. However, if a research program is believed to be too large to receive an adequate judgment on all research covered by this program, the Executive Board of the university may request for a supplementary evaluation at a lower aggregation level. The external assessment at this lowest level can, if desired, remain confidential. The SEP provides for this eventuality in the management letter: 'Matters of personnel policy and sensitive decisions are generally treated in the confidential management letter to the Board and do not form part of the public report.'

Re d) Minimal assessment

Institutes at the RUG are organized on a disciplinary and local level. Within the previous national system, an institute was assessed simultaneously with comparable research groups at other Dutch universities. In the current system national, disciplinary visitation is no longer compulsory but still an option, provided that the relevant Executive Boards approve. The RUG is determined to keep the option for national co-operation open, particularly because of the increased comparability of the assessments and the more efficient use of peer reviewers. An alternative for national co-operation would be to allow a single Peer Review Committee (PRC) to assess several Groningen institutes. This option is offered to faculties aiming to cluster their multidisciplinary research institutes.

[2] The full text in Dutch and an English summary can be downloaded from:
http://www.rug.nl/Corporate/onderzoek/kwaliteitszorg/index

2 Review of the Life Sciences Institutes

2.1 The review committee

The peer review committee members for the research assessment of the Life Sciences Institutes were appointed by the Executive Board of the University of Groningen, after a thorough selection procedure assuring an authoritative, critical and independent assessment of the research institutes.
The committee consisted of:
Prof. dr. W.P.M. Hoekstra (Chair), *Microbiology, The Netherlands*
Prof. dr. M. Bolognesi, *Biomolecular Sciences and Biotechnology, Italy*
Prof. dr. R. Dantzer, *Integrative Neurobiology, France*
Prof. dr. H.P. Lipp, *Neuroanatomy & Behavior, Switzerland*
Prof. dr. G.A. Parker, *Evolutionary Biology, UK*
Prof. dr. A.J. Sinskey, *Microbiology and Biotechnology, USA*
Prof. dr. I. Valiela, *Marine Biology, USA*

Dr. J.M. van Rooij, Department of Academic Affairs, University of Groningen, was appointed secretary to the review committee.

All members of the Committee signed a declaration and disclosure form (see: Appendix A) to safeguard that:
- the panel members judge without bias, personal preference or personal interest, and
- the judgment is made without undue influence from the institute, the program or other stakeholders.

Additional information on the committee members and their curriculum vitae can be found in appendix B.

2.2 Scope of the assessment, assignment to the committee

The assessment comprised the three Life Sciences Institutes of the Faculty of Mathematics & Natural Sciences (FMNS):
- Groningen Biomolecular Sciences and Biotechnology Institute (GBB)
- Centre for Evolutionary and Ecological Studies (CEES)
- Centre for Behaviour and Neurosciences (CBN)

The review committee was asked to evaluate the institutes separately as well as the research programs within each. For the institutes, emphasis was on strategy and organizational aspects,

while the program assessments focused on results, quality and future perspectives of the scientific research. The PRC had to take into account the general rules laid down in the Standard Evaluation Protocol.

In addition, the following specific instructions were given by the Executive Board:

Numerical scores for Q, P, R, V&F

The SEP is somewhat ambiguous about the use of the five point scale. Following the SEP guidelines for the evaluation report (§3.6, p.16), the PRC was asked to provide numerical scores at the level of the research programs only. At the Institute level, verbal judgments would suffice.

Publication numerical program scores

The SEP prescribes that the final evaluation report will be made public. However, sensitive parts may be left out and can be addressed instead in a confidential management letter to the Executive Board and the Board of the Faculty of Mathematics & Natural Sciences.
Given the low level of aggregation of the Life Science programs, the PRC was asked to restrict the individual program scores to a confidential management letter and to provide anonymous frequency tables of the numerical scores in the public evaluation report.

Citation analysis

An advanced bibliometric analysis was performed by the independent Centre for Science and Technology Studies (CWTS; http://www.cwts.nl/), covering the scientific output over the period 1994-2004. It provided a sophisticated view of (trends in) relative citation impact of the Life Sciences Institutes and programs (compared to the world averages in relevant subfields and journal sets), thus providing some sort of an international benchmark. The PRC was requested to take these into consideration before drawing its final conclusions, as considered appropriate.

The committee based its assessments on the self-evaluation reports of the three institutes, additional documentation provided (see § **2** 3) and on discussions with the program leaders, institute Directors and members of the Faculty Board.

A total of 27 research (sub)programs were presented to the PRC for evaluation, 12 for GBB, 8 for CEES and 7 for CBN (see Contents for overview).

2 3 Input for the research assessment

Prior to the site visit the committee received the following documentation:

- a summary of the SEP and RUG protocol
- the self-evaluation reports of GBB, CEES and CBN (cf. SEP format, including a SWOT analysis, tables with input and output at institute and program levels, publication lists and full text copies of key publications)
- the results at FMNS and institute level of the bibliometric analysis mentioned above.

Upon arrival the committee received the following additional information:

- the results at the program level of the bibliometric study mentioned above
- an overview of the relative productivity (output : input ratios) of the three institutes and 27 research programs

The self-evaluation reports covered the 7-year period 1998 – 2004, were written in accordance with the directives of the SEP and comprised information at three levels of aggregation:

- FMNS (organization; management; publication strategy; human resource policy)
- institute (leadership; mission, strategy & policy; research staff & input; resources, funding & facilities; collaboration; reputation; internal evaluation; external validation; results; SWOT analysis)
- research program (leadership; mission, strategy & policy; collaboration; reputation; external evaluation; research staff & input; resources, funding & facilities; results; SWOT analysis)

2 4 Working procedure of the Committee

Given the extensive documentation and the large number of programs to be evaluated, a division of labor between committee members was followed.
In preparation of the evaluation, all members were asked to read Part A (description at FMNS and institute level) of all three institutes. First responsibility for studying the documentation on the research programs in Part B was allocated as follows:

Institute	Program(s)	PRC members
CBN	All programs (1-7)	Dantzer, Lipp (Hoekstra)
CEES	Microbial ecology (7) Other programs (1-8)	Parker, Valiela, Hoekstra Parker, Valiela (Hoekstra)
GBB	Developmental Genetics (5) Molecular Biology of Plants (6) Other programs (1-12)	Bolognesi, Sinskey, Dantzer Bolognesi, Sinskey, Hoekstra Bolognesi, Sinskey (Hoekstra)

To keep an overview and to guard uniformity, the chair studied all documentation.

All PRC members sent their individual qualitative pre-assessment of each institute and of the allocated programs to the secretary prior to the site-visit. These were compiled and used as input for the closed 'kick-off' meeting.

With respect to the interviews, the PRC was divided into three subcommittees:

Institute	PRC members	Reporting
CBN	Dantzer, Lipp	Streefland (additional support RUG)
CEES	Parker, Valiela, Hoekstra	Hoekstra
GBB	Bolognesi, Sinskey	Van Rooij (secretary PRC)

Dr. C. Streefland from the RUG department of Academic Affairs provided secretarial support to the CBN subcommittee and took minutes of all interviews with the CBN program leaders. The chair and secretary took down notes of the other interviews. Notes were exchanged and discussed in plenary sessions several times during the site visit.

Regarding the writing of the report, each subcommittee was responsible for the first draft of the separate institute and program assessments. However, all drafts were exchanged and compiled by the chair and the committee wishes to stress that all subsequent versions of the compiled report were fully supported by all PRC members.

The first draft of the compiled report was presented to the management of the institutes and the Faculty Board for verification of the facts and to comment on the findings of the PRC. The comments were seriously considered and led to some corrections in the final text and/or scores.

2 5 The site visit

The committee members were welcomed in Groningen on Sunday evening, March 13th by representatives of the university 's Executive Board (Prof. dr. F. Zwarts), the Faculty Board (Prof. dr. J. Koolhaas) and the management of the three institutes.

The actual site visit started Monday morning March 14th and ended March 17th in the afternoon. The program comprised:

- plenary sessions:
  - closed meetings of the PRC:
    - kick off meeting (March 14th 9:00-13:00): comparison preliminary assessments; formulation major topics for discussion with the University and Faculty Boards, institute directors, and program leaders; request for additional information; adjustment program
    - 'calibration' meetings: exchange of preliminary impressions and scores between subcommittees (during the lunches on Monday, Tuesday and Thursday; 30-45 minutes 'lobby-meetings' preceding the dinners on Monday – Wednesday; March 16th 20:30-21:45)
  - meetings with:
    - the three institute directors separately: two times 1 hr each (on March 14th, 9:00-13:00 and March 17th, 9:00-12:00)
    - the University and Faculty Boards and the three institute directors: concluding session with presentation preliminary findings of the PRC (March 17th, 13:30-14:30)
- parallel subcommittee meetings for the three institutes:
  - 45 minute interviews with all program leaders
  - informal discussion/drink with appr. 25 PhD students and postdocs (March 16th, 16:00-17:45).
- tours of the facilities
  - three parallel tours for each subcommittee showing specific program facilities
  - one tour for the entire committee to the neuro-imaging facility

2 6 Assessment criteria and Ratings

The SEP calls for an assessment based on four main criteria: Quality, Productivity, Relevance and the dual criterion Vitality & Feasibility. The questions to be answered with the assessment concern both the institute and the research programs. These questions are:

For past performance:

- What are the quality and relevance of the institute?
- What is the quality of the leadership, management, strategy and research programs of the institute, its (human) resources, organization and infrastructure and how can they be improved?
- To what extent has the institute/research program achieved its mission and goals formulated for the period under review?

For future plans:

- Is the mission of the institute well chosen and phrased in view of the actual developments in the relevant research field(s)?
- How do you assess the institute's research plans and is there sufficient coherence in the research portfolio of the institute?
- What is the quality of the leadership, management and strategy of the institute, its (human) resources, organization and infrastructure and how can they be improved?
- Which of these aspects has room for improvement and how could that be accomplished?

Assessment criteria according to the SEP and interpretation by the PRC

Quality is to be seen as a measure of excellence and excitement. It refers to the eminence of a group's research activities, its abilities to perform at the highest level and its achievements in the international scientific community. It rests on the proficiency and rigor of research concepts and conduct; it shows in the success of the group at the forefront of scientific development. The members of the committee judged quality largely based on the discussions with the program leaders and the information in the self-evaluation reports, relying on their own

knowledge and expertise. Relative citation impact as emerging from the bibliometric analysis by CWTS was helpful for the evaluation of the institutes, but played a minor role in assessing the quality of the research programs.

Productivity refers to the total output of the group; that is, the variegated ways in which results of research and knowledge development are publicized. Usually, quantitative indicators measure this. The output needs to be reviewed in relation to the input in terms of human resources.
The committee used the productivity analysis provided by the management only in the final stage of the assessment, mainly for 'calibration' of program scores within each institute. The subcommittees first based the program's productivity on the information in the self-evaluation report, not only on numbers but also on the nature of publications. Both academic publications and dissertations were taken into account and for GBB patents were counted as well. Output numbers were primarily related to the research input of the tenured plus non-tenured staff, but the input of PhD students was not neglected totally. Given differences in publication culture, the committee paid little attention to differences in output : input ratios between the institutes.

Relevance is a criterion that covers both the scientific and the technical and socio-economic impact of the work. Here in particular research choices are assessed in relation to developments in the international scientific community or, in the case of technical and socio-economic impact, in relation to important developments or questions in society at large.

Vitality & Feasibility refer to the internal and external dynamics of the group in relation to the choices made and the success rate of projects. On the one hand, this criterion measures the flexibility of a group, which appears in its ability to close research lines that have no future and to initiate new venture projects. On the other hand, it measures the capacity of the management to run projects in a professional way. Assessment of policy decisions is at stake, as well as assessment of project management, including cost-benefit analysis.

Ratings

The SEP provides a five-point scale to allow for the attribution of a numerical score on each of the four criteria. The scores used in this assessment are excellent (5), very good (4), good (3), satisfactory (2), and unsatisfactory (1). It should be stressed that these scores cannot replace the verbal judgments that supply more relevant information.

A more extended description of this scale is as follows:

Excellent: work that is at the forefront internationally, and which most likely will have an important and substantial impact in the field. Institute is considered an international leader.

Very good: work that is internationally competitive and is expected to make a significant contribution; nationally speaking at the forefront in the field. Institute is considered international player, national leader.

Good: work that competitive at the national level and will probably make a valuable contribution in the international field. Institute is considered internationally visible and a national player.

Satisfactory: work that is solid but not exciting, will add to our understanding and is in principle worthy of support. It is considered of less priority than work in the above categories. Institute is nationally visible.

Unsatisfactory: work that is neither solid nor exciting, flawed in the scientific and or technical approach, repetitions of other work, etc. Work not worthy of pursuing.

As pointed out above, the committee was instructed to provide scores at the program level only. Furthermore, as recognized by the SEP, it is not always feasible or satisfactory to measure on a five-point scale. To allow for more 'fine-tuning', the committee therefore extended the scale to include intermediate scores (e.g. 3-4).

In order to keep the program scores in this public report anonymous, as instructed, a frequency table is provided for each institute, listing the number of programs with a specific rating for each of the four criteria separately. Furthermore, graphs are provided of the mean program scores (unweighted average of the scores on the four criteria) plotted against the score on Quality.

Finally, it should be noted that previous external assessments used a different scale, prescribed by the former 'VSNU Protocol 1998' that was used in the national quality assessments until 2003. The table below provides an overview of the differences that should be taken into account carefully when comparing present and past scores.

VSNU 1992-2002 (previous reports)		**SEP 2003-2009** (this report)	
5	Excellent	5	Excellent
		4	Very good
4	Good	3	Good
3	Satisfactory	2	Satisfactory
2	Unsatisfactory	1	Unsatisfactory
1	Poor		

Assessment of the Life Sciences Institutes

3

3 1 General remarks

The documentation

It is essential that any documentation for research evaluation

- clearly highlights why the chosen research questions are important (for basic science and/or societal reasons)
- reveals how and under what conditions the research questions are approached
- states what kind of results were achieved
- contains the relevant managerial information
- presents a realistic outlook for the future.

The written reports by the various research groups were not always informative about the state of the art and the justification of the research strategy. Often the research was presented more as the continuation of a tradition or by virtue of a mission than in its own rights. The standardized presentation certainly reflected the very strict national Standard Evaluation Protocol, and it would have been useful to see a more concise presentation of the most important results and their implications.

The site visit

The intensive site visit was very well organized and highly informative. In retrospect, however, precious time could have been gained by restricting the facility tours to those facilities that really matter for the research. The committee did not find it very appropriate to see general facilities and standard equipment.

The bibliometric analysis by CWTS

The committee appreciated the very thorough bibliometric analysis by CWTS. This analysis was helpful for the evaluation of the institutes. The committee, however, did not feel that the analysis was of great help for the evaluation of the research programs within the institutes. At this lower level of aggregation potential flaws may influence the analysis, as clearly indicated by the CWTS authors themselves. For that reason, the bibliometric analysis fulfilled a minor role when it came to the evaluation of the research programs within the institutes.

The interviews

The directors of the institutes and the various research program leaders were very open in informing the committee about the mission of their research, about their achievements in the research and they gave clear indications about their future plans. The open and communicative dialogue with the research leaders appeared, next to the written documentation, very essential, for the evaluation procedure.

Although the quality of the PhD training programs is evaluated separately by the KNAW-ECOS in the framework of the Dutch Research School evaluation, the committee also invited PhD students to discuss various aspects of their research training. We met PhD students – and a few postdocs- who, in general, enjoyed their research and appreciated the scientific environment in the various institutes. The committee was very pleased to see that the students articulated clearly their positive opinions as well as their criticisms.

Institute leadership

The committee learned that the Directors of the institutes spend much time in organizing their institutes. We appreciate the institute organization as an effective intermediate level between researchers and the Faculty Board. We feel that this vital role of the institutes, so effectively exerted by the present directors, should be stimulated by the Faculty Board through continuous moral support and moreover by material facilities. The assessment of the institute organization by our committee would require, however, a more detailed presentation of the overall strategy of the institute and its positioning both at the international and national levels.

The Human Resource Management

The Human Resource Management policy by the University / Faculty Board revealed besides positive elements also some aspects with negative consequences for the research institutes.

- Heavy teaching loads were frequently mentioned in the documentation as a matter of concern. In various interviews with research leaders it appeared that teaching as such was no problem for the researchers. On the contrary, the researchers expressed that they wholeheartedly accept even heavy teaching loads. The real concern and main reason for increasing frustration is caused by the frequent changes in the teaching program dictated by the Faculty Board / University Board. The introduction of a bachelor-master system, the start of Top Master programs and the conversion of research schools into graduate schools, all in a short time and not always presented in a consistent or transparent way, as we were informed, are main causes for serious frustration.
- In the same vein, the introduction of a bursary system for the PhD program in Groningen is experienced by the staff as well as by the PhD students as very frustrating. The system has, at least for the time being, the consequence that it only allows the appointment of foreign students. Although research leaders highly appreciate the participation of foreign PhD students in their teams, they don't like to see that talented Dutch students are excluded as potential PhD students.
- In CEES and GBB the number of tenured staff members decreased in the evaluation period, for GBB also the number of non-tenured staff members decreased. At the same time, the number of PhD students showed a large increase in both institutes. Our concern is that the staff / PhD student ratio might affect the quality of the PhD training in these institutes.
- For all institutes the participation of women in staff positions is very low, in particular when related to the high number of female undergraduate respectively PhD students. It is clear that thereby potential female talents are not optimally used. We therefore appreciate the Rosalind Franklin program of the RUG as a serious first step towards a more balanced gender profile. However, it can be questioned whether other measures on a shorter term basis should not be implemented to attenuate the present gender bias.
- The recent implementation of a tenure-track system (the "Bèta's in Banen" program) is also welcomed by the committee as it offers more career perspectives for talented young scientists. We do not share the fear expressed by some research leaders that the Bèta's in Banen and Rosalind Franklin programs, both with strong emphasis on individual expression, will inevitably disturb the coherence in the running research programs.
- Finally, the committee was very pleased to see that in the evaluation period many new research leaders successfully replaced distinguished former group leaders. We hope that the foreseen replacements of group leaders at various institutes will be as successful and that they are not hampered by financial cuts.

Financial resources

All institutes receive substantial funding from the competitive '2nd funding source' (16-23 %, largely money from NWO). One of the concerns revealed by research leaders concerns the substantial matching obligations resulting from this type of funding. As a consequence, success in competitive funding programs, general considered an indicator of high quality, is accompanied by a heavy matching load, either for the university or the faculty. This will consequently affect flexibility in spending 1st funding sources (direct university funding by the government). The Executive Board of the RUG should therefore try to put pressure on funding agencies to relieve at least part of the heavy matching load.

The fundamental research performed in the various institutes leads to all sorts of applications. The committee is convinced that a determined and more daring (university) policy to sell the valuable fundamental knowledge could help to face the financial problems foreseen by the institutes.

The comments on the provisional report

The comments on the provisional evaluation by directors and program leaders frequently dealt with different views on scores for Productivity or Relevance.
As outlined in section 2.6, the Productivity scores only partly reflect the output: input ratios over the period of the evaluation. The nature of the output is diverse (academic papers in journals, books or chapters in books, dissertations), as well as the nature of input in the various programs (tenured staff, non-tenured staff and PhD students). Therefore, judgment of productivity is not always as straightforward as one would wish.
From the comments on Relevance we learned that some directors and program leaders interpret "Relevance" merely as "Societal relevance". We stress that we have included in our score societal as well as scientific relevance of a program.
Some reactions asked the committee to take into consideration facts, figures and developments beyond the period of evaluation. The committee kept to the protocol and ignored such reactions.

Assessment Groningen Biomolecular Sciences and Biotechnology Institute (GBB)

4

4 1 The Institute

DIRECTORS

'04-present:	L. Dijkhuizen
'99-'04:	D.B. Janssen
'98-'99:	G.T. Robillard

RESEARCH INPUT 2004 (FTE)

Tenured staff:	9.7
Non-tenured staff:	35.8
PhD students:	69.8
Total:	115.4

The Groningen Biomolecular Sciences and Biotechnology Institute (GBB) coordinates and supports scientific programs in life sciences. GBB's broad approach to the topic includes front-line projects in fields such as genetics, microbiology, biochemistry, molecular and structural biology, functional genomics, and bioinformatics. As a more specific example, the institute focuses on the fundamental study of the structural and dynamic behavior of proteins and membranes in their cellular roles, with a long-term view of their applications to biotechnology and medical research. Other examples can also be described, for instance in the areas of microbial physiology, microbial genetics and biotransformations that demonstrate GBB's abilities to do basic applied science that aids in the translation of the research into the commercial sector.

In addition to its strengths in research, GBB actively pursues a distinct, well-defined educational mission, providing a stimulating environment within which the institute trains undergraduates, PhD students and postdocs in the life sciences and biotechnology. The checks and balances required for an effective doctoral program are in place, and students, mentors, and PhD committees are all well aware of the objectives of the thesis research being pursued and of the research timeline.

Research lines at GBB are, in general, well established, based on several years of strong leadership with clearly defined scientific goals at both the basic science and applied levels. Bibliometric statistics indicate that most GBB research lines are striking the top fraction of the literature in their respective fields, with a significant international output. In general terms, the relevance of GBB research activities is very high, and the research is well positioned relative to competing international organizations. The research lines show potential value in biomedical or pharmaceutical research, and societal impact is seen in the translation of research into spin-offs or industrial research/production.

Teaching at GBB, particularly PhD student training, appears to have been very successful during the review period (as measured by the fact that PhDs were able to find jobs in academia or industrial research rather quickly after graduation). Current PhD students, however, see low chances of employment in the coming years. In this respect, the "Top-Master" program and the implemented supervision plan for PhD students will be important developments for GBB's entire educational arena. It should be noted that a European Graduate College, although only of a bilateral nature (Ruhr University, Bochum, Germany), has recently been established.

GBB management during the review period has shown high levels of competence and care. Despite having to make some obvious cuts due to the general funding shortage, management has been able to act promptly and craft convincing solutions for the continuation of fruitful activities: participation in the Rosalind Franklin program; faculty replacement; relations with the University and external bodies; and maintenance of a very lively research spirit within the institute. It was encouraging to see a specific recruitment program for senior female research staff; every effort should be made to increase the support for senior female staff at GBB. GBB is a leading institution in the Life Sciences at the University, and female staff should be attracted to its intellectual pursuits, facilities, research opportunities and student support.

The funding levels within GBB for scientific projects appear, on average, to be sufficient, although this is not easily discernible from the documentation provided. In most cases, the interviewed groups did not appear to be limited in running their activities by the unavailability of funds. Most funding for the groups comes from external sources (competitive grants, such as from NWO, the European Union, or contracts with companies). Such a level of funding should be granted for the future, and the search for external sources, occasionally supported by matching funds, should be encouraged by management, by FMNS and by the University.

The Review Panel was impressed during the interviews by the amount of activities, their frontline standing and strategic value, and the level of external collaboration achieved by quite a number of programs in the institute. These programs, for reasons detailed in the attached specific documents, are seen as strong international competitors in their fields, and their current activities bode well for the future development of excellent research.

During the interviews, some critical issues requiring particular care were noted. The planned move of Prof. P.J.M. van Haastert (Cell Biochemistry) to cooperate with the Developmental Genetics program is seen as a very positive solution, alleviating the difficulties created by staff changes in the latter program. Management might consider forming a new umbrella, "Molecular and Cell Biology," under which the programs Eukaryotic Microbiology, Developmental Genetics and Cell Biochemistry can better exploit their expertise. This will help identify the programs to the outside world, perhaps attract more students interested in broader opportunities in the field, and assist in maintaining a more competitive critical mass of scientists and better use of facilities.

The unique educational role at GBB played by the Molecular Biology of Plants program cannot be underestimated in the context of Life Science training curricula. Nevertheless, maintaining this program at the current activity / output level may prove increasingly difficult due to competition with stronger national and international efforts in the same field. GBB should undertake an analysis of how sustainable this program will be in the future, especially in light of what is required to maintain fully active greenhouse facilities, and given the reported national trend of general reluctance to research on genetically modified plants.

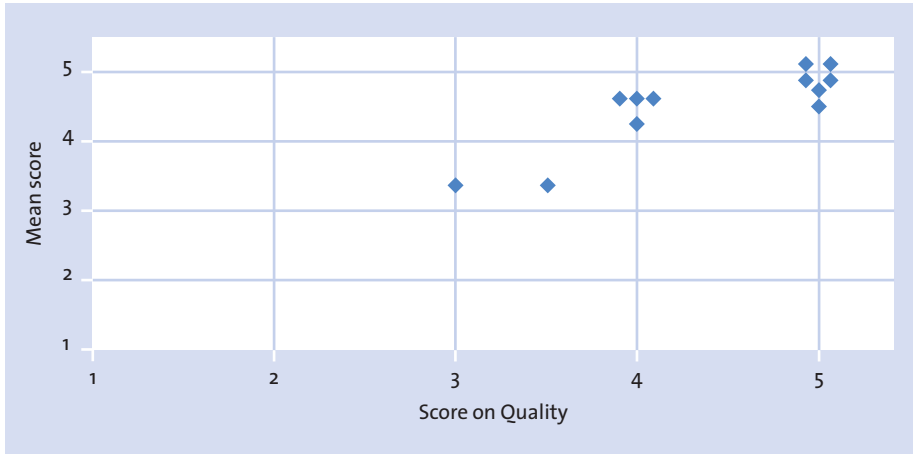
State-of-the-art NMR facilities are required for continued excellence in several programs, as well as in building the Center for Carbohydrate Bioengineering. The existing NMR installation, however, is based on old hardware that requires special technical care to maintain it in optimal condition (although there has been some recent refurbishment). Further, maintenance relies strongly on the competence of one member of the technical staff, who is close to retirement. Competition with higher field spectrometers will become more difficult over time. The recent appointment of a senior postdoc to this facility is a sensible move, but is a short-term solution. It should be kept in mind that this piece of instrumentation will not attract frontline NMR researchers to GBB in the future.

Students interviewed were supportive of the Molecular Dynamics program. However, the move of Prof. Mark to Brisbane (Australia) will leave this strong program in a delicate situation. The foreseen joint appointment of Prof. Mark will work fine for some time, but a strong replacement must be found quickly. This program's evolution and direction will depend on how the departure of Prof. Mark and the initiation of a new PI play out. It is bound to be a delicate situation given Prof. Mark's five-year joint appointment at Groningen.

Overview program scores GBB

Score	Number of programs with score on			
	Q	P	R	V&F
2				
2.5				
3	1			2
3.5	1	2	1	1
4	4	2	1	1
4.5		5		
5	6	3	10	8
n.a.				
Total:	12	12	12	12

Mean score vs. Quality GBB programs



Mean program scores (unweighted average of the scores on all four criteria) plotted against the program score on Quality.

4 2 Research programs

4 2 1 Molecular Microbiology / Biomembranes (GBB1)

PROGRAM LEADERS

'03-present:	A.J.M. Driessen
'99-'present:	J.S. Lolkema
'98-'02:	W.N. Konings
'98-'99:	B. Poolman

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	15.0

The focus of the group is fundamental molecular biology research with a strong emphasis on biomembranes, leading to applications in many areas of life sciences. The group pursues outstanding studies on the structural and functional analysis of bacterial protein export, insertion of proteins in membranes, multi-drug resistant transporters, and structure-function properties of secondary transporters.

The Committee assessed the Molecular Biology / Biomembranes progam to be excellent, based on the high quality and depth of its research, the impact this research may have on human health models, the quality of the research team, its international reputation, and the program's successful industrial collaborations.

The Molecular Biology / Biomembranes program continues in the tradition of high-quality research in the general area of membrane biology. The research addresses front-line hypotheses and projects and is well recognized by the international and national scientific communities; it is therefore rated qualitatively excellent.

While productivity measured quantitatively has dropped slightly in the past two years it is maintained at a very good level. Research funding from competitive sources, which comprises one-third of the group's funding input, is also maintained at a very good level.

Biological systems communicate with their environment through a variety of molecular mechanisms. This group has focused on several fundamental issues, such as structural and functional analysis of bacterial protein export, fundamental studies on protein transporters that address structural questions as well as basic physiological control mechanisms, biogenesis and function of unique cell envelopes from thermophilic archaea, groundbreaking studies on bacterial V-type ATPases, and, more recently, DNA export using *Neisseria gonorhoeae* as the model organism. Results useful both in health care and biotechnology have resulted, and more are expected. The research on penicillin G export from industrial filamentous fungi is an excellent example of the program's translation of its fundamental research endeavours into economically viable biotechnology processes. The research, therefore, is rated as excellent, with respect to both its scientific relevance and societal relevance.

Evidence of the program's vitality can be seen in the academic reputations achieved by the group's PIs, grants awarded, and by the large number of PhD students and postdocs hosted by the lab. The group's vitality has improved with the recent addition of Dr. C. van der Does as a tenure track member of the group. The successful completion of several challenging projects is the best indicator of the feasibility of the projects carried over by this program.

4 2 2 Eukaryotic Microbiology (GBB2)

PROGRAM LEADERS

'98-present:	M. Veenhuis
'00-present:	I.J. van der Klei
'98-'02:	W. Harder (honorary)

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	12.0

The central theme of the program is the investigation of structure formations in eukaryotic cells. The group's primary focus has been microbody formation, i.e. peroxisome biogenesis in the methylotrophic yeast *Hansenula polymorpha* and, more recently, microbody formation in its relationship to penicillin production using *Penicillium chrysogenum*.

The Committee assessed the Eukaryotic Microbiology progam to be very good to excellent,

based on the quality and depth of the research performed, its international level, the quality of management, the successful industrial collaborations, and the impact this research may have on human health models.

The Eukaryotic Microbiology program, utilizing the latest techniques in genetics, biochemistry and confocal imaging, has consistently produced papers at the international level. The quality of this research program is evidenced by these published papers, prizes to members of the group, and invitations to lectures. Bibliometric statistics, which rate this group slightly above the world average, probably underestimate the overall group performance.

Productivity is consistently at a high level.

Future scientific activity planned for the Eukaryotic Microbiology program is to focus on the mechanisms of microbody biogenesis versus degradation. Studies will seek to answer specific questions on the formation of peroxisomal membranes, mechanisms of peroxisomal matrix protein import, as well as peroxisome degradation, leading to more quantitative descriptions of organelle formation. Advanced confocal imaging techniques with genetics and biochemistry will lead to a significantly better understanding in this well recognized and important research program. Elements of past research have biotechnological relevance for more efficient protein production process; some of the basic findings are being applied on secondary metabolites such as antibiotics, which has led to important spin-offs in medicine and industry. Overall, the relevance of the Eukaryotic Microbiology program is rated as excellent, both with respect to science and society (for its impact on human health and on industrial activities).

The group is undoubtedly vital. There is a productive interaction between the two faculty members, which allows a large PhD student community to be trained in this research environment. In addition, a continuous collaboration with industrial partners is demonstrated. The rating is, therefore, excellent.

4.2.3 Microbial Physiology (GBB3)

PROGRAM LEADERS

'98-present:	L. Dijkhuizen
'98-'01:	T.A. Hansen
'98-'01:	H.A.B. Wösten

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.1
Total:	10.4

The Microbial Physiology program focuses on two main areas: the primary and secondary metabolism in actinomycetes, and structure/function of glycoside hydrolase enzymes that act on primary carbohydrate substrates, such a starch and sucrose. In its research endeavors the group employs the most recent advance in genetics and molecular biology to understand basic physiological parameters, including high-throughput methods leading to rational strategies for manipulating secondary metabolism and biochemistry applications. The ongoing studies on sterol metabolism and modifications, as well as the surface active protein studies from *Streptomyces*, are excellent examples of the group's creativity. At least 19 patent applications were submitted during the period under review, and the potential commercial relevance of the research has not gone unnoticed by the investigators.

The Committee assessed the Microbial Physiology program to be close to excellent. The group's research is state-of-the-art, addressing cutting-edge problems by utilizing advanced techniques, genetics, molecular biology, and analytical and high through-put screening to gain a better understanding of how to manipulate the molecular biology of gram positive bacteria in novel ways. The Microbial Physiology program has achieved a high international and national standing, and has been a leader in establishing programs such as the Centre for Carbohydrate Engineering.

Bibliometric statistics appear to estimate correctly the quality of the group's research, which can be considered to be at a very good international level. This is suggested by the high number of contracts and relationships with external companies and granting institutions. Indeed, the level of external funding achieved by the program is a clear indicator of strong quality.

The Microbial Physiology program shows steadily increasing productivity across the different research lines. The group lists many PhD students as well as postdocs, and the program serves an important educational role both within the University and for training industrial scientists. The substantial level of external funding also testifies to the excellent productivity level.

The Microbial Physiology program is producing work of excellent scientific and social impact. The topics dealt with by the program have led to many applications, particularly in the carbohydrate metabolism field; these contribute to an ongoing tradition in the Groningen area and at the same time provide a platform for spin-offs and industrial applications. In addition, the group's activity attracts a large number of PhD students. Overall, the relevance of this program is excellent.

The activity in this program is carefully coordinated and directed, resulting in a coherent set of projects that find counterparts and collaborations almost everywhere – locally, internationally in academia, and at the industrial level. Not surprisingly, this program has supported the birth of spin-off companies in which postdocs have found job opportunities. Given the several parallel commitments of the PI, special attention should be placed on the proper staffing of this program (also in relation to replacement of retired staff).

4.2.4 Molecular Genetics (GBB4)

PROGRAM LEADERS

'99-present:	O.P. Kuipers
'98-'04:	J. Kok
'98-'04:	S. Bron
'98:	G. Venema

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	13.8

Traditionally, the group has focused on the molecular genetics of model high AT Gram-positive bacteria – *Bacillus subtilis* and *Lactoccus lactis* – both important as non-pathogenic industrial organisms for production of various bio-products. More recently, a functional genomics program was started on the pathogen *Streptococcus pneumoniae*. This allows the group, employing advanced genomic approaches, to investigate the basic biology of both "good" and "bad" Gram-positive bacteria. The outcomes will be in both biotechnology and medicine, demonstrating the wide-ranging relevance of the group's efforts.

The Committee assessed the Molecular Genetics program to be excellent, based on the quality of the research performed, the breadth of topics, its high level of local, national, and international collaboration, and its interactions with the biotechnology community in general.

The quality of the Molecular Genetics program research is rated as excellent, based on the publication record (including high-level journals), the breadth of the research, and on international recognition and collaborations.

The group has continued to be excellent in training students and postdocs and continues to be very productive in publications, in-house and national / international collaborations, relationships with companies, and raising external grant money. With the majority of the technical problems eliminated for printing of DNA micro-arrays, and the integration of a more robust bioinformatics effort, future productivity is expected to be even higher.

Over the next five years, the Molecular Genetics group plans to focus on the fundamental of the bioinformatics and genomics of *B. subtilis*, thus allowing more global approaches to answering questions on the heterogeneity of gene expression and protein secretion in the organism. With regards to *L. lactis*, more precise studies on carbon and nitrogen metabolism will be undertaken. This will lead to improved carbon / nitrogen utilizations, critically important for efficient and highly productive bioprocesses. A long-term goal is the rational control of the carbon and nitrogen fluxes in these important bacteria. This research will establish guiding principles for metabolic engineering in the GBB that can be utilized by several other groups. Studies of the biosynthesis of bacteriocins and of resistance development against bacteriocins will lead to improved bacteriocin structure-function relationships, resulting in the opportunity to design novel bioactive peptides. Scientific and social aspects of this research, therefore, merge in an excellent manner for this program and warrant an excellent rating on relevance.

All the ongoing activities are solidly rooted in experimental methods properly applied in the program's labs. The program has been very successful and consistent in attracting postdocs and PhD students over the years. The same success characterizes external grants and industrial collaborations. Part of this successful profile is undoubtedly linked to the vitality of the program's management.

4.2.5 Developmental Genetics (GBB5)

PROGRAM LEADERS

'03-present:	B.J.L. Eggen
	P.J.M. van Haastert
'01-'03:	D.B. Janssen
'98-'01:	W. Kruijer

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.4
Total:	2.2

A vibrant and fundamentally sound program in developmental genetics is essential for understanding biological processes, including apoptosis, proliferative cell behavior critical to cancer biology, stem cell differentiation, and other cellular processes. In this program, goals have shifted midstream towards research that focuses on the identification and characterization of genes involved in the maintenance of stem cell pluripotency.

The Committee assessed the Developmental Genetics program to be good, based on its past performance and in consideration of the anticipated joint activities with the Cell Biochemistry program, which will add significantly to the program performance by strengthening the staff and promoting additional interaction within GBB.

The high staff turnover during the review period makes evaluation of the quality of research performed a difficult task. Indeed, Dr. Eggen has been fully assigned to this program only since 2003, and the previous scientific output was by people who have since moved elsewhere. Evaluating the 2003-04 scientific output, the quality of research can be evaluated as good.

The time required for publications to develop in cell biology is recognized to take longer in most cases than for simpler biological systems. For this reason, and because of the group's small size and staff turnover, the group's productivity has been rated as good.

The Developmental Genetics program has undergone a significant change in personnel over the review period. The science described in detail by Dr. Eggen was found to be a very exciting

scientific story, that is unraveling with new and novel findings relevant to cancer and developmental biology. Establishing the role of UTF1 in the complex protein network and establishing how genes are regulated in the pathway being investigated will provide insights into how the network controls the processes of stem cell development. (Prior studies on cytokines were not discussed in any depth, since the scientific goals have changed to focus on stem cells.) The current research being pursued is unique and of high quality. This program should be strengthened since its medical relevance is high.

Personnel changes have called into question the vitality and feasibility of the Developmental Genetics program as a standalone unit. Improvements in manpower and staff commitments are needed. The joint appointment of Prof. P.J.M. van Haastert appears as a positive event in this direction. The program is maintaining important collaborations with medical institutes in Groningen. Such collaborations appear strategic and should be strengthened. The amount of funding available to foster these activities, however, has been cited as limiting.

4.2.6 Molecular Biology of Plants (GBB6)

PROGRAM LEADERS

'99-present:	J. Hille
'98:	J.G.H. Wessels

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.0
Total:	4.7

The Molecular Biology of Plants program focuses on the study of programmed cell death in plants, and considers in particular genes in leaf senescence contributing to the early regulation of cell death of plant or plant tissue. Studies on programmed cell death in stress responses due to plant infections by *Alternaria alternata* have been conducted in tomato plants, leading to the observation that the toxin produced by the fungus inhibits the enzyme ceramide synthase and results in a tomato toxin resistance gene product that prevents the inhibition. The group has national standing and potential for international standing. The program plays an important role in providing plant molecular biology education at GBB.

The Committee assessed the Molecular Biology of Plants program as good, based on its overall past performance, in view of its pivotal role in the GBB educational mission, and considering the strategic value of plant molecular biology as a research area on which internal and external collaborations (including industrial partners) can be further developed. Also adequate green house faculties are available for an increased research output. The committee took into consideration that the present group leader had to rebuild the group when he was appointed as successor of Prof. Wessels.

The quality of published papers is good to very good, with some instances of excellence. Nevertheless, the bibliometric statistics seem to overestimate slightly the group's impact, given the limited number of papers presented (relative to the size of the group).
The volume of papers produced by this group, including some keynote publications, is good to very good.

The research done by the Molecular Biology of Plants program is potentially very relevant for society, as it is related to the survival of crops from senescence and stress, which is related, in turn, to improvements in food production, safety, and quality. The scientific relevance of the research during the review period is good to very good.

The group is not as vital as are other programs at GBB, which may reflect the generally negative public reaction to genetically modified organisms in agriculture. As a result, the number of PhD students and postdocs has dropped. Moreover, relationships/contracts with companies were interrupted in relation to the transfer of the industrial research activities in other countries. Feasibility of research in this specific area may be threatened by current laws on the use of transgenic plants. Experimental plant research in the Netherlands is effectively organized in the school EPS. Due to the policy of the RUG the group Hille does not participate in this school, which may jeopardize the V&F of the group. Another point of concern with respect to V&F within GBB is that the group until recently has no significant collaborations within GBB. Given these considerations, the viability of this program in the coming years should be kept under scrutiny, with an effort to strike the appropriate balance between the unquestionable value of education in plant molecular biology and the efforts required to maintain a high standard of scientific output (and facilities) in this field.

4.2.7 Electron Microscopy (GBB7)

PROGRAM LEADERS

'02-present:	E.J. Boekema
'98-'01:	A. Brisson

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.4
Total:	6.1

The EM program focuses on the application of electron-crystallography and single particle analysis (cryo-EM) to large protein complexes. A past activity in Atomic Force Microscopy (AFM) has been discontinued in favor of local collaborations (Physics Dept.) or collaboration with The University of Leiden, where a large park of AFM instruments and specific experience are available. In addition to the above, new experience in electron-tomography is being currently acquired. The EM program just obtained a state-of-the-art He-cooled new microscope (FEI T.P. microscope) with funding from the Netherlands Science Foundation (NWO), which is a significant recognition of the group's performance and a potentially important innovation in the structural biology field. The new microscope will allow higher-resolution single particle analysis and electron-tomography analyses.

The Committee assessed the EM program to be very good to excellent, based on the very good quality of the research performed, the vitality of the group, and its international collaboration and standing.

The scientific activity of the EM program appears to remain competitive relative to other institutions active in this field. Facilities and support are adequate to sustain international competition. The EM program is focusing on leading-edge structural investigations either through several in-house collaborations or with international contacts. Such collaborations are important not only in providing new investigation subjects, but also for the development of new methodological approaches. Their research is highly relevant for the advancement of knowledge in fundamental biology. The quality of publications is high in general, with some instances of excellence. The publication output is very good; overall, the bibliometric statistics indicate productivity well above the world average in this field.

The group leader is a successful researcher with an international profile. His standing was instrumental in acquiring the new microscope suited for electron tomography, and is crucial for establishing the contacts and information exchange required for the new investigation method. In this respect, the gradual shift to tomography will require some refocusing of some program personnel on the new technique. The overall quality is very good to excellent.

The EM program has focused on the study of membrane proteins in large aggregates, particularly on photosynthetic complexes in plants and in cyanobacteria, where key papers have been published. This effort has also strengthened the reputation of GBB as a leading institution in the fundamentals of membrane structure and biology. Significant results have also been achieved in the study of V-type ATPase from *Caloramator fervidus* and export systems such as the one from *Shigella*. The basic competence and experimental setups available to this program are solid bases for future activity, which will see an improvement in cryo-EM studies on chloroplast and mitochondrial membrane proteins through higher-resolution reconstructions (on the He-cooled stage), coupled proteomics approaches, mutational analyses, and transient complex studies. The recent development of methods for the analysis of complexes from solubilized membranes not subjected to purification is worthy of notice. The impact on society is high: the basic understanding of the organization of complex structures will contribute to health, improvement in biological processes for applications, and increased fundamental knowledge.

Under the current setup and given the well-balanced level of funding, no specific threats are seen for the next few years. There should be specific efforts in the selection of PhD students, as it appears to be difficult to recruit candidates in this specific field. Future activities, particularly the new installation and related developments, appear to have been carefully planned. The acquisition of the microscope with electron-tomography capabilities will support a lively activity in this group for the coming years.

4.2.8 Cell Biochemistry (GBB8)

PROGRAM LEADERS

'98-present:	P.J.M. van Haastert
'98-present:	M.H.K. Linskens

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	5.3

The Cell Biochemistry group has been focusing on the molecular mechanisms that underlie cellular responses to external stimuli. The main reference system is the eukaryote *Dictyostelium* and its chemotaxis within cAMP gradients. Such processes have been analyzed extensively, with a significant level of quantitative analysis in relation to the role played by G-protein coupled receptors in detecting minute local concentration differences of the signaling molecule. The connection of this research to other programs within GBB (e.g. the confocal microscopy facility) has led to very convincing examples of the group's capabilities to conduct experiments made very difficult by time and concentration vectors. A second research line concerns the use of *Dictyostelium* to screen for mammalian proteins with desired functions, and for their mutants. *Dictyostelium* is being tested as a convenient cell system, providing post-translational modifications closely comparable with those of mammalian cells. This research line has received support from external grants and from a company. The two research lines are scientifically very sound, with potential for translational research.

The Committee assessed the Cell Biochemistry program to be very good, based on the quality of the research performed, the productivity (showing selected instances of excellence), and the commitment, motivation, and standing of the PI.

The Cell Biochemistry program has produced some excellent papers during the review period, maintaining a consistently very good level of scientific quality.

The number of papers produced has been roughly constant through the years, and consistent with the small size of the Cell Biochemistry program. The committee appreciates the strategy of the group leader to let prevail quality over quantity. The scientific value of the reviewed activities, could likely be better interfaced to applied research.

Understanding cell signaling genetics and biochemistry are fundamental to cellular processes such as cellular differentiation, development, and chemotaxis. Translation of signals sensed by the cell requires an interdisciplinary approach that includes the ability to do quantitative biochemistry – which is a very unique strength of this program.

The vitality of a small group is more difficult to assess. The Cell Biochemistry program has maintained a constant size (about 8 people, likely a group leader's choice) throughout the review period. Perhaps this group might consider hosting a larger number of PhD students

in the future. It should also be mentioned, however, that the group leader is involved in substantial teaching at the undergraduate level. Moreover he is very active in organizing and reorganizing education at the faculty level. Such cooperative attitude of a faculty member has to be highly appreciated, however one has to realize that this may jeopardize the research activities of the group. The program has extensive in-house collaborations that can further the breadth of its research. The forthcoming close coordination with the Developmental Genetics program may well strengthen overall efforts in molecular and cell biology at GBB, which is a clear sign of the vitality and the intellectual capabilities of the Cell Biochemistry program.

4.2.9 Biotransformation and Biocatalysis (GBB9)

PROGRAM LEADERS

'98-present:	D.B. Janssen
'99-present:	M.W. Fraaije

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.9
Total:	10.1

The principal aim of the Biotransformation and Biocatalysis program is to gain insights into the biochemistry and enzymology of biotransformations of organic compounds. A second aim is the discovery and engineering of biocatalysts, including metabolic pathways, for use in bioconversion of relevant compounds such as pollutants, pesticides chlorinated solvents, and xenobiotics. New enzyme activities based on novel screening and discovery principles are investigated through a variety of methods, resulting in an increased understanding of catalytic mechanisms and enzyme selectivity. This multidisciplinary approach is a significant strength of this very creative and productive group with unique competences, and has lead to several internal and external collaborations and to a strong international and national reputation.

The Committee assessed the Biotransformation and Biocatalysis program to be excellent, based on the high quality and depth of the research performed, and especially due to its creativity in using novel screens to isolate and characterize enzymes with useful properties. The Committee's assessment is also based on the group's international and national reputation, the quality of the research team, and the successful academic and industrial collaborations.

The quality of the research is very high. The group brings a certain creativity in methods and screening to the challenging issues; the result is an effective biocatalyst discovery program together with solid kinetic descriptions of enzyme activities in a variety of reactions.

The productivity of the group is excellent. The wide-ranging PhD thesis research leads to significant publications in the scientific literature as well as to meaningful industrial collaborations.

This group, a leader in bio-transformations and biocatalysts, has had an excellent publication record, as well as excellent development of intellectual property and global industrial collaborations. Future research in the area of halohydrin dehalogenases, emphasizing nucleophile selectivity and engineering, redox enzymes focusing on Baeyer-Villiger reactions, carbohydrate oxidase, and novel (de)amination enzymes is a new (and non-trivial) challenge to be pursued by the group. As with the group's past research, it is expected to be productive as well as relevant to developments in green chemistry worldwide.

The vitality and feasibility of the group is strong, based upon the leadership and managerial skills of the PI and on fruitful collaborations with chemistry and biology groups within the University of Groningen.

4.2.10 Protein X-ray Crystallography (GBB10)

PROGRAM LEADERS

'98-present:	B.W. Dijkstra
'98-present:	A.M.W.H. Thunnissen

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	9.8

The Protein X-ray Crystallography program focuses on the analysis of protein three-dimensional structures through X-ray crystallographic methods and other biophysical techniques. Traditionally, the group has been focusing on enzyme catalytic mechanisms comprising carbohydrate converting enzymes, dehalogenases, (phosphor)lipases, and, more recently, dioxygenases and tyrosinases where it has established itself as a leading international and national scientific group. The research direction has recently been expanded to larger protein assemblies and to structural problems more closely related to cell biology.

The Committee assessed the Protein Crystallography program to be excellent, based on the quality of the research performed, the breadth of topics, the high level of local, national, industrial collaborations, and the program's international standing.

The research in the Protein Crystallography program has consistently been at a very high

international level. Structural biology methods have been applied with continual success to topics appropriate to the higher-ranking journals. At least for part of the specific fields covered, the group is among the world's top leaders, attracting graduate students and postdocs from abroad as well as collaborations with large biotech companies.

Productivity is very good, with instances of excellence. The productivity level has been constant over the reviewed years, as also shown by the bibliometric statistics.

The scientific activity planned for the next five years by the Protein Crystallography program will focus on host cell invasion factors in *Shigella*, on proteins of cytoskeletal reorganization, and on processes of genetic competence in *B. subtilis*. As in past research, the group is applying not only crystallographic methods, but also different biophysical techniques. The projects planned aim at the frontiers of structural biology, including several challenging projects on membrane proteins. Some of the topics dealt with in the past have biotechnological relevance and will be continued. Some aspects of the future project are of interest for human health. Altogether, the relevance of the Protein Crystallography program is excellent.

The group has maintained a high turnover of successful research and postdocs (2-3 theses / year), who later relocated promptly to external research labs. In addition, projects have been kept alive and in fruitful collaboration with several local, national, and international groups. A significant part of the group's vitality must be attributed to the PI's skills, demonstrated in his ability to deal with students / collaborators and to secure external funding. The continuation of this specific activity, many years after it was established in Groningen, is a clear sign of ongoing vitality. From the experimental viewpoint, the Protein Crystallography program will tackle challenging problems, particularly for membrane proteins, strengthening in the coming years the expertise and uniqueness of GBB in membrane biology. All the elements of feasibility can be easily seen in the existing competencies and facilities.

4 2 11 Molecular Dynamics (GBB11)

PROGRAM LEADERS

'99-'04:	A. Mark
'98-present:	R.M. Scheek
'98-'99:	H.J.C. Berendsen

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	10.9

The Molecular Dynamics program focuses on the understanding and simulation of basic properties of biological macromolecules based on fundamental physical properties of their constituting atoms and bonds. The group has been led in the review period by Prof. A. Mark, following a renown tradition in this field established in Groningen several years ago. The size of the group is considerable, with contributions from several PhD students and postdocs. This program includes the NMR group and facility, currently assigned to a senior postdoc (hired on a five-year contract) under the supervision of R.M. Scheek.

The Committee assessed the Molecular Dynamics program to be excellent. The group's research is state-of-the-art, addressing leading-edge problems that may have swift practical returns, while making excellent use of the advanced computing facilities available at Groningen University. The program clearly has a high international standing.

The MD group has produced significant results on challenging simulation problems. Among these, worthy of notice is the activity on the self-aggregation mechanisms in phospholipids bi-layers and the combination of MD and quantum mechanics (mixed MD / QM) in the study of fast reactions of protein cofactors. In addition, the MD group is one of only five or so sites in the world that continuously updates force fields for use in molecular simulations, providing a unique service to the entire scientific community. The quality of the scientific activity is, therefore, rated as excellent.

Productivity has remained consistent at significantly high levels, covering several different fields of macromolecular simulations. The output reflects the extensive collaborations by the group locally and worldwide, as well as the continuous flow of PhD students and postdocs. The bibliometric statistics indicate prominently that MD activity is flourishing. Productivity is rated as excellent.

The use of advanced MD methods is having a strong impact on the ways to prove hypotheses on the physical and biological properties of protein, nucleic acids, and other (macro)molecules. A Groningen-based MD group is seen as a strategic asset for the coming years for the study of thermodynamic properties of biomolecules, the simulation of self-assembling systems (e.g. biomembranes), and the refinement of protein models, to mention a few. The high number of collaborations established by this group, locally and at the international level, are true indicators of the program's excellent standing in the MD field. The relevance of the MD program's research is rated as excellent, including for its societal impact. Most of the code and technical developments in the MD group have become worldwide academic and industrial standards.

The MD group has been extremely vital, and of good size, during the review period. There are two to three theses per year and a substantial turnover of young collaborators. However, the future prospects are less clear in view of the recent PI move to Brisbane. The joint appointment (in collaboration with Queensland University) of Prof. Mark for the next five years to continue his own projects and follow students is seen as positive. However, this is not a substitute for finding a replacement, and his work must be balanced properly with the newcomer's activity. We have been informed that the faculty has made good progress in selecting and appointing a high level successor and that RUG collaboration with Prof. Mark is guaranteed. In view of that, we feel encouraged to judge the V&F of the group positively. The NMR component of the program is facing a period of uncertainty. The lack of a senior group leader and the obsolescence of the NMR installation (despite clear and fruitful efforts to keep it at a competitive level) pose serious risks. It seems rather obvious that this facility cannot at

present effectively attract external postdocs and/or frontline collaborations. It is possible, however, that the present setup and competences can be used in the context of local scientific niches. In particular, the experiences on dynamics measurements, and a series of specific projects that could arise in collaboration with the Groningen Carbohydrate Center, appear as viable routes for a restart in biological NMR. The NMR group is centered around a recently appointed senior postdoc and one technician. The technician is vital to grant the smooth running of the spectrometer; it is his long experience, in part, that keeps the instrument performing competitively. His likely retirement in two years adds somewhat to the uncertainty about the Faculty's commitment to maintain a state-of-the-art NMR facility. Based on the mentioned management uncertainties, the Committee rated Vitality & Feasibility as good to very good.

4 2 12 Membrane Enzymology (GBB12)

PROGRAM LEADERS

'99-present:	B. Poolman
'98-'99:	G.T. Robillard

RESEARCH INPUT 2004 (FTE)

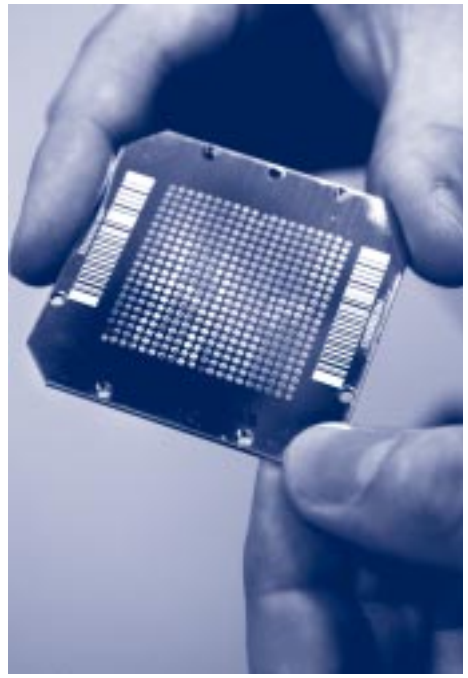
Tenured staff:	1.1
Total:	10.0

The Membrane Enzymology program addresses fundamental questions about the functionality of biological membrane components through a multidisciplinary approach that includes classical biological, biophysical, proteomics and bio/organic chemistry methods. The emphasis is on the mechanisms of signal or small molecule translocation across membranes. The PI is also member of the Top-school Materials Science Center (MSC^{plus}), where bio-nanotechnological applications are being designed and tested.
The Committee assessed the Membrane Enzymology program to be excellent. The group is developing strategic activity with a strong perspective for the future. Most of the selected topics reflect a critical view of where membrane enzymology is moving, with challenging choices and significant results.

The work being pursued is based on the availability of state-of-the-art experimental lab facilities, a very good funding level, and vigorous turnover of PhD students and postdocs. The program's academic reputation and the journals that publish the group's results point to the excellent quality of the PI and of the program's current activity, although these appear largely underestimated by the bibliometric indicators.

The ME group has been highly productive, not only in terms of published papers, but also in fundraising from external sources and in supervising several PhD students.

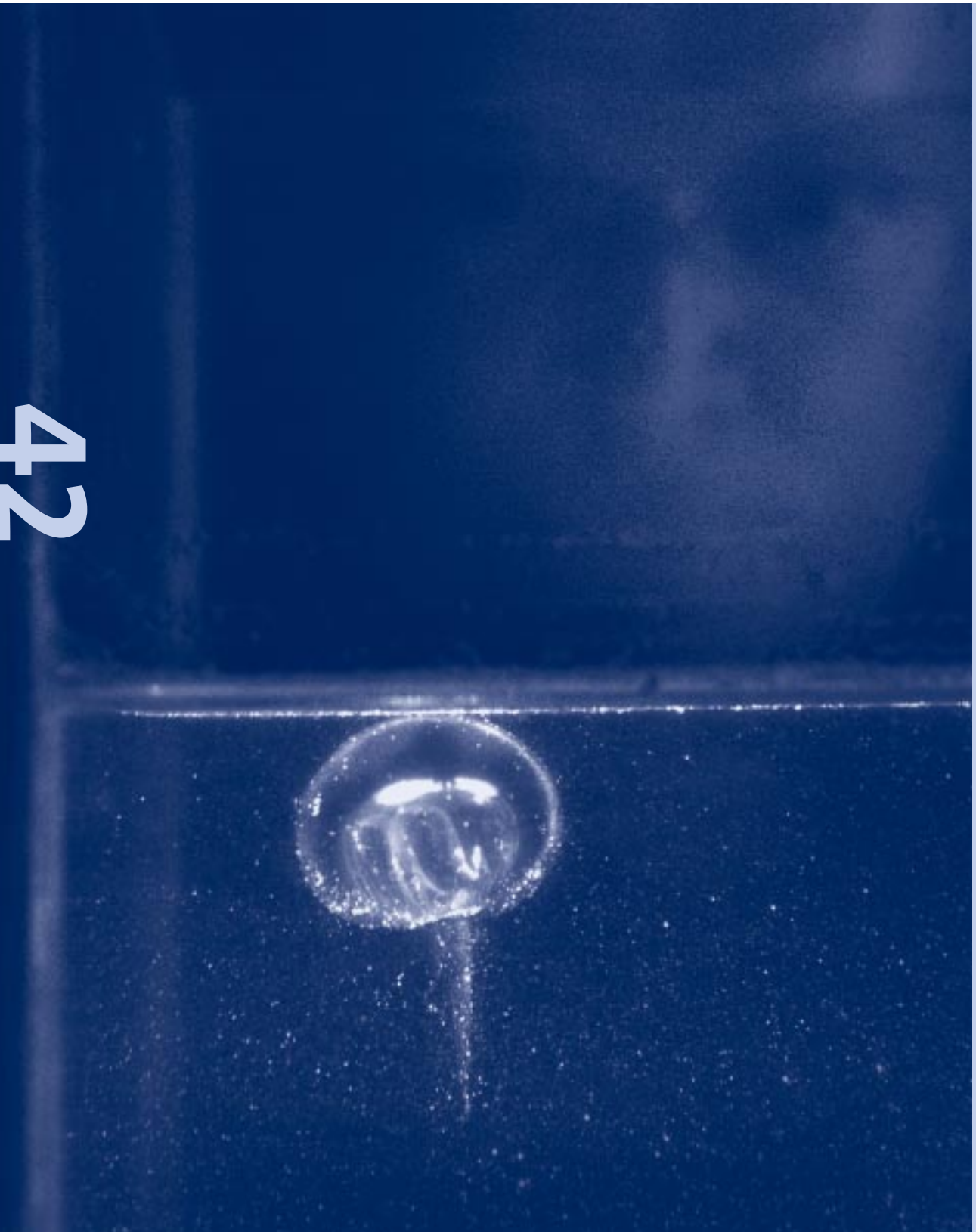
The research activity of the ME program aims to shed light on many processes taking place among membrane components, for which our understanding is quite limited. All these studies



make proficient use of different investigation methods available within GBB. The impact of the ME research on society is related primarily to the discovery of new drugs. Most of the systems investigated are involved in human pathologies and are targets for new drugs. Applications of the basic findings are relevant to microbiological processes in food systems as well as in the environment. In addition, the use of controllable ion channels in artificial membranes or vesicles may provide drug release systems for therapy.

The PI made a fine impression with respect to the results achieved and for his clear forward look into developments in his field. His participation in the MSC^{plus} appears to be quite deliberate. The group is very alive, and its size has increased over the review period despite difficulties in recruitment at all levels. The multidisciplinary flavor of the ME program activities may indeed have helped in this respect. The program has gained access to several competitive external grants and maintains several local and international collaborations, including with companies.

Assessment Centre for Ecological and Evolutionary Studies (CEES)



5.1 The Institute

DIRECTORS

'02-present:	J.T.M. Elzenga
'98-'02:	R.H. Drent

RESEARCH INPUT 2004 (FTE)

Tenured staff:	10.4
Non-tenured staff:	17.6
PhD students:	42.4
Total:	70.4

This institute pursues understanding the processes and dynamics that shape ecosystem development and the responses of communities, populations and individuals to a changing environment.

CEES is an excellent institute that has grown during 1998-2004 period by about 50% in total staff, funds procured and number of PhD students. During the same period the number of publications increased by about 20%. CEES papers have made significant impact, as evident in the significant high ratio of citations relative to world citation average and with 43 papers in the most frequent cited category (CWTS analysis).

CEES staff derive much professional and personal satisfaction from their presence in the institute and seem as a group quite happy with present arrangements. It is unusual to find that in one institution there is work on such a diverse set of topics as found in CEES; ranging widely across taxonomic groups, from molecular to global scales, from the fundamental to the applied and from empirical to theoretical. This diversity is admirable in one institute and goes a long way in fostering the research and academic success of CEES. The heads of programs, on the whole, have developed mechanisms fostering interaction among groups and among programs. These interactions strengthen the contribution from the various staff and this bears on consistent success in fund-raising and research accomplishments.

The institute structure works well for CEES, in that it furnishes a level of organization that serves as a liaison and an intermediary between the diverse programs and the Faculty and University administration. The CEES institute structure also provides an important umbrella for organization of common seminars, sharing graduate students and programming talks by external speakers. The professional quality of the staff, the diversity and complementary nature of research areas and the structure of CEES therefore have created a vibrant academic structure

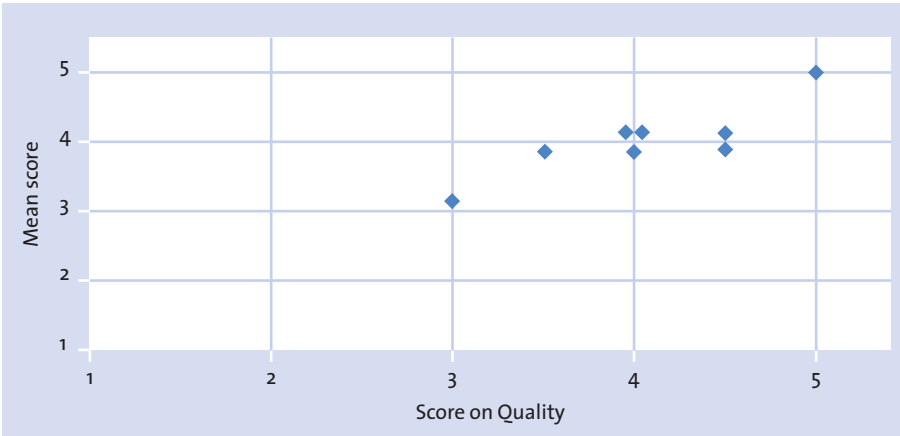
that has improved during the 1998-2004 time span and that has achieved well-merited recognition within the Netherlands, Europe and the world.

There are some issues, however, that challenge the program directors. On the whole to maintain their success, there is intense pressure on group leaders required to maintain support for their staff, both for financial and personnel management affairs. The program leaders are talented enough to sustain the pressure of work, but to improve efficacy, reassessment of teaching and administrative responsibilities might help in the future. Meanwhile, as mentioned in section 3.1 ('General remarks'), redefining of the constraint on bursaries and addressing the issue of matching 2nd funding sources might be helpful.

Overview program scores CEES

Score	Number of programs with score on			
	Q	P	R	V&F
2				
2.5				
3	1		1	1
3.5	1	3		
4	3	3	6	4
4.5	2	1		1
5	1	1	1	2
n.a.	1	1	1	1
Total:	9	9	9	9

Mean score vs. Quality CEES programs



Mean program scores (unweighted average of the scores on all four criteria) plotted against the program score on Quality.

5 2 Research Programs

5 2 1 Animal Ecology (CEES1)

PROGRAM LEADERS

'03-present:	T. Piersma
'98-present:	J.M. Tinbergen
'98-'03:	R.H. Drent

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.3
Total:	14.4

In order to understand the distribution and abundance of animals from an evolutionary perspective detailed behavioral and physiological measurements are primarily done in natural settings; their emphasis towards behavioral ecology is strong and of international standing. Experiments are done whenever possible and always with theoretical underpinning in mind. The application of findings and developments in other fields of biology in the ongoing research, whenever possible, enables the group to perform its research at a high level. Papers in journals with the highest impact illustrate the success of this approach.

The various research themes fit in the general framework of "Understanding life history strategies" and are linked with each other.

Strong leadership – until 2003 by Prof. Drent and since 2003 by Prof. Piersma and during the whole period by Dr. J.M. Tinbergen – enabled the group to act in a concerted way. Based on the coherence between strong individuals the group as a whole achieved a high and unique reputation. The fundamental research of the group is very meaningful for conservation biologists and its societal significance is well recognized.

The outlook for the future of this dynamic and cooperative group is very positive, provided that sufficient analytical and technical support is available and educational pressure "from above" is relieved.

5.2.2 Community and Conservation Ecology (CEES2)

PROGRAM LEADERS

'02-present:	H. Olff
'98-'02:	J. van Andel

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.8
Total:	12.5

The program was led till September 2002 by Prof. J. van Andel and since then by Prof. H. Olff appointed as a "Van der Leeuw" professor.

The biological relevant mission of the group is to understand the processes that determine the species composition and diversity of ecological communities. Profound knowledge of these processes, studied in temperate wetlands, coastal ecosystems and African savannas as well as in green houses, could be used to prevent further loss of biodiversity and provide means for restoration of damage once impaired.

A very positive element for the evaluation is the fact that in the past period the research program has been critically adjusted. There is now more emphasis on basic ecological research, more cooperation and international orientation and, last but not least, a strong improvement in the theoretical basis of the work. These adjustments resulted in higher research output, higher quality and provide a positive outlook for the future.

In general the committee evaluates this vital program as very good and appreciates the efforts to translate its fundamental research to a broader audience.

5.2.3 Evolutionary Genetics (CEES3)

PROGRAM LEADERS

'02-present:	L.W. Beukeboom
'01:	R. Bijlsma
'98-'01:	W. van Delden

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.2
Total:	7.7

Recently split off program: Theoretical Biology (CEES3a)

PROGRAM LEADERS

'04-present:	F.J. Weissing

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.2
Total:	6.3

Some far going developments within the group came up during the evaluation period. There was the retirement of Prof. W. van Delden in 2000, the appointment of Prof. L. Beukeboom on 1 October 2002 and the splitting of the subgroup Theoretical Biology towards an independent program. These developments, with slight but inevitable effects on productivity, apparently did not harm the group. This is an indication of strong and balanced leadership.

The study of the interplay between genetic and evolutionary processes is the central and biologically relevant mission. In the research approach there are at present two sub-programs: a) evolutionary genetics of reproductive systems and b) population and conservation genetics. The research aims at achievement of fundamental insights in evolution of different reproductive systems and at understanding the consequences of genetic erosion in a fragmented world for the persistence of populations. However, next to fundamental insights the genetics and evolution delivers useful tools for applications in the conservation area. The group has a rather unique and important niche in the field of genetics.

A point of concern is whether the present group, with a relative small number of tenured staff members, will be able to handle the many subjects in their research.

Theoretical Biology was until September 2004 a third sub-program and operated since then as an independent group. This program has been extremely successful and reveals a high quality not only in itself but also for CEES as a whole. In a natural way the group, based on extreme effective leadership, evolved into a now independent very strong group. The outlook of this program, with a prominent research leader, is very promising and of great value for CEES since it provides the theoretical framework for various ecological and evolutionary

problems in the CEES programs. Some consideration could be given to allowing the new Theoretical Biology program to expand without sacrificing excellence.

5.2.4 Marine Benthic Ecology (CEES4)

PROGRAM LEADERS

'03-present:	J.L. Olsen
'98-'03:	W.J. Wolff

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.1
Total:	8.2

The mission is to carry out research on 'Dispersal, adaptation and diversity of benthic organisms in space and time' against the background contexts of climate change and human influences on coastal systems.
This program has made a successful transition in leadership from Wolff to Olsen and has maintained a good record of publications and funding during the transition. Olsen and her group have demonstrated leadership in the largely unexplored field of macro-algae and macrophyte genomics and appear to be poised in a very good position to produce future exciting findings in understanding the interaction of genetic and ecological features. There are a number of other projects involving basic and applied aspects of marine organisms that are also likely to result in valuable contributions per se.

In general, added value would be furnished by a clear expression and focus on specific questions, as well as by fostering evident interaction among the various subprojects being undertaken by this group. It would be quite essential that a) the retiring staff post be filled as soon as possible, and b) that the post description includes requirements for strong interactive efforts with other programs in CEES. Filling this position seems essential because marine biology at CEES constitutes the only marine biology degree-granting unit in The Netherlands. In addition, a great number of biology students in RUG express interest in marine biology, generating a substantial teaching demand.

5.2.5 Ecophysiology of Marine Plankton (CEES5)

PROGRAM LEADERS

'98-present:	H.J.W. de Baar
	W.W.C. Gieskes
'03-present:	A.G.J. Buma

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.2
Total:	6.9

The program aims at understanding, quantifying and predicting the interactions of marine micro-algae within the chemical, physical and biological constraints of the plankton ecosystem.

This is a well-respected group led by Prof. de Baar and under the daily leadership by the world recognized Dr. W.W.C. Gieskes with the active involvement of Dr. A.G.J. Buma (since mid 2003).

They have a long-established record of excellent publications on the impact of UV irradiation on plankton, phytoplankton, on plankton production and consumption of climate driven trace gasses and on Si -biomineralization. The various research themes are very relevant to understand the (complex) interactions between marine microbial organisms and their chemical and physical environment.

Senior staff has increased substantially in recent years and so have funding levels, with a good mix of various funding sources. There are vigorous interchanges with research centers such as NIOZ, which ought to be encouraged and made more formal as seems feasible, to increase synergy of collaborations and education. There is a strong need to strengthen the group wit a new scientist in zooplankton ecology. It is necessary to increase the time commitment of the leadership in the group to look forward to continual improvement in performance.

5.2.6 Experimental Marine Zoology (CEES6)

PROGRAM LEADERS

'98-present:	J.J. Videler

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	1.9

The central theme of the group is to study behavioral energetics of marine animals in interaction with their environment.

The senior staff is a very inspiring, enthusiastic person who has developed novel research areas and had high profile publications, however did not manifest interest in large expansion of the

group. He is retiring soon; his collaborator has the expertise in fluid dynamics and technology to suggest that he can become a valuable collaborator in several other zooplankton, phytoplankton and macro-algae groups within the framework of Marine Biology. There are certainly many important fluid dynamics issues in these organisms that could capture the interest of a person willing to interact.

The review committee is aware of the strict rules in the Netherlands about retirement and knows that many universities try to find ways in order to keep valuable emeriti linked to research and teaching. Given the unique qualities of Prof. Videler, we would think it worthwhile for the Faculty and the Board of the University to seek for a creative way to extend his appointment for a further period.

5.2.7 Microbial Ecology (CEES7)

PROGRAM LEADERS

'03-present:	J.D. van Elsas
'02-'03:	J. van Andel
	H. Bolhuis
'00-'02:	J.C. Gottschal
'98-'00:	L.J. Forney

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.8
Total:	5.8

The main interest of the group is to study the ecological mechanisms that enable micro-organisms to survive and evolve in the natural environment and ensure adaptations to changing environmental conditions.

The Microbial Ecology group has a long and very strong tradition at RUG. Unfortunately, the group experienced a very difficult period during the evaluation period. After the untimely death of Prof. Prins, his successor professor Forney led the group for only two years. Meanwhile very experienced and distinguished senior staff member retired. The new appointed leader Prof. Van Elsas is faced with the challenging but difficult task of re-establishing the microbial ecology group, which at the moment for understandable reasons appears as too diverse.

The present group leader has keen interests and profound knowledge on the adaptive value of horizontal gene transfer processes in the environment. He is very familiar with molecular techniques that enable ecologist answer profound questions. However, for the future of the group it will be very crucial to build a niche around a well-defined research theme and to approach this theme with clearly defined research questions. We suggest that the group seeks its niche within CEES. Especially in the field of marine ecology collaborations might be very fruitful, as illustrated by a recent Science paper by two staff members (one former and one present) of Microbial Ecology as main authors (Science, Jan. 2005).

5.2.8 Ecophysiology of Plants (CEES8)

PROGRAM LEADERS

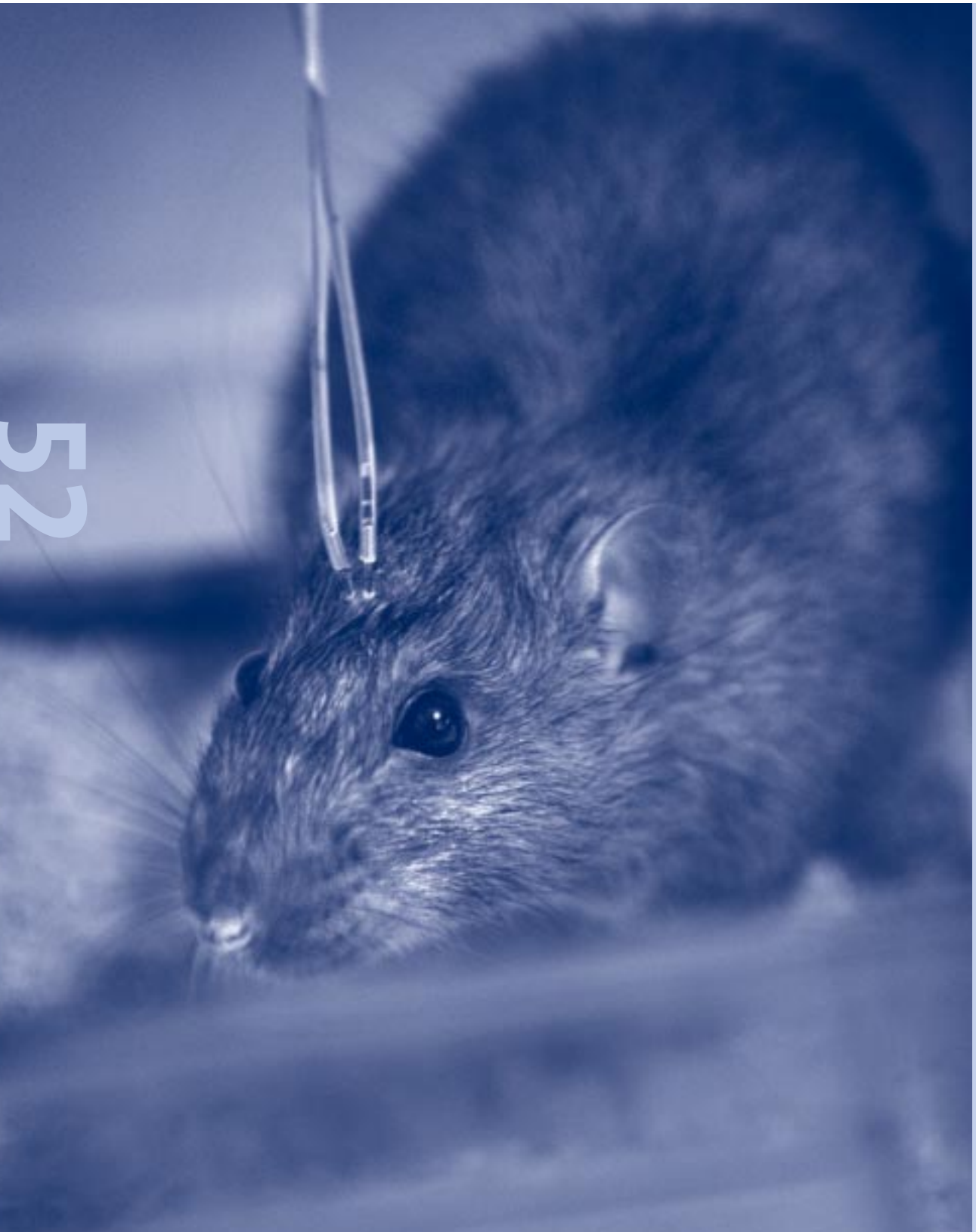
'00-present:	J.T.M. Elzenga
'98-'99:	P.J.C. Kuiper

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.1
Total:	6.8

The long term aim of the group is to elucidate the interaction between plant and environment. The ambition is to analyze the plant responses from the molecular / biochemical level up to the level of the intact plant The integrative responses of the plants towards salinity, drought, air pollution, elevated CO_2, UV, sulfur and nitrogen nutrition and the effect of temperature have been studied in the past 7 years.

During the site visit we learned more about sulfur metabolism and sulfur nutrition as a nice and impressing illustration of the integrative research approach. On the whole, we find this a very valuable group within CEES and with strong links to applied science. It would be wise, not only on the basis of the drastic changes in staff composition, for the group to seek for focus in their rather broad research program. This might also help to get more 2nd funding sources. Appreciating the good work the group leader is doing presently for the CEES institute, we suggest that he should get some compensation by the Faculty in order to prevent the program itself being negatively affected.



Assessment Centre for Behaviour and Neurosciences (CBN)

6.1 The Institute

DIRECTORS

'01-present:	P.G.M. Luiten
'98-'01:	S. Daan

RESEARCH INPUT 2004 (FTE)

Tenured staff:	8.9
Non-tenured staff:	6.3
PhD students:	20.9
Total:	36.1

CBN is an aggregate of 7 research groups (including 3 that are in a different geographical localization) that aims at covering the field of neuroscience from the molecular to the behavioral level. At the descriptive level, three different research domains are supposed to summarize the diversity of activity of these 7 groups:

- domain I: sensory processing mechanisms and their input pathways (vision and audition).
- domain II: central nervous system processing and integration.
- domain III: output mechanisms of behavior and physiology.

Over the last 7 years, the research staff has increased by about 20 percent but with a wide variation between research groups (from minus 40 percent to plus 70 percent). The resources, all budgets combined, have increased by about 80 percent, but most of the budget (73 percent) is still coming from the 1st funding source (the University). Expenditures have roughly doubled, which means that the money available for research at the bench has been in net augmentation.

In terms of scientific output, the number of publications has increased by 20 percent over the 7-year period, which roughly corresponds to the increase in personnel, implying that the productivity at an individual level has remained the same. In terms of cost/benefit ratio, it certainly means that the increased amount of money at the bench level has allowed the implementation of more expensive techniques (e.g. molecular biology).

The formation of a centre is certainly an impetus for promoting and/or strengthening collaborations between the different research groups. According to the report, the institute aims at organizing these collaborative efforts so that they contribute to four themes:

- Theme I: performance, fatigue, recovery
- Theme II: neuroimaging and modeling of cognition, emotion and motor behavior

- Theme III: cellular signaling
- Theme IV: computational and theoretical modeling of structures in performance.

The means to achieve this strategic objective were not described in the report. The pertinence of this categorization was questioned by the Committee that pointed out the need of promoting cooperation between research groups so as to favor integrative approaches. In an institute like CBN that is characterized by multidisciplinarity, the focus should be on complementarity and synergy between the different levels of analysis (from molecules to neuronal networks and behavior), rather than on diversification of activities as has been the tendency too often.

In his discussion with the committee, the institute's director stated that due to the drastic budgetary reductions that have taken place since the writing up of the report, the priorities of the institute have changed and are limited now to three, including:

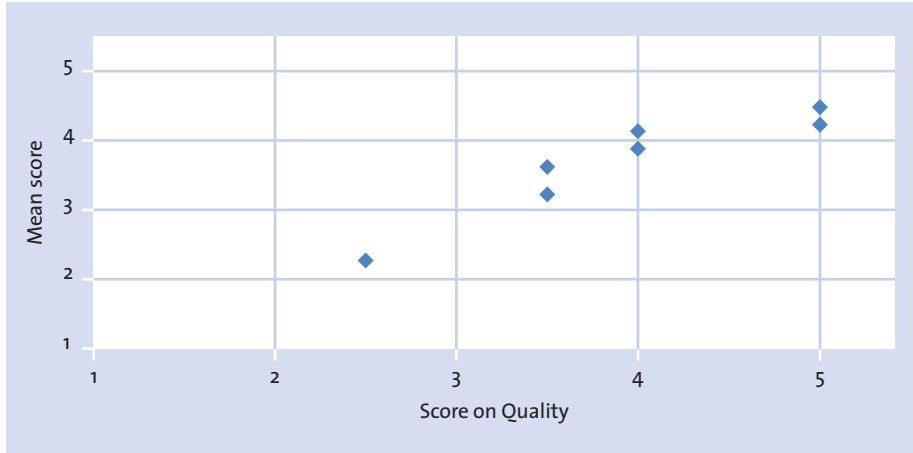
- chronobiology (timing of activities)
- molecular analysis of behavior
- neuroimaging

Because of the high cost of animal facilities, it will be necessary to reconsider the activities of those groups who do not fit within these priorities and are, partially, responsible for the comparatively lower ranking of the CBN in citation analysis and output as compared to the other two Life Sciences Institutes. The Committee emphasized that the reputation of CBN has been mainly built around its integrative approach to behavior and that genomic and post-genomic approaches as well as neuroimaging are only tools. These should complement other approaches, not replace them. The Committee's recommendations are outlined at the end of this chapter in section 6 3).

Overview program scores CBN

Score	Number of programs with score on			
	Q	P	R	V&F
2			1	1
2.5	1	1		
3		1	1	
3.5	2	2	1	2
4	2	2	3	2
4.5		1	1	2
5	2			
Total:	7	7	7	7

Mean score vs. Quality CBN programs



Mean program scores (unweighted average of the scores on all four criteria) plotted against the program score on Quality.

6 2 Research Programs

6 2 1 Behavioural Biology (CBN1)

PROGRAM LEADERS

'98-present:	S. Daan

RESEARCH INPUT 2004 (FTE)

Tenured staff:	2.3
Total:	9.5

This group, chaired by Prof. S. Daan, is specialized in behavioral analysis. It is working on three subprograms including nycthemeral timing, energetics, and development (including epigenetic inheritance). Most of this research is carried out in various vertebrate species, with birds predominant for the last two subprograms and rodents and humans for the first subprogram. The group (3 full professors, 5-7 assistant professors, 2-5 postdocs, 11-16 PhD students) is very active at the local, national and international levels. External funding includes NWO (30 percent of resources), and the European Community (BRAINTIME network coordinated by Daan). Research facilities are excellent. Although oriented toward a basic understanding of behavior, the research programs are also applied when there is an opportunity as exemplified by the studies on energy expenditure in children carried out in Brazil, on sleep pacemaker characteristics in depressed patients with the local Department of Psychiatry, and on environment-gene interactions in feather pecking in chickens. The number of publications is about 40 per year with 2.5 PhD theses. Besides its traditional role in behavioral analysis, the group has generated a number of very original findings such as the discovery of reversible

paired helical filament-like phosphorylation of tau as an adaptive process taking place during hibernation. In terms of impact factor, the level of publication is good with a few publications published from time to time in high-level impact factor journals (Nature, PNAS, Journal of Neuroscience). Members of the group are very active internationally.

Development plans include implementation of genomic and post-genomic approaches. An example of application of these techniques is the characterization of those genes that are differentially expressed at dawn and dusk in mice. Concerning the behavioral timing subprogram, a key initiative (EUCLOCK) will shape the future. The subprogram on behavioral energetics should benefit from the recent promotion of one staff member to professorship and the recruitment of a new staff member on a tenure track position, enabling the launch of an ambitious program on the relationship between metabolic rate, energy allocation, oxidative stress, and senescence. The behavioral development subprogram is taking shape around the demonstration that maternal effects are transmitted through endocrine levels in avian egg yolk and that there is a seasonal sex ratio trend in pigeons. This will enable to shift from description to studies of causality. Given the intra-institute availability of molecular techniques and neuroendocrinology, it would seem worth the efforts to develop an additional rodent model of non-genetic inheritance, e.g., of paternal transgenerational effects of developmental hyperthyroidism as observed in rats and mice.

It is important to note that it is certainly difficult to maintain the right equilibrium between a global approach aiming at making (ecological) sense of the variations in the behavior under study and a more mechanistic approach aiming at identifying the intermediate mechanisms. Limitations of mechanistic approaches that are carried out within the department are evident for instance in the case of vasopressin, viewed as an output of the suprachiasmatic nucleus. The results of this particular research have been published independently of the behavioral ones and in low impact publications.

The possible recruitment of a top external scientist as a replacement for Daan is certainly an important aspect of the success of the plans for future. This recruitment would maintain the University at the top level in the very fast moving field of chronobiology. The programmed splitting of the department in two groups after Daan's retirement will certainly facilitate management at the scientific level. It is important to make sure the splitting has no negative consequence on the excellent facilities that are presently available to all members of the department, and does not weaken the non- chronobiology research.

In summary, the Behavioural Biology group which belongs to the tradition of RUG has been successful and has carefully prepared its future, with a realistic consideration of its strengths and weaknesses, and a dynamic positioning in relations to opportunities. The splitting of this group should not be done without consideration of the ways to maintain a research of quality in the other fields, including the relationship between metabolic rate, energy allocation, oxidative stress, and senescence and the early developmental influences of sex steroids. The first approach would certainly benefit from better interactions with the molecular neurobiology group, especially in relation to neuronal cell death and the effects of micronutrients. The second approach relates to the general field of epigenesis and the phenotypic plasticity of behavior in response to early environmental influences. This aspect is also under consideration by the Neuroendocrinology group in a somewhat different context, that of the metabolic programming. A junction between these two approaches would certainly be beneficial.

6 2 2 Behavioural Physiology (CBN2)

PROGRAM LEADERS

'98-present:	J.M. Koolhaas

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.5
Total:	3.0

This group, chaired by Prof. J.M. Koolhaas, is working on the theme of stress and adaptation. It uses laboratory rodent models. Its originality in the field stems from the emphasis put on social stressors and the consideration of individual variations (the so-called coping styles). Mechanisms are addressed in terms of serotoninergic and vasopressinergic neurotransmission.

The group is poorly doted in terms of personnel (1 professor and 2 associate / assistant professors, with heavy teaching and administrative duties). Most of the funding is coming from 2nd funding source. The relationships with the drug industry and more recently agro-business has not resulted in significant external funding except during 1998-1999.

Significant results have been obtained on the generalization of the concept of coping styles, the role of serotonin and vasopressin in aggression and violence, and the various biological and cognitive consequences of social defeat. The average level of publication is 7 per year plus 2 PhD theses; with a good level of publication in terms of impact factor. The facilities for housing rodents in naturalistic environment are excellent and represent an important plus for the group. There is obviously a great originality in terms of research themes. The concept of coping styles is of relevance to several disciplines ranging from stress physiology to psychiatry, via evolutionary ecology and farm animal welfare. The question of the relationship of violence to aggression is very important at the societal level. Despite the fact that the research of this group needs to be continued and amplified, the future of this group is in question because of its insufficient staff and its relatively global analysis of mechanisms. The implementation of in vivo micro-dialysis for monitoring serotoninergic neurotransmission is certainly an improvement but the relatively low productivity of this technique will be a limiting factor. In collaboration with the genomic platform of Leiden University, genomic approaches have been used to characterize gene expression in the brain of mice differing by their latency of attack, but the complexity of the data set generated by this approach has been rather repulsive. Another approach under consideration is the study of the genetic polymorphism of target genes to account for the behavioral variations observed in the rodent populations under study.

In summary, the Behavioural Physiology group has been at the origin of innovative concepts in

the field of stress physiology. Its future depends on the possibility of recruiting junior leaders for continuing and amplifying this line of research. Part of this could be carried out in relation with the Molecular Neurobiology Group, in an attempt to find out whether different coping styles are associated with differential risk for neuronal death, and if so, what are the factors responsible for these differences. The descriptive approach of individual variations in coping styles that has predominated so far would certainly benefit from further studies aiming at modifying the phenotypes under study via for instance differential early experience. This would enable this group to significantly contribute to the field of epigenesis that has already been mentioned.

6.2.3 Molecular Neurobiology (CBN3)

PROGRAM LEADERS

'98-present:	P.G.M. Luiten

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.0
Total:	5.8

This group, previously headed by Prof. B.G.J. Bohus, is now directed by Prof. P.G.M. Luiten who is at the same time the CBN Director. It aims at analyzing molecular and cellular aspects of adaptive behavior with a recent focus on chronic stress and loss of sleep. It combines behavioral approaches with molecular biology and aims at testing and designing new neuroprotective strategies to protect from the adverse neuronal consequences of chronic stress and chronic loss of sleep. The emphasis in terms of possible mechanisms is on phosphorylation / dephosphorylation of cytoskeletal proteins, TNF receptor, interactions between adenosine and serotonin vs. TNF, cholinergic neuronal systems. Within CBN, this group has strong historical links with Behavioural Physiology and Neuroendocrinology, plus Behavioural Biology (chronobiology).

The group is relatively small (2 full professors plus 2 assistant professors, and 4-8 PhD students). Funding is mainly internal (65%) and external to the Dutch system (20%, drug companies and agro-business). Newly implemented transgenic facilities are available to the group. Results include data on hippocampal plasticity in memory tasks, degeneration of brain microvessels during aging, the effects of the omega-3 fatty acid DHA on resistance to neurodegeneration and protein aggregation, mechanisms of beta-amyloid induced neuronal damage, inflammatory factors in neurodegeneration and neuro-protection, physiology of NMDA receptor subunit functions in the murine brain, and role of sleep loss in brain function and neuronal pathology. Although much is done in collaboration, this range of research themes seems too diverse in view of the relatively small size of the group. Thanks to frequent collaborations, the level of publications is good both in quantity and quality, with recently 2 PNAS in association with the Hungarian group they are collaborating with.

Projects aim at a better integration between in vitro and in vivo approaches and the implementation of transgenic methods. The group has benefited from two junior recruitments. A VIDI fellow will further extend his research on the neuropathological consequences of sleep loss. The recent arrival of an assistant professor in the Molecular Neurobiology group will also lead to a development of research on TNFR2-mediated neuroprotection. Another assistant professor already positioned in the group will push further the theme of synaptic plasticity and role of signaling pathways he has already initiated within the context of modification of existing memories. Obviously, there is no foreseen improvement in the diversity of research themes that characterizes this group.

In summary, the group of Molecular Neurobiology is very productive in terms of both publications and awarded PhD theses, despite its relatively small size. It has benefited from an impressive number of new and prestigious (VIDI) positions in a relatively short amount of time. The main challenge this rejuvenated group will face is the necessity to restrict its research to fewer themes that increase the external visibility of the group. There are certainly possibilities at the intersection between neuroinflammation, neuronal injury and synaptic plasticity, but they will need to be carefully delineated. This effort should not be made in isolation from the other groups within the institute, including the Behavioural Biology group and the Behavioural Physiology group, since they offer excellent opportunities for original animal models, genetic and epigenetic ones.

6.2.4 Neuroendocrinology (CBN4)

PROGRAM LEADERS

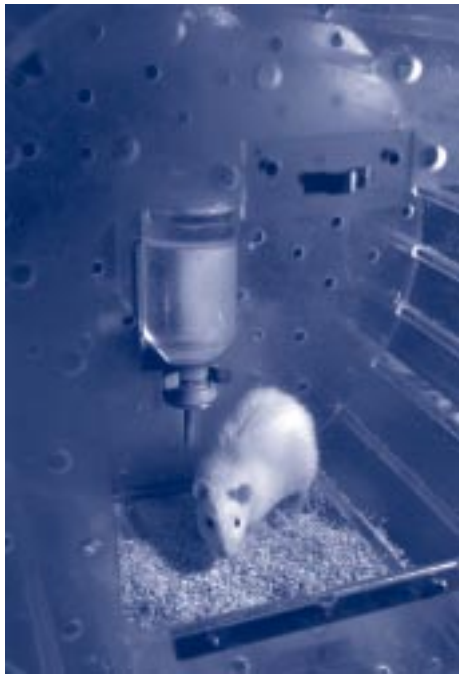
'04-present:	A.J.W. Scheurink
'01-'03:	A.B. Steffens
'98-'00:	B.G.J. Bohus

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.9
Total:	4.9

This group has seen 3 different program leaders during the last 7 years, although its situation is now stabilized thanks to the internal promotion of Dr. Scheurink to the rank of full professor. In its present composition the group acts as a team since only one year. Its main focus is on the neuronal, hormonal and physiological mechanisms that regulate food intake, body weight and energy balance at the periphery and in the brain, the ultimate goal being the understanding of the pathophysiology of obesity and food intake disorders. The group is known best for its expertise for in vivo physiological approaches in freely behaving rats that has been applied with success to the characterization of the effects of various peptides on food intake and metabolism. This expertise is also of much use for students who can sell it outside, as technicians or researchers.

The size of the group is very small (1 professor, 1 associate and 1 assistant professors and 3-6 PhD students over the last period of activity) whereas the budget is well equilibrated between the different sources of funding. There are about 10 publications per year but only 2 PhD theses



over the last 7 years. Most publications are in average impact factor journals, but they are solid and provide excellent descriptions of the effects of gastrointestinal peptides and other peptides on food intake and peripheral metabolic factors, with important insights on those effects that are direct and those that are indirect via e.g., changes in weight gain. Studies carried out previously at the transcriptional level thanks to external collaborations will be done on site in the future, thanks to the implementation of RT-PCR.

Despite its expertise, the group is lacking a clear strategy to better position itself in the rapidly moving field of regulation of food intake and metabolism, certainly because of its heavy focus on methodology and the relative slowness and burden of in vivo approaches. An investment in the promising area of metabolic programming via maternal influences could be an answer to this problem, but only if the group is able to clearly delineate the questions of interest in this field.

In summary, the group of Endocrinology is well performing in a field that has become very competitive, thanks to its mastering of in vivo approaches. Its success appears to be more dependent on appropriate external collaborations with research groups that have access to the tools the group is missing (e.g., RNA-interference strategies for neutralization of specific genes) than on internal carefully selected scientific options. Investment in the field of epigenesis via the study of the interactions between specific genotypes and maternal influences could be an interesting possibility that would help narrowing the gap between this group and other CBN groups. In general, there are good perspectives for this refurbished and vital group.

6.2.5 Molecular Pharmacology (CBN5)

PROGRAM LEADERS

'98-present:	J. Zaagsma

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.2
Total:	5.0

This group headed by Prof. J. Zaagsma focuses on receptor pharmacology and pathology within the context of lung pathology, especially asthma and chronic obstructive disorders. The group includes 1 professor, 1 assistant and 1 associate professor, and 4-6 PhD students. Funding is limited to University and external sources, mainly from pharmaceutical laboratories and the Dutch Asthma Foundation.

This last funding exploits the expertise of the group in the online study of airway function in conscious, micro-surgically instrumented, unrestrained animals, and in the study of airway function in vitro and ex vivo by measuring differential pressure alterations at constant flow in perfused, intact airway preparations. The laboratory is very well equipped for this type of research and the facilities are excellent. Results concerning regulation of airways functions have been obtained on G-protein coupled and tyrosine kinase receptors (beta-adrenergic receptors, growth factors, angiotensin II receptor, cannabinoid receptors and NK receptors), phosphodiesterases, and nitric oxide. Research is also carried out on chronic adaptation processes and remodeling of asthmatic airways and the role of growth factors. Major focus is also given to signaling mechanisms involved in the various pathophysiological processes, using cellular and molecular biological techniques. Last but not the least, this group is characterizing beta3 receptors in a comparative pharmacology manner using different animal species.

The number of publications per year is about 9, and 1 PhD thesis. The impact factor is average. Future plans for development include more focused approaches in the ongoing program of neural and non-neural control of airway function under physiological and pathophysiological conditions. Further emphasis will be put into airway hyperresponsiveness and airway remodeling. An important development for which the group received several credits concerns the role of NO in allergen-induced AHR and remodeling. In that frame an effort to study the arginase / NOS balance in asthmatic patients will be made. Investment in this line of research certainly will help the group to remain active in the field despite the anticipated retirement of Prof. Zaagsma.

In summary, the Molecular Pharmacology group has a number of well mastered approaches for studying bronchial smooth muscle hyper-responsiveness and remodeling in relation to asthma and chronic obstructive pulmonary disorders. The group has a good potential for a more in depth investment in basic mechanisms. Its relationship to the other CBN groups could be strengthened in the context of inflammation, despite the fact this theme is not studied in an explicit manner. A clearer strategy needs to be defined, especially after retirement of the present leader of the group.

6.2.6 Neurobiophysics (CBN6)

PROGRAM LEADERS

'98-present:	D.G. Stavenga

RESEARCH INPUT 2004 (FTE)

Tenured staff:	1.2
Total:	5.9

This research group aims at understanding how simple animal preparations (insect eye and fish lateral line) extract and exploit information encoded in physical entities (light and sound).

There are 3 subprograms dealing respectively with photoreceptors and color processing, visual information processing, and mechano-electrical signal transduction.

The group includes 1 professor, 1 associate professor and 1 assistant professor, 2-3 postdocs, and 4-6 PhD students. Most of the funding comes from 2nd funding sources (NWO), attesting the basic nature of the research themes.

An important characteristic of the group is its combination of experimental and theoretical approaches. Results have been obtained on photo-receptors and light adaptation, mechano-receptors, and natural stimuli and neural processing. The number of papers is around 10 per year, with 1.5 PhD thesis. Publications appear in journals with good or excellent impact factor.

An interesting approach is the use of movies of the spatiotemporal input to the eye, reconstructed from measured flights, as a stimulus to analyze the responses of optic flow processing neurons in the fly brain. Developments include extension to mammals and use of genetically modified animal preparations (e.g. Zebrafish). This is certainly a very well performing group in a relatively narrow but well delineated part of neuroscience, at the intersection between physics and biology.

The group clearly belongs to the department of physics and its interactions with other CBN groups are unlikely to grow in the future. The expected retirement of the group leader with no clear successor will leave the group in an unstable situation very much depending on political considerations. This is unfortunate in view of the overall performance of the group.

6.2.7 Biomedical Engineering (CBN7)

PROGRAM LEADERS

'98-present:	H. Duifhuis

RESEARCH INPUT 2004 (FTE)

Tenured staff:	0.9
Total:	4.0

This group is working on auditory neurosensory processes in natural conditions. Its leader, Prof. H. Duifhuis, has a past record of research in non-linear auditory processing. The group uses psychophysical measurements together with brain imaging techniques to study pitch perception and multimodal perception (i.e., audiovisual integration of speech and visual information). Applications include reduction of noise in fRMI equipment and automatic speech recognition.

The group involves 2 professors, 2 assistant professors, and 2-5 PhD students. One professor retired last year and Prof. Duifhuis, former director of the BCN Neuroimaging Center, will retire in 3 years. The group has benefited from temporary postdocs. Funding comes mainly from the University (96%).

The group lists 6 publications per year, most of which are unrelated to the group's activities, plus 0.65 PhD thesis. We concluded that little can be expected from this group that appears to be in a state of extinction.

6.3 Summary and Conclusions

CBN has been built on the main theme of behavior, with initial emphasis on functions of behavior in the natural environment in which it has developed. This classical ethological tradition has been complemented by analysis of the proximal mechanisms of behavior, which has necessitated an investment in physiology and endocrinology. Neuroscience has moved in obviously later. It is not sure that the marriage has really been successful despite the many efforts of those who have organized it. The research groups of CBN are still known for their expertise in behavioral analysis and the excellence of their in vivo approaches in behavioral physiology. The investment of physicists in sensory systems and perception has been successful but has not really helped to bridge the gap between biophysics and behavioral biology. However, it is not certain that re-orienting physics toward neuroimaging is the right solution to solve this problem. Neuroimaging and the same holds for genomic and post-genomic approaches are potent and very powerful tools in neuroscience, but they need to be applied to important scientific questions to make the best use of their potential. There are enough questions that are presently addressed in a diversity of animal models and animal species within the realm of CBN, making it not mandatory to develop new ones. Therefore, the future evolution of CBN will depend very much on the possibility of favoring, at the Institute's level, the development of appropriate – bottom up – interactions at the junction of the different groups' expertise. The University can promote this by several means including the renewal of positions left by retiring personnel and the fellowship systems that has been recently introduced for both promising young scientists and female researchers. There are already a number of strong scientific bases from which it is possible to build up such networks and favor the emergence of a true interdisciplinary research. This is a very exciting perspective, especially in times of restricted resources.

Appendix A

Quality assurance at the University of Groningen[3]

Selection Criteria and Guarantee of Independence for Peer Review Committees

Peer review and quality assurance committees are expected to produce authoritative, critical and independent assessments of the quality of the research schools, institutes or programs they have been asked to examine. This means that the members must meet high standards with regard to quality.
The authority of the assessment in terms of quality, objectivity and influence stands or falls with the independence of the assessing peers. It is in everyone's interests that such peer review committees be carefully selected in order to guarantee their independence. This appendix lists selection criteria for members of peer review committees as well as instruments to guarantee the independence of these committees.

Contents

1 Guidelines for selecting a Peer Review Committee

When choosing an external peer review committee (PRC) which conforms with the criteria of independence, expertise and academic quality, the following points must be taken into consideration when selecting potential candidates:

- Authoritative scientific expertise in at least one discipline or subdiscipline of the department to be assessed
- National or international authority in the field
- Independence with regard to the department to be assessed and to the researchers within the department
- Insight into, and if possible some expertise in, related disciplines and subdisciplines
- Insight into and an overview of national developments in the field

[3] Based on the format of the national organization "Quality Assurance Netherlands Universities" (QANU) d.d. Dec. 2003

- Insight into and an overview of international developments in the field
- Insight into relevant interdisciplinary developments
- Some familiarity with how research is organized in the Netherlands.

In order to determine the independence of the potential chairperson and members of the visitation committee, the following issues at least must be considered:

- ***Excluded*** from a PRC are:
  - (former) employees or PhD students of the Institute to be assessed,
  - (former) members of an advisory body for the Institute to be assessed (or the associated Research School),
  - co-authors of scientific publications from employees or PhD students of the Institute to be assessed.
- Has the potential candidate ever worked intensively with members of the department to be assessed, for example, long-term participation in alliances, regular participation in PhD assessments?
- Has the potential candidate close links with one or more members of the department to be assessed, for example as the PhD supervisor of a member, or as a member of the same research group, joint editorships?

If one or more of these questions must be answered with yes, then this must be clearly stated by the Institute when proposing the candidate in question. It should also be made clear why the board is of the opinion that the independence of the proposed candidate can be sufficiently guaranteed.

When potential candidates are approached with the request to participate in a PRC, they will be asked to sign a standard declaration of independence, including a brief *code of behavior* (see below), before accepting. During the final meeting, the members of the committee will be asked to confirm or expand the declaration they signed earlier, and to state that they have actually fulfilled their commitments.

2 Reporting obligation

The list with potential peer review committee members must be presented to the heads of the programs, research schools and institutes to be assessed before it is sent to the Executive Board. The former are obliged to report any potential conflicts of interest, prejudice or influence on the part of the proposed peer review committee members and must be able to report and substantiate their objections in writing to the Faculty Board.

3 Code of behavior + declaration of independence for peer review committees

The following will be sent together with the invitation to participate to the individual members of the peer review committee and must be signed and returned before the site visit takes place.

Competence and independence of peer review committee members

1 Members of the peer review committee must base their assessment primarily on:
- the Standard Evaluation Protocol 2003-2009 for Public Research Organizations[4]
- the 'specific peer review protocol' adopted by the Executive Board of the University[5]

2 When judging the quality of research, members of the peer review committee must base their assessment on the following information:
- the self-evaluation report and accompanying documentation
- possible additional information provided at the request of the peer review committee
- interviews, lectures and talks conducted within the framework of the assessment

3 Members of the peer review committee must meet the generally accepted quality demands within scientific research, including:
- competence and professionalism
- independence and objectivity
- care and consistency
- transparency and impartiality

4 Members of the peer review committee may not have any personal, scientific, financial or any other potential conflicts of interest when participating in the research assessment of the Life Sciences Cluster of the Faculty of Mathematics & Natural Sciences, and are therefore both qualified and competent to carry out their task as independent assessors.

5 Members of the peer review committee must report any potential conflicts of interest in the assessment procedure to the chairman of the review committee.

I declare that I have read the above-mentioned and that I will follow these to the best of my ability.

Place and date: .....

Signature: .....

Name: .....

.....

[4] This national protocol can be downloaded from: *http://www.qanu.nl/?contentid=144*

[5] The RUG protocol and other relevant documents are available at: *http://www.rug.nl/kwaliteitszorg*

Appendix B

Brief curricula vitae PRC members

Prof. dr. W.P.M. Hoekstra, Royal Netherlands Academy of Arts and Sciences, Amsterdam.
Prof. Hoekstra was Professor of Microbiology (University Utrecht) from 1980 – 2004, and Dean of the Faculty of Biology (University Utrecht) from 1997 – 2003. He is a member of the KNAW (since 1996). In addition, he is a former Chairman of the Evaluation Committee Dutch National Herbarium (2003), former Chairman of the Dutch Society for Microbiology (NVvM), and member of the Biology Council and Section Biology of the KNAW. Most recently, May 2004, he became Director Life Sciences of the KNAW. Expertise areas: Microbiology, Ecology, Molecular Biology.
Further information: *http://www.niwi.knaw.nl/en/oi/nod/onderzoeker/PRS1234610/toon*

Prof. dr. R. Dantzer, Neurobiologie Integrative, CNRS, INRA, Bordeaux, Frankrijk.
Prof. Dantzer is head of the Laboratory of Integrative Neurobiology and is a renowned scientist in this research field with authorships of over 300 peer-reviewed papers, 90 book chapters, 3 scientific books, and numerous plenary lectures at scientific congresses.
Further information: *http://www.inb.u-bordeaux2.fr/siteneuro2/pages/UniteINB/1244dantzer/umr1244accueil.htm*

Prof. dr. H.P. Lipp, Institute of Anatomy, University of Zürich, Switzerland.
Prof. Lipp is professor in Human Anatomy (since 1995), head of the Laboratory for Neuroanatomy & Behavior (since 1994) and head of a neurobehavioral core facility within a National Competence Grant to the UoZ (since 2001). Besides Neuroanatomy, his expertise is in the fields of Behavioral Genetics, Behavior, Neuroecology, Transgenic mice and Spatial cognition. He has produced 120 publications, mainly in ISI-rated peer-reviewed journals (including 17 in Nature, Science, Proc Natl Acad Sci USA, Cell, Neuron, Trends NeuroSci).
Further information: *http://www.neuroscience.unizh.ch/e/groups/lipp00.htm*

Prof. dr. A. Sinskey, Department of Biology, Massachusetts Institute of Technology (MIT), Cambridge MA, USA.
Prof. Sinskey is Professor of Microbiology and has major research interests in Microbiology, Biotechnology, Metabolic and Biopolymer Engineering, and Cell Cultures. He has been very active in his academic career in numerous advisory and editorial boards and in various departmental- and MIT committees. Prof. Sinskey is a renowned scientist, who received many awards and honors and who has published a significant number of papers (271), patents (31), technical reports, and books.
Further information: *http://web.mit.edu/biology/www/facultyareas/facresearch/sinskey.shtml*

Prof. dr. M. Bolognesi, Department of Biomolecular Sciences & Biotechnology, University of Milano, Italy.

Prof. Bolognesi has been Associate Professor of Biophysical Chemistry at the University of Pavia (1981-1991), and, subsequently, full Professor of Biophysics, at the University of Genova (1991-2004), where he started and led a bio-crystallographic lab at the Advanced Biotechnology Center. Since October 2004 he is full Professor of Biochemistry at the University of Milano, Dept. of Biomolecular Sciences and Biotechnology. His scientific career has been constantly centered on the study of protein structure through X-ray crystallography, with 290 papers published to date on metallo-proteins, enzymes, proteins of the immune response, and others (more than 120 original depositions in the Protein Data Bank). During his career Prof. Bolognesi has been (and is) member of different international scientific advisory committees, and issued invited lectures at academic or private institutions, in about twenty different Countries. He is member of EMBO since 1995, and part of the Editorial Board of several different Journals in the structural biology field.

Further information: *http://www.cebr.unige.it/martino_bolognesi.htm*

Prof. dr. G.A. Parker, School of Biological Sciences, University of Liverpool, UK.

Prof. Parker, professor of zoology since 1989, has a particular interest in developing and applying evolutionarily stable strategy (ESS) models, and is most noted for introducing the concept of sperm competition in 1970. Since 1996 he became the Derby Chair of Zoology. His research focuses on evolutionary biology and behavioral ecology, with special emphasis on the evolution of the two sexes, sexual selection, sexual conflict and intra-familial conflict, the evolution of animal distributions, and the evolution of complex life cycles.

Further information: *http://sphere.bioc.liv.ac.uk:8080/bio/people/academic/parker_ga*

Prof. dr. I. Valiela, Marine Biological Laboratory, Woodshole, Massachusetts, USA.

Prof. Valiela is noted for his work on the structure and function of salt marsh ecosystems and coastal embayments, including studies on predation, herbivory, decomposition and nutrient cycles, eutrophication in coastal marine communities, watershed and coastal water interactions. He has been professor of Biology at Woodshole since 1980 and director of the Boston University Marine Program since 1985. His expertise lies in the fields of Community and ecosystem ecology, Predation, Herbivory, Coastal wetlands, Watershed-estuary couplings and Applied ecology, in which he has published over 200 academic publications.

Further information: *http://www.bu.edu/biology/Faculty_Staff/valiela.html*

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BCN-FMS Institutes: Motor Systems and Control (MSCL), Emotional and Cognitive Disorders (ECS) – University of Groningen
Assessment of Research Quality 1997-2002 (May 2005)

Institute for Biomedical engineering, Materials Science and Application (BMSA)
Assessment of Research Quality 1997-2002 (June 2005)