

# **Research assessment UMCG and FMNS/GRIP 2009 - 2014**

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## List of abbreviations

3GI	Groningen Institute for Gastrointestinal Genetics and Immunology
ACC	Academic Collaborative Centres
AD	Alzheimer's disease
AF	Atrial fibrillation
ALS	Amyotrophic lateral sclerosis
ANDDI	Abnormal Neurological Development: Early Diagnosis and Intervention
ARWU	Academic Ranking of World Universities
ASPIRE	Augmenting Scholar Preparation and Integration with Research-Related Endeavours
ATTP	Abel Tasman Talent Programme
AVL	Antoni van Leeuwenhoek
BAI	Biomaterial-associated infections
BCN-BRAIN	Research Institute for Neurosciences and Healthy Ageing
BDDD	Biopharmaceuticals: Design, Discovery and Delivery
BIOBI	Bioadhesion, Biocompatibility and Infection
CAPE	Critical care, Anesthesiology, Perioperative and Emergency medicine
CCC	Comprehensive Cancer Centre
CHMP	Committee for Medicinal Products for Human Use
CI	Cochlear implants
CLDM	Centre for Liver, Digestive and Metabolic Diseases
CMI	Centre for Medical Imaging
COPD	Chronic Obstructive Pulmonary Disease
CRCG	Cancer Research Centre Groningen
CT	Computerised tomography
CVC	Preservation of cardiac function over time
CWTS	Centre for Science and Technology Studies
DARE	Damage and Repair in Cancer Development and Cancer Treatment
EBM-P	Evidence-based medicine in practice
EC	European Commission
EHA	European Haematology Association
EMA	European Medicines Agency
ENT	Ear, nose and throat
EORTC	The European Organisation for Research and Treatment of Cancer
ERC	European Research Council
ERIBA	European Research Institute for the Biology of Ageing
ERS	European Respiratory Society
EU	European Union
EXPAND	Extremities, Pain and Disability
FBR	Foreign body response
FDG-PET	8-Fluoro-deoxyglucose positron emission tomography
FIGON	Dutch Federation for Innovative Drug Research

FMNS	Faculty of Mathematics and Natural Sciences
fMRI	Functional magnetic resonance imaging
FTE	Full-time equivalent
G-CURE	Groningen Cardiology University Research Enterprise
GBB	Biomolecular Sciences and Biotechnology Institute
GIANT	Genetic Investigation of Anthropometric Traits
GIKD	Groningen Institute of Kidney Disease
GIOT	Groningen Institute for Organ Transplantation
GKC	Groningen Kidney Centre
GMP	Good manufacturing practices
GRAP	University of Groningen Research Assessment Protocol
GRIAC	Groningen Research Institute on Asthma and Chronic Obstructive Pulmonary Disease
GRIP	Groningen Institute of Pharmacy
GSMS	Graduate School of Medical Sciences
GUIDE	Groningen University Institute for Drug Exploration
GUTS	Guided Treatment in Optimally Selected Cancer Patients
H2020	Horizon 2020
HA	Healthy Ageing
HD	Huntington's disease
HFpEF	Heart failure with preserved ejection fraction
HFrEF	Heart failure in the setting of reduced ejection fraction
HOVON	Haemato Oncology Foundation for Adults in the Netherlands
HPR	Health Psychology Research
HRM	Human Resource Management
HTA	Health Technology Assessment
IBD	Inflammatory bowel disease
ICPE	Interdisciplinary Centre Psychopathology and Emotion Regulation
IMDI	Innovative Medical Devices Initiative
IMI	Innovative Medicines Initiative
IP	Intellectual property
IRB	Institutional review board
ISRT	Interval Shuttle Run Test
ITN	Innovative training networks
KNAW	Royal Netherlands Academy of Arts and Sciences
KOLFF	Kolff Institute for Biomedical Engineering and Materials Science
LCE	Life Course Epidemiology
LSH	Life Sciences & Health
M2O	Methods in Medicines Evaluation and Outcomes of Research
MCB	Medicinal Chemistry & Bioanalysis
MEB	Medicines Evaluation Board
MHD	Microbes in Health and Disease
MNCS	Mean normalised citation score

MNJS	Mean normalised journal score
MOHOF	Maintaining Oral Health and Oral Function
MOLAR	Molecular Neuroscience and Ageing Research
MRI	Magnetic resonance imaging
MS	Multiple sclerosis
NANOBIOMAT	Nanobiotechnology and Advanced Therapeutic Materials
NEJM	New England Journal of Medicine
NESDA	The Netherlands Study of Depression and Anxiety
NGS	Next-generation sequencing
NKI	Netherlands Cancer Institute
NNCO	Northern Netherlands Oncology Centre
NWO	Netherlands Organisation for Scientific Research
PCN	Perceptual and Cognitive Neuroscience
PD	Pharmacodynamics
PDX	Patient-derived xenograft
PHR	Public Health Research
PI	Principal investigator
PK	Pharmacokinetics
PKU	Phenylketonuria
PPP	Public–private partnership
PRC	Peer Review Committee
PSI	Parelsnoer Initiative
PUSH	Partnership of UMCG – Siemens for building the future of Health
REGENERATE	Restoring Organ Function by Means of Regenerative Medicine
ROAHD	Reproductive Health: Reproductive Origins of Adult Health and Disease
RRR	Research Review Reports
RUG	University of Groningen
SALL	Stem cells, Ageing, Leukemia and Lymphoma
SEP	Standard Evaluation Protocol
SHARE	Science in Healthy Ageing & Healthcare
SMART	Smart Movements
SME	Small- and medium-sized enterprises
SPRINT	Smart Mobility Devices with Improved Patient Prosthesis Interaction
STW	Technology Foundation STW
SWOT	Strengths, weaknesses, opportunities, threats
TARGON	Targeted Gynaecologic Oncology
TI Pharma	Top Institute Pharma
TN	Translational neuroscience
TRIALS	Tracking Adolescents' Individual Lives Survey
TRIGR	Translational Immunology Groningen
TRIO	Institute for Transplantation, Immunology and Infections
UMC	University medical centre
UMCG	University Medical Centre Groningen

USP	Unique selling point
VAP	Vascular Ageing Programme
VSNU	Association of Universities in The Netherlands
WHO	World Health Organisation
ZIAM	Zernike Institute for Advanced Materials
ZIN	National Health Care Institute

# Executive Summary

The present evaluation is part of a regular cycle of research assessments of universities and research institutes in the Netherlands, and was conducted according to the Standard Evaluation Protocol 2015-2021. This summary, which highlights the main conclusions, relates to the key objectives of the assessment (listed as grey bullet points).

- Assess the research quality, relevance to society and viability of the research conducted by the five research institutes and their 31 programmes/themes (collectively defined as 'units') in the medical and pharmaceutical sciences at the UMCG (University Medical Centre Groningen) and at the University's Faculty of Mathematics & Natural Sciences (FMNS).
- Provide an overall assessment of the UMCG research programme.
- Deliver a qualitative assessment of each unit's strategic targets and governance and of the leadership skills of the management.

During the period covered by this review, the UMCG has made major advances, and the PRC (Peer Review Committee) was impressed with the performance of its principal investigators (PIs) and leadership. Overall, there has been significant growth in both the quality of the research and the size of the institution. The latter has also become more independent in terms of its 'direct' funding and strengthened its group of talented young PIs. This has resulted in a good balance of activity between departments with emphasis on applied/clinical science and those with a more fundamental research focus. There is also clear evidence of effective interdisciplinary and translational research as well as increased emphasis on demonstrating the societal impact of findings. As can be expected, most programmes comprise a mix of stronger and weaker components and larger and smaller teams. Some older groups are well-established in their fields, while some newer groups are still striving to reach their full potential. For a detailed discussion of the output of the various research units we refer to the main text of the report.

The PRC proposed some specific steps to strengthen the research activities of the UMCG with respect to research quality, relevance to society and viability: (1) Consider amalgamation of smaller groups around focused themes to increase viability; (2) Expand technology platforms (*e.g.* to enhance delivery of precision medicine); (3) Develop an even greater integration of disciplines in biological/health sciences and physical sciences concerning the digitisation of patient and research data and the promotion of personalised medicine; (4) Strengthen resources with respect to immunology; investment in a new 'immunology core facility' would create a range of opportunities for enhancing many of the UMCG programmes as a major feature of the Healthy Ageing theme; (5) Identify unique selling points and translate these into powerful messages to the outside world; (6) Expand efforts to convert research outcomes into measurable societal and economic impacts, thereby intensifying contact with stakeholders.

In addition, the PRC suggested a major change in funding mechanisms. In the current model the research programmes have limited funding at their own disposal since resources are linked primarily to the departments. This compromises the freedom to operate of the leadership of the research programmes in terms of planning and implementing new initiatives and limits their future development. The PRC urged the UMCG leadership to discuss this issue with the

programmes and to consider their wishes and options in resolving this highly undesirable situation.

- Provide a qualitative assessment of the Institute of Pharmacy (GRIP) with regard to strategic targets, governance and the leadership skills of its management.
- Comment on the quality and visibility of FMNS/GRIP research and its researchers embedded in the UMCG research.

Included in the remit of this review was an assessment of the Groningen Research Institute of Pharmacy (GRIP), as this occupies a strategic position between the basic research disciplines of the FMNS and the basic/pre-clinical and clinical disciplines in the UMCG. There are probably very few life/health science campuses in the world where the pharmaceutical sciences and the ‘clinic’ meet in such a close, systematic and productive manner. The co-housing of GRIP’s facilities on the UMCG campus is a critical pre-requisite for further successful collaboration between UMCG and FMNS.

Given that the drive towards ‘personalised/precision medicine’ is now at the forefront of therapeutics, this should galvanise GRIP to increase its expertise in and contribution to this important area of translational science. In this context, there should be greater recognition, within GRIP, of the need for and a sustained investment in PK/PD modelling as it relates to quantitative systems pharmacology. There should also be increased interaction with repositories of ‘big data’, such as LifeLines especially, with regard to the interrogation of prescription data. To maintain optimal alignment with its teaching role, GRIP should formulate a plan for fostering pharmacy practice/clinical pharmacy research.

In the longer term, the development of a ‘3D Institute’, combining research on Diagnostics, Drugs and Developed could further strengthen the rather unique ecosystem that exists in Groningen. With this branding, demonstration of societal value could be enhanced by concentrating on tangible ‘products’ as outcomes.

- Assess the extent to which the Healthy Ageing theme has been adopted by the individual research units.

The PRC noted many links to the Healthy Ageing theme and genuine attempts on the part of the programme leadership to address this theme. Clearly, Healthy Ageing provides a very broad umbrella by allowing many ‘points of entry’ for research. In some cases, the link between Healthy Ageing and specific aspects of the UMCG research are self-evident, in others the connection is more subtle or indirect (especially with respect to those units based on ‘enabling sciences’).

- Assess the extent to which ‘internationalisation’ has been adopted by the individual research units.

The research conducted at the UMCG has a strong international profile in terms of the outreach of the units, staffing and competitiveness. Since 2009, the net turnover from EU projects has doubled, and UMCG/GRIP is host to many non-Dutch staff members (facilitated by the tenure-

track system) and PhD students (about 35% of the 'regular' PhD student population is from abroad).

- Reflect on general aspects of the institutes' policy on research integrity and the ways in which violations of such integrity are prevented.

The UMCG has initiated a number of laudable initiatives to ensure research integrity and the quality of the data generated by its members. These include the establishment of an institutional Research Code, close attention in the master's and PhD programmes to scientific integrity, implementation of the ISO 9001 quality management system (including the new data storage system), and the development of a mediator system. The UMCG leadership is advised to evaluate these systems regularly and to use lessons learned from individual cases in making further improvements.

- Give an expert opinion on the quality of the supervision and instruction of PhD candidates.

The PRC received a highly favourable impression of the quality of the Graduate School of Medical Sciences, especially considering that the School was only instituted in 2009. To further strengthen the programme, the recommendations made include the following: (1) Increase the visibility of the programme to potential students; (2) Ensure that PhD projects are feasible and can be completed within the 4-year period; (3) Ensure that PhD students see the relevance of the educational programme; (4) Improve the possibilities for progress monitoring; (5) Expand the supervision course for PhD supervisors; (6) Ensure that PhD projects do not greatly exceed the nominal 4-year limit; (7) Consider scheduling a scientific event prior to the formal PhD defence during which the external examiners can hold a public discussion of the project with the PhD student (8) Place greater emphasis on career guidance after graduation; (9) Consider appointing a chair of the Education Committee who is independent of the school's management.

# 1. Introduction

## Preface

The current peer review covers the period 2009-2014 and is based on the framework provided by the Standard Evaluation Protocol 2015-2021. The objectives of the review, as set out in the Terms of Reference provided by the Board of the University of Groningen (see annex A), and as interpreted by the PRC (Peer Review Committee) were the following:

- Assess the research quality, relevance to society and viability of the research conducted by the five research institutes and their 31 programmes/themes (collectively defined as 'units') in the medical and pharmaceutical sciences at the UMCG (University Medical Centre Groningen) and at the University's Faculty of Mathematics & Natural Sciences (FMNS);
- Provide an overall assessment of the UMCG research programme;
- Deliver a qualitative assessment of each unit's strategic targets and governance and of the leadership skills of the management;
- Provide a qualitative assessment of the Institute of Pharmacy (GRIP) with regard to strategic targets, governance and the leadership skills of its management;
- Comment on the quality and visibility of FMNS/GRIP research and its researchers embedded in the UMCG research;
- Assess the extent to which the Healthy Ageing theme has been adopted by the individual research units;
- Assess the extent to which 'internationalisation' has been adopted by the individual research units;
- Reflect on general aspects of the institutes' policy on research integrity and the ways in which violations of such integrity are prevented;
- Give an expert opinion on the quality of the supervision and instruction of PhD candidates.

The PRC was constituted in mid-2015 according to the terms of reference included as Annex A. By December 2015 the self-assessment reports from the programmes/themes/institutes to be evaluated were completed. The members of the PRC and the leadership of the UMCG and FMNS/GRIP research units were then informed of the activities to be carried out before ('pre-homework'), during and after the site visit ('post-homework'), the time schedule and the responsibilities of the committee members, chair and secretary.

Reviewing 31 programmes/themes in 5 institutes with 2 different infrastructures (UMCG and FMNS) is not a trivial endeavour. As part of the review procedure, an impressive amount of material had to be made available on time for the PRC. The commitment of the responsible UMCG/GRIP (and unit) leadership and staff to collect, align and edit the 1076 pages of information in the self-assessment is very commendable. Overall, the work of the PRC covered more than 90% of the scientific output (estimate of the PRC). Hopefully, the reporting system has evolved now to the point that storage of all relevant data and its retrieval for the next peer review will be facilitated.

Scheduling the PRC interviews with the UMCG/FMNS leadership of this large number of units in a three-day site visit to Groningen from 15-17 February 2016 was a challenge. However, in practice, it proved to be workable and provided the PRC with a good overview of the institutes

and their programmes. Although the PRC was divided into several subcommittees based on specific expertise required for the institutes (see Chapter 2), the text of this final report reflects the consensus view of the full PRC, unless specifically indicated otherwise, albeit with some differences in ‘tone’ between the different sections.

Because the PRC was one of the first groups to work with the new SEP 2015-2021 (Standard Evaluation Protocol), it encountered some specific challenges. For example, as a result of the changes in the scoring system, there was no benchmark for comparison with earlier peer reviews of UMCG or indeed of any other UMC in the Netherlands. We were the forerunners. In this context, the PRC questioned the precision of the revised metrics, particularly with respect to the evaluation of ‘societal relevance’. As a general recommendation, the PRC encouraged further development of the scoring system based on the relevant experience of other countries (e.g. the UK). They were concerned that the current publication scoring system (p. 8 of the SEP document) might undervalue the contribution of individual groups, as it is an aggregate score. According to the PRC, the narrative texts for each unit that accompany the scores provide more detailed opinions, recommendations and advice to the RUG Board, and the report should be read with this in mind.

By its nature, a peer review tends to look backward with an emphasis on previous performance. This is also reflected in the self-assessment reports, where the bulk of the text deals with the past. Only limited space was available in the reports to outline future plans and ambitions to assist assessment by the PRC. Such information would have added to the discussion, especially with respect to the determination of ‘viability’. Nevertheless, the PRC understood that this shortcoming is an inherent result of the SEP and the format of the self-assessment report. In discussing the ‘aggregate level of assessment’, the SEP (p. 10) indicated a minimum size of 10 FTEs (tenured staff and tenure track positions). The PRC noted that the majority of programmes in UMCG/GRIP fall well below this threshold. Furthermore, the PRC stated that the UMCG system, in which PIs can be part of two programmes, should be reviewed. The PRC saw clear advantages for commitment to a single programme, while welcoming collaboration with others.

This report describes the evaluation by the PRC of most of the units that were assessed. Because of their size and (for ROAHD) more recent launch, the PRC was requested to provide its assessment of SHARE HPR and SHARE ROAHD separately in the form of a confidential letter to the Board of the University.

## 2. Procedure followed/methodology

In accordance with the Standard Evaluation Protocol (SEP), the task of a Peer Review Committee (PRC) is to assess the quality of the research, its relevance to society, viability and to recommend improvements where necessary. The recipients of the evaluations are other researchers, the boards of public and private institutions, government agencies and society in general.

This assessment was conducted according to the Standard Evaluation Protocol (SEP)<sup>1</sup> established by VSNU (Association of Universities in The Netherlands), NWO (Netherlands Organisation for Scientific Research) and KNAW (Royal Netherlands Academy of Arts and Sciences). SEP 2015-2021 is the most recent version of SEP, dating from 1994 and renewed in 1998, 2003 and 2009. The SEP was used as the basis for the University of Groningen Research Assessment Protocol (GRAP), which serves as a manual for the planning, organisation and follow-up of external SEP assessments once every six years and of interim internal midterm reviews. The implementation of the protocol is coordinated by the faculty board(s). For the present evaluation, this was done by the Dean of Research of the University Medical Centre Groningen (UMCG) on behalf of the Faculty of Medical Sciences (FMS as part of the UMCG) and by the Director of GRIP on behalf of the Faculty of Mathematics and Natural Sciences (FMNS).

The PRC was appointed by the Board of the University of Groningen in the autumn of 2015 to assess the quality and relevance to society of the research conducted by five medical sciences and pharmacy research institutes of the RUG and their 31 programmes/themes, as well as their strategic targets and the extent to which they are equipped to achieve them. The full terms of reference are appended to this report as Annex A. The preface of this report gives a short summary of the objectives (see page 11).

The following research units were assessed:

Cancer Research Centre Groningen (CRCG):

- Damage and Repair in Cancer Development and Cancer Treatment (DARE)
- Guided Treatment in Optimal Selected Cancer Patients (GUTS)
- Stem cells, Ageing, Leukemia and Lymphoma (SALL)
- Targeted Gynaecologic Oncology (TARGON)

Groningen University Institute for Drug Exploration (GUIDE):

- Biopharmaceuticals: Design, Discovery and Delivery (BDDD)
- Centre for Liver, Digestive and Metabolic Diseases (CLDM)
- Critical care, Anesthesiology, Perioperative and Emergency medicine (CAPE)
- Groningen Institute for Gastrointestinal Genetics and Immunology (3GI)
- Groningen Institute for Organ Transplantation (GIOT)
- Groningen Kidney Centre (GKC)

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<sup>1</sup> VSNU, NWO, KNAW. Standard Evaluation Protocol 2015 – 2021, protocol for research assessment in the Netherlands. Available from: <https://www.knaw.nl/nl/actueel/publicaties/standard-evaluation-protocol-2015-2021> (Accessed 4 March 2016).

- Groningen Research Institute on Asthma and COPD (GRIAC)
- Medicinal Chemistry & Bioanalysis (MCB)
- Microbes in Health and Disease (MHD)
- Preservation of cardiac function over time (CVC)
- Translational Immunology Groningen (TRIGR)
- Vascular Ageing Programme (VAP)

Kolff Institute for Biomedical Engineering and Materials Science (KOLFF)

- Bioadhesion, Biocompatibility and Infection (BIOBI)
- Maintaining Oral Health and Oral Function (MOHOF)
- Nanobiotechnology and Advanced Therapeutic Materials (NANOBIOMAT)
- Restoring Organ Function by Means of Regenerative Medicine (REGENERATE)

Research Institute for Neurosciences and Healthy Ageing (BCN-BRAIN)

- Abnormal Neurological Development: Early Diagnosis and Intervention (ANDDI)
- Centre for Medical Imaging – UMCG (CMI-UMCG)
- Interdisciplinary Centre Psychopathology and Emotion Regulation (ICPE) [joint with SHARE]
- Molecular Neuroscience and Ageing Research (MOLAR)
- Perceptual and Cognitive Neuroscience (PCN)
- Translational Neuroscience (TN)

Science in Healthy Ageing & Healthcare (SHARE)

- Extremities, Pain and Disability (EXPAND)/Smart Movements (SMART)
- Health Psychology Research (HPR)
- Interdisciplinary Centre Psychopathology and Emotion Regulation (ICPE) [joint with BCN-BRAIN]
- Methods in Medicines Evaluation and Outcomes of Research (M2O) Life Course Epidemiology (LCE)
- Public Health Research (PHR)
- Reproductive Health: Reproductive Origins of Adult Health and Disease (ROAHD)

The assessments of two of the SHARE institute's programmes (HPR and ROADH) were provided to the Board of the University in a confidential letter, because these programmes are relatively small and/or new. Originally, this would also have been the case for the KOLFF REGENERATE and KOLFF MOHOF programmes, but the University Board recalled this request. Therefore, the assessment of these two programmes is now included in this report. The Graduate School of Medical Sciences (GSMS) was also assessed as a separate institute. The overall assessments of UMCG, GRIP and GSMS are strictly qualitative assessments.

Owing to the diversity of the programmes and the expertise required to evaluate them, different groups of experts (Subcommittees) were selected by the Board of the University for the assessment of each of the five institutes. Within these Subcommittees, individual members took responsibility for leading the review of a specific unit and were responsible for drafting the final text of the assessment in consultation with the other committee members.

The PRC members were, with Subcommittees indicated:

#### Chair & Secretary

- Prof. dr. Daan J.A. Crommelin, Chair, Emeritus professor, Utrecht University, The Netherlands
- Dr. Pieter Stolk, Independent secretary

#### CRCG Subcommittee

- Prof. dr. Cristiana Sessa, Oncology Institute of Southern Switzerland, Switzerland
- Prof. dr. med. Arnold Ganser, Hannover Medical School, Germany

#### GUIDE/GRIP Subcommittee

- Prof. dr. Stephen T. Holgate, University of Southampton, United Kingdom
- Prof. dr. Hubert Leufkens, Utrecht University, The Netherlands
- Dr. Ton Rijnders, Lygature, The Netherlands
- Prof. dr. Geoffrey T. Tucker, Emeritus professor, University of Sheffield, United Kingdom

#### KOLFF Subcommittee

- Prof. dr. rer. Nat. Klaus D. Jandt, Friedrich Schiller University Jena, Germany
- Prof. dr. Wenyuan Shi, University of California Los Angeles, United States

#### BCN-BRAIN Subcommittee

- Prof. dr. Paul Boon, Ghent University Hospital, Belgium
- Prof. dr. Marco Prinz, University of Freiburg, Germany

#### SHARE Subcommittee

- Prof. dr. Peter Allebeck, Karolinska Institute, Sweden
- Prof. dr. Ronan O'Carroll, University of Stirling, United Kingdom
- Prof. dr. Guy Vanderstraeten, Ghent University Hospital, Belgium

#### GSMS Subcommittee & GUIDE/GRIP subcommittee

- Prof. dr. Michael J. Mulvany, Aarhus University, Denmark
- Prof. dr. Frans G.M. Russel, Radboud University Medical Centre, The Netherlands

The curricula vitae of the members of the Peer Review Committee are given in Annex B. All members signed a statement of impartiality and confidentiality (Annex C).

## **2.2 Documentation, timeline and reporting**

In line with the SEP guidelines, all units to be evaluated prepared an extensive self-assessment report covering overall strategy, targets for the past six years, relevant performance indicators, key results, a self-assessment based on the three SEP criteria (research quality, relevance to society and viability), relevant environmental factors, a SWOT analysis. An evaluation of the PhD programme and a reflection on research integrity issues was provided as well. In addition, an extensive bibliometric analysis was conducted by the Centre for Science and Technology Studies (CWTS) of Leiden University. Key characteristics of the research units assessed can be found in

Annex D. This documentation was provided to the PRC mid-December 2015 and formed the basis for an initial assessment by its members.

From 15 to 17 February 2016, the PRC visited the research site and held discussions with representatives from all units and the UMCG/GRIP leadership (the programme of this site visit is attached as Annex E). The presentations and discussions during the site visit and the materials provided earlier by the UMCG/GRIP formed the basis of the final assessment by the Committee.

This report reflects the final assessment and is based on the principles outlined in the SEP 2015-2021 (Appendix E of that document). The text represents the consensus view of the Committee, unless specifically indicated otherwise, as confirmed by all of its members. Most units have received scores based on three categories defined in the SEP. These categories and the meaning of the individual scores are summarised in Table 1 (copied directly from the SEP 2015-2021). The PRC followed these descriptions closely and agreed on common criteria to obtain consistency across the report.

<b>Cat.</b>	<b>Meaning</b>	<b>Research quality</b>	<b>Relevance to society</b>	<b>Viability</b>
<b>1</b>	World leading/ excellent	The research unit has been shown to be one of the few most influential research groups in the world in its particular field.	The research unit makes an outstanding contribution to society.	The research unit is excellently equipped for the future.
<b>2</b>	Very good	The research unit conducts very good, internationally recognised research.	The research unit makes a very good contribution to society.	The research unit is very well equipped for the future.
<b>3</b>	Good	The research unit conducts good research.	The research unit makes a good contribution to society.	The research unit makes responsible strategic decisions and is therefore well equipped for the future.
<b>4</b>	Unsatisfactory	The research unit does not achieve satisfactory results in its field.	The research unit does not make a satisfactory contribution to society.	The research unit is not adequately equipped for the future.

**Table 1** – Meaning of categories SEP 2015 – 2012 (from the SEP protocol)

### 3. Overall assessment

- *Overall observations*

The PRC was impressed with the performance of the UMCG/GRIP PIs and their leadership. It noted a sincere commitment to collaboration and a positive drive to be successful as a group, remarking that the interactions between the UMCG research organisation and GRIP/FMNS are very close and unique in the Netherlands. Indeed, it is rare to find this degree of collaboration between researchers in medicine and in the pharmaceutical sciences in other universities around the world. There are many joint initiatives at the programme level and these interactions have clearly matured since the last PRC assessment. In the following sections a number of aspects related to UMCG and GRIP are discussed. As the structure of the UMCG research organisation is fundamentally different from that of FMNS/GRIP, some comments specific to the UMCG are made at the end of this section.

- *Role of the previous peer review: ‘Research Review Reports’ (RRR) 2003-2008*

The PRC had full access to the Research Review Report (RRR) 2003-2008.<sup>2</sup> In the 2015 self-assessment reports of the institutes/programmes/themes recommendations from this RRR 2003-2008 were discussed. In general, the PRC was satisfied with how the leadership of the UMCG/GRIP has addressed the RRR 2003-2008 recommendations. In some cases, actions were undertaken as suggested, in others recommendations were not followed, but alternatives were implemented with justification.

The PRC 2003-2008 suggested major organisational changes in the institute/programme structure, many of which were adopted subsequently by the leadership of UMCG. These new structures have been implemented over the last 6 years. The current PRC concluded that the time from the conception of these new structures to the point where success can be demonstrated is, in general, too short to evaluate the long-term benefits of the changes. Therefore, it was inclined to give the new structures further time to prove themselves, and kept its suggestions for immediate organisational changes to a minimum.

The PRC 2003-2008 advised a realignment of the organisation of GRIP with UMCG. But, in the corresponding self-assessment report, the authors argued that full incorporation of GRIP into the UMCG was ‘a bridge too far’. The current PRC understood this position and, therefore, advised reviewing the alignment of the organisations when new opportunities emerge that reflect ‘best practices’ in both institutes and, indeed, in other university groupings such as materials science. In the longer term, the development of a ‘3D Institute’, combining research on Diagnostics, Drugs and Developed, could further strengthen the rather unique ecosystem that exists in

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<sup>2</sup> Research Review Reports 2003-2008: Assessment FMS UMCG and GRIP-FMNS. Available from: [https://www.rug.nl/about-us/where-do-we-stand/quality-assurance/prcreportsumcg\\_mrt11.pdf](https://www.rug.nl/about-us/where-do-we-stand/quality-assurance/prcreportsumcg_mrt11.pdf) (Accessed 17 March 2016).

Groningen, founded on the close collaboration between UMCG and FMNS. With this branding, demonstration of societal value could be enhanced by concentrating on tangible ‘products’ as outcomes.

- *Research themes/focus*

In 2006 the RUG decided to focus on ‘Healthy Ageing’ as one of its three research priorities (the others are ‘Energy’ and ‘Sustainable Society’), and the PRC was asked to comment on this with respect to UMCG/GRIP research. In the template used for the self-assessments, units were instructed specifically to indicate how their research has contributed to Healthy Ageing. Subsequently, the PRC discussed the topic with the various programme leaders, and with the GUIDE/GRIP management.

Overall, the PRC noted many links to Healthy Ageing in the research that has been presented. It acknowledged the benefits of the Healthy Ageing theme, given current demographic and public health challenges, and it supported this development. In some cases the link between Healthy Ageing and specific aspects of the UMCG research is self-evident, for example in the context of research on Alzheimer’s disease and other diseases that are prevalent in the elderly population, but in other cases the connection is more subtle or indirect. Clearly, Healthy Ageing provides a very broad umbrella in allowing many ‘points of entry’. The PRC noted that groups with a translational strategy (balanced pre-clinical and clinical contributions) or with a strong clinical research emphasis are consistently adopting Healthy Ageing as their ‘point on the horizon’. On the other hand, for units based on ‘enabling sciences’ (i.e. contributing to different disease-oriented programmes), the target of Healthy Ageing is not so obvious. Nevertheless, the PRC noted genuine attempts on the part of the programme leadership in these latter units to address the theme.

In the UMCG report, ERIBA was mentioned a number of times. It also came up in the discussions during the site visit. However, no substantive information on this new department was provided in the PRC information package. As a consequence, the PRC was unable to comment on ERIBA and its obvious relevance to the UMCG strategy in becoming a world leading academic organisation in Healthy Ageing research. The PRC would have valued the opportunity to review ERIBA in more detail and strongly recommended that ERIBA be included in future peer reviews.

- *Internationalisation*

The internationalisation of the research organisation has been one of the focal points of the UMCG/GRIP leadership, and this approach has been very successful. This is indicated, for example, by a doubling of the net turnover from EU projects since 2009 (UMCG), an impressive achievement in times of budget cuts. Initiatives such as the EU Grant Support Hub have clearly contributed to this success, and the assistance provided by the research support staff in the various units is to be commended.

The fact that the UMCG/GRIP is host to many non-Dutch staff members and PhD students from many countries is also clear evidence of internationalisation. About 35% of the ‘regular’ PhD

student population (*i.e.* non part-time, non-company based, non-extranei) is from abroad. The tenure-track system has also contributed to the internationalisation of research staff.

- *Research integrity (p 8-9 SEP report)*

The UMCG has initiated a number of laudable initiatives to ensure research integrity and the quality of data generated in its research organisation. The UMCG Research Code, based on that developed by VSNU (Association of Universities in The Netherlands) has been published and is available online for consultation. Close attention to scientific integrity is paid in the master's and PhD programmes. An obligatory electronic data storage system is presently being installed as part of the UMCG ISO 9001 certified quality management system.

Having such a visible and functional 'learning' system to safeguard research integrity is critical. The PRC had the opportunity to talk to PhD students during the site visit and, in general, they were aware of the content of the documentation related to research integrity. PRC members also discussed the operation and performance of the mediator system with one of its two representatives. The need for this system was confirmed by the fact that the mediators had been called upon in a substantial number of cases over the years. Their work is highly appreciated by the PRC. The UMCG leadership is advised to evaluate the system regularly and to use the lessons learned from individual cases in making improvements (at present this is not mentioned in the Annual Report of the UMCG). Assurance of access to the system by PhD students and the avoidance of underreporting should be prominent policy objectives.

- *Human resource management*

Over the last decade the RUG has gained experience with a university wide tenure-track system for new faculty that is unique in the Netherlands. Previous PRCs have applauded this daring concept. This PRC understands and appreciates the value of such a system in attracting young international talent to Groningen. In the discussions with some of the programme leaders the danger of 'fragmentation' and 'loss of focus' was mentioned as a potential problem. The PRC advises the RUG to investigate this 'side effect' of the tenure-track system and to take appropriate measures if necessary. The Rosalind Franklin fellowship initiative is highly applauded as a mechanism for increasing the diversity of tenured staff.

- *Quality of research*

The reports on the institutes, programmes and themes give detailed information regarding research quality. In the ARWU ('Shanghai ranking') Groningen is rated among the 75–100 best institutions worldwide in the field of Clinical Medicine/Pharmacy. The CWTS ranking for 2015 lists Groningen at 55 (size independent) in Biomedical and Health research. These data attest to the overall high quality of the research in the UMCG/GRIP. A more nuanced picture is provided in the detailed discussion of the individual programmes in the present report. As can be expected, the UMCG hosts a wide variety of research groups centred on different themes. Most programmes contain a mix of stronger and weaker components and larger and smaller teams. Some groups have been in existence for a long time and are well-established in their field, while

other newer groups are still striving to reach their full potential. The reports on the individual units consider this in more detail.

- *Research infrastructure*

The UMCG research groups are well equipped with impressive ‘hardware’ and access to biobanks and unique databases facilities (e.g. LifeLines). The PUSH initiative is an important asset and ensures essential access to up-to-date imaging equipment. During the site visit, only one strong signal of perceived deficiencies in research infrastructure was detected from discussions with the leaders of the various units: the repeated concerns that were voiced about lack of core funding staff to support databases. This is a risk to a great resource.

Further involvement of FMNS scientists might provide an even stronger modern equipment base (e.g. through ZIAM). The UMCG is expanding its laboratory facilities. In this context, the co-housing of GRIP’s facilities on the UMCG campus is a critical precondition for further successful collaboration between UMCG and FMNS. Such ‘cohabitation’ should be nurtured.

- *Stakeholders and networks*

The units of the UMCG/GRIP are embedded in national and international networks. To preserve their pursuit of excellence in research and its relevance to society, they should consider the establishment of permanent or *ad hoc* external advisory committees. In particular, UMCG/GRIP leadership might encourage this for units in which ‘viability’ concerns are expressed in this report. These committees should act as sounding boards and a means of challenging existing structures, plans and ambitions. Individual patients and/or patient organisations should be included in such initiatives whenever issues of ‘societal relevance’ are discussed.

- *Funding*

Detailed information on the funding of the different units was provided in the self-assessment documentation and is discussed in specific sections of this report. The PRC did not receive information on the overhead costs of GUIDE/GRIP research and cannot comment on this. The ‘direct funding’ data presented in the unit self-assessment reports included the number of FTEs in relation to a predefined standard (0.4 FTE per tenured staff member; 0.3 FTE for a clinical investigator). The percentage of direct (*‘eerste geldstroom’*) funding varied considerably (from 20 to 80%) between the various units. The PRC was informed that a financial model was developed in the FMNS and is under development in the UMCG to support those groups that have been financially successful to preserve their future strength. No details were given, but the PRC applauds the principle.

Since direct funding will not increase in the coming years, growth in income must come from other sources such as NWO, the EU, charities and industry. The PRC noted that the Research Policy and Support Offices under the UMCG Dean of Research are active in supporting researchers, which is crucial for realising the research ambitions of UMCG.

- *Governance and leadership (UMCG only)*

During the site visit the governance structure of the UMCG research programme was explained. The dominant role of departments in controlling the resources of the institutes and programmes was a point of discussion on multiple occasions. In the current model, the research programmes have limited funding at their own disposal since resources are linked primarily to the departments. This compromises the freedom to operate of the leadership of the research programmes in terms in planning and implementing new initiatives and limits their future development. The PRC urges the UMCG leadership to discuss this issue with the programmes and to consider their wishes and options in resolving this highly undesirable situation.

## 4. Groningen Research Institute of Pharmacy (GRIP)

Scientific Director GRIP: Prof. dr. Wim J. Quax

### Staff (2014)

- 10.6 FTE tenured staff
- 23.8 FTE postdocs
- 120 PhD students

### Mission/Objectives

The mission is to perform internationally recognised advanced research at the frontiers of knowledge in the pharmaceutical sciences, to bridge the gap between the fundamental natural sciences and the medical/clinical sciences in the field of medicinal products and to amalgamate advanced research and education in order to provide professional pharmacists and pharmaceutical researchers to society.

### Brief description

GRIP covers multiple aspects of drug discovery, development, application to pharmaceutical practice and patient-oriented research. Since this is a broad ambition, GRIP fosters close interactions with chemistry, biotechnology, physics and UMCG medical sciences. These collaborations have been formalised in GUIDE and SHARE through combined research programmes. GRIP occupies a strategic position between the basic disciplines of the FMNS and the pre-clinical and clinical disciplines in the UMCG. This intermediate position helps to generate effective translational research and has opened fruitful directions for multidisciplinary collaborations. There are probably very few life science campuses in the world where the pharmaceutical sciences and the ‘clinic’ meet in such a close, systematic and productive manner. As one of the catalysts of such encounters, GRIP is well regarded and appreciated, an achievement that reflects the strong strategic vision of the leadership of both FMNS and UMCG. GRIP generates new scientific findings specifically focused on scientific questions related to the pharmaceutical sciences, it acts as a go-between chemistry/physics and the medical sciences and it provides a source of well-trained pharmaceutical scientists.

Embedding GRIP in the FMNS/UMCG environment remains a complex task, but it is well managed by the leadership. The previous PRC suggested a full ‘organisational realignment of GRIP with UMCG’. However, this was considered ‘a bridge too far’. Nevertheless, a further attempt was made to integrate the ‘enabling technology’ platform oriented programmes in GRIP (BDDD and MCB) with the disease-oriented programmes in GUIDE. The location of UMCG and GRIP within the same building complex is definitely a great advantage and should be sustained. An important feature of GRIP is its strong involvement in the education of future pharmacists and pharmaceutical scientists; virtually every GRIP researcher has a significant teaching commitment. Accordingly, an on-going issue is keeping an appropriate balance between time devoted to teaching and time for research.

### Research quality

The BDDD and MCB programmes within GUIDE involve a majority of the researchers in GRIP; GRIP scientists can also be found in the GRIAC and M2O programmes which are integrated in

GUIDE and SHARE, respectively. According to bibliometric analysis, the research output of BDDD and MCB has high ratings in both the ‘pharmacology & pharmacy’ and relevant ‘chemistry’ domains. Publication and citation performance indicators range from ‘very good’ to ‘excellent’. For example, in 2014 29% of the output was published in the top 10% of the journals in the domains.

Within GUIDE, GRIP contributes the BDDD and part of the GRIAC programme, which are world class. As a whole, the performance of GRIP is rated very good to excellent.

#### Relevance to society

The output of GRIP research is especially oriented towards the development of products for patients and public health. In collaboration with industry, several products are in various phases of development or have reached the market. Several PIs are highly visible within their subject area and their expertise is in demand in the practice, policy and regulatory space. To strengthen this societal engagement, the beneficiaries should become more involved in agenda setting and strategic planning within GRIP.

GRIP programmes participate in public-private partnerships and are therefore well positioned within various societal alignments of the RUG to the outside world. Particularly through BDDD and M2O, GRIP has reached out with its research activities, resulting in significant societal impact. Within GRIP a number of scientists are members of important national/international committees such as the MEB and FIGON. Some GRIP groups, in particular those groups with a strong technology provider focus, (e.g. MCB), take a more reactive approach towards the defined RUG research priorities.

#### Viability

The emphasis on nurturing talent and the tenure-track programme are important elements of GRIP that will secure its continued success. However, the 10.6 FTE tenured staff as of 2014 is a relatively low number given the research ambitions of GRIP. Staff members are dispersed over both GUIDE (29) and SHARE (9), which could present a challenge in maintaining focus and direction. Endowed chairs and appointments from the UMCG are a welcome addition to the GRIP staff.

GRIP is acknowledged for its higher earning capacity: GRIP is responsible for 30% of the RUG patents (based on approximately 50 RUG patent applications during the period under review) and 90% of the royalty income of the RUG. However, its capacity to continue to undertake this high-level research needs continual review to build a sustainable future. Given that the drive towards personalised medicine is now at the forefront of therapeutics, this should galvanise GRIP to increase its expertise and contribution in this important area of translational science. In this context, there should be greater recognition of the need for, and a sustained investment in, PK/PD modelling as it relates to quantitative systems pharmacology. There should also be increased interaction, not just through M2O, with repositories of ‘big data’ such as LifeLines, especially with regard to the interrogation of prescription data as an obvious priority.

To maintain optimal alignment with its teaching role, GRIP should formulate a plan for fostering pharmacy practice/clinical pharmacy research.

## 5. Cancer Research Centre Groningen (CRCG)

### 5.1 CRCG-Institute

Director: Prof. dr. E. Vellenga

#### Staff (2014)

- 24.2 FTE tenured staff
- 13.3 FTE postdocs
- 158 PhD students

#### Mission/Objectives

The mission of the CRCG is to organise and facilitate high-quality, oncology-related research activities within the UMCG in a coherent and effective manner and to achieve fundamental, clinical and societally relevant research output. To fulfil this mission, researchers within the CRCG investigate the molecular mechanisms that are involved in the process of malignant transformation in a broad spectrum of tumours, in order to translate these fundamental insights into improved early detection and treatment of cancers. In addition, the CRCG aims to provide a stimulating and inspiring research and training environment for young aspiring investigators, PhD students and research master's students, as well as established researchers.

#### Scores

Research quality	2
Relevance to society	2
Viability	1

#### Brief description

CRCG was founded in 2012 as a research institute of the UMCG and was preceded by the Northern Netherlands Oncology Centre (NNOC). The research is focused on molecular mechanisms of malignant transformation, translation into improved early detection and treatment of cancers, and development of biomarkers to enable more personalised therapy.

CRCG has been structured into four research programmes – DARE, GUTS, SALL and TARGON – to promote the existing, strong research activities and on this basis to develop a clear profile of high national and international standing and visibility. CRCG provides support for organising the meetings of trainees and researchers, performs annual evaluations and selections of PIs and “young” PIs, encourages participation of PIs in the GSMS curriculum, and carries out periodic Midterm Reviews and Self-Evaluation Protocols.

An annual CRCG meeting is held for the PhD and the MD/PhD students to communicate their research results. In addition, a PhD council provides social and other activities for the trainees.

With its theme “healthier and longer lives of cancer patients through improved care”, CRCG is centrally placed in and closely linked to the UMCG/RUG theme Healthy Ageing.

With the integration of top ranking researchers from ERIBA as PIs in CRCG, the input of basic research has been strategically extended and has greatly enhanced the science-driven research

programmes. A further opportunity to promote clinical research at CRCG is the establishment of the Comprehensive Cancer Centre (CCC), which should include a clinical trial centre to support the clinical investigators in the planning and submission of clinical trial protocols to the authorities as well as in the monitoring of clinical trials. In addition, the CCC should provide GMP facilities, including GMP training.

Since much drug development in cancer therapy takes advantage of our knowledge of molecular alterations and tumour heterogeneity, the CRCG groups should be sought after as partners for the pharma industry. Many collaborations with industry are currently in place, and industry funding has increased. This strategy should be further pursued.

Under the strong leadership of the present CRCG director and supported by dedicated programme leaders, 77 PIs from 23 basic science, pre-clinical and clinical institutions educate and train 158 PhD students. Each programme has 2-3 programme leaders who are responsible, together with the CRCG Director, for the management and policy decisions involving research, while the educational activities (master's and PhD programmes) are the responsibility of the GSMS.

Targets for the coming five years are: further streamlining of the research programmes, bridging preclinical and clinical research interests and identifying highly talented master's students, PhD students and postdocs. An interesting project is the development of a master's track on oncology within the GSMS with international visibility.

#### Research quality

The research output is very strong. This is based on the number of publications, the percentage of refereed journals in the Q1 (79% in 2014) and in the Top 10% segment (44% in 2014). Also, the citation analysis provided by the CWTS showed an excellent result, demonstrating that the PIs for some of the research programmes are internationally leading scientists.

Many PIs have an excellent track record. The expertise in biomedical imaging technology is world class. The number of grants from national and international funding agencies is impressive. The number of EU grants is increasing, which may be related to the establishment of a special EU office.

The visibility of the internationally highly competitive research is documented by a large number of science and scholarship awards, the membership of many PIs on the editorial boards of important international journals in the field and in important clinical working groups and advisory boards. Since these national and international consortia, such as HOVON and EORTC, are increasingly important to obtain grants and to get access to biological materials, memberships in international collaborative study groups should be encouraged even more.

The integration of ERIBA into the programme has proved to be an excellent strategic decision that has certainly contributed to outstanding resources and infrastructure of CRCG. The biobanks with clinical specimens are of special importance since they allow the rapid correlation of new genetic/ biological findings with clinical data. The OncoLifeS programme will certainly ensure the continuation of excellent research output.

In general, integration into national and international networks and the strategic national and international collaborations is good, but should be further extended for some programmes (TARGON, DARE).

#### Relevance to society

The relevance for society of the research topics within the four CRCG research programmes is very high and has had an important impact on this region in the Netherlands and the country as a whole.

More than 30 CRCG members have been involved in the development of clinical guidelines, in the WHO classification of malignancies as well in European quality assessment initiatives. Many PIs have authored or co-authored book chapters and textbooks, thereby disseminating the scientific knowledge of the institute among non-specialists; this is crucial for translating scientific findings into improved patient care.

The programmes operate at various levels, but all have research contracts with companies. However, only a small number of patents have been acquired. Therefore, collaborations with companies should be further developed. It is also advisable to support spin-offs and explore opportunities for patenting wherever possible.

Considerable numbers of articles were published for the general public, both in newspapers and other media. Websites have been launched by ERIBA to inform the lay audience about ageing and by the clinical departments to inform patients, the general public and clinicians about the latest clinical guidelines and protocols. However, to evaluate the relevance of CRCG activities for society, more time should be invested in developing innovative metrics and including laypeople.

#### Viability

After leaving GUIDE, CRCG management, with a dedicated director and the support of the programme leaders, has certainly developed into a highly successful research institute with a very good infrastructure. The institute holds an excellent position within the central theme of UMCG (Healthy Ageing). The interdisciplinary composition of the group of PIs, ranging from basic science to translational and clinical medicine, enables unique interaction. With the formation of a Comprehensive Cancer Centre (CCC), which will also be the home of the new proton therapy centre, the outlook is bright. By offering a state-of-the-art clinical trial centre and a clinical data warehouse, the CCC should facilitate the acquisition of clinical trials.

A possible weakness, to be regularly assessed and monitored carefully, is the broad variety of expertise and the autonomy of the groups, with potential lack of synergy or overlap among the research lines. A greater emphasis on collaboration and a more stringent programming of meetings and exchange of information among the four programmes should be established. This also includes a strict internal system of self-evaluation. Besides the weekly meeting there should be time for informal contacts between clinicians, clinician scientists and basic scientists.

## 5.2 Damage and Repair in Cancer Development and Cancer Treatment (DARE)

Programme leaders: Prof. dr. M.A.T.M. van Vugt, Prof. dr. R.P. Coppes and Prof. dr. G.H. de Bock

### Staff (2014)

- 5.4 FTE tenured staff
- 1.4 FTE postdocs
- 43 PhD students

### Mission/Objectives

The aim of the programme is to coordinate research activities on the mechanistic insight and clinical implications of short and long-term effects of anti-cancer treatments and preventive strategies. The objectives are to coordinate research activities and to provide a stimulating research environment for both established and future investigators.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

The DARE programme (Damage and Repair in Cancer Development and Cancer Treatment), was launched in 2012, and is based on strong collaborations between basic and preclinical researchers. DARE research focuses on chromosomal and genetic defects in tumorigenesis and responses at the cellular level to genotoxic agents, and incorporates clinical studies on the short-term (response and toxicity) and long-term effects (toxicities) of genotoxic anticancer treatments, including effects on quality of life (QoL).

The development of the programme involves the expansion of infrastructure to collect clinical and quality-of-life data and biological specimens within OncoLifeS.

Due to its structure and aims, the DARE programme is inherently based on close cross-disciplinary collaboration between investigators; the monthly interdepartmental meetings are therefore crucial for the success of the programme. To improve collaboration between the groups, leaders in the field of DNA repair, stem cell biology and ageing have been invited to provide seminars and master classes for PhD students.

The PIs come from ERIBA, basic science, epidemiology and many clinical disciplines, including radiotherapy and surgery. Over the 3-year period, the number of PIs and PhD students has been at a constant, high level, but only two postdocs have been hired. This low number of postdocs has been recognised as a problem that requires special attention.

Under its dedicated management and leadership, DARE has made every effort to promote internal and external collaboration. The DARE PIs not only have strong publication and fund-acquisition records from national and international funding sources, but they also have excellent

networks, including participation in academic consortia. DARE has successfully attracted new young PIs, especially from the basic sciences, to increase the previously low number of basic scientists in oncology research. The integration of ERIBA into the programme has been an excellent strategic decision as it contributes resources and infrastructure and further increases the proportion of basic scientists with strong track records.

The research topic of DARE is important for society in that the increasing number of cancer survivors and the ageing society make it more and more important to reduce the long-term risks of cancer treatment (cf. the Healthy Ageing theme UMCG/RUG). The close and successful interaction between preclinical and clinical investigators, to be potentially improved, is also crucial to develop personalised medicine, to participate in drug development programmes with industry and to develop proof of concept studies.

#### Research quality

DARE has been in operation for only the last three years, but during this period there has been tangible improvement in research quality, funding, markers of esteem and impact. The overarching themes seem to map well onto the current expertise of the DARE staff. The research output is very good. This judgement is based on the number of publications, the percentage of refereed journals in the Q1 (80% in 2014) and in the top 10% segment (43% in 2014). Citation analysis also shows a strong result, which demonstrates that DARE PIs are internationally leading scientists.

The number of PhD theses has increased significantly, from two in 2012 to fourteen in 2014. Furthermore, direct funding is 60% (relatively high), but the number of grants from national and international funding agencies is still increasing. A strong effort is needed to increase the number of European grants either at the individual level or as part of academic consortia. Because of the broad field covered, a strong self-evaluation programme with regular interdisciplinary meetings certainly is necessary to make sure that the desired exchange of expertise takes place.

Biobanking allows access to clinical specimens and the analysis of genetic alterations in tumour cells relevant to clinical outcome. Thus, the use of specimens from the “OncoLifeS” programme offers new opportunities for translational and clinical research. Research projects should be formulated now.

The visibility of the research is documented by an outstanding number of science and scholarship awards, the membership of PIs of the editorial boards of important international journals in the field, and membership in important national and international scientific and clinical working groups and on advisory boards.

#### Relevance to society

The relevance of the research topics covered by DARE is high. Due to an ageing society and the improvements in treatment outcomes, the number of people affected by cancer is increasing. The general public is therefore inherently interested in supporting research that can prevent age-related disease, and they want to be informed about progress in this field that has been made by science and medicine.

Many of the PIs have been involved in the development of clinical guidelines for hereditary and non-hereditary cancers, but these are all national rather than international guidelines. Considerable numbers of lectures have been given for the general public. The same holds for contributions both to newspapers and other media. Many PIs have been authors/co-authors of book chapters and textbooks for laypeople. However, few projects are taking place in collaboration with industry; this is a theme for future action.

### Viability

The management by the programme leaders has resulted in a highly successful research programme. DARE is well positioned in the central theme of UMCG – Healthy Ageing – and has steadily improved its performance. The researchers are still in an active phase of building their strengths. For example, the radiobiology expertise of DARE researchers has led to the development of highly competitive research programmes (in collaboration with surgeons and radiotherapists). These research topics (DNA damage and repair) will become even more important in the future.

A close internal collaboration and an increase of the external visibility/collaborations by participation in national and international academic consortia is a prerequisite. The excellent track record of the PIs is a very good basis to ensure sufficient financial support, i.e. additional external funding and support of career fellowships in basic and clinical science, in the future.

The “OncoLifeS” programme, with repeated tissue samplings from cancer patients prior to and during therapy, is an important tool for viability that should now be integrated into translational and clinical projects.

### 5.3 Guided Treatment in Optimally Selected Cancer Patients (GUTS)

Programme leaders: Prof. dr. J.A. Gietema and Prof. dr. G.M. van Dam

#### Staff (2014)

- 9.6 FTE tenured staff
- 0 FTE postdocs
- 63 PhD students

#### Mission/Objectives

Mission of the GUTS programme is to establish and maintain an optimal collaborative multidisciplinary environment for principle investigators and researchers-in-training with the aim of improving cancer diagnosis and treatment outcome with better guided therapy in optimally selected cancer patients, with the fewest possible unintended early and late effects

#### Scores

Research quality	1
Relevance to society	2
Viability	1

#### Brief description

The GUTS programme (Guided Treatment in Optimally Selected Cancer Patients - Translational and Clinical Research in Oncology), founded in 2012, is a multidisciplinary and collaborative (internally and externally) translational/clinical research programme. Its aim is to translate research data into clinical care for cancer patients.

GUTS' main features are globally recognised research facilities and expertise in molecular imaging – nuclear and optical – with in-house GMP production of new pharmaceuticals and radiopharmaceuticals, expertise in early, small and smart clinical studies, and the availability of a genomics coordination centre with the ability to process and analyse big data.

As such, GUTS can act as transversal matrix structure to provide services and allow the development of translational projects, also in the other three CRCG programmes. Due to its key position, during the next five years GUTS should be able to maintain its high level of quality, cope with requests for internal/external collaboration – especially involving industry partners – and develop innovative tools and fields of competence. Examples of the latter include the collaboration in immunotherapy with NKI/AVL (see below) and the collaboration with the sister programme TARGON (see viability section).

The PIs come from a variety of preclinical and mostly clinical departments with special input from medical oncology/pulmonary oncology, nuclear medicine, molecular imaging/radiology, clinical pharmacology and pharmacology, as well as from the Genomics Coordination Centre. The number of PIs and PhD students has been consistently high and has increased during the review period, but there are no postdocs. The problem of losing potential postdocs to other institutes is recognised.

GUTS provides a good opportunity for young investigators to engage in research activities with a pre-clinical and clinical appointment within the same institution, which further increases its attractiveness.

The mission of GUTS corresponds entirely with the general concept of improving patient care through personalised medicine, as indicated by the extensive national and international network collaboration and, therefore, with the Healthy Ageing central research theme of UMCG/RUG.

#### Research quality

In 2014, 80% percent of publications were in the Q1 sector and in the top 10% segment (49% in 2014). NWO support, a 5-year KNAW professorship, ERC Advanced Grant and KWF grants have been awarded. Many senior PIs are members of international editorial boards and national and international committees and working groups, which is also crucial for the viability of the programme. The number of PhD theses has increased since the start of the programme: from three in 2012 to eleven in 2014.

The existing collaboration with the NKI/AVL (Amsterdam) is crucial for the development of immunotherapy research and placed GUTS in a top position in the competitive field of developing adoptive immunotherapeutic approaches

With regard to drug development, the group has secured a number of highly relevant grants from programmes based on photopharmacology, optoacoustic and other forms of imaging, and there is clear evidence of collaboration with major pharmaceutical and molecular diagnostics companies. This rather unique and successful collaboration will be further strengthened. The studies on imaging in the clinical and preclinical research are complemented by correlative studies on molecular biomarkers to identify biomarkers for broader and easier clinical application.

#### Relevance to society

The opportunities for promoting the societal impact of the group are significant given that increasing longevity in the population with cancer will become more prevalent. Therefore, the societal value of the work of the group is bound to increase, consistent with its relevance to the overall theme of Healthy Ageing.

The clinical competence is recognised by participation in guideline working groups, giving public lectures and recognition by societal groups.

The many research contracts for the development of imaging tools are an indicator of the value of research products of GUTS for societal groups. This is also relevant to ensure a continuous flow of new compounds/tools to be investigated. However, due to the collaborative nature of the work, patents and spin offs are difficult to generate.

#### Viability

The acquired expertise, the available infrastructure and the worldwide recognition are indicators of viability. Essential goals are to maintain the top-level quality and define and strengthen the intra-institutional collaboration with the sister programmes, increase collaboration and shared projects and define the respective roles to avoid conflicts and non-productive competition. The

new field of checkpoint inhibition – shared with TARGON – creates many additional opportunities in preclinical and clinical research. (See above)

The SWOT analysis indicates that GUTS management has identified potential threats, including limited administrative support and limited QPs and lab staff in the GMP facility. There is clearly a need to improve the GMP facility to ensure autonomous production.

## 5.4 Stem cells, Ageing, Leukaemia and Lymphoma (SALL)

Programme leaders: Prof. dr. J.H.M. van den Berg and Prof. dr. J.J. Schuringa

### Staff (2014)

- 5.8 FTE tenured staff
- 11 FTE postdocs
- 37 PhD students

### Mission/Objectives

The mission of SALL is to better understand the molecular mechanisms regulating hematopoietic stem cell functionality, how these are perturbed in the development of leukemia and lymphoma, and how this can be translated into improved treatment, also of late sequelae of these diseases.

### Scores

Research quality	2
Relevance to society	2
Viability	1

### Brief description

The aim of SALL is to study fundamental and clinical aspects of stem cells, leukaemia and lymphoma by incorporating various disciplines with state-of-the art technologies and ‘omics’ approaches. The programme encompasses the full gamut: basic research, translational research and clinical readout. To accomplish its goals, senior PIs of the disciplines involved in SALL (pathology, molecular biology and clinicians) work in close collaboration by holding weekly meetings for young PIs, PhDs, postdocs and technicians to present and exchange results/ideas. A programme for attracting young scientists, mainly in basic research, has been implemented with the aim of appointing promising/well known researchers. In addition, a well-structured programme for PhDs has been established, resulting in an increase of postdoc and PhD students in the last 2 years.

Two additional favourable aspects of SALL are long-standing collaboration with European (EORTC) and national (HOVON) networks and internal collaborations with ERIBA. The ‘ERIBA-connection’ and SALL’s focus on leukaemia and lymphoma demonstrate the compatibility of this programme with the Healthy Ageing theme of the UMCG/RUG. The research projects benefit from the animal research facilities of ERIBA and from access to the long-standing clinical biobanks with leukaemia/lymphoma samples. The strategic collaborations are not only limited to national and international academic partners, but also include the pharmaceutical industry to translate research findings into new therapies.

The relatively young PIs come from preclinical (basic science) and clinical departments, including ERIBA, which has a positive impact on the quality of the programme. This balance not only fosters interaction, but also enables clinically relevant questions to be answered and provides access to clinical specimens. The number of tenured staff, postdocs and PhD students has increased over the 3-year period. The two programme leaders have international standing in their fields.

### Research quality:

The research output is very strong. This is based on the number of publications and the percentage of publications in refereed journals in the Q1 (83% in 2014) and in the top 10% segment (44% in 2014). Also, the citation analysis has shown an impressive result, demonstrating that the PIs are internationally leading scientists. Linking ERIBA to the programme has been an excellent strategic decision. As a result, the research output should reach such high standards that it will be predominantly published in the top 10% segment of journals.

The research theme fully embraces the overarching concepts of Healthy Ageing and personalised medicine. The success can be attributed for a large part to the recruitment of a cadre of first class scientists in their respective fields. The establishment of joint laboratories with preclinical and clinical scientists can be seen as a role model for translational research.

One good reason for this success is strong senior leadership. The weekly research meetings at which collaborative links are forged are exemplary for this drive to connect. The activities of the programme have been greatly enhanced by the technological and analytical platforms and informatics expertise that researchers have been able to acquire themselves or share with others across the faculty. The increasing independence from direct funding (which is now only 36% of the budget) is an excellent indicator of vitality. The award of eight highly competitive fellowships, a number of large government grants as well as receipt of a range of awards, including five EU grants, indicates that SALL participants are at the cutting edge of their disciplines. Furthermore, senior and newly recruited PIs hold leading roles in national and international networks, with high visibility for SALL. Efforts should be made to maintain this high quality of funding and to strive for leadership positions in national and international academic networks.

### Relevance to society:

Based on the excellent research and the international reputation of the PIs, many have been involved in the development of clinical guidelines and also in the WHO classification of hematopoietic malignancies. Many PIs have been authors/co-authors of book chapters and textbooks aimed to translate scientific findings into improved patient care.

Considerable numbers of lectures were given for the general public through newspapers and other media. Websites have been launched by ERIBA to inform a lay audience about ageing and by the Department of Haematology to inform patients, the general public and clinicians about latest clinical guidelines and protocols.

### Viability:

The programme leadership certainly has initiated a highly successful research programme attracting young investigators. SALL holds an excellent position within the central theme of UMCG (Healthy Ageing) and has already established research projects related to ageing and the development of haematological malignancies. Partnering with ERIBA has been an excellent strategic move to provide access to the latest developments in technology and bioinformatics. However, since this research field has emerged as one of the hottest areas in biomedical research, ERIBA and UMCG should continue to recruit world-class young researchers and to create positions for clinician scientists to allow them sufficient time for translational research.

The excellent track record of the PIs and their active participation in the European road map consortium in haematological research (EHA) and in national and international consortia is a very good basis to ensure sufficient financial support in the future.

## 5.5 Targeted Gynaecologic Oncology (TARGON)

Programme leaders: Prof. dr. H.W. Nijman and Prof. dr. S. de Jong

### Staff (2014):

- 3.4 FTE tenured staff
- 0.9 FTE postdocs
- 15 PhD students

### Mission/Objectives:

The mission is to promote, integrate and optimise excellent basic, translational and clinical research that has an impact on overall survival and quality of life in patients with premalignant and malignant gynaecologic neoplasia.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

The TARGON programme started officially in June 2013. The rationale and premises to justify and support the development of the programme are: the geographical location of the UMCG as a referral centre for the North East of the Netherlands, the existing and intensified multidisciplinary approach to the treatment of gynaecological cancers, the existence of a database with clinical, genetic and pathological data of the patients treated at UMCG and the establishment in 2012 of a programme of patient-derived xenografts (PDX models) of ovarian cancer. Four lines of research have been identified: (1) Hereditary cancers, BRCA1 and BRCA2 mutation carriers; 2) Cervical cancer, prevention and early diagnosis; 3) Multimodality treatments in histological subtypes (clear cell) of ovarian cancer; 4) Imaging-guided treatment: immunotherapy for ovarian cancer and detection of lymph node metastases in vulvar cancer.

The most innovative and original research can be found in lines 2, 3 and 4. Due to the development of methylation markers for the early diagnosis of cervical cancer and the development up to clinical stage of a new therapeutic vaccine for the treatment of HPV induced cancers, line 2 spun out the company Vicinivax. Line 3 is still at a preclinical stage with the PDX models and the EurOPDX consortium, and line 4 has a leading role in international studies on sentinel nodes in vulvar cancer. The research lines are consistent with the theme of Healthy Ageing because this research augments translational approaches to improve the daily lives of women with gynaecological cancer.

To strengthen the research component of the programme, the number of basic researchers has been increased; three basic research PIs have been appointed as professors.

The PIs predominantly come from the clinical departments of Gynaecology & Obstetrics, Medical Oncology, Surgery, Radiology, but other departments are also represented: Pathology & Medical Biology, Medical Microbiology, Clinical Pharmacy & Pharmacology, and Genetics. The

number of PIs and PhD students has increased over the 3-year period, but there is only one postdoc. The research group is rather small and therefore vulnerable.

Under a dedicated management and leadership team TARGON has promoted internal and external collaboration with academic and with industrial partners.

#### Research quality

In 2014, 80% of publications are in the Q1 segment, 32% of the articles published in 2014 are in the top 10% journals and grants have been awarded to senior PIs. Many senior PIs are also members of scientific committees and/or editorial boards. No international research grants have been obtained. The number of PhD theses in 2012, 2013 and 2014 were 5, 1 and 1, respectively.

The number of grants from national funding agencies again is very good, but needs to be increased and more attention should be paid to acquiring international research grants.

#### Relevance to society

Besides the usual activities, such as participation in the development teams for clinical guidelines, the acquisition of patents and the foundation of a start-up company (ViciniVax) was relevant to society. In addition, PIs from TARGON were among the founders of the Dutch National Hereditary Breast and Ovarian Cancer Consortium and EurOPDX consortium. Finally, members of the research group have created websites for clinicians and patients on standard care for gynaecological tumours. This will have a high impact on society that could be quantified by measuring the success of websites providing information on the various TARGON topics.

#### Viability

This is a relatively small group that is well organised and positioned for growth. The citation analysis indicates a very good global research impact. The PRC acknowledges the value of having basic scientists directly alongside clinical researchers in delivering a comprehensive and integrated approach to research, but also the difficulty of recruiting such individuals. The appointment of a bioinformatics expert should greatly enhance the capability of the group in utilising 'big data' coming from their patient database.

Important strengths include the geographical location with patient referral, the availability of a patient database, the possibility of transferring patient-derived tumour specimens directly to the lab and the collaboration with GUTS for imaging-based trials. Important weaknesses and threats include the limited size and limited synergism with other programmes and the existence of strong competitors. The integration in the future Comprehensive Cancer Centre is important for viability and the improvement of clinical activities in clinical studies (Clinical Trial Centre).

In particular, funding from international agencies, including EC grants, should be obtained. Furthermore, the integration into international networks should be increased. This would raise the international visibility.

## 6. Groningen University Institute for Drug Exploration (GUIDE)

### 6.1 GUIDE Institute

Director: Prof. dr. D. de Zeeuw

Deputy Director GUIDE and Scientific Director GRIP: Prof. dr. W.J. Quax

#### Staff (2014)

- 58.9 FTE tenured staff
- 38.1 FTE postdocs
- 458 PhD students

#### Mission/Objectives

GUIDE strives to fill the unmet need for the cure and prevention of disease by optimising drug and other treatment for individual patients. To achieve this mission GUIDE is committed to excel in creating an interdisciplinary research and education environment.

GUIDE performs and stimulates translational, innovative and drug-oriented research on a selected number of chronic and other diseases in an interdisciplinary setting. New insights into the pathophysiology of these diseases can lead to the development of new drugs and/or treatment options, or optimisation of existing therapies (from bench to bed). Alternatively, patient-oriented research is structured in such a way that this could lead to new pharmacological concepts (from bed to bench).

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

GUIDE has made great strides in integrating research at the UMCG and GRIP, a process that has taken place in few other universities throughout the world. This is especially important now with the demise of clinical pharmacology as an independent entity in many medical schools and the supposition of many national funding bodies (e.g. MRC in the UK) that drug development is primarily the domain of the pharmaceutical industry. The GUIDE leadership has shown vision and, within the limits of its mandate, actively extended the success of the institute over the period under review (2009-2015).

#### Research quality

Since the scientific areas covered by GUIDE are interdisciplinary in nature, the focus on collaborative research between UMCG and GRIP is entirely appropriate as a way forward.

The total research staff and the quantity of publications are increasing steadily. The quality of the research output is demonstrated by high citation scores in the subfields relative to world averages. Funding is holding steady despite the downturn in funding sources, such as from the pharmaceutical industry, and pressure on direct funding. The number of personal grants indicates

that GUIDE is successful in acquiring individual-oriented funding and in attracting talented researchers. The Spinoza and Saal van Zwanenberg awards received by GUIDE participants also demonstrate broad recognition of scientific quality.

Within GUIDE, there is scope for increased interaction with biotechnology companies and for increased spin-out of such companies. In addition, the PRC recognised that there is clearly a need to increase EU funding even further. For this purpose, a formal analysis is needed to identify which of the GUIDE programmes, sub-programmes or combinations of programmes are best positioned to be successful in this respect. This will also help to focus on those aspects of infrastructure within Groningen that are world leading and, therefore, deserving more internal support, and those that can best take advantage of external collaboration. Areas of research that might need more development and encouragement in GUIDE include immunology, biologics, gene therapy and systems biology/quantitative systems pharmacology (as a modelling basis for integrating knowledge of disease mechanisms and target identification). Perhaps more consideration should also be given in GUIDE to an area of urgent medical need: the development of new anti-infectious agents to combat resistance. The UMCG/RUG theme Healthy Ageing is clearly well addressed within GUIDE, but the area of translational research with respect to ‘personalised medicine’ needs more emphasis, especially from the clinical viewpoint.

The infrastructure available within the GUIDE units appears to be well-established to meet its goals. In this context, it is equally important that the awareness of the availability of facilities, expertise, equipment and biobank data outside the specific units is enhanced.

The organisational complexity is such that an independent reviewer needs considerable time to try and understand the roles of GUIDE in relation to the UMCG departments, GRIP and the GRIP programmes. Inevitably, interactions with other faculties and interdisciplinary interactions within GUIDE itself lead to organisational complexities that are difficult to navigate and can frustrate outstanding scientists. The leadership of GUIDE needs to manage this in such a way that organisational issues do not obstruct scientific interaction between PhD students, postdocs and PIs.

Clearly some programmes benefit more from the interdisciplinary environment than others. GUIDE would be more effective if the investigators had at least some control over/input into budgets, investments and staff appointments. An alternative consideration could be the formation of a new interfaculty organisation that would encompass GUIDE and GRIP (see above, Section 3)

#### Relevance to society

The societal relevance of GUIDE’s efforts towards the development of more effective and safer drugs and the provision of their optimal dosing in individual patients is obvious and fits seamlessly into the Healthy Ageing theme of the UMCG/RUG. Emphasis on precision medicine and Healthy Ageing also aligns well with the societal challenges defined in the Horizon 2020 programme and the national LSH Top Sector agenda. The introduction of the *Healthy Ageing Campus Nederland* may further stimulate interactions between companies and RUG/UMCG, thereby facilitating the creation of spin-offs. GUIDE PIs are active in national bodies, such as MEB and FIGON. These are laudable activities that may be further expanded, ideally with more

emphasis on patient involvement. The effectiveness of GUIDE is enhanced by the close relationship between clinical practice and science embedded in its organisation. Specifically with respect to patient outreach and education, the PharmD/PhDs, as providers of evidence-based medical information, are particularly well positioned and qualified to demonstrate how science informs practice and, just as important, how practice can inform science.

A quantitative assessment of output in terms of patents and spin-outs was restricted to the individual programmes. However, there is a general need for validation of societal relevance. Both reach and significance need to be assessed by methods that collect independent external opinions.

### Viability

The prospects for GUIDE are very good and depend on strong leadership with a forward looking vision and power to operate. In addition, the intellectual intertwining of GRIP and UMCG research under the GUIDE umbrella, as well as its physical juxtaposition in the same building complex, should be continued and none of the parties should divert from the successful formula that GUIDE is and can continue to be in the future. However, too many organisational layers may leave too little room to manoeuvre for the GUIDE management.

Further opportunities for growth are plenty, and should be selected carefully in alignment with the capabilities and resources of UMCG and GRIP in order to retain the benefits of this unique collaborative arrangement.

In a number of GUIDE programmes the lack of basic immunology expertise was mentioned as a weakness that needs to be addressed. The PRC was unanimous in this view and recommended that immunology expertise be strengthened and provided with basic core facilities to support this important discipline and to provide a nucleus for collaboration with multiple programmes. Although adversely affected by the regrettable lack of national focus on drug research, exemplified by the disappearance of funding sources such as TI Pharma, the viability of GUIDE should be safeguarded given the wider recognition by the medical world and society in general of the need for safer and more effective medicines and for their optimal dosing in individual patients. In this respect, a greater investment in ‘quantitative systems pharmacology’ and modelling approaches in general may help to identify targets and stratify patients where intervention and modulation are not subject to significant detrimental feedback effects from other elements, and to provide a rational basis for the selection and design of experimental studies.

Success will depend largely on the acceptance by the wider medical research community of the need to link understanding of pathophysiology to drug development much more closely. This is a lesson that the pharmaceutical industry has had to learn with respect to having a better appreciation of the fundamental mechanisms of diseases as a basis for the design, selection and evaluation of new compounds.

## 6.2 Biopharmaceuticals: Design, Discovery and Delivery (BDDD)

Programme leaders: Prof. dr. H.W. Frijlink and Prof. dr. G.J. Poelarends

### Staff (2014)

- 3.8 FTE tenured staff
- 9.4 FTE postdocs
- 47 PhD students

### Mission/Objectives

The BDDD programme strives to bring together researchers who focus their activities on enabling technologies applied in pharmaceutical R&D and aims to generate societal and economic value through the innovative drug concepts that are studied. The overall objective is to design, investigate and develop new and improved drugs and therapeutic interventions and to investigate and develop new and innovative technologies for drug development.

### Scores

Research quality	1
Relevance to society	1
Viability	2

### Brief description

GUIDE-BDDD brings together researchers whose activities focus on enabling technologies in pharmaceutical R&D with a special emphasis on biopharmaceuticals (e.g. production, stability, administration and safety-related issues), from early phase drug design/development up to use in practice. The programme focuses on bringing enabling technologies to disease-related research projects within the full scope of GUIDE, thereby fulfilling a central position in drug-related research and acting as a bridge between the FMNS and the applied and basic research performed at the UMCG.

A promising development is the strengthened research on PK/PD, which also brings the clinical pharmacy perspective as a powerful binding/consistency factor to the table. The interaction with the MCB programme was further intensified, but a merger, as recommended by the previous PRC, did not take place. The BDDD programme strives not only to increase coherence within the programme, but also to remain flexible and capable of partnering with various therapy-oriented research groups. Under a dedicated management and leadership, strategies have been developed to increase the scientific strength, to increase external funding, to strengthen interactions with clinician-scientists from UMCG and with the MCB programme, to attract young talented researchers, and to increase the coherence of the programme by starting new integrative research projects, e.g. on fibrosis and antibiotics.

Overall, GUIDE-BDDD has done extremely well. The PIs not only have a strong publication record and have obtained substantial national and international funding, including three ERC starting grants, but they also have excellent networks, including their participation in consortia. There is extensive collaboration with and funding from industry.

### Research quality

This programme reflects the classic scenario of the ‘middle man’ between two parties (UMCG and FMNS), and the programme performs extremely well in this respect. The strong links to the more fundamental researchers of FMNS have certainly paid off. Moreover, the number of joint scientific projects with UMCG researchers has increased tremendously over the reporting period. The capability of attracting funding has remained very high, despite the termination of the TI Pharma projects around 2014. Also, the output of papers and patents has increased over the reporting period and the Q-ranking of the papers is very high. Additionally, the programme produced a high number of PhD theses (4 in 2009 to 12 in 2014). The excellent leadership over the years has paid off. The core of GUIDE-BDDD is grounded in FMNS, and this has been one of the keys to its success. For the future, the level of commitment and alignment between UMCG and FMNS has to be sustained.

The visibility of the research has been demonstrated by several scientific and scholarship awards, the membership of PIs on journal editorial boards, and membership on important national and international scientific and clinical committees and advisory boards. The integration into national and international networks has again been excellent, including collaboration with top institutions (Oxford, Harvard and MIT). Furthermore, there is extensive collaboration with industry that is essential in this field. The programme is outstanding in the fields of enzyme-mediated synthesis and pulmonary drug delivery. Transfer of eight patents to industry demonstrates the relevance of the IP that was generated. Some technologies, like *ex vivo* human tissue preparation (liver and intestinal slices), allow new approaches to drug metabolism and toxicity studies.

Bibliometric data show an expected dominance of the prime domain ‘pharmacology & pharmacy’ in terms of number of publications; adjacent ‘chemistry’ domain contributions are smaller, but of excellent quality, contributing overall to an excellent performance of the programme. Publication and citation performance indicators, both quantitative and qualitative, are excellent (average MNCS 1.97); MNCS is growing over the years, i.e. 2009-2012 = 1.81 and 2010-2013 = 2.03. In 2014, on average 30% of the papers were published in the top 10 % segment. All in all, this demonstrates that the PIs are world-leading scientists.

### Relevance to society

The relevance of the research topics covered by GUIDE-BDDD is high due to an ageing society focus in terms of disease areas (cancer, COPD, fibrosis, Parkinsonism and influenza), which demonstrates that the Healthy Ageing theme is deeply embedded. Staff members are actively involved in societal debates and communication to the general public. Collaboration with industry is significant and has resulted in tangible and clinically relevant products for patients, which is unique, in terms of both type and magnitude. Royalty income was €8 million during the period under review, and in 2015 alone was €4.5 million. This is quite unusual in the Netherlands, and it amounts to 90% of royalty income at RUG. Public awards have been granted to members of staff for their societal contributions. The development of new methodologies, such as *ex vivo* human tissue preparations for research on drug metabolism and toxicity testing, has been acknowledged as a landmark achievement in the context of reducing animal research.

The solid visibility of established PIs (animal testing, respiratory formulations, public-private collaboration, IP generation) is acknowledged and highly appreciated; moreover a new

generation of PIs within the programme is characterised by its keen societal interest and commitment.

### Viability

The excellent track record of the PIs is a very good basis to ensure sufficient financial support for the future. Quality of the technology platforms is high and should be used to continue collaborations with industry. The programme is well placed for collaboration with a wide variety of medical research groups. The fibrosis and antibiotics projects are attempts to operate integral projects, but need future proof of sustainability. The collaboration with other groups in the UMCG with experience in these areas is of crucial relevance to bring these projects forward.

The number of tenured staff in 2014 is 3.8 FTE, which is rather low given the ambitions, and asks for further reflections on sustainability and feasibility of the programme for the future. On top of that, the numbers of 16 PIs, 4 research groups and 47 PhD students give some concerns about governance and the breadth of student direction and supervision by tenured staff. For the future, important decisions have to be made on transition of leadership and capacity building. Furthermore, the sustainability of funding after the decline of royalty incomes should be ensured.

### 6.3 Centre for Liver, Digestive and Metabolic Diseases (CLDM)

Programme leaders: Prof. dr. H.J. Verkade and Prof. dr. S.C.D. van IJzendoorn

#### Staff (2014)

- 5.4 FTE tenured staff
- 0.9 FTE postdocs
- 49 PhD students

#### Mission/Objectives

The mission of the programme is to define the molecular basis of inborn, acquired and age-related diseases that are caused by perturbations in metabolism and/or the flow of metabolites, which often involve the liver and intestine, and to define leads for new treatment strategies. The CLDM aims to develop tools for the better prediction of the onset of metabolism-related chronic diseases and the earlier detection thereof, and to better prevent or more efficiently treat disease later on.

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

The programme was reorganised three years ago, and a new generation of young PIs has been recruited. Compared to the previous programme, CLDM is much more focused, with a single research line on transport and metabolism mainly in the liver and intestine. The mission is to define the molecular basis and treatment modalities of diseases that are caused by disturbances in metabolism and/or metabolite flow, impacting all age groups from the unborn child to the elderly. Research is organised along the following five themes: metabolic programming, cardiovascular diseases, liver and intestinal diseases, diabetes and systems biology. A systems medicine approach is taken, integrating human genetics, human cohorts, biobanking, mouse and cellular models, systems biology and computational modelling. Emphasis is on identifying novel drug targets, developing new treatments, and improving the disposition and efficacy of drugs and nutrients. CLDM aims to better predict and detect the onset of metabolism-related chronic diseases and to improve prevention and effective treatment of the disease, thereby ultimately prolonging a healthy individual life span.

#### Research quality

CLDM combines a number of excellent research groups with good academic reputations in complementary fields and has contributed to the realisation of important research facilities, including microscopy and systems biology. PIs of the programme are well represented in scientific organisations, committees, editorial boards and important research networks. CLDM is internationally recognised in the field, particularly for fundamental studies, as evidenced by a number of high-impact papers in recent years. Involving more clinicians could strengthen translation of this cutting-edge research from bench to bedside. Traditionally, a strong focus of the programme has been on paediatrics, but with broadening of the perspective to life course

research, more involvement of PIs working in adult metabolic medicine would be beneficial. Competitiveness for external funding is good and publication output has increased over the years, as have the bibliometric indicators of quality. Two prestigious personal grants (Vidi) at the national level have been obtained by young PIs, and substantial income from charities and industry PPP's was secured. Of the focused research themes, systems biology is in a somewhat special position as it is more dedicated to methodology development, which is a great asset to UMCG, but could be more integrated with the disease-oriented areas within CLDM to make a step change in the field.

#### Relevance to society

Despite a primary focus on fundamental research, PIs of CLDM have reached out prominently in the past period by extending their research to industry, public and societal groups. Obviously, the topic is highly relevant to society and spot-on for the overarching UMCG/RUG Healthy Ageing theme. The programme also recognises that the growing need for funding has to be drawn from societal opportunities. There has been ample attention for scientific achievements in the media and the number of patents shows that the scope of the programme has good potential for valorisation. Societal publications are first and foremost papers in high-impact journals with important long-term implications for public health. Considering the timeliness and importance of metabolic research in Healthy Ageing, there is great potential for more involvement and interaction with policy makers, patient groups and organisations.

#### Viability

CLDM has a strong leadership, with a clear vision and sound scientific and societal strategy. The programme should be poised to take advantage of the translational opportunities that arise. However, its relatively small size renders it sensitive to the performance of a few key people. The priority should be on expanding the critical mass of this productive team and making real efforts to involve clinicians. Targeting EU funding is important, also at the level of personal grants, and a stronger input of clinical researchers should be sought. New research opportunities can be explored, perhaps by expanding the interaction and engagement with the LifeLines and LifeLines-Next cohorts. The recommendation of the previous assessment committee to foster promising young researchers was followed, resulting in the recruitment of excellent new PIs from renowned institutes, boding well for the sustainability of the programme. It is important that these young PIs receive all required support to maintain technical knowledge in the lab and to develop their own lines of research.

## 6.4 Critical care, Anaesthesiology, Perioperative and Emergency medicine (CAPE)

Programme leaders: Prof. dr. A.M.G.A. de Smet and Prof. dr. M.M.R.F. Struys

### Staff (2014)

- 3.1 FTE tenured staff
- 0 FTE postdocs
- 19 PhD students

### Mission/Objectives

The purpose of CAPE research is to reduce mortality and especially morbidity among high-risk patients undergoing emergency care, major surgery and critical care. The major goals are (1) broadening knowledge of the pathophysiological changes occurring in emergency, perioperative and critical care patients, (2) identifying the most accurate methods for observing, predicting and controlling these alterations, (3) understanding the pathophysiological consequences of different interventions and (4) finding and/or optimizing druggable targets.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

In directing its research towards the restoration and maintenance of vital homeostatic functions in vulnerable patients after emergency and critical surgery and perioperative procedures, this new programme challenges a perception that anaesthesia and critical care medicine is now so advanced that further research in the area is not a major health priority. It focuses on understanding mechanisms of long-term sequelae (immunological, metabolic and inflammatory), with an emphasis on the mechanics and outcome of target and closed-loop administration of intravenous anaesthetics, automated glucose control and the identification of druggable targets. The aims of the research programme are entirely consistent with those of GUIDE overall, also in terms of the relation to Healthy Ageing, in tandem with a concentration on drug effects and drug development.

### Research quality

Based on information mostly related to the period before the start of CAPE, the research output is good with respect to publications and citation analysis, and there is no doubt that members of the group are at the forefront of target controlled and closed-loop administration of intravenous hypnotics and analgesics. The latter status is founded on sound application of the principles of advanced pharmacokinetic-pharmacodynamic modelling and control engineering, combined with the use and development of state-of-the-art technology to monitor organ function in patients. Of note, a patent on ‘System and Method for Adaptive Drug Delivery’ was filed in 2005. Key collaborations in the areas of controlled anaesthesia are well established, including those with both internal (RUG) and international academic units and with the pharmaceutical and medical devices industries, although such interaction to identify druggable targets seems to be at an early stage. Contribution to understanding concern about long-term cerebral and neuronal toxicity due

to anaesthesia is demonstrated by the group's significant involvement in influential multi-centre studies. The group receives a considerable proportion of its funding through grants and contracts, but the direct funding in terms of FTEs is 84%. This is quite high and action should be taken to bring this percentage down. The number of PhD theses is low (one in 2012 and two in 2014), presumably reflecting the relatively recent implementation of the programme. The visibility of the research is evident from several awards, memberships of PIs on editorial boards of key journals in the field and on national and international working groups and advisory boards. Without information on specific research objectives for the future, a general recommendation is that careful thought be given to determining the benefit-to-risk ratio of intravenous anaesthesia relative to inhalation/regional anaesthesia.

#### Relevance to society

Because the research is focused on 'early to late bedside', its societal value is clearly linked to a very direct transfer of scientific knowledge to routine patient care. This is particularly evident through the creation of systems and devices, in association with industry, for the optimal administration of anaesthetics and related drugs. Given the constraints of providing both high-level clinical service and research, the PIs have contributed significant time to demonstrate the societal value of their research. Thus, there is evidence of important contributions to major textbooks with broad medical impact, non-specialty and lay publications, and lectures to young people. In prioritising medical research in general, the CAPE field might not be considered to be at the top of the list. For this reason, it is recommended that further thought be given to creative ways of demonstrating the life-saving importance of acute medical care.

#### Viability

Although it has been in existence for only a relatively short time, CAPE has made a promising start on an ambitious research programme that has yet to achieve its highest level. It appears to be a young, vibrant group of mainly clinician researchers, who have clearly recognised the need for the dual MD PhD label and for productive interaction with non-clinical scientists. The PIs include world leaders in the field of closed loop anaesthesia who see further application of the concept with regard to the administration of many other drugs outside of anaesthesia. There is clear scope for extending the application in, for example, paediatrics. Much will depend on the enthusiasm of the leadership in building coherence and stability and their ability to sustain the already respectable financial base of the group, ideally with a clear strategic plan and with more outreach to EU funding. While identifying strengths and opportunities in their SWOT analysis, the group also recognises the hurdles and analyses them in detail. Their efforts should be encouraged, particularly since clinical research and the recruitment of clinical scientists is not easy, and with a view to establishing CAPE as a centre of excellence in the Netherlands. The group expresses a clear enthusiasm for GUIDE as a productive framework for research collaboration. They are also very keen to establish greater collaboration with GRIP, where they indicate that they have found a source of stimulating discussion.

## 6.5 Groningen Institute for Gastrointestinal Genetics and Immunology (3GI)

Programme leaders: Prof. dr. C. Wijmenga and Prof. dr. Weersma

### Staff (2014)

- 4.2 FTE tenured staff
- 0.9 FTE postdocs
- 28 PhD students

### Mission/Objectives

Our mission is to contribute to personalised and precision medicine for immune-mediated diseases by developing a framework that bridges clinical and population research. The goal is to investigate disease mechanisms in immune-mediated diseases by using predisposing genes and genetic variations as disease initiating factors.

### Scores

Research quality	1
Relevance to society	1
Viability	1

### Brief description:

The departments of genetics and gastroenterology are the main contributors to 3GI, with additional contributions from epidemiology, rheumatology, cell biology and medical microbiology. The programme of 3GI is focused on understanding immune-mediated diseases through detailed genetic analysis, combined with disease phenotypes. The group focuses its research on the combined effects of genetic risk variants and environmental influences on the gut microbiome with respect to the progression and treatment of major immune-mediated inflammatory and infectious gastrointestinal diseases (coeliac disease, IBD, candidemia, Crohn's disease and ulcerative colitis). In doing so it develops, evaluates and employs an array of 'omics' and advanced biomarker technologies to follow the diseases in prospective patient cohorts, with the aim of identifying new targets for drug and pre/pro and anti-biotic intervention. These aims of the research programme are entirely consistent with those of GUIDE overall in contributing to Healthy Ageing.

### Research quality

Under very strong and visionary leadership, this interdisciplinary group, combining genetic and gastrointestinal expertise, has built an impressive infrastructure for biobanking and the acquisition/analysis of big data to help unravel genetic causes of the diseases they investigate. The leadership has a strong track record and an excellent strategic plan for growth and expansion. The output of scientific papers is of outstanding quality as indicated by the citation analysis of the refereed papers. The level of external funding is very high. The group is also clearly aware of the need to acquire parallel functional information in order to establish a detailed understanding of disease mechanisms. This should point the way to better treatment through drug development and nutritional control. This vision has led to a significant number of influential cohort studies in collaboration with many international partners, a commendable level of national and EU funding, and sustained publication in high-impact journals with a high citation rate.

Modulation of the gut microbiome by new and old drugs and nutritional supplements appears to be a particularly fruitful area for the development of better methods of treatment, and there is evidence that the group may, for example, be having some success with respect to novel therapy for IBD. The research is progressing to combine genetics and microbiome data for individual patients to achieve real personalised medicine. Microbiome expertise is increasingly shared with other groups within the UMCG. The results of this programme are starting to have impact on other immune related disease areas. However, strengthening immunology expertise (mucosal and otherwise) is strongly recommended. Furthermore, the focus is on genetics and the microbiome, while proteomics and metabolomics are used more incidentally and not necessarily within GUIDE.

The group appears to have established an excellent environment for its PhD students, providing a productive bridge between basic and clinical research and with careful monitoring of progress. The memberships in scientific organisations and scientific committees are numerous, as are the other marks of recognition. As stated previously, the programme has demonstrated extremely high scientific quality; further strengthening the link between these scientific outcomes and new drug discovery programmes should be fostered.

#### Relevance to society

The prevalence, associated disability and economic cost of the diseases that the group addresses are clearly of great relevance to public health, and advances in genetics/genomics continue to be at the forefront of societal interest in science. This programme covers human genetics and the gut microbiome, one of the most important medical fields with specific connection with Healthy Ageing. Its translational potential is also very high. The group appears to have been highly successful in exploiting both of these aspects in developing an excellent profile with respect to societal interaction. The outreach of the 3GI members to the general public has been very significant. The group is a major driver of the LifeLines cohort study, one of the largest in the country, involving over 165,000 participants and the PSI data bank. Patient input from Dutch patient organisations is also used. Clearly, the genomics research has been widely publicised nationally, and there has been a high level of activity in reaching out to patient groups and the lay public, including school children. The marks of recognition are considerable and although 3GI may not yet be very well known as a brand, the research and PIs certainly are. From this perspective, the visibility of the 3GI brand could be strengthened.

#### Viability

The track record and high national/international profile of the group will clearly help to sustain the group's viability. Strong scientists have come together in a joint programme and found a home within GUIDE. 3GI is well positioned to collaborate with industry or participate in large public-private partnerships. Expansion of the group with additional expertise in mucosal immunology and bioinformatics is desirable. However, the pending regulations on the use of biobank materials may be a real threat, as the 3GI research is heavily dependent on the availability of these materials.

In moving forward, they have specifically identified the need for larger facilities, staffing and resources to define function and phenotypes, alongside genetic and metagenomic findings, and

the need for careful evaluation of biomarkers and risk score models. Considering the performance of the group these requests should be taken seriously by the UMCG leadership. Also important for the future is continuing recognition of the statistical challenges of making sense of big data, and the potential added value of investment in systems biology and quantitative systems pharmacology to integrate information and to identify druggable targets. Enhancing human microbiome research, especially into the direction of therapeutics (reengineering the human microbiome) will further improve the programme.

## 6.6 Groningen Institute for Organ Transplantation (GIOT)

Programme leaders: Prof. dr. H.G.D. Leuvenink, Prof. dr. S.J.L. Bakker and Prof. dr. R.J. Porte

### Staff (2014)

- 2 FTE tenured staff
- 0 FTE postdocs
- 27 PhD students

### Mission/Objectives

The mission is to improve outcome after solid organ transplantation by providing a comprehensive programme of translational and clinical research with the main focus on improving the availability of suitable donor organs and improving long-term survival and quality of life after transplantation.

### Scores

Research quality	2
Relevance to society	1
Viability	3

### Brief description

During the period under review the team went through a reorganisation, including changes in leadership. Its aims are consistent with those of GUIDE/UMCG overall: contributing to the UMCG/RUG Healthy Ageing initiative. Thus, the group addresses the impact of ageing on both patient and graft since they are differentially affected. It is relevant in this context that older patients are increasingly accepted for transplantation and there is greater use of older donor organs. In designing clinical studies, the group seeks to refine strategies for management of the individual patient with regard to the use of immunosuppressive drugs, nutrition and lifestyle.

GIOT has played a leading role in the development and evaluation of organ preservation and resuscitation, most notably through the design and implementation of organ preservation machines for clinical use. In building on this reputation, the current research aims in the area of graft viability are to define and improve experimental and clinical evidence for the pre-treatment of donors and organs and to obtain a more mechanistic understanding of the beneficial effects of ex-vivo perfusion of donor organs. However, details on how these aims are being and will be achieved are sparse. With regard to the research related to the long-term outcome of transplantation, there is significant attention paid to the genetic aspects and biobanking – through collaboration with an international consortium (GeneTRAIN) – to the reconditioning of organs and to influencing lifestyle and diet by initiating long-term follow-up programmes.

### Research quality

Given the relatively small size of the group and its clinical responsibilities, the citation scores for indicators of current research success are impressive. The citation analysis shows a MNCS of 1.70. The sizeable number of PhD students is also impressive: they presumably comprise a mix of clinical and non-clinical candidates.

### Relevance to society

The topic ‘improvement of organ transplantation outcome’ is obviously relevant for society. The number of patients needing a new organ is growing at a higher pace than the number of donors. The GIOT team is addressing a key question: where can progress be made, both in number of organs available and the performance of these organs in the patients? The group has close relationships with the Dutch Kidney Foundation and is the only group in the Netherlands certified to transplant kidneys, hearts, lungs, livers, small intestines and pancreata. Furthermore, the group has developed and implemented organ preservation machines (a university spin-off company: Organ-Assist) which are now used in clinical practice, and it continues to build improved follow-up prototypes and test them in the clinic.

Organ transplantation has high public visibility and the group has made its mark nationally with respect to exposure in the local and national press, interaction with patient associations and has attracted interest from investors and other funding sources.

### Viability

In the long run, the viability of such a small group doing highly relevant research has to be questioned. More specifically, this is because (1) it is highly dependent on the activities of one or two key people who seem to be responsible for organising and executing the research and (2) it is highly reliant on internal, direct funding (65%) for its research. Additional and stronger support from research foundations like NWO/STW and charities should be secured. Since there is a strong practical component to the research objectives, the existing and new interactions with industry and generation of IP should be fostered.

While the excellent work on organ preservation and survival must be acknowledged, a potential weakness is the lack of strong basic immunological research. Transplant rejection is clearly a major issue and great strides are being made in understanding this problem, resulting in the introduction of new therapeutics and biologics. It may be that GIOT needs to explore merging/linking effectively with other groups that conduct immunology research. This further strengthens the case for drawing together immunological expertise in the UMCG and to use this for expanding research on the immunology of transplantation and organ rejection. For example, there has been much excitement recently about growing human organs in animals, as a strategy to increase availability of such organs for transplantation. Besides immunology expertise, moving into this promising field would require research activity in regenerative medicine and stem cell biology, which is taking place elsewhere at the UMCG/RUG. It is difficult to envisage how novel scientific methodology development, such as stem cell biology and gene editing, can occur in the present structure.

In conclusion, the PRC recommends investigating whether GIOT should strengthen its basic research activities and broaden its research focus. It could create this opportunity and the necessary critical mass by merging with or integrating into another group.

## 6.7 Groningen Kidney Centre (GKC)

Programme leaders: Prof. dr. C.A.J.M. Gaillard, Prof. dr. H. van Goor and Dr. H.J. Lambers Heerspink

### Staff (2014)

- 4.7 FTE tenured staff
- 1.1 FTE postdocs
- 44 PhD students

### Mission/Objectives

The overall mission of the GKC is to promote research leading to improved understanding of the functional renal decline caused by an underlying renal disease or the physiological process of ageing. The overall objective of the research programme is to acquire knowledge of the devastating process of renal disease through interpretation, translation, prevention and intervention, ultimately leading to the coveted improvement of prognosis and well-being of patients with cardiac and/or renal disease.

### Scores

Research quality	1
Relevance to society	2
Viability	2

### Brief description

Mechanisms leading to progressive renal function loss are investigated in renal disease patients and in the experimental setting. The programme is a continuation of the former Groningen Institute of Kidney Disease (GIKD) and the programme has been extended through new collaborations on cardio-renal interactions and transplantation. Research includes (1) mechanistic human, animal and in vitro studies, (2) clinical pharmacological and life-style interventions, and (3) collecting large cohort data sets in the general population. Specific lines focus on albuminuria/proteinuria, deregulations in mineral metabolism, cardiometabolic complications of chronic kidney disease and renal replacement therapy, polycystic kidney disease, gasotransmitters, and personalised/precision medicine. The UMCG departments of Nephrology, Pathology and Medical Biology, and Clinical Pharmacy and Pharmacology are at the heart of GKC. The programme aims to identify novel druggable targets for personalised treatment and develop strategies for prevention and intervention, leading to improved prognosis and well-being of patients.

### Research quality

GKC has an excellent reputation for its cohort studies and major drug intervention trials in nephrology. Based on the recommendations of the previous assessment, the programme has initiated new collaborations and extended its basic and experimental research to cardio-renal interactions, gasotransmitters, genetics of renal ageing, transplant metabolic syndrome, and personalised treatment. This has strengthened the fundamental research profile, but the programme has to keep a careful watch on maintaining a productive balance between breadth and focus. Research on drug development could be strengthened by involving researchers from GRIP.

Bibliometric data show an appreciated dominance of two primary domains – renal and cardiovascular – complemented by relevant adjacent fields. The productivity of GKC is high and the quality of publications is excellent. A relatively large part (50%) of the earning capacity is obtained from direct funding, but the programme has been successful in securing external grants from national agencies, public-private institutions and EU programmes. Young investigators have acquired prestigious Veni and Vidi awards. The research is conducted within an excellent infrastructure provided by the UMCG, and GKC has a strong national and international network. PIs have a good academic reputation; some of them qualify as top scientists in their field.

#### Relevance to society

Renal performance in the context of an ageing population, lifestyle, nutrition and personalised medicine is a topic of high societal relevance. GKC is cognisant of and engaged in activities to demonstrate the societal relevance of its research. The programme PIs contribute to global guidelines on prevention and treatment of kidney disease to optimise patient care and increase its visibility beyond the scientific community. There has been tangible recognition and appreciation from the regulatory and policy communities and civil society on GKC's work on repositioning existing drugs, and better use of available healthcare resources. PIs are active in committees that provide advice on the prevention and treatment of kidney disease, including influential bodies such as the Health Council of the Netherlands. Their exposure in the media has been extensive, there is excellent interaction with companies and a proactive strategy to communicate and disseminate knowledge to the general public. In addition to actively participating in patient organisations, the societal impact of GKC could be strengthened further by involving a patient advisory board more directly in the research strategy of the programme.

#### Viability

With the increasing importance of maintaining renal integrity for Healthy Ageing, GKC has great potential. There is a clear strategy to exploit these opportunities, of which the NeFraiLines Geriatric Nephrology programme, and the focus on life style, nutrition and personalised medicine are promising examples. Tenured staff capacity (4.7 FTE) seems rather low given the ambitions and asks for further reflections on sustainability and feasibility of the programme for the future, also with regard to governance and student mentoring. Recent changes in the GKC leadership have clearly been major events for the programme, but these challenges seem to be adequately addressed. There is much confidence in the new composition of the PI group, although there remains a question about the future leadership in clinical pharmacology.

Moving forward, GKC leadership may want to reflect on how it will maintain focus within the topic areas GKC is working on, increase scientific visibility and recognition, and strengthen fundamental research with input from GRIP. Progressive renal disease is a complex interplay of many different molecular, biological and clinical networks, requiring a multifactorial approach to understand the mechanisms, stratify the patients and develop personalised therapeutic interventions. This is ideally suited for a systems biology approach, and the GKC may wish to consider recruiting expertise and/or exploring more collaboration in this field.

## 6.8 Groningen Research Institute on Asthma and COPD (GRIAC)

Programme leaders: Prof. dr. H.M. Boezen, Prof. dr. G.H. Koppelman, Prof. dr. W. Timens and Prof. dr. R Gosens

### Staff (2014)

- 8.1 FTE tenured staff
- 8.7 FTE postdocs
- 42 PhD students

### Mission/Objectives

The mission of GRIAC is the multidisciplinary translational study of obstructive airway and pulmonary diseases and Healthy Ageing. The ultimate aims are to prevent disease development, minimise disease impact and improving quality of life.

### Scores

Research quality	1
Relevance to society	1
Viability	2

### Brief description

GRIAC operates within the University Medical Centre Groningen (UMCG) and partially within the Groningen Research Institute of Pharmacy (GRIP). The specific aims of the research programme (to prevent disease through identification of risk factors, to optimise diagnosis and therapy, and improve quality of life for people with obstructive airway and pulmonary diseases) are consistent with those of GUIDE overall in improving the progress of Healthy Ageing in tandem with a concentration on new drug discovery and development.

In addressing the mechanisms, progression and remission of asthma and COPD, the research of this programme covers a full spectrum of activity from the laboratory to the clinic. This is done through integrated sub-programmes on epidemiology and genomics, molecular medicine and pharmacology and clinical medicine with ambitious programmes for developing methods and advancing knowledge, using methods for genetic analyses, in vitro and in vivo test systems, longitudinal cohort studies and clinical, patient-oriented studies.

### Research quality

GRIAC is a large, mature, research group that continues to build its infrastructure and output in response to the recommendations of the previous PRC. GRIAC demonstrates the integrative activity between members of GRIP and GRIAC: at least four members of GRIP are PIs in GRIAC. The research undertaken by GRIAC is of very high quality and internationally competitive (potentially in the top 3% of respiratory research worldwide). The reasons for this high quality include: the focus on expression of asthma and COPD in the natural setting across the life course, the establishment of disease cohorts, the infrastructure for deep phenotyping, the strong translational activities, cross fertilisation of specialities within GRIAC, a high-performing and effective pathology laboratory, strong collaboration and networking and investments in disease stratification. The excellent performance of GRIAC on the international stage is due to a

range of factors: high-quality PhD students, strong leadership, large quantity of high-impact publications, interdisciplinary environment, high level of international and national awards and other markers of esteem (2015 Trudeau Medal– the highest award worldwide in lung science as well as a Member of the Royal Netherlands Academy of Arts and Sciences, ERS COPD research award), a strong impact on patient care and disease prevention/progression and input on national and international policy. GRIAC has a rich and diverse publication output of top quality. A proportion of the publications are necessarily in specialised, more practical journals that do not have the highest impact but are still crucial for disseminating translational research. It is important to note that GRIAC is ranked 3rd out of 300 research centres in Europe in the field of airways diseases and number one in the Netherlands (source Expertscape).

There is ample evidence of the group's contribution to drug discovery and development, particularly through identification of targets by the Molecular Medicine sub-programme leading to significant collaboration with Pharma and patent and 'spin-out' (GRIP - Aquilo) activity. At the clinical end, there is continued participation in key international clinical trials and specific clinical studies.

The programme has received considerable external funding, from highly competitive sources as well as contract grants. Over 70% of funding from the Dutch Lung Foundation has been awarded to GRIAC members. Several members of the team have received Veni and Vidi grants and other prestigious awards. Additionally, training and monitoring of PhD and postdoc students appears to have been upgraded significantly since the last assessment, with the introduction of lectures by and for the students, including ones on career development and planning. It is noteworthy that they have specifically set aside time for a retreat to discuss the topic amongst PIs and postdocs. Also, participation of staff on national/international committees and editorial boards is impressive.

Strong input by patients into the discussions on research priorities and individual projects has been achieved by incorporating a Patients' Forum into GRIAC.

#### Relevance to society

GRIAC is one of the flagships of GUIDE and is a real beacon of success due to its outreach activities. Indeed, this is among the most remarkable distinguishing features of this research group.

The effectiveness of the group's ability to move research into practical settings becomes very clear when looking at indices of activity such as: leadership in professional societies, advisory boards, roles in local/national government; active promulgation of their research to healthcare professionals, patients and the public at large; production of educational materials; strong interaction with companies, patent applications and establishing a spin-off company.

In all areas the team shows an impressive creativity and enthusiasm for developing policy and practice.

#### Viability

The performance of the group on all indicators bodes well for its continued success and viability and there can be no doubt that their current activity will continue to produce high quality results.

With a change in leadership there is an opportunity to create a visionary plan for its future development to take full advantage of the technology revolution and the population and patient disease cohorts. The SWOT analysis gives some insight into issues that will need to be addressed in a forward-looking strategy. First of all, the new and ambitious leaders face a challenging task in following in the footsteps of the current leader, a world-class and charismatic scientist, who will retire in April 2016. Other challenges are: acquiring national and EU funding to enable multidisciplinary research (e.g. in consortia); raising the bar by securing more grants to enable talented individuals to become leaders in their own right; framing some challenges in lung disease such as stratifying airways disease along causal pathways and develop therapeutics accordingly with GRIP; using novel technology platforms such as imaging, biosensors, biomarker exploration; taking multi-omics approaches in addition to genomics (systems approaches); developing relationships with the diagnostic devices and imaging industries e.g. to explore remote monitoring the exposome to explore gene/environmental interactions; considering interfacing with other disease areas, where appropriate (e.g. COPD/lung cancer and asthma/other allergic diseases).

## 6.9 Medicinal Chemistry & Bioanalysis (MCB)

Programme leaders: Prof. dr. R.P.H. Bischoff and Prof dr. E.M.J. Verpoorte

### Staff (2014)

- 3.1 FTE tenured staff
- 6.8 FTE postdocs
- 26 PhD students

### Mission/Objectives

The mission is drug development through medicinal and bioanalytical chemistry. The objectives of MCB are to discover and validate disease-relevant biomarkers, accelerate the discovery of novel drugs for unmet medicinal needs, advance in vitro technologies for improved in vivo predictability in cell and tissue studies and to enable tools and strategies for early drug development

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

MCB is a GRIP programme contributing to the GUIDE programmes. The Medicinal Chemistry and Bioanalysis (MCB) programme plays a unique role within GUIDE as it links medicinal chemistry and bioanalysis to biomedicine and clinical practice. It comprises a set of technology platforms associated with small molecule drug research that can be used across multiple therapy domains. It covers biomarker discovery, medicinal chemistry, analytical chemistry, microfluidics and structural biology. In the previous PRC report only the Analytical Biochemistry group was reviewed. Synthesis and Analysis was the previous name of today's Medicinal Chemistry and Bioanalysis programme. Three of the four groups which made up the previous programme (Pharmaceutical Analysis, Biomonitoring and Sensoring, and Medicinal Chemistry) were not included in the earlier review process.

The Medicinal Chemistry and Bioanalysis (MCB) programme consists of eight PIs in three GRIP basic units (Analytical Biochemistry, Pharmaceutical Analysis, Drug Design) and three Principal Investigators from adjacent GRIP units whose primary GUIDE affiliations are Pharmaceutical Gene Modulation; Pharmacokinetics, Toxicology and Targeting, and Pharmaceutical Biology (i.e. BDDD). It is based on the previous Synthesis & Analysis programme, and has since undergone significant changes with the deletion of some areas and addition of new areas and new PIs. The programme has grown substantially to a total 21 research staff and 26 PhD students, grouped around 5-6 senior PIs.

The MCB research lines fall generally into the category of early drug development, and as such rely on researchers who have strong backgrounds in synthetic and bioanalytical chemistry, as well as a unique pharmaceutical perspective. Internal collaborations within the MCB programme

and with PIs in other GUIDE programmes are commonplace, in keeping with the nature of modern drug research.

### Research quality

The report illustrates the versatility of the individual platforms to contribute, in collaboration with UMCG / ERIBA scientists, to a variety of high quality programmes. The increase in medicinal chemistry resources is a welcome contribution to the broader area of drug discovery. Each of the technology platforms has had a healthy development of implementing state-of-the-art new developments. The platforms are capable of attracting external funding; combined, the MCB has seen a healthy increase of funding. The coherence between the three technology platforms is not impressive, but all have made major strides forward in the past six years. Closer interactions with, in particular, BDDD and clinical institutes in the UMCG, may facilitate further success in the future. MCB is well recognised by peers, as is demonstrated by substantial grants to its members, a large number of scientific committees in which MCB members participate and various collaborations. Overall, MCB conducts very good, internationally recognised research; e.g. the group claims to have a PD1 PD1L interacting small molecule. The research output in terms of number of publications and PhD theses is moderate, but this may be explained by the growth of the programme from 10 research staff in 2009 to 21 in 2014 and PhD students from 15 to 26. The quality of the publications is very good, with 29% in the top-10% group. The non-direct funding level is impressive (80%) in 2014.

A key strategy of MCB is the development and use of cutting-edge technology in areas with unmet medical needs. Alzheimer's is mentioned as an example, fitting well in the UMCG/RUG Healthy Ageing theme. There are good strategic international collaborations. Programme leaders stress the importance of being together and working together and caution for major organisational changes (see text under 'viability')

### Relevance to society

Demonstration of societal relevance is more challenging for technology platforms than it is for programmes that are focused on a specific therapeutic area. The societal activities listed are primarily research based, although three outreach activities and three publications for the general public are listed. More emphasis could be given to these activities in the future.

In addition, extensive contract research projects, spin off generation and patents show the relevance of MCB's research for the industry and its economic impact. Expectations were expressed to have compounds going into phase 1 studies in 2 years from now. That would enhance relevance to society significantly and the PRC encourages activities in this direction.

### Viability

The MCB leadership has actively re-oriented the research programme and acquired funding to significantly expand all MCB sub-programmes. The citation analysis is indicative of a competitive research programme and the increased number of PhD students now pursuing their degrees in various labs within the programme ensures further increases in research output in terms of quantity and, more importantly, quality. The MCB programme continues to be reasonably well positioned with respect to funding, with strong links between industry and MCB researchers giving access to public private partnerships, which form a significant part of the Dutch and European funding landscape. Besides funding, the continued viability of the MCB

programme depends to a large degree on its integration in a biomedical and clinical research environment. GUIDE and its associated institutes provide such an environment. Additionally, the MCB programme, being embedded in GRIP, is ideally positioned to collaborate with FMNS groups in the Stratingh Institute (chemistry), ZIAM (materials science and applied physics), and GBB (biomolecular sciences, biotechnology). This could lead to truly interdisciplinary projects. Viability depends on cutting-edge infrastructure and equipment. This has been assured, for instance, by recent integration of the MCB biomarker programme with the Interfaculty Mass Spectrometry Centre and parts of research groups from the Medical Faculty in the newly established European Research Institute on the Biology of Ageing (ERIBA).

The viability of MCB as a separate entity was questioned in the previous peer review report. Although the development and performance of the individual technology platforms is of high quality, the programme lacks internal coherence and therefore the same questions came up again. Merging with BDDD was suggested in the previous review, but the leadership of GRIP decided not to follow this suggestion. The present PRC concluded that the MCB programme – bringing together the technology research lines associated with small molecule drug discovery – suffices as a ‘raison d’être’. Attempts are being made to start an internal cross-MCB programme. However, it is clear that the true value of the MCB resides in the contributions to a diverse set of projects on various therapeutic indications in collaboration with both internal GUIDE programmes as well as in external collaborations and public private partnerships.

## 6.10 Microbes in Health and Disease (MHD)

Programme leaders: Prof. dr. J.M. van Dijk, Prof. dr. A.W. Friedrich and Dr. Y. Stienstra

### Staff (2014):

- 6.3 FTE tenured staff
- 6.3 FTE postdocs
- 45 PhD students

### Mission/Objectives:

The mission is to define the detrimental and beneficial roles of microorganisms in human health and disease, and to exploit this knowledge in the prevention and fight against infectious diseases in order to promote Healthy Ageing.

### Scores

Research quality	2
Relevance to society	1
Viability	1

### Brief description

MHD is a new research programme aiming at performing cutting-edge research on the prevention and treatment of infectious diseases in order to promote Healthy Ageing. The programme has sought to achieve critical mass by bringing together expertise in areas of drug research that are key for preventing infections, fighting infections and harnessing the potentially beneficial effects of microbes. The team comprises microbiologists, epidemiologists, clinicians and pharmacists from ten different departments, although the large majority stems from medical microbiology. Systems biology approaches are used to integrate the results of interdisciplinary studies on microbes at the molecular, cellular, organism and community levels by theory-based and mathematical modelling.

The MHD research is highly relevant for the UMCG's overarching theme of Healthy Ageing. In total, seven research themes are defined with a strong drug related aim. Given the emergence of antibiotic resistance, this is an important area. A more education-oriented aim is to ensure that this area is integrated in the Graduate School of Medical Sciences. Current research involves the development of smart antimicrobial compounds, prophylactic and therapeutic vaccines and passive immunisation strategies to fight infections. MHD members have established laboratory facilities for microbiological analyses that are shared with other researchers (e.g. isolation, characterisation and culturing of anaerobic bacteria from the human gut, the 'Microbes in Motion' programme which uses the LifeLines biobanking facilities). The programme collaborates actively with public and private partners, and has filed relevant patent applications. The overall impression is of a strong well-structured programme.

### Research quality

This programme combines successfully bacteriological, virological, and epidemiological research from the perspective of a systems biology approach. A number of strong PIs pave the way for a large variety of high profile research projects. Although the core activities are still in basic

microbiology and vaccines work, alignment with research topics on the appropriate use of antimicrobial agents, health economics and pharmacoepidemiology of vaccines, and public health impact of antimicrobial resistance is acknowledged. The drug discovery/development ambitions of the programme have been fostered over the last few years (e.g. through TI Pharma projects and others). There are a large number of local, national, and international collaborations and networks. Bibliometric data show no real dominance of prime domains in terms of number of publications; publication and citation performance indicators, both quantitative and qualitative, are very good; in 2014, 28% of the papers were published in the 'top 10' segment, mainly in the 'microbiology' and 'infectious diseases' domains. The programme could consider a more targeted top-level publication strategy, instead of a broad array of high-impact journals with some middle-impact journals.

### Relevance to society

Combating microbes has always been an important societal mission in the context of public health, civil society and research. Members of the programme have contributed to large numbers of reports and research papers for policy making and public outreach activities. There have been multiple projects in cooperation with societal groups, civil society and industry; there is increasing IP output. The programme has real and tangible impacts on society. Several PIs of the programme are highly visible in the lay press and are well-aligned with patient groups, regulatory communities and healthcare in general. Also at regional level, the team has helped to inform clinicians as well as the public on infectious disease matters, including information on the Ebola crisis.

The influx of HTA and pharmacoepidemiology projects has increased societal impact opportunities. In terms of valorisation and IP, significant contributions are well acknowledged and five spin-offs were launched in the reviewed period. Total funding amounted to €3.6 M in 2014, which included major industry, regional, national, transnational, European and international sources. The programme is very strong on training ambitions and outreach in order to increase awareness of the problems associated with infectious diseases and to contribute to solutions for these problems. These successful interactions with societal groups, civil society and industry should be maintained.

### Viability

The strategy of the programme appears secure, and the research area is undoubtedly an area of public interest. The programme is relatively new, but appears well-run, with solid and varied funding. The defined research strategy is very appealing, timely initiated, and should deliver; if not now, for sure in the near future. The core building blocks are excellent. Viability of this programme is very convincing, i.e. a clear mission and long-term plans, well connected to essential infrastructures (e.g. LifeLines) and superb leadership. For the future growth of the programme finding funding to sustain the required high quality lab facilities should be a priority.

## 6.11 Preservation of cardiac function over time (CVC)

Programme leaders: Prof. dr. R.A. de Boer and Prof. dr. I.C. van Gelder

### Staff (2014)

- 6.5 FTE tenured staff
- 0.9 FTE postdocs
- 56 PhD students

### Mission/Objectives

The CVC is dedicated to preserving cardiac function over time, aiming at Healthy Ageing. CV diseases remain a major killer in Western society, and it is the mission to minimise this burden to our patients and society as a whole. The objectives are (1) to gain better understanding of the mechanisms and development of HFpEF, HFrEF and AF, at both younger and older ages, using relevant experimental models of disease, detailed phenotyping, in combination with genotyping, biomarker analyses, proteomics, and sophisticated systems biology analyses, with an overall aim of preventing new onset HF and AF and (2) to improve treatment of both HF and AF epidemics.

### Scores

Research quality	1
Relevance to society	2
Viability	2

### Brief description

Since the last review CVC has shifted its focus to heart failure with preserved ejection fraction and atrial fibrillation. Also, the leadership of the group has changed during the review period.

The CVC now consists of 25 PIs from 9 departments (about half from Cardiology and Thorax Surgery – Cardiology) and 56 PhD students. Eleven of these PIs have h-indices over 24. The CVC covers not only clinical aspects but also genetic analyses and experimental studies. This has resulted in well-recognised clinical and experimental research lines on cardio-renal interaction, heart failure, anaemia, and atrial fibrillation and cerebrovascular morbidity.

The programme has been very successful in attracting significant funding, especially with regard to prestigious career incentive grants for young PIs. CVC emphasises the integration of education and research, but the number of PhD students has remained fairly constant, and there are few postdocs. The CVC indicates that it is more interested in increasing the quality of the PhD students than the quantity.

Consistent with the recommendations of the previous assessment, commercial collaborations include an UMCG-Siemens partnership that is being developed as well as establishment of the Groningen Cardiology University Research Enterprise (G-CURE), an SME aimed at “enabling and accelerating the development process from preclinical to Proof-of-Concept of new cardiovascular drugs”. The CVC also stated that it has had an increase in the number of external grants, including a joint EU grant of €12 million.

### Research quality.

The PRC finds that the CVC is a world-class programme with strong output including good publications in *NEJM* and *Nature*. CVC has an excellent reputation, particularly for their clinical studies on patient stratification and interventions in heart failure and atrial fibrillation.

Researchers have produced an impressive number of scientific papers of outstanding quality, the metrics of which are among the best of all UMCG programmes. Thus the CVC publication record shows a rising level of around 10 publications per PI per year, about 80% of which are in Q1 journals and about 50% in top-10% journals. The CWTS impact (MNCS = 2.4) is high.

A distinctive feature of CVC is that the participating departments cover the whole spectrum from bench to patient to population. CVC uses ‘omics’ technologies and evaluates their use in diagnosis and therapy stratification, collecting, storing and analysing big data and investing in new MRI and CT technologies.

CVC PIs are members of a large number of scientific associations and organisations, are national coordinators of many trials, have editorships of several scientific journals, are members of several scientific boards, and contribute to a very large number of international studies. Over the past six years CVC has also started work with pulmonary hypertension and embolism, and this small group has been very successful; however, the interaction of the group with the rest of CVC is not clear.

### Relevance to society

Research on cardiovascular disease has the strong potential to contribute to health, society and technology and is an important spearhead of UMCG’s Healthy Ageing mission. PIs of CVC are involved in influential national and international organisations that provide advice on guidelines for treatment and prevention (Dutch Heart Foundation, membership of many committees (e.g., CHMP/EMA)). However, attention in the media appears to have been modest. There is a strong drive to bring new treatments and technologies to the patient, which is recognised by grants from the Netherlands Heart Foundation, EC and industry. Participation of patient groups or advisory boards in CVC is less apparent, and it is recommended that this should be increased. Over 50 industrial grants are listed, but only one patent is mentioned. An average of a patent every two years is planned, but this seems modest.

### Viability

The programme has undergone a change in leadership almost halfway during the period under review. Both new programme leaders are, like their predecessors, from the same clinical department. Apparently, this is a proven concept with good collaboration between the many participating departments, and doesn’t affect the internal coherence of the programme. The SWOT analysis speaks of inadequate infrastructure and funding opportunities becoming more restricted. The SWOT analysis also emphasizes the dependence on emerging technologies, like large-scale ‘omics’ and big data handling, and mentions it being a threat. Developing a clear vision of the specific goals for which these technologies will be deployed could aid in focusing and anticipating on the relevant developments. Strengthening the fundamental research profile of the programme will be an important aspect of this endeavour.

The number of PhD theses has grown considerably over the years. Thus CVC is building a new generation of researchers to ensure continuity for the future.

The PRC had the impression that although the current research was strong, there were insufficient activities in areas such as drug development. It was notable that there is not much interaction with other GUIDE or GRIP programmes. Thus, CVC was not taking full advantage of the environment provided by other programmes (e.g. in proteomics). The new leadership has a continuing commitment to link basic research (e.g. the genetic stratification; ‘omics’ input) with clinical outcomes. However, CVC remains centred around Cardiology & Thorax Surgery and the PRC recommends that the long-term viability of the programme would be enhanced if the leadership could be expanded with a third senior member with expertise in a field such as drug development.

## 6.12 Translational Immunology Groningen (TRIGR)

Programme leaders: Prof. dr. A.M.H. Boots and Prof. dr. P. Heeringa

### Staff (2014)

- 5.7 FTE tenured staff
- 2.3 FTE postdocs
- 37 PhD students

### Mission/Objectives

The mission of TRIGR is to unravel the mechanisms underlying immune-mediated chronic diseases by translating basic immunological concepts into clinical practice (and the reverse) in order to improve prevention and/or treatment of immune-related chronic diseases during the life course.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

The strategy and organisation of GUIDE has been adapted, resulting in multiple smaller, but more flexible, research programmes that are strongly focused on a specific research topic. One of the new programmes, established in 2012, is Translational Immunology Groningen (TRIGR). It is a collaboration between 15 clinical and pre-clinical departments involving 26 PIs at the UMCG. Together, these participating research groups provide a multidisciplinary platform for fundamental, translational and clinical research.

The TRIGR programme fits very well in the UMCG/RUG Healthy Ageing theme. It is based on the premise that age is an intrinsic risk factor for the development of many chronic, immune-mediated systemic diseases and cancer. Multidisciplinary research themes have been formed around three topics to investigate ageing of the healthy immune system and to understand the pathophysiological mechanisms underlying immune-mediated diseases in the ageing population, with a special emphasis on drug development and interventions.

Major disease areas studied are vasculitis, Sjögren's syndrome and systemic lupus erythematosus, using cellular and animal models, vascular imaging, biobanking, 'omics platforms and systems biology. These methods are used to translate basic concepts into clinical practice and the reverse.

### Research quality

This programme has been operating for only three years, so any evaluation has to take this into account. The TRIGR staff members are well recognised and participate extensively in the scientific community through editorships/memberships of scientific organisations/committees and PIs show considerable international activity by their participation in EU and NIH projects and trials. Additionally, the publication rate and impact is very good; a third of the publications

are high-profile papers, mostly in journals within the discipline. TRIGR emphasises quality over quantity of publications with an MNCS score of 1.77.

This is truly an outstanding but still evolving immunology programme that has begun to refine its research focus. To achieve the next level, several critical changes are now needed. The top priority is to bring together the best scientific leaders in TRIGR into a single laboratory location within UMCG around core technologies. They have already started this in the case of flow cytometry, but other high fidelity technologies are now needed, such as mass cytometry (CyTOF) and seromics. This will not only empower the TRIGR-related activities but also open up a range of new opportunities for immunological discovery and interventions in other programmes (e.g. cancer, organ transplantation and allergies). Without this key investment, TRIGR will continue to produce, but its worldwide competitiveness will progressively diminish as others take up these powerful technologies. This platform also provides a great opportunity for embedding systems biology in the Healthy Ageing paradigm in immunology and will greatly help to identify the disease signatures for stratification of complex autoimmune diseases that they wish to pursue. The appointment of a scientific leader in immunology, which was recently approved, should be conditional on the completion of the new immunology laboratory/building. Indeed, attracting the best immunologists worldwide to apply for this position will require the development of this new facility, with the appointee leading a new and science-driven immunology focus within TRIGR. Even more added value would result if the proposed immunology resource centre could be aligned and linked closely to the new bio-banking centre in Groningen with its emphasis on the biomarkers of early disease and the evolution of these across the lifespan. For example, this would enhance understanding of complex autoimmune diseases and vasculitis.

In conclusion, if Groningen is serious about high-level immunology then it should consider these actions seriously. We think that other major groups such as GRIAC and the cancer programmes would also benefit from some of these actions. Without this major consolidation of immunology around the best technology, the future of TRIGR could be uncertain.

#### Relevance to society

The Healthy Ageing theme is of clear relevance to society and the sub-theme of TRIGR is a very relevant part of it. The focus on personalised prevention and treatment has the potential to increasingly contribute to societal relevance, provided the research is effectively translated and valorised.

In terms of outreach, members of TRIGR have been effective. They have been involved with patient charities/groups, expertise centres, professional societies etc. Additionally, there has been a range of activities including public debates, lectures for the public, and a range of communications in the written media (but less so on radio/television).

What is less obvious is the interface with the public over Healthy Ageing of the immune system and how TRIGR is advising the public in this important domain. PIs are active in steering committees and advisory boards to patient-oriented foundations. The leading research position of TRIGR should enable further participation in influential policymaking bodies and guideline committees.

Few patents have been filed. The centre should develop a concrete strategy to increase the awareness among researchers of patentable discoveries.

### Viability

The centre has very good international visibility due to its clinical and translational research. It also has a solid acquisition capacity. The goals are clear and fit very well within the UMCG theme. Additionally, there is much confidence in the senior leadership of TRIGR and strong efforts should be made to safeguard continuity by attracting promising young scientists – both fundamental and clinical – with the potential to successfully apply for prestigious personal grants (NWO, ERC).

The future success of this group, however, is totally dependent on some critical changes. Most important is to bring the group together in one site adequately provided with technology platforms and data analytical facilities to compete on the international stage. The collaboration of scientists from 15 departments in the young TRIGR programme presents a challenge to the management of TRIGR. A major first step has been made: the decision to establish a chair in Immunology of Ageing. The next step should be consolidation at a single site with the best technology. Immunology is a core scientific discipline that deserves strong investment by the University if this is at all possible. An enormous benefit could be gained by combining the group with other small groups, such as GIOT, which has transplantation as its core. Immunotherapeutics are also progressing rapidly in allergy and clinical immunology (e.g. GRIAC and SALL), leading to great opportunities for collaboration. Considering the emphasis on drug development and personalised drug treatment, TRIGR may also wish to explore collaboration with GRIP groups.

In conclusion, it appears that this research group recognises all the main issues for them to become “serious players” on the world stage of immunology and translational immunology, but the big question is how they will achieve this and what resources the university is willing to invest to create a fully integrated endeavour for the benefit of UMCG as a whole.

### 6.13 Vascular Ageing Programme (VAP)

Programme leaders: Prof. dr. Zeebregts and Prof. dr. M.C. Harmsen

#### Staff (2014)

- 5.9 FTE tenured staff
- 0.9 FTE postdocs
- 38 PhD students

#### Mission/Objectives

The mission is to understand the pathophysiological mechanisms of vascular diseases in the ageing population, to find therapeutic targets and to develop novel treatment modalities that successfully combat these diseases. The major goal of VAP is – where possible and appropriate – to act as a platform on which vascular scientists can meet, share, discuss and organise their ideas on vascular science and clinical translation and in this way add value to the research of the VAP PIs.

#### Scores

Research quality	3
Relevance to society	2
Viability	3

#### Brief description

VAP was established only recently (mid-2013) by joining the forces of basic and clinical expertise. Research is divided into three lines: pathophysiological mechanisms, therapeutic and diagnostic target finding, and prevention and treatment strategies. A wide range of disciplines and technologies is brought together, including vascular biology, imaging and patient-based research, enabling a translational approach to treat vascular disorders.

VAP describes itself as “a communication and collaboration platform in which clinical scientists and basic scientists meet to share, discuss and organise their ideas on vascular ageing research and development on novel therapies to treat vascular disease.” This is a sizable programme in terms of the number of PIs (28) and 38 PhD students. VAP members are also engaged in other institutes. There are several double appointments, e.g. with CVC, CAPE and GIOT. VAP was founded in part on the basis of criticism in the previous PRC report on TRIO, where reorganization of TRIO was suggested. TRIO was dissolved, but the present PRC was concerned that VAP in its present form is still not contributing adequately to meeting this criticism.

#### Research quality

Many of the PIs of VAP are established investigators with very good past performance, as demonstrated by the number and quality of publications, national and international collaborations, editorships of high-ranked journals, memberships of influential scientific boards, and ability to acquire funding. Quantitative indicators for a number of the participating PIs are very good (publications, citations, h factor). Also, the bibliometric analysis outcome is positive: 1.59 for MNCS. However, it is not clear from the self-evaluation how VAP will ensure that this quite powerful combination of research strengths can be synergistic.

Certainly, the title “vascular ageing” is in line with the overall mission of UMCG, but this is very broad, and no evidence is provided that the PIs are gathering around particular themes. This is a common difficulty with investigations of the vasculature but currently it does not seem that VAP has an answer. Indeed, if the research interests of the members are disparate, perhaps it is better that they continue in the areas where they have proven expertise, perhaps combining in smaller groups.

Direct funding is the main source of support as compared to national grants and contract research. Three young investigators at VAP have acquired prestigious personal Veni and Vidi grants from the Dutch NWO.

The research strategy and ambitions of this young programme clearly needs further development. As such, VAP is not yet internationally recognised and visible. Much remains to be done in order to establish a coherent and focused programme, improve communication between the many participating departments, and join forces between basic and clinical researchers. With 27 members from 12 different departments, the programme structure is not conducive to helping VAP to establish itself, since they have no funds to initiate cohesion initiatives. For this reason, it is difficult to evaluate the overall research quality of VAP. Thus at this stage the research quality score is 3. If the programme is able to focus research efforts and find its niche(s), this score is expected to rise at the next assessment.

The vasculature is indeed a major organ involved in the pathogenesis of a multitude of diseases, and VAP is encouraged to continue its efforts in providing a meaningful platform for vascular research with a focused agenda, which can provide a basis for a strong and distinctive programme. VAP should receive more support from the GUIDE management to get it off the ground. The two leaders have sufficient scientific credentials and experience, but they need the tools to drive the process of forming this programme.

#### Relevance to society

Many of the members of VAP have had strong societal interactions, but the PRC, as stated above, is concerned about the synergism of the programme. Collaborations with industry are fostered, grants from charity organisations have been acquired and knowledge has been translated into a number of patents and spin-off companies. However, participation in influential bodies on policy and treatment guidelines as well as interaction with patient organisations seems to be lagging behind. Focusing more on personalised treatment of the ageing vascular patient and involving patients in setting the research agenda will provide further opportunities to increase the societal relevance of VAP.

#### Viability

The objectives of VAP are compatible with the goals of the UMCG/RUG Healthy Ageing initiative. However, the strategy that VAP intends to set out for the coming years is still in progress and has not yet taken shape. It appears that the VAP leadership is working on establishing common ground between, and acquiring commitments from, the many different researchers who have joined the programme. It is of great importance that VAP clearly marks the contours of its position in the field and finds its niche(s). Rethinking the number of participating members with a true interest in vascular ageing and creating optimal conditions for the formation

of coherent and focused research teams is critical. The collective research potential of VAP is promising, and if responsible decisions are made, the programme will be well equipped for the future.

# 7. Kolff Institute for Biomedical Engineering and Materials Science (KOLFF)

## 7.1 KOLFF-Institute

Director: Prof. dr. Y. Ren

### Staff (2014)

- 11.2 FTE tenured staff
- 5.9 FTE postdocs
- 89 PhD students

### Mission/Objectives

The mission of the KOLFF Institute is to establish a centre of expertise of biomedical engineering and biomaterials science ranging from basic scientific aspects to actual medical product development and their clinical evaluation in order to contribute to a long-term well being of patients. The goals are: (1) to contribute to a high quality of life during the extended life time of patients relying on biomaterials implants or devices, (2) to provide new tools and strategies to maintain and restore oral health and function, (3) to generate structures with dimensions on the nanometer scale that can be used to tackle disease and (4) to realize the re-establishment of tissue and organ function by means of biological or engineering intervention strategies.

### Scores

Research quality	2
Relevance to society	2
Viability:	2*

### Brief description

In the KOLFF institute scientists from departments in the UMCG and the Faculty of Mathematics and Natural Sciences, in particular the Zernike Institute for Advanced Materials (ZIAM), are working together. One of the current programmes was designed following advice from the previous SEP Peer Review Committee and a subsequent internal evaluation. As a result, the Institute has four distinct programmes. Some of them work closely together in joint projects, as evident by cross-programme PIs assignments, cross-programme publications, PhD theses and patents. The four programmes are:

1. BIOBI: Bioadhesion, Biocompatibility and Infection
2. MOHOF: Maintaining Oral Health and Oral Function
3. NANOBIOMAT: Nanobiotechnology and Advanced Therapeutic Materials
4. REGENERATE: Restoring Organ Function by Means of Regenerative Medicine

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\* A dissenting opinion about this score from Prof. dr. Jandt and Prof. dr. Shi is added as Annex F to this report.

The majority of these programmes are not constructed along the lines of traditional medical sub-disciplines. This enables cross-fertilisation between different clinical sub-disciplines, as diverse as for instance ophthalmology and orthopaedics. An exception has been made for MOHOF. This programme is solely devoted to dental diseases and its relation with health in general.

The KOLFF institute went through a reorganisation and the present institute leader took the helm only recently. The institute is now in relatively quiet waters and prepares itself for new endeavours, i.e., to establish two new programmes with the help of a number of successful KOLFF members that will deal with eHealth and robotic surgery/imaging. Moreover, participation of the Hanze University of Applied Sciences and internationalisation of the KOLFF Institute by participating in the RUG initiative to form a campus in Yantai, China, will yield the necessary faculty to staff these programmes.

#### Research quality

In general, the KOLFF Institute provides research of good quality. Groups with potential for excellence can be identified. The KOLFF Institute has produced a large number of high quality publications, PhD theses and patents. In addition, large amounts of funding were obtained in each year of the review period with a clearly increasing trend. The research funding is unequally distributed over the four programmes. Publications of the KOLFF Institute are highly cited demonstrating the international scientific impact of the institute. The institute is recognised by national and international peers as evident for example by prestigious ERC/Vici grants, and several high calibre national and international collaborations. The existing programmes and the eHealth growth direction defined by the KOLFF leadership are innovative and visionary. Among the major scientific accomplishments is a paradigm change from non-functional to multi-functional coatings of biomaterials and the development of printable anti-microbial dental composite. In choosing the score for the research quality, the special circumstances of the KOLFF Institute have to be considered, for example, that some of the programmes are novel and still in the process of maturing.

#### Relevance to society

What the KOLFF institute is doing is highly relevant to modern medicine and public health. The KOLFF Institute has produced several high quality products for societal target groups such as lectures addressing the public, patents, panel discussion, publications in the press, and publications outside the core research field.

It is in the nature of the scientific results of the KOLFF Institute to implement the findings in the healthcare environment. The media coverage of the KOLFF Institute's work is outstanding. KOLFF's PIs contributed to the movie "Resistance" by an US science movie producer. Further evidence of the relevance of the KOLFF Institute's work can be found in the individual research programmes (see their individual reviews).

#### Viability

In the KOLFF Institute a number of ambitious and able tenured PIs of less than 45 years of age are available. The programmes may also benefit from stability in staff as less than 10% of the current faculty will retire in the next evaluation period. Society urgently demands the assets of biomedical engineering in order to keep an ageing population healthy and socially active. In

summary, in the assessment of KOLFF leadership, the future has sufficient opportunities (see SWOT section 9) to state that the research fields covered by KOLFF are a highly viable. KOLFF's new director is a very dynamic, strong and inspiring leader and an excellent ambassador for the institute. She is a clinician with a good scientific profile and a long and promising career prospect. This could help to promote the collaborations among researchers and clinicians and the better integration between different programmes. Importantly, KOLFF staff is committed to pick up these challenges and carry the Institute to the wider area of biomedical engineering. Therefore, the KOLFF institute is excellently equipped for the future.

The KOLFF institute operates in highly competitive fields of research. A benchmarking with (inter)national groups is recommended to identify those subfields where the KOLFF programmes want to excel.

The institute is relatively small and it is therefore recommended that the institute grows. It seems to have limited supporting resources from UMCG. Looking at the prospects depicted above, the contributing UMCG departments should consider increasing their support. At the same time, the KOLFF programmes/themes should expand their efforts to bring in external funding as for some the external income has potential to grow.

Some of the activities in other programmes/institutes such as on microbiology, stem cells or fibrosis could offer important collaboration points for programmes of the KOLFF institute.

On a more general note the competence-power gap of the director needs to be closed, i.e., the director needs more discretion what to do with funds. For this, direct funds need to be provided to the director. It would be also desirable to provide the director with fully funded PhD positions for the director to distribute within the institute.

## 7.2 Bioadhesion, Biocompatibility and Infection (BIOBI)

Programme leader(s): Prof. dr. ir. H.J. Busscher

### Staff (2014)

- 2.5 FTE tenured staff
- 3.4 FTE postdocs
- 21 PhD students

### Mission/Objectives

The mission of this programme is to contribute to a high quality of life during the extended life time of patients relying on biomaterials implants or devices by designing anti-infection strategies for permanent and temporary biomaterials implants and devices.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

BIOBI focuses its research efforts on biomaterial-associated infections (BAI) and their prevention. It is developing new anti-infection strategies for permanent and temporary biomaterials implants by elucidating physicochemical and biological mechanisms for interaction of micro-organisms, mammalian cells and the immune system with biomaterial surfaces and designing new functional coatings that limit bacterial adhesion and promote tissue integration.

Although mechanisms of bacterial and mammalian cell adhesion have been studied for decades, no generally accepted mechanism has been forwarded, and within BIOBI research is on-going to define mechanisms of bio-adhesion and to shift the paradigm for the development of biomaterials coatings from mono-functional to multi-functional ones. Co-culture methods, including microbes, mammalian cells and immune cells are being setup in the programme to evaluate advanced, multi-functional biomaterials and coatings. Such studies not only attempt to find solutions for the current problem of BAI but also prepare to address the future problem of infections related to porous, biodegradable scaffold materials as used in tissue engineering.

The ageing population is increasingly becoming dependent on biomaterial implants and devices (connect with Healthy Ageing). BAI is a key issue in this area, which has caused a great discomfort to the patients and high costs to the healthcare systems. So the research focus is highly relevant to society. BIOBI is a small but clearly a well-focussed and integrated programme encompassing clinical UMCG Departments that use biomaterials and the Biomedical Department and relevant partnerships with other Dutch and some international universities and the industry (DSM).

Interestingly, 5 of the BIOBI 12 PIs also participate in the MOHOF programme.

### Research quality

This is one of the strongest programmes within the KOLFF institute. The programme leader is highly prominent in the field and visionary in management. The programme has significant and high impact publications that have paved the way for paradigm shifts.

The research theme BIOBI of the KOLFF Institute has produced a large number of high quality publications and PhD theses. In addition, six patents were produced during the review period. The BIOBI programme can be considered as one of the leading programmes world-wide, especially regarding the understanding and prevention of BAIs. However, the overall BIOBI citation impact of the programme is ‘only’ good (MNCS).

### Relevance to society

Topics researched by BIOBI are directly health related and impact many infections in medicine and dentistry. The translational opportunities are vast as well. BIOBI has produced several high quality products for societal target groups such as lectures addressing the public, patents, work on advisory boards, publications in the press, and work on support groups for patients. There is public media coverage of BIOBI’s work. Overall, the research unit makes an outstanding contribution to society. One reviewer thought that, while the potential societal impact of this programme is huge, the actual realisation is relatively modest. The number of obtained patents is high but this is usual not so much a measure of societal impact, rather of innovative potential.

### Viability

Research on biomaterial infections and biofilms in health and disease in general is in high societal demand, offering many opportunities for the future of the programme. Less than 10% of the current PIs will retire in the next evaluation period. These two aspects make the programme highly viable for the coming years. BIOBI is funded for 64% by direct funding. This is below average and the leadership should encourage the PIs to be more active in bringing in grants. Moreover, the future would even brighter if the overall BIOBI MNCS rating would increase above the ‘good’ level.

The leading scientist is an outstanding and internationally recognised leader in his field. However, some subgroups within the programmes are lagging behind. More help will need to be provided to these subgroups to enhance their research quality.

The new Biomaterials Development Centre may be a ‘magnet’ for attracting external funds, but little details were revealed so far and recommendations concerning this potentially interesting initiative have to be withheld.

Extension of this programme with other PIs in the field of microbial biofilms and infections within the UMCG is encouraged and is expected to result in strengthening of the programme. In particular, BIOBI could be upgraded if some microbiology investigators at the GUIDE institute could be integrated in the programme.

### 7.3 Maintaining Oral Health and Oral Function (MOHOF)

Programme leader(s): Prof. dr. H. Meijer and Dr. P. Sharma

#### Staff (2014)

- 2.8 FTE tenured staff
- 0.5 FTE postdocs
- 20 PhD students

#### Mission/Objectives

The mission of MOHOF is to provide new tools and strategies to maintain and restore oral health and function during life with minimal patient morbidity.

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

MOHOF is a young programme. It focuses its research efforts on oral health with an emphasis on developing new dental materials and devices. Materials are more crucial in dentistry than in any other medical sub-discipline, so it is important for KOLFF to have a dedicated programme on oral health and function, while enabling it to have close connections with BIOBI (5 joint PIs assignments), NanoBioMat and medical microbiology. Via collaborations, MOHOF investigates new molecules to alleviate oral dryness. Particularly in the elderly, decreased salivary lubrication often needs treatment including artificial salivas. MOHOF's research efforts are also directed to the inhibition and manipulation of oral biofilm formation (such as probiotics and functional dental materials) as new strategies to prevent chronic oral infectious diseases. Another uniqueness of MOHOF is the close collaboration between basic researchers and clinicians in oral health.

Maintaining oral health and restoring function is relevant to quality of life and Healthy Ageing. The major concern is that this theme is small and does not have much independent resources. MOHOF does not have lab space and is for the lab work dependent on collaborations.

#### Research quality

KOLFF has a dental programme that covers multiple disciplines within dentistry and an engineering department, having PIs from both clinical and preclinical disciplines. The overall scientific quality is high. MOHOF is productive in terms of the number of PhD theses and publications. The scientific output is of a very good quality and quantity, higher than the world average for this particular domain (MNCS 1.52).

An important characteristic of MOHOF is the intense collaboration with other research programmes such as NANOBIOMAT or BIOBI that shows the coherence of research at the KOLFF Institute. In addition, three patents were produced during the review period. Important research achievements are reported, for example a landmark development of the first 3D

printable anti-microbial dental composite or the development of a novel synthetic peptide. Overall, the research unit has been conducting very good, internationally recognised research.

#### Relevance to society

Dental diseases are among the top three world health burdens and managing dental health with innovative research is highly important and relevant to society. The societal impact of MOHOF is well directed as it has clear interactions with the Healthy Ageing initiative. MOHOF has produced several high quality products for societal target groups such as lectures addressing the public (some of which have been mentioned also in other KOLFF research programmes), patents, societal projects, guidance questionnaires, and public campaigns to support patients. In addition, there is public media coverage of BIOBI's work in the context of MOHOF. Overall, the research unit makes important contributions to society.

#### Viability

This young theme may have a bright future but it is still early days. At the start of 2015, MOHOF had 20 PhD students and the number of PIs had increased to 13 of which two are under the age of 45. This shows a clear growth over the entire evaluation period of 2009-2014 with the potential to continue growing. Importantly, dental curricula are becoming more research oriented which will increase the quality of the research in general and yield a greater interest among dental students to obtain a PhD. Furthermore, an increasing public awareness of oral health in relation to human health in general will increase the funding prospects for dental research projects for which a number of grant applications are in preparation. To secure its viability the theme needs to mature and gain focus. Research efforts should be more focused, such as zooming in on some specific dental materials and aim to become the best in the field. To choose the proper niche areas, (inter)national bench marking is essential as there is strong competition out there.

Eighty-four percent of MOHOF's funding is coming from the UMCG (direct funding). This is one of the highest percentages of research programmes/themes in the UMCG. The theme must improve its external funding and enhance the visibility of clinical PIs. Enhanced industry relationships and clinical studies may increase its independence from direct funding.

## 7.4 Nanobiotechnology and Advanced Therapeutic Materials (NANOBIOMAT)

Programme leader(s): Prof. dr. A. Herrmann and Dr. P. van Rijn

### Staff (2014)

- 2.8 FTE tenured staff
- 1.6 FTE postdocs
- 34 PhD students

### Mission/Objectives

The mission of NANOBIOMAT is to develop and apply nanoscopic objects and systems with features on the nanoscale that allow to overcome these shortcomings to tackle diseases in a highly targeted manner and at the same time lower side effects, enlarge the scope of drug candidates to enter the clinic and implement extra functionalities for monitoring of the disease status.

### Scores

Research quality	2
Relevance to society	2
Viability	2*

### Brief description

NANOBIOMAT is a newly established theme with a group of talented scientists involved and translational aims: 'to take nanotechnological findings from bench to bed'.

Nanotechnology for use in the medical/pharmaceutical sciences has gained a strong interest in the last decade. It is logical that researchers who have affiliations with this field combine their research efforts. A multidisciplinary approach is highly commendable and laudable if one wishes to be successful in the clinical setting. The identified targets are treatment of the eye and cancer. A cohesive strategy to reach these goals is currently being developed. For example, the eye is taken as target, but there is little evidence in the report regarding publications on eye delivery. If the eye is the target organ the involvement of an ophthalmologist would be recommendable. In 3.2 (scientific goals) a more realistic set of goals is defined.

A number of group members belong to different institutes/have other (primary) commitments. A strong leadership should straighten out the list of participating scientists and ensure that indeed the focus is directed on the clinical targets and include clinical oncologists.

### Research quality

NANOBIOMAT has developed a healthy staff to student ratio over the last years. It has produced a large number of high quality publications, PhD theses and patents. NANOBIOMAT's MNCS is 1.56. Its members received prestigious grants for example ERC starting and Vici grants. NANOBIOMAT has been able to gain access to an impressive equipment 'park'. The success of

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\* A dissenting opinion about this score from Prof. dr. Jandt and Prof. dr. Shi is added as Annex F to this report.

the theme in the future depends very much on the cooperation between the groups from the ZIAM/GRIP and the clinical input from the UMCG. Overall, this newly established team conducts internationally recognised research of high quality but has yet to demonstrate that its members are successful because of the existence of this theme and not because of their individual capacities (added value NANOBIO MAT?). The theme members have a proven track record in bringing in external funds: only 29% of the budget is direct funding.

#### Relevance to society

NANOBIO MAT has produced several high quality products for societal target groups such as lectures addressing the public, patent applications, panel discussion, publications in the press, and publications outside the core research field. The media coverage of NANOBIO MAT's work is growing.

The research outcome of the programme could greatly impact society via developing new biomedical materials. However, currently the programme is mostly at a research stage.

NANOBIO MAT members participate in important societal groups and advisory bodies. Overall, this theme has great potential to contribute to societal needs but should be given more time to realise its ambitions.

#### Viability

The newly established theme NANOBIO MAT aims to develop therapeutic nanomaterials 'from bench to bed'. NANOBIO MAT's goals are translational in nature; it is dealing with fundamental questions in the design of nanomaterials and to translate these nanosystems to clinical settings to solve patients' needs. This is achieved by having about half of the PIs from UMCG and the other half from the FMNS. The clinical input is in some cases difficult to identify in the present text of the self-assessment report and no input from the UMCG oncology clinical researchers is noted. The close collaboration is reflected in coupled UMCG/FMNS double tenure track appointments ensuring continuous joint developments.

The theme needs strong leadership. Translation of new nanomaterials as well as tackling all obstacles associated with in vivo testing requires a broad, diverse knowledge base as well as following a well-thought-out strategic plan. NANOBIO MAT should consider the options/niches for its research strategy keeping an eye on the 'competition', internationally and nationally. Overall NANOBIO MAT is well equipped for the future.

The programme director is a very dynamic and an outstanding researcher. It is hoped that he will make this translational theme a success. The leadership should bring more coherence in the theme and ensure commitment of PIs with relevant background and stature and should aim towards quality development of the whole group. A strategic plan, including benchmarking with the 'competition', to find the right niches is recommended.

Finally, there is room for improvement in the cooperation with other programmes/themes within the KOLFF institute.

## 7.5 Restoring Organ Function by Means of Regenerative Medicine (REGENERATE)

Programme leader(s): Prof. dr. R.A. Bank and Prof. dr. S.K. Bulstra

### Staff (2014)

- 2.5 FTE tenured staff
- 0.9 FTE postdocs
- 15 PhD students

### Mission/Objectives

The mission of this programme is to ensure the re-establishment of tissue and organ function by means of biological or engineering intervention strategies based on an understanding of the determinants of cell plasticity, in particular the role of the micro-environment and the extracellular matrix.

### Scores

Research quality	3
Relevance to society	2
Viability	3*

### Brief description

Different factors such as trauma, disease, and ageing can leave critical defects that the body cannot heal by itself. Using a combination of cells, bioactive molecules and degradable biomaterials, regenerative medicine seeks to achieve functional restoration of tissues and organs. The focus of REGENERATE is on tissue repair reactions as seen after tissue damage and implantation of biomaterials. More specifically, fibrosis and osteoarthritis are the two major research lines, which is in good alignment with the Healthy Ageing theme.

REGENERATE is a newly established research theme. The main goal is to understand the nature of the fibrotic reaction and how one can influence it (biomaterials / drug delivery / epigenetic targeting) in order to combat fibrosis and to modulate the foreign body reaction. In this context, the primary cells of interest are fibroblasts and macrophages. Furthermore, REGENERATE aims to improve the quality of skeletal tissues. Tissue damage and biomaterials implanted into the body invariably evoke an inflammatory response, which sets the stage for tissue repair. Normally, the progression from inflammation to repair is well regulated, but aberrant inflammation can lead to fibrosis as a highly undesired side effect. With the implantation of materials the non-specific immune system will start the foreign body response (FBR). Macrophages are key players in the FBR, as well as the giant cells that are formed by means of fusion of macrophages. Controlling the activation of macrophages and the formation of giant cells is a powerful therapeutic tool studied within REGENERATE to modulate the FBR, thereby improving regenerative strategies to repair tissues but here, too, the understanding of the mechanism is poor. Within the processes

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\* A dissenting opinion about this score from Prof. dr. Jandt and Prof. dr. Shi is added as Annex F to this report.

of inflammation and FBR, fibrosis is a unifying factor. Fibrosis also is the pathological outcome of wound healing processes in a variety of organs (e.g. heart, liver, lung, kidney, skin) through the deposition of an excessive amount of collagen, being the hallmark of fibrosis and REGENERATE research. The pathogenesis of fibrosis remains poorly understood, mainly because it is unknown what subsets of fibroblasts are involved in collagen deposition.

#### Research quality

REGENERATE addresses important questions in biomedicine. The participating scientists perform basic and clinical research around fibrosis and osteoarthritis. The research programme is well-embedded in current national PPP programmes and outside funding covers about 60% of the total spending. Research quality measured in MNCS factors varies among the members of REGENERATE and the average MNCS is relatively low, 1.15, and needs improvement.

#### Relevance to society

The research outcome of the programme could greatly impact society by developing new medical procedures for tissue regenerations. This is particularly relevant to the Healthy Ageing initiative. The focus has been on the fundamental understanding of key biological processes that underlie fibrosis and osteoarthritis, following the recommendations of the previous PRC. Naturally it takes a long time to develop products with a major societal impact.

REGENERATE has produced several high quality products for societal target groups such as lectures addressing the public, webinars, movies, laypeople lectures and several patent applications. In addition, REGENERATE members have leading functions in national research programmes and active memberships in important organisations. Overall, the research unit makes a very good contribution to society.

#### Viability

REGENERATE has chosen a very important research area that has an outstanding potential for growth. It is estimated that 45% of deaths in the Western world can now be attributed to diseases in which fibrosis plays a major aetiological role. There is no cure for fibrosis. This creates an urgency to prevent fibrosis that fits well within the Healthy Ageing theme of UMCG. This urgency warrants supporting REGENERATE as a theme. However, it is currently relatively small and needs to grow. More efforts should be made towards increasing research capacity, overall quality and the visibility of PIs. Elsewhere in the UMCG/GRIP programmes other groups are working on fibrosis and osteoarthritis and one could imagine that forces could be joined to give REGENERATE critical mass in terms of science base and clinical read out. Overall REGENERATE shows a good viability, considering also the short duration of the programme.

This young research theme needs to further develop as it is rather small. The theme needs growth with respect to the number of PhD students and PIs. The overall publication output (cf. MNCS factor) has room for improvement.

There needs to be a contingency plan developed for the time after the current indirect funding ends.

## 8. Research Institute for Neurosciences and Healthy Ageing (BCN-BRAIN)

### 8.1 BCN-BRAIN Institute

Director: Prof. dr. H.P.H. Kremer

#### Staff (2014):

- 21.6 FTE tenured staff
- 15.53 FTE postdocs
- 179 PhD students

#### Mission/Objectives

The mission is to understand: 1) the evolving and waning function of the healthy brain over the lifespan and 2) nervous system dysfunction as it manifests in neurological and psychiatric ageing-associated disorders. To safeguard the continuity of brain research for society as a whole, BCN-BRAIN's mission also entails educating and training bachelor's, master's, and PhD students to become independent neuroscience researchers.

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

BCN-BRAIN encompasses all neuroscience research activities within UMCG, including MSc and PhD training programmes. The institute implements the UMCG and University of Groningen focus on Healthy Ageing through neuroscience research, including basic, translational and applied research. There are nine research interests (abnormal neurological development, psychopathology and emotion regulation, motor control and movement disorders, mild cognitive impairment and dementia, perceptual and cognitive aspects of ageing, protein aggregation, neuro-inflammation, acute neurological damage and neuroimaging). These interests are addressed in 5 research programmes (MOLAR, ANDDI, TN, PCN, ICPE) and a separate imaging platform (CMI). BCN-BRAIN harbours both clinical and basic neuroscience research (work with *Drosophila*, *C. elegans*, mouse models, etc.).

BCN-BRAIN participates in the multidisciplinary Research School of Behavioural and Cognitive Neurosciences (BCN) of the University of Groningen.

#### Research quality

The output is very good both in terms of quantity and quality, with a high ratio of publications per PI (588 refereed articles were published in 2014). More than 1/3 of the manuscripts are published in the 10% top segment of journals. The MNCS ratings range between 1.36 and 1.90, which is very good on average. There are differences between the various programmes but the overall quality of research output is very good and comparable to leading European neuroscience

institutes. The infrastructure of this programme seems to be extremely good and contains numerous high-end tools in both basic and clinical research in the six research programmes.

A number of prestigious national (Veni, Vidi, Vici) and European grants (ERC, H2020-ITN) have been obtained. In general, the amount of funding is considerable (approx. 50% self-funding). The 12 PIs listed in the self-assessment report are very productive, with an impressive scientific output and a significant amount of grant acquisition.

Given the very good quality that should be maintained and possibly even increased, striving for more focus and more top segment publications is to be recommended (see Viability). Acquiring a higher proportion of EU funding is also advisable.

#### Relevance to society

The BCN-BRAIN PIs reach out to society by targeting specific societal groups and building links with commercial enterprises. General public exposure seems good but there is room for improvement in terms of being more visible by developing a proactive communication and dissemination strategy.

Due to the many patients suffering from brain diseases such as dementia, the societal relevance of the mentioned research topics is very high. The programme has worked on the physiological and pathophysiological manifestations of the ageing brain and the associated mechanisms. The combination of basic and clinical research is excellent. There is a visible contribution to public debates and activities. Non-proprietary devices were developed and two patent applications were filed. Members are active in patient organisations, but usually not in industry nor in the most visible non-industry funding organisations (NWO, STW, IMI, etc.). An advisory board (see Introduction) could be of help here.

#### Viability

The PRC recognises that BCN-BRAIN went through a major restructuring phase and should be given time to prove itself. However, while the overarching theme of ageing is relevant and visible in the institute, one may question whether nine different research interests are not too many. While this can certainly be explained by organic growth and personal and traditional interests of key researchers, it would be wise to decrease the number of research interests or at least consider an evaluation of the full portfolio in terms of competitive strengths and restructure where necessary. There are many ways to do this. Benchmarking may help in choosing the right research directions in the future, and an advisory board might act as a sounding board.

Overall BCN-BRAIN is more than viable. The institute seems to have all the necessary equipment to perform the planned research and it is well connected with relevant strategic partners in and outside of the Netherlands. Young investigators seem to be involved. There are obviously many outreach activities and activities for the general public. Since more causal therapies are becoming available for the diseases studied, the translational activities of the BRAIN research programmes are clearly needed and have to be further supported ('from bench to bed').

The new strategy has to prove itself in the years to come. The fact that a large HRM/science focus overhaul was performed a few years ago demonstrates flexibility and determination, and

this flexibility should remain in the organisation. Funding is a challenge and new strategies should be implemented as soon as possible to acquire the necessary funding to sustain the operation. Forming research networks is definitely a good idea to help bringing in external funding. The efforts to train new generations of scientists should be continued.

## 8.2 Abnormal Neurological Development: Early Diagnosis and Intervention (ANDDI)

Programme leaders: Prof. dr. C.M.A. van Ravenwaaij-Arts and Dr. T.J. de Koning

### Staff (2014)

- 2.95 FTE tenured staff
- 0 FTE postdocs
- 21 PhD students

### Mission/Objectives

The mission is to conduct research that contributes to an improvement of the quality of life and the number of healthy years lived by those with impaired neurological development. ANDDI aims at promoting research, training and funding that is in line with Healthy Ageing, specifically the Ageing Brain. This encompasses not only aged individuals, but also brain development in children in this theme.

### Scores

Research quality	2
Relevance to society	1
Viability	2

### Brief description

ANDDI is a theme created in 2013 that aims at studying and developing early diagnostic tools and interventions for children with abnormal neurological development and/or genetic diseases, in a multidisciplinary and comprehensive setting. These include patients with specific chromosomal syndromes, movement disorders, epilepsy, developmental delay, phenylketonuria (PKU) and others.

There are four research lines:

1. Improvement of diagnostics by NGS (Next-Generation Sequencing);
2. Identification of novel genes in neurological child diseases;
3. Study of treatment and epigenetic influences;
4. Implementation of new early prenatal diagnostic techniques for the identification of structural abnormalities of the developing brain.

The mission statement and objectives are clear. However, embedding ANDDI in the overarching ageing brain theme proves to be somewhat artificial in the sense that there is often no direct, clinically significant relationship between developmental abnormalities in childhood and brain ageing later in life, although ageing obviously starts at conception. However, what is needed is more focus and providing a stronger scientific basis for the assumption that developmental abnormalities in childhood are in fact related to abnormal brain ageing later in life. Making this point should be a prime strategic objective for ANDDI.

Moreover, many of the major objectives seem to be purely operational tools rather than objectives. Finally, it is far from certain that “bringing together longstanding successful research

lines that were previously invisible ensures that the present theme aims can be met”, as the group states.

With regard to the SWOT analysis provided in the self-assessment report, a switch from rare diseases to prevalent diseases is mentioned as a threat in the Netherlands, while in fact rare diseases are a top EU priority.

#### Research quality

The infrastructure of this programme is very good with access to Next-Generation Sequencing techniques and bioinformatics at the Genomics Coordination Centre.

The scientific output is very good, with a relatively high number of publications at an excellent level. The Q1 is 76%, and 41% are published in the 10% top segment journals. Furthermore, the group has a very good ratio of publications per researcher. ANDDI is well embedded in national and EU/international networks. Several national and international grants have been acquired, but no ERC grants. The amount of external funding has increased over the years, but could be increased further (43% self-funding).

#### Relevance to society

The relevance to society is very clear. Most research performed within ANDDI has direct and important consequences for patient care. Particularly impressive examples include:

- (a) the introduction of new diagnostic tests and strategies, (e.g. the 13th week ultrasound scan);
- (b) the clinical trial of intranasal insulin in Phelan-McDermid syndrome;
- (c) the interactive web-site for patients with rare chromosome disorders;
- (d) close contact with and actual funding of ANDDI research by patient support groups/organisations and crowd funding.

The only recommendation is to continue on the successful path.

#### Viability

This is a young and rather small programme but very promising, apparently fast growing and, in principle, viable. The necessary tools to perform its research are clearly present.

Since new causal therapies are currently available for neurodevelopmental diseases, the translational aspects of the ANDDI research programme are clearly needed and should be further supported.

It is also striking that for 12 PIs, in 2014 there were only 2.95 FTE tenured research staff and 0 postdocs. As the programme leaders identified in their SWOT analysis, there is a subcritical mass of PIs and there is inadequate recruiting of external and joint PhD students. This needs to be remediated. In addition, more direct university funding for pilot research, which is difficult to get funded otherwise, is advised.

### 8.3 Centre for Medical Imaging – UMCG (CMI-UMCG)

Programme leaders: Prof. dr. R.A. Dierckx and Prof. dr. M. Oudkerk

#### Staff (2014)

- No data on FTEs provided.
- 12 PhD students

#### Mission/Objectives

In addition to supporting imaging projects in existing programmes in the various institutes, the CMI research programme is actively implementing a singular vision: that by 2020 in individuals at risk of developing cancer, cardiovascular, infectious/inflammatory disorders and neuro-psychiatric (ageing brain) diseases these diseases can be identified at an early stage. This clearly fits into the ambitions of the UMCG/RUG theme Healthy Ageing. The CMI programme's specific aims are to research and develop minimally/non-invasive medical imaging techniques, improve existing technologies and optimize their integrated use.

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

CMI is a UMCG platform programme offering campus-wide imaging facilities and expertise to clinical researchers and developing imaging methodologies, including initiating and setting up large imaging facilities. CMI supports other brain-related programmes and has its own Healthy Ageing research objectives. CMI is part of a large national network of 8 Centres of Research Excellence in the IMDI (Innovative Medical Devices Initiative) programme (endorsed by ZonMw-NWO) and Siemens Netherlands. CMI deals with four major research themes (cardiovascular diseases, oncology, infection/inflammation and ageing brain research).

#### Research quality

The infrastructure of this programme seems to be extremely good and contains numerous high-end tools in imaging (including fMRI and FDG-PET).

The quality of the research output from CMI is very good with a high number of publications often in top-rated journals (79% published in Q1 Journals and 43% in the top 10%). A number of prestigious national and European grants (ERC) have been acquired. In general, the amount of funding is considerable (approx. 50% self-funding). The 7 PIs listed in the self-evaluation report are very productive with an impressive scientific output and a significant number of grants.

Recommendations are to continue working at the highest ambition level and for the university to provide more funding options for pilot research.

#### Relevance to society

The relevance to society is very clear. Better imaging and navigation that is more accurate lead to less extensive interventions posing decreased burden on patients and producing better clinical outcomes. Virtually all the research performed within CMI has direct and important consequences for patient care. The researchers are clearly sensitive to the risk/benefit trade-off in relation to more versus less invasive imaging techniques. Particularly impressive examples include the NELSON lung cancer and the coronary calcium research programmes. Traditionally, it has close contacts with a number of imaging companies (e.g. Siemens/PUSH programme) and pharmaceutical companies, both 'big pharma' and small and medium sized companies. The first CMI spin-out company is being launched.

### Viability

CMI seems to be very viable in many ways, the research position of the programme being supported by high level equipment, strong ambition and strategic planning and oriented towards the future. However, the programme leaders state that progress is hampered by lack of supporting personnel and infrastructure and that continuity is jeopardised due to lack of subsequent academic positions for PhD students and shifts in external funding policies. The UMCG leadership is advised to discuss these views with CMI and take appropriate measures.

There are obviously many outreach activities and activities for the general public. Since causal therapies are currently available (or are becoming available) for the diseases studied, the translational aspects of the CMI research programme are clearly needed and have to be further supported.

## 8.4 Molecular Neuroscience and Ageing Research (MOLAR)

Programme leaders: Prof. dr. H.W.G.M. Boddeke, Prof. dr. J.D. Laman and Dr. E.F. de Vries

### Staff (2014)

- 5.75 FTE tenured staff
- 2.7 FTE postdocs
- 47 PhD students

### Mission/Objectives

The mission of MOLAR is to unravel the mechanisms underlying the ageing brain, in both normal brain ageing and age-related neurodegenerative diseases, and to translate these basic concepts into clinical practice. The overarching goal of MOLAR is to improve early diagnosis, monitoring and timely treatment of age-related neurodegenerative diseases.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

This research programme focuses on the process of brain ageing and on exploring new preventive, diagnostic and therapeutic strategies for neurodegenerative diseases: dietary supplements, drug development and the development of novel biotechnological tools, such as cell-based therapy. The level of research in this programme ranges from basic neuroscience to clinical research with the intention of using newly acquired scientific knowledge in the clinic.

There are three main lines of research:

1. Neurodegenerative diseases: a.) toxicity of aggregation-prone proteins, b.) neuro-inflammation;
2. Neuro-repair strategies (primarily multiple sclerosis);
3. Imaging of neurodegenerative diseases.

### Research quality

This programme has 19 PIs and 47 PhDs in different areas. The infrastructure of this programme is very good and all state-of-the-art techniques are available. The proportion of external funding is 50%. Currently, one ERC starting grant and one Vici grant have been acquired. Some of the newly recruited senior PIs have an impressive scientific output.

The research staff is rather small and relatively stable compared to the previous evaluation.

Potential opportunities for the future are due to the presence of the talented tenured staff.

However, the low number of non-tenured postdocs is a concern to be addressed in the near future.

### Relevance to society

This research topic is very relevant to society due to the expected increase in the number of people suffering from neurodegenerative diseases. Furthermore, novel insights into the process of ageing will help to decipher strategies for fighting neurodegeneration.

The staff of MOLAR have demonstrated the societal relevance of their research activities by participating in educational activities for the lay public and developing diagnostic tests. Three patent applications have been filed. Contacts with industry could be improved.

### Viability

It is a good idea to combine classical neurodegenerative disorders such as Alzheimer's Disease with classical neuro-inflammatory diseases such as MS within one programme. Furthermore, the combination of basic and clinical research is very good to excellent.

MOLAR is a backbone programme of BCN-BRAIN. Its viability is very good. Some elements of the SWOT self-analysis are debatable. For example, the well-known increasing demands from journals or the tediousness of IRBs should not be considered as threats nor do they hamper the competitiveness of MOLAR. They could also be listed under 'opportunities'.

The small number of staff might not be able to sustain the current percentage of external funding (approx. 50%). Opportunities to stabilize or even expand the external funding can be found in a stronger cooperation with biomedical companies and an increased drive to tap European funding agencies.

## 8.5 Perceptual and Cognitive Neuroscience (PCN)

Programme leaders: Dr. F.W. Cornelissen and Prof. dr. D. Başkent

### Staff (2014)

- 2.89 FTE tenured staff
- 2.25 FTE postdocs
- 23 PhD students

### Mission/Objectives

It is PCN's mission to study perceptual and cognitive aspects of ageing, with the ultimate aim of individuals and society benefiting from this research. PCN aims at promoting research, training, and funding opportunities, in line with this strategic overarching directive, narrowing the Healthy Ageing focus to the 'Ageing Brain'.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

Research in this programme aims at unravelling normal and impaired functioning of the human visual and auditory systems and the processing of this sensory information, i.e. the underlying cognitive processes. A special focus is on ageing.

There are two main research lines:

1. Sensory and cognitive systems throughout the lifespan (with focus on ageing);
2. Disease-related changes in sensory and cognitive systems, with a particular attention to ageing aspects.

The mission is clearly to perform translational research.

BCN-BRAIN-PCN is the result of the previous evaluation with a reorientation towards the strengths of the 'old' programme with specific research lines relevant to society. The strong age-related component fits very well into the general topic of the BCN-BRAIN Institute and the Healthy Ageing theme of UMCG/RUG.

### Research quality

PCN originally emerged from clinical ophthalmology and ENT (Ear Nose and Throat) departments. It is to be applauded that this developed into a truly translational research theme, keeping strong links with the clinic but driven by excellent neuroscientists. The infrastructure of this programme is very good and contains imaging facilities, eye tracking facilities and links with LifeLines.

PCN is relatively small. Nonetheless it has a very good research output and has acquired prestigious national and EU grants. For example, 95 refereed articles were published in 2014. The amount of funding is considerable (50% self-funding).

The three PIs listed in the self-assessment report are very productive, with an impressive scientific output.

#### Relevance to society

There is a high relevance of this research topic to society due to the many patients suffering from glaucoma, tinnitus, hearing impairment and/or receiving cochlear implants. The programme has worked on the development of diagnostic tools and algorithms. The combination of basic and clinical research is very good and ensures direct translation of findings to patient groups.

There is a visible contribution to public debates and activities. Obtaining reimbursement for cochlear implants in children is a significant achievement.

#### Viability

PCN is in a very good shape, but remains a small theme. The vulnerability of its small size is a threat for the future (see SWOT self-analysis). There are difficulties in recruiting highly specialised qualified staff and there is a lack of administrative support for writing complex grants.

One wonders whether the theme would benefit from increased critical mass, e.g. by forging stronger links with larger experimental psychology, neurology or cognitive neuroscience groups.

There is also a strong competition in acquiring external funding. In this respect, additional opportunities may be found in industry e.g. in the area of cochlear implants. An increased effort from the UMCG for funding pilot research and providing biostatistical support is recommended.

## 8.6 Translational Neuroscience (TN)

Programme leaders: Prof. dr. ir. N.M. Maurits and Dr. J. van der Naalt

### Staff (2014):

- 5.15 FTE tenured staff
- 0 FTE postdocs
- 36 PhD students

### Mission/Objectives:

TN's mission is to translate insights from research on age-related brain disorders into clinical neurological practice. TN, as part of BCN-BRAIN and focused on the 'Ageing Brain', aims at promoting research, training and funding that is in line with this strategic overarching directive.

### Scores

Research quality	2
Relevance to society	2
Viability	3

### Brief description

Research in this programme aims at bridging the gap between non-clinical studies and clinical studies on specific aspects of ageing of the CNS across the lifespan. The ultimate goal is to optimize health and patients' participation in daily life and to improve their quality of life at all stages, including the final stages of neurodegenerative diseases.

There are two main research lines:

1. Motor control and movement disorders;
2. Neurological damage: long-term outcome and its determinants.

### Research quality

This programme encompasses 21 PIs and 34 PhDs in various areas, who generated 126 refereed articles in 2014. The amount of external funding is considerable (50% self-funding). The Q analysis of refereed publications gives a Q1 of 64%, which is below average. The three PIs listed in the self-assessment report are very productive with a good scientific output and significant own funding.

TN is a young and small theme, the translational aspects of which remain quite vague. While more focus has been achieved since the previous assessment, there still is a highly mixed bag of diseases and conditions that are explored which lack homogeneity or a central theme. More focus seems to be mandatory. Moreover, no clear bench-to-bed research line is visible and this should be improved and/or made more visible. Quality and quantity of research output is good to very good, given the limited number of staff and resources. However, there is a clear weakness and threat in the time allowed for research relative to clinical duties.

### Relevance to society

There is major relevance of this research topic to society due to the many patients suffering from movement disorders such as Parkinson's Disease, dystonia and ataxia.

The programme has worked on the development of diagnostic tools, clinical guidelines and technical applications. In this area, the programme is very visible. Furthermore, numerous educational, organisational and outreach activities have been documented, which could be expanded.

### Viability

The major issue is a lack of critical mass. The absence of postdocs and the apparent difficulties in attracting young and outstanding researchers is a concern. TN continues to suffer from the UMCG's focus on PhD programmes at the expense of funding postdoc positions. The observed imbalance between time for research and clinical duties for the clinician PIs may be a threat for the future viability of TN. The group has to think about a focus in topics, as so many pathologies are included in different domains, taking into account the competition in acquiring funding. If these issues can be fully or partially remediated, the viability is good.

## 9. Science in Healthy Ageing & Healthcare (SHARE)

### 9.1 SHARE- Institute

Director: Prof. dr. M.J. Postma

#### Staff (2014):

- 25.9 FTE tenured staff
- 33 FTE postdocs
- 289 PhD students

#### Mission/Objectives:

To identify and understand determinants and consequences of illness and ageing, quality of life, care and cure, conducted within multiple interdisciplinary programmes, to elucidate factors related to health, notably Healthy Ageing.

The institute investigates and evaluates factors that are patient-related and/or healthcare-system-related. It aims to add to knowledge on adaptation to disease and societal participation of patients with chronic somatic and mental disease and on cost-effectiveness and efficacy of pharmaceutical, medical and psychosocial interventions.

#### Scores

Research quality	2
Relevance to society	2
Viability	2

#### Brief description

SHARE (Science in Healthy Ageing and Healthcare) is a research institute comprising research groups from the UMCG and the FMNS, with in total six programmes/themes. The assessments of two of the SHARE institute's programmes (HPR and ROADH) were provided to the Board of the University in a confidential letter, because these programmes are relatively small and/or new.

The research agenda is strongly linked to the Healthy Ageing theme. Multidisciplinary research is performed under the very broad umbrella of health, Healthy Ageing, and healthcare. SHARE seems to be more of a network, supporting and providing certain infrastructures to the various programmes, than a strong institutional body with a clear identity.

The goals of SHARE are to understand mechanisms underlying the development of disease, develop methods for early detection, develop interventions to reduce illness and develop analytical methods and tools. Within SHARE both observational and experimental studies on humans are performed. Goals also include health services and health economics research.

Healthy Ageing, including life-course studies, is a core theme of research, although the various programmes have adopted this theme to varying degrees. Extensive use is made of the population and patient cohorts set up by the UMCG and FMNS, and members of SHARE have participated intensively in the creation and maintenance of research infrastructure.

The total staff is around 60 tenured staff/postdocs and more than 280 PhD students. The previous PRC gave very high scores, but had several recommendations, e.g. regarding postdoc involvement, internationalisation and attracting research master's students.

### Research quality

As specified in the assessments of various programmes, the overall research production is at a high scientific level. Research has increased significantly according to various metrics: research output, refereed articles, PhD theses, research staff and funding. There has also been an impressive increase in quality regarding the Q analysis and MNCS score. This is also reflected by a strong recognition by peers internationally.

Total number of refereed articles has grown considerably during the assessment period (680 in 2014), and the number of PhD theses has also increased (50 in 2014). Around 70% of publications are in Q1 and around 30% in the Top 10; both indicators were stable during the assessment period. The level of external funding has doubled during the assessment period, and several programme members have received highly competitive scientific awards.

Major collaborations are mentioned, but these are related to individual programmes. One has the feeling that the SHARE leadership could take a somewhat stronger role in coordinating the programmes, with some “transverse” structure development across the rather independent programmes.

### Relevance to society

SHARE has a high societal relevance. All programmes have adopted the Healthy Ageing focus in their strategy, although from various angles and with varying levels of ambition. Life-course studies and disease prevention at all ages are core themes in many research groups.

The programme has strong and close links to policy and practice. Research is performed in close contact with clinical practice, health services, the social insurance system and other societal functions. Many of the researchers have combined posts in healthcare practice and services. Many of the team members have influential roles in national and international societies and organisations, including national policy and practice-oriented functions. Support for guidelines, national strategies, production of educational material and participation in debates is mentioned at an impressive level. Overall, however, the SHARE institute seems to lack high visibility within Dutch society. The SHARE institute should be more visible: a kind of trademark and an important and recognised facilitator to channel the UMCG research efforts in healthcare to society.

### Viability

The institute has gone through some changes since the last assessment, but has basically retained its mission and profile, and that process seems to have been very successful. The number of tenured staff has increased, the level of external funding has increased, and overall, there seems to be strong leadership and enthusiasm among the programmes to further develop research, PhD training and dissemination of knowledge. All in all, there is a good basis for further development and future scientific research.

The institute capitalises on multidisciplinary competence and research collaboration, and this should continue. However, some programmes (e.g. the programmes with a limited number of tenured staff) could benefit from a stronger focus and closer collaborations or from merging of groups to achieve critical mass and ensure sustainability.

A number of leaders in the field have left and the successors have yet to develop track records. Competent successors have to be found to continue specific topics in some of the programmes with a limited number of tenured staff.

And finally, as mentioned previously, the SHARE leadership could take a somewhat stronger role in coordinating the programmes, with some “transverse” structure across the rather independent programmes.

## 9.2 Extremities, Pain and Disability (EXPAND) - Smart Movements (SMART): the MOVEMENT theme

Programme leaders: Prof. dr. J.H.B. Geertzen, Prof. dr. C.K. van der Sluis, Prof. dr. C. Visscher, Prof. dr. L.H.V. van der Woude and Prof. dr. T. Hortobahyi.

### Staff (2014)

- 5.1 FTE tenured staff
- 0.9 FTE postdocs
- 68 PhD students

### Mission/Objectives

The aim of the MOVEMENT theme is to conduct high-quality multidisciplinary research on how movement and regular motor activity act as restorative, preventative and performance-enhancing agents for motor and cognitive function across the lifespan and to develop effective interventions for improving health and quality of life through the effects of movement.

### Scores

Research quality	3
Relevance to society	2
Viability	2

### Brief description

The collaboration between SMART and EXPAND is logical and offers a mutual benefit. This rationalisation and integration has been realised to address the remarks of the previous review. The MOVEMENT theme has emerged logically and appears to be a sensible research grouping, with a clearly described set of topics, objectives and a well-stipulated strategy.

Beyond the study of healthy movement, the focus in the theme is on two groups of patients: (1) disorders and amputations of the extremities and (2) chronic pain. The idea that “exercise is medicine” is key to many health problems in society and is thus extremely relevant. The assessment below applies to both groups without differentiating between them.

### Research quality

There has been a clear increase over the years in research quality and quantity. Moreover, funding has increased four-fold since 2009 and the reliance on direct funding has decreased from 79% to 34%. As indicated, the quality of the research output has also improved significantly, with the proportion of Q1 publications steadily increasing from 39% in 2009 to 71% in 2014. Overall, this represents a striking improvement since the last assessment period, but the MNCS still performs around the world average and below the current UMCG goal. To strengthen the impact of the research, the group could promote joint PhDs with leading external institutes, with clear criteria concerning collaboration (quality). It is also important to increase the number of postdoc positions.

Finally, to create a stronger integrated theoretical perspective and focus, the link between EXPAND and SMART (and SPRINT) should be promoted in the future.

### Relevance to society

The impact and output of the MOVEMENT theme in the societal context is indeed clearly visible and growing. In many countries movement and health promotion are top priorities, and this programme contributes to smart technical innovations in this field.

EXPAND is also growing in the societal context. The following features are impressive: public engagement due to a wide variety of appearances, the development of evidence-based guidelines, the development of the internationally used Interval Shuttle Run Test (ISRT), development of interventions (e.g. apps to help people using a prosthesis) and the submission of a patent application for a leg prosthesis with improved balance. To ensure success, particularly of SPRINT, strong collaborations with engineers are also advised.

The application of research findings in practice, one the programme's aims, is also demonstrated by the significant contributions of the programme leadership to professional and societal target groups.

### Viability

This is a very active, motivated and productive group of researchers working around a very relevant scientific and social theme. As society is adapting to demographic changes, more and more research will be necessary in the field of Healthy Ageing. MOVEMENT is strongly embedded in this university-wide theme. Prevention of disorders such as cardiovascular disease and musculoskeletal pathologies will be a major focus in the future and could also be integrated in the MOVEMENT theme.

As the PIs identified in their SWOT analysis in the self-assessment report, the MOVEMENT theme is built mainly on collaboration between individual PIs and shared topic areas. They noted that collaboration at the theme level requires further development to create a strong, integrated theoretical perspective and focus.

The SWOT analysis also mentioned a low percentage of funding from research grants. The PRC recommends a focus on obtaining these research grants in the future, even though the theme has already seen a significant decrease in dependence on direct funding. The important role in national programmes and the strong collaboration with national and international institutes should enable the theme to continue to attract funding from grants and other external sources.

### 9.3 Interdisciplinary Centre Psychopathology and Emotion Regulation (ICPE)

Programme leaders: Prof. dr. A.J. Oldehinkel, Prof. dr. P.de Jonge and Prof. dr. A. Aleman

#### Staff (2014)

- 4.9 FTE tenured staff
- 10.6 FTE postdocs
- 52 PhD students

#### Mission/Objectives

The Interdisciplinary Centre Psychopathology and Emotion regulation (ICPE) aims to perform high-quality interdisciplinary research on psychobiological processes involved in the onset and course of mood-related problems, in order to develop effective personalised interventions to improve social-emotional functioning. Major objectives are: (1) to better understand which factors contribute to the onset and course of mood-related problems and how these factors vary across individuals; and (2) to use this knowledge to develop effective personalised interventions to prevent and treat emotional dysregulation.

#### Scores

Research quality	1
Relevance to society	1
Viability	1

#### Brief description

ICPE is an interdisciplinary programme consisting of researchers in psychology, psychiatry, sociology, family medicine, philosophy and other fields, and focusing on mental health problems, in particular affective disorders. The overall aim of ICPE is to conduct interdisciplinary research that contributes to understanding of causes, course, prognosis and possibilities to intervene in the development of affective disorder and other mood related problems. The ultimate aim is to develop and evaluate personalised intervention to prevent and treat mental health problems.

The team works in different areas: longitudinal studies on risk factors and prognosis for affective problems, fundamental studies on brain processes, development of measurement instruments, development and evaluation of interventions. The team consists of 15 PIs and currently 50 PhDs, a number that has more than doubled during the assessment period.

#### Research quality

In the previous assessments, the programme received an ‘excellent’ rating, with some suggestions on which they have clearly worked, e.g. to strengthen links with primary care.

Total research funding has increased steadily over the last six years. The group has received highly competitive research grants and contract funding, with substantial amounts from both types of sources. This illustrates that excellent science can be combined with societally relevant work. The major NWO Vici research grants acquired by the three programme leaders are particularly impressive. Peer recognition is also very high.

The quality of research output has been excellent and consistent. Bibliometric indicators are particularly strong. The number of refereed articles has more than doubled during the assessment period, with 100-150 papers/year during the past years. Around 80% are published in Q1 journals, and 30-50% in the top 10%. The number of citations per paper is high (over 12) and the MNCS is 1.9.

Collaboration is strong, and the team has been able to attract prominent researchers from various departments at the university. They collaborate closely with researchers from strong environments in the Netherlands and other countries. The programme makes fruitful use of several cohorts, such as TRAILS, NESDA and LifeLines; the group has clearly adopted the Healthy Ageing perspective.

#### Relevance to society

The relevance to society is very clear. Particularly notable were:

1. Press releases for all PhD theses;
2. TV programmes, YouTube channels, books and lectures for the general public;
3. Use of crowdsourcing to involve the participation of the general public in research;
4. Development of interventions (e.g. apps to help people overcome anxiety).

Members of the team hold a number of positions in professional and public societies related to psychiatry and mental health. The team has strong contacts with healthcare providers and patient organisations. They have published papers, books and reports on mental health issues directed at the general public and have been active in increasing knowledge and reducing stigma of mental health problems. Members of the team have also been active in lecturing at public meetings, and have shared knowledge in public media, including a TV series on mental health, a Twitter page, and various other types of dissemination.

The detailed description of activities of some of the senior researchers is impressive, e.g. a book which has sold 40,000 copies and has been translated into various languages, as well as features in daily newspapers, radio and TV. “How nuts are the Dutch” is also a very impressive development with clear societal impact.

#### Viability

ICPE has grown significantly over the past six years and is in a very healthy state. The three programme leaders appear to be doing an excellent job. The programme has been very successful in focusing on an area of high scientific and societal relevance. They have managed this in a very fruitful way, achieving a high level of external funding, comprising both highly competitive sources and contract grants. They have apparently created an attractive environment and have been able to recruit new scientists from various fields. Not only has the level of tenured staff increased considerably, but the number of postdocs has also increased, thus assuring growth in terms of younger scientists.

There is a proposal to improve patient care for patients with affective disorders and other mood-related problems with specific personalised perspectives. This represents an important development in their research paradigm. We encourage pursuit of this exciting and important new goal.

The ICPE is an outstanding, internationally recognised research group. The only significant risk to continued success is a lack of structural budget. There is a relative lack of structural research capacity at the level of assistant and associate professors. Also, outflow of high-quality staff due to temporary appointments is an area that requires attention. Resolving these issues would appear essential to ensure the future viability of this very successful research grouping.

## 9.4 Methods in Medicines Evaluation and Outcomes of Research (M2O) - Life Course Epidemiology (LCE)

Programme leaders: Prof. dr. P. Denig, Prof. dr. E. Hak and Dr. H. Burger

### Staff (2014)

- 6.6 FTE tenured staff
- 7.7 FTE postdocs
- 65 PhD students

### Mission/Objectives

The overall mission of the M2O/LCE theme is to increase our understanding of the progression and treatment of diseases – including multifactorial diseases – in actual practice and add to the optimal use of treatment and prevention strategies, all as part of Healthy Ageing. With the focus on prevention of disease and disease complications, and on improving medication therapy management and safety, the aim is to contribute to the broader RUG research theme of Healthy Ageing.

### Scores

Research quality	2
Relevance to society	2
Viability	2

### Brief description

The M2O/LCE theme is a relatively new programme. It integrates research activities from the UMCG (Department of Clinical Pharmacy & Pharmacology, Department of General Practice, units of Life Course Epidemiology, Health Technology Assessment, Medical Statistics) with activities from GRIP (Pharmacoepidemiology & Pharmacoeconomics, Pharmacotherapy & Pharmaceutical Care) in the areas of research into pharmacoepidemiology, health services research, clinical epidemiology and pharmacoeconomics.

The theme comprises two programmes, one addressing use of drugs and measurement of outcomes (M2O), and one addressing risk factors and exposures (LCE). It evolved from EBM-P (Evidence-based medicine in practice), which was favourably assessed before, in response to suggestions that the two areas should complement each other. The self-assessment could be more convincing in terms of the added value of the merger of M2O and LCE.

Five research topics are listed. 1) Pharmacoepidemiology with focus on treatment effects, 2) Prognosis and outcome assessments based on existing cohorts and databases, 3) Development of personalised treatment and tailored interventions, 4) Medication safety and medication errors, 5) Health economics, regulations and pharmacovigilance.

The programme aims to contribute to improving medical practice, health services and healthcare monitoring. It has been successful in using several of the existing cohorts and infrastructures at the university. There is a strong focus on strategic collaboration with various departments at both

UMCG and GRIP, as well as with other groups in the Netherlands. Collaboration with pharmaceutical companies is strong, notably in pharmacoeconomics.

There is ample use of longitudinal observational databases. Secondary analyses of existing clinical trial data to optimise their use in practice, conduct of pragmatic trials and surveys are also included.

### Research quality

The team has the ambition to contribute substantially to important aspects of healthcare delivery and patient outcomes. It has a valuable multidisciplinary composition, and strategic collaboration, both within and outside the university, is well planned. The number of tenured staff has increased from 11 to 22 during the period, and number of PhDs from 38 to 65. The number of PhD theses is around 7 per year, with a peak of 16 in 2013.

The research quality is impressive. In 2014 they doubled the number of peer-reviewed publications compared with 2009. Similarly, research income has doubled over the same period. The quality of research output is generally very good. The percentage of Q1 output has averaged around 70%, with a high proportion in the top 10%. MNCS=1.45.

Bibliometric analysis, however, shows some variability across the group. Publication and citation performance indicators, both quantitative and qualitative, range from good to excellent. In 2014, 36% of the papers were published in the top 10% segment, mainly driven by the ‘cardiac & cardiovascular systems’ and ‘medicine, general & internal’ domains.

The programme has a high and increasing level of external funding.

### Relevance to society

The relevance to society is very clear; the examples of vaccination scheduling and risk factor monitoring are particularly impressive. The programme addresses important questions for health services and healthcare planning. Collaboration with health services and companies is strong. Six spin-out companies have originated from the group. Group members have developed educational modules and feedback materials for GPs and others. They have advised the Dutch Government on the reimbursement and introduction of new drugs and vaccines. Also, they have made contributions to multidisciplinary and evidence-based guidelines. They have provided annual feedback/audit reports on diabetes care to all GPs in the region. Of special interest for society are pharmacoepidemiology and pharmacoeconomics; the team’s ambition to develop these areas is laudable.

The Healthy Ageing perspective is well-covered: Lifelong vaccination (M2O), Quality of life and optimal treatment in chronic disease (M2O) and Generational cohorts (LCE). The links with innovative data platforms such as LifeLines or GIANTT for the research activities are also impressive.

### Viability

This is a strong multi-disciplinary research grouping that tackles key societal issues. The group appears to be well managed and the research outputs are impressive. The programme has increased in terms of staff, PhDs and external funding. The level of external funding is good. The

team has shown a good capacity to collaborate and to join forces with other groups within as well as outside Groningen. The group has a very impressive number of PhD students but a relatively low number of tenured research staff and postdocs (6.6 and 7.7, respectively, in 2014).

The PRC wants to make three recommendations/observations to improve the viability of the programme:

- LCE could collaborate effectively with other programmes in SHARE that have an epidemiological perspective;
- One could also imagine that M2O could exist as part of GUIDE, but the case for inclusion in SHARE was persuasive;
- In their SWOT analysis, the group identified the lack of structural funding as a key weakness/threat e.g. for maintenance of longitudinal cohorts and data management, putting a high burden on postdocs and staff to perform duties not directly resulting in personal output. Resolving this issue would appear essential to ensure the future viability of this successful research group.

## 9.5 Public Health Research (PHR)

Programme leaders: Prof. dr. S.A. Reijneveld and Prof. dr. U. Bültmann

### Staff (2014)

- 3.8 FTE tenured staff
- 8.9 FTE postdocs
- 53 PhD students

### Mission/Objectives

The mission of the Public Health Research (PHR) programme is to contribute to the Healthy Ageing theme of the RUG over the life course. The ultimate goal of the programme is to contribute to Healthy Ageing by excellent research focussing on prediction and early detection of deteriorating health and disease and on social participation in case of health problems

### Scores

Research quality	3
Relevance to society	2
Viability	2

### Brief description

The research of PHR is highly multidisciplinary in nature; social scientists and health scientists cooperate with clinical groups (e.g. orthopaedic surgery, sports medicine, psychiatry, paediatrics and oncology). It is coordinated by the Department of Community and Occupational Medicine, and thus has a public health and community orientation focusing on youth, working people and older adults. Another multidisciplinary aspect concerns the close links with preventive and public health services of the community.

The number of tenured staff has been stable during the assessment period, but the number of postdocs has increased

There is strong collaboration with several international partners, in particular in Denmark, Central and Southern Europe, the USA, Australia and Canada.

### Research quality

During the assessment period, the production of papers by the program increased by half, from 66 to about 95 refereed articles per year. The number of PhD theses is high, given the number of tenured staff, and has increased to over 10/year in recent years. Publications from the group cover a variety of research problems and some have a considerable number of citations, although only one of them above 50. Papers are mostly in clinical or public health journals with a moderate impact factor, although some were published in high-impact journals. Bibliometric indicators have increased considerably during the assessment period, with around 70% of papers in Q1, and 25-30% in the top 10%. The group should have the potential (and ambition) to publish in journals with higher impact. Perhaps it should also consider a stronger focus on fewer research topics in order to establish a world leading position in these selected research areas.

The share of external funding of the programme has increased during the review period and has stabilised at about 70%. Funding has been acquired from national, EU and other sources. The level of collaboration has increased since the last assessment, and the programme has reported valuable collaborations both within the Netherlands and internationally.

#### Relevance to society

The research areas addressed are closely related to policy or clinically relevant problems. The ambition to focus more on primary care is highly relevant. Senior researchers have strong contacts with national and international professional societies and organisations related to development of policy and practice. Many of the researchers have clinical positions in or connections with community health organisations. Members of the team have advisory roles in a number of national and international organisations, and collaborate with various Dutch institutions such as the National Healthcare Institute (ZIN), insurers and occupational health organisations. They have been active in a number of ways to disseminate science: books and articles in Dutch, lectures and other media. Thus, the programme has been successful in identifying and addressing societal needs, catching up with patient needs, civil society demands and to outreaching research results in valorisation trajectories. The societal impact of the programme has been further strengthened with the initiation of Academic Collaborative Centres (ACC), in which researchers meet patients, healthcare professionals and other stakeholders. It is notable that the PHR has developed an impressive and sustainable structure to enhance the research capacity for public health in Central Europe; it has trained 25 PhD graduates who have continued to work in Central Europe.

While the societal impact is impressive and relevant, it may be difficult in the long run to sustain an active presence in so many societal arenas, so the groups might consider a narrower focus.

#### Viability

The programme has an ambitious vision, although the various interests and competence areas might benefit from better alignment and by focusing on a few central research areas. The level of funding has increased in recent years. The high number of PhDs theses and the high number of postdocs in relation to tenured staff indicate good viability. Especially impressive is the strong increase in number of postdocs, while the number of tenured staff has been stable. However, the programme may be vulnerable in having a very small number of FTE core staff. The PHR also identified the following limitations: (a) a limited structural research capacity at the level of assistant/associate professors and (b) lack of permanent post-doc capacity. The number of PhDs is impressive, although PHR needs to reconsider whether this is sustainable in the long run. It should carefully weigh the time and effort required for training versus that required to strengthen core staff and increase high-impact publications.

The programme states in the SWOT self-assessment that the strong clinical and societal impact may compromise possibilities to obtain highly competitive funding and generate high-impact publications. However, there is evidence, also from other groups at the UMCG, that this may not be a direct trade-off.

## 10. The Graduate School of Medical Sciences (GSMS)

Graduate training at the University of Groningen is organised so that each of the ten faculties has its own graduate school. Thus PhD training at UMCG is organised through the Graduate School of Medical Sciences (GSMS), which was established in 2009. The present Director was appointed in 2012.

- *The institutional context of the PhD programmes*

GSMS aims to train and educate excellent researchers in the medical sciences and prepare them for careers in both academia and society. The UMCG believes that their PhD students are a vital part of the research capacity of the UMCG institutes and contribute at a high level to their scientific quality. The overall impression of the PRC is that GSMS is extremely well organised, with strong outcomes for the PhD students.

There is a strong collaboration with the Faculty of Mathematics and Natural Sciences (FMNS), which is reflected in the interconnection of research institutes (GUIDE, SHARE) and research programmes. The Graduate School of Science that organises the FMNS PhD training was not assessed as part of this review.

The GSMS responsibilities include admission of PhD students, organising courses, monitoring student progress (using a web-based application *Hora Finita*) and making the final assessment of the thesis. GSMS also shares responsibility for certain research master's programmes. In 2014, 180 PhD students were enrolled, and the total number of PhD students is in excess of 1000.

- *The selection and admission procedure*

Apart from regular admission routes, in particular from UMCG and FMNS master's programmes, the school has a strong internationalisation policy by offering scholarships and sandwich PhD positions to international students who are recruited and selected from strategic partners through the Abel Tasman Talent Programme (ATTP). An additional category involves 'industry' PhD students who work part-time at a company. Another entry route is an impressive MD/PhD programme, in which medical students do two years of their research in an integrated and extended undergraduate medical programme and then complete their project with a further two years in a PhD position.

The primary criteria for acceptance seem to be that the applicant can present a research project and the willingness of two qualified PIs to be supervisors. Admission has to be approved by the Director of the GSMS, but not the individual PhD project. Advertising of available positions is limited. Recruitment is primarily through contact of the student with the PI.

Most PhD students are RUG employees with salaries/stipends, but it is also possible to be admitted on the basis of "self-acquired funding". This may result in substantial differences in the remuneration received by various categories of PhD students.

- *The programme content and structure*

The nominal length of the PhD study is (as for other Dutch PhD programmes) four years. For students who have completed a research master's programme, the length is three years. The

GSMS programme is very attractive and well-structured and provides an impressive range of relevant courses, hands-on practical training and in-depth research experience. The importance of research integrity is embedded in the programme by a mandatory course on this topic and the formal commitment by every PhD student to the Netherlands Code of Conduct for Scientific Practice. PhD students are expected to participate in courses and other activities not directly related to their project corresponding to 30 ECTS, but this is less for students admitted from research master's programmes and for MD/PhD students.

- *Supervision and the effectiveness of the programme plans and supervision plans*

The supervision, tracking and monitoring of PhD students and the progress of their projects seem to be in order, although in a recent university-wide survey a number of students cited problems with supervision as a reason for considering quitting their PhD programme. That survey also showed that 20% of the students were critical about the quality of the supervision. This emphasises the need for the one-day supervisor course that has recently been introduced (2014) by the GSMS. It is the intention that all supervisors, including senior researchers, should take this course. Supervision is supplemented with an adviser (mentor), who meets with students once or twice a year for a confidential discussion on their progress.

- *Quality assurance*

The PRC has the general impression that GSMS PhD students meet a high standard, although most admissions seem to be only based on the recommendation of the potential supervisors, which is in contrast to procedures at many international graduate schools. The contents and teachers of all courses are evaluated by students and course coordinators and are reviewed by members of the Education Committee (EC), which consists of students and PIs.

The primary quality assurance of the progress of PhD students is through regular meetings with the supervisors and monitoring through the *Hora Finita* website, but it is not clear how the GSMS Director is able to evaluate these data. There are bi-annual surveys of student opinions.

The PhD thesis has to be approved by a committee of three members, of whom one is external to RUG. There are no fixed requirements, but according to the GSMS website the thesis should demonstrate that the student is an excellent, independent and trusted researcher; normally two published manuscripts are needed, but the average is more than four papers/manuscripts, sometimes even six. Examination of the published PhD theses supports the statement that a high proportion (70%) of the work is published in high-quality (Q1) journals and indicates a quality that compares favourably internationally with other graduate schools.

A particular feature of PhD assessment in the Dutch system is the ceremonial nature of the defence, which precludes intensive scientific discussion. Thus, in practice, the assessment of the thesis is a written procedure alone and does not allow the PhD student to demonstrate oral skills, or indeed to confirm that he/she is fully conversant with all aspects of the thesis. The GSMS could consider including an additional activity to precede the PhD defence. The event could include presentations by the PhD student and the external examiners of their own work, and thus allow for more discussion and interaction.

- *Guidance of PhD candidates regarding the job market and relevance to society*

GSMS aspires to provide a well-organised, coherent, and productive research environment in which PhD candidates are trained to become independent researchers and to develop a wide range of additional, high level skills relevant to and of enduring value for both academia and society. Concerning graduate employment, a high percentage of the graduates find jobs in healthcare, academic research or industry. However, the numbers are rather rough and this emphasises the need for the alumni tracking system that has recently been set up. Despite the aspirations, discussions that the PRC had with selected PhD students indicated that the career guidance in the PhD programme is rather limited.

- *Duration, success rate, exit numbers and career prospects*

The median time from enrolment to defence is about 4.6 years. This is consistent with the Dutch 4-year PhD programme, but by international comparison, this is rather long. More than 20% have not completed their thesis after 7 years, which is clearly unsatisfactory.

- *Viability*

GSMS foresees that the number of enrolments will remain roughly constant over the next assessment period. It will be important to ensure that the programme continues to increase its relevance for employment outside of academia, in particular industry and other businesses. Increased career guidance is recommended. It will also be important to ensure that the healthcare sector continues to find PhD training important for their employees.

### Recommendations

The PRC has a most favourable impression of the high quality of the GSMS, particularly taking into account that it started only in 2009. The PRC has the following recommendations:

1. The visibility of the GSMS PhD programme to potential PhD students could be improved by more advertising in appropriate national and international media.
2. To ensure that PhD projects are feasible within the time-frame of the 4-year PhD programme, it should be a condition of enrolment that the project has been evaluated and approved by independent experts.
3. The programme of activities not directly related to the research project with 30 ECTS is impressive, but it needs to be ensured that PhD students see the relevance of this as regards development of the competences they will need in their future careers.
4. Improved possibilities for the Director to track the progress of PhD students should be provided.
5. The GSMS should continue to expand their supervision course programme to ensure that all supervisors participate.

6. Efforts should be made to ensure that PhD projects do not greatly exceed the nominal 4-year limit. To maintain the high productivity of PhD projects, more PhD graduates could be given a postgraduate position to complete their investigations.
7. The scientific value of the defence could be improved by supplementing the traditional ceremony with a prior scientific event in which the external examiners have the option of holding a public discussion of the project with the PhD student.
8. More emphasis should be placed on career guidance. As an example, the GSMS could consider the ASPIRE programme at Vanderbilt University. This should be supplemented by having an external board of advisers from employer organisations including the health sector to ensure that the PhD programme corresponds to employers' needs. Efforts to improve the alumni tracking system should be continued.
9. Consider appointing a chair of the Education Committee who is independent of the school's management.

## Annex A – Terms of reference research assessment

The board of the University of Groningen, also on behalf of the board of the University Medical Centre Groningen (UMCG), hereby issues the following Terms of Reference to the committee assessing the Medical Sciences and Pharmacy research at the UMCG and the embedded research of the University's Faculty of Mathematics & Natural Sciences (FMNS) that is part of the Groningen Research Institute of Pharmacy (GRIP).

### Assessment

You are requested to assess the quality and relevance to society of the research conducted by the five Groningen research institutes and their 30 programmes/themes described in the appendix below [not added], as well as their strategic targets and the extent to which they are equipped to achieve them. You should do so by judging the units' performance on the three assessment criteria outlined in the national Standard Evaluation Protocol 2015-2021 (SEP):

- *Research quality*
- *Relevance to society*
- *Viability*

Please take into account current international trends and developments in science and society in your evaluation. For a description of these criteria, see section 2 of the SEP. Please provide a written assessment on each of the three criteria for each research unit (both institutes and programmes/themes), supplemented by a quantitative score at programme/theme level only, using the discrete scale (1, 2, 3 or 4) prescribed by the SEP. Please provide recommendations for improvement as well.

In addition, we would like your report to provide a qualitative assessment of each unit's *strategic targets* and *governance and leadership skills* of the management, including any recommendations for improvement you may have. Besides assessments of the individual research units, we ask you to pay special attention to *strategic recommendations for the Groningen Medical Sciences and Pharmacy* as a whole, in relation to its national and international position.

In accordance with the SEP, please also reflect on the following two aspects in your report:

- *PhD programmes;*
- *Research integrity.*

You are requested to give your expert opinion on the supervision and instruction of PhD candidates, including the institutional context of the PhD programme, the selection and admission procedures, the programme content, structure and effectiveness in relation to supervision, quality assurance, guidance of PhD candidates to the job market, duration, success rate, exit numbers, and career prospects. The information needed for this part will be provided largely by the UMCG based Graduate School Medical Sciences (GSMS). However, the research environment is provided by the institutes and programmes/themes, whose contribution may be considered as well.

In addition to the questions above that are prescribed by the SEP, we would like you to also answer the next two questions:

- A. To what extent do you think the UMCG strategy to focus on the (University wide) societal theme ‘*Healthy Ageing*’ and to stimulate Internationalisation has been adopted by the individual research units?
- B. Please provide a qualitative assessment of the Institute of Pharmacy (GRIP) of the Faculty of Mathematics and Natural Sciences (strategic targets, governance and leadership skills of the institutes management and comment on the quality and visibility of the FMNS/GRIP research and its researchers embedded in the UMCG research).

Finally, four programmes to be evaluated are relatively small and/or new: SHARE’s HPR and ROADH, and REGENERATE and MOHOF of the Kolff institute. We kindly request to provide your assessment of these four units in a confidential management letter. In accordance with our Groningen Research Assessment Protocol (GRAP2), this is to ensure that “*Sensitive information that might harm the privacy of individuals or ..... can be provided in a confidential management letter, either at the PRC’s own initiative or at the request of the Board.*”

### **Documentation**

The necessary documentation will be available on a secure website no later than 6 weeks before your site visit to Groningen. The documents will include at least the following:

- Self-evaluation reports of each unit of assessment plus the appendices prescribed by the SEP (appendix D) [not added]
- A self-evaluation report of the Institute of Pharmacy and a factsheet clarifying the involvement of FMNS/GRIP researchers in the UMCG programmes.
- These Terms of Reference
- The Standard Evaluation Protocol 2015 – 2021
- The most relevant parts of the GRAP
- The (draft) programme for the site visit (already approved by the Chair of your committee)
- Short CV’s of all committee members and the secretary
- Background documentation on Research Integrity and Data Management Policy

### **Preparation, site visit and follow up**

Interviews of the committee with the research units will take place in Groningen and have been scheduled from 15-17 February, 2016. The secretary of the committee will contact you about logistical matters no later than 2 months prior to the site visit. Given the number of research units, the diversity of (sub)fields to be covered and the programme drafted for the site visit, your evaluation will require substantial preparation prior to the site visit, a division of labour between subcommittees and individual members, and some time investment following the visit. This has been taken into account in your compensation, which is based on approximately 6 (GUIDE) or 5 (other units) days for each member, 20 days for the Chair and 25 days for the secretary. Your Chair will bear final responsibility for a balanced division of tasks and comparable judgements and scores, assisted by the secretary and in consultation with the UMCG coordinator.

### **Statement of impartiality**

Before embarking on your assessment work, you will be asked to sign a statement of impartiality. In this statement, you declare that you have no direct relationship or connection with the research units mentioned in the appendix [see Annex C] below.

**Assessment report**

We ask you to report your findings in an assessment report drawn up in accordance with the SEP guidelines and format. You are expected to send the relevant sections of the draft report to the UMCG coordinator no more than 6 weeks after the site visit. Each research unit will check its own part of the report for factual inaccuracies. If such inaccuracies are detected, you will see that they are corrected. You will then send the corrected version of the assessment report to the Board of the University of Groningen, upon which your committee will be discharged (before May 2016).

28 September 2015

## **Annex B – Curricula vitae of the committee**

### Chair & Secretary

#### **Prof. dr. Daan J.A. Crommelin**

Daan Crommelin is professor emeritus at the Department of Pharmaceutics at Utrecht University. Until December 2011 he was scientific director of the Dutch Top Institute Pharma in Leiden. He is adjunct professor at the Department of Pharmaceutics and Pharmaceutical Chemistry at the University of Utah. Crommelin is co-founder of OctoPlus, a Leiden based company specialised in the development of pharmaceutical (mainly protein based) product formulations and advanced drug delivery systems. He published extensively and is on the editorial board of 10 peer reviewed journals in the pharmaceutical sciences. He is Editor-in-Chief of the AAPS book series ‘Advances in the Pharmaceutical Sciences’. He advises venture capital groups and acts as consultant. He chairs the UCAB Foundation: the Utrecht Centre of Excellence for Affordable Biotherapeutics, a WHO supported initiative. He chaired the Board of Pharmaceutical Sciences of the International Pharmaceutical Federation (F.I.P.), was chair of the organizing committee of the Pharmaceutical Sciences World Conference 2007 in Amsterdam. He is past president of the European Federation of Pharmaceutical Sciences (EUFEPS) and past vice-chair of the scientific advisory board of the European Innovative Medicines Initiative (IMI).

#### **Dr. Pieter Stolk**

Pieter Stolk has a PharmD degree (2003) and PhD degree (2008) from Utrecht University, The Netherlands. After finishing his PhD, he has worked in a strategy & business development position at TI Pharma, a large public-private partnership in The Netherlands. In 2010 he co-founded a consultancy firm and in this capacity works for NGOs, governments, companies and research organisations in the life sciences field; primarily in business development, value creation and project management roles. One of his key areas of interest is the regulatory system for medicines.

### GRCG subcommittee

#### **Prof. dr. Cristiana Sessa**

Professor Cristiana Sessa graduated in Medicine and Surgery at the University of Milan in 1978, followed by a Degree in Pharmacology at the Mario Negri Institute of Milan in 1981, Specialisation in Obstetrics and Gynaecology at the University of Verona in 1983, Diploma in Palliative Medicine at the College of Medicine of University of Wales in 1991 and a Master degree in Economics and Health Management at the University of Lugano in 2002. Since 2009, Cristiana Sessa has been Professor at the University of Bern (Switzerland).

Prof. Cristiana Sessa has been working at the Oncology Institute of Southern Switzerland, Ospedale San Giovanni, Bellinzona since 1981, she has been appointed as Head of Phase I-II Unit and Pharmacology and she is currently Vice Head of Medical Oncology and Head of Clinical Research. She is the Bellinzona site Director of the Clinical Trial Unit of the Ente Ospedaliero Cantonale (CTU-EOC) since 2012.

Cristiana Sessa is a Member of the European Society for Medical Oncology (ESMO), where she is a committee member of the ESMO Guidelines Working Group and of the Translational Research Working Group.

She is also President of the Swiss Group for Clinical Cancer Research (SAKK) New Anticancer Drugs project group and of the working group on Gynaecological tumours. Professor Cristian Sessa was appointed to the Executive Board of the European Society of Gynecologic Oncology (ESGO) in 2013.

**Prof. dr.med. Arnold Ganser**

Arnold Ganser has received his Board certification for Internal Medicine (Frankfurt am Main) in 1990 and finished his Ph.D. thesis (Habilitation) in Internal Medicine Johann Wolfgang Goethe-Universität Frankfurt am Main), Lecturer (Privatdozent) for internal medicine in 1991. From 1991-1995 he was Deputy Head of the Dept. Hematology-Oncology, J.W.Goethe-University Frankfurt/Main, in 1992 he received his Board certification for Hematology/Oncology (Frankfurt am Main). He was senior lecturer in Hematology/Oncology at the J. W. Goethe University Frankfurt/Main (1993).

Since 1995 Arnold is Full Professor of Medicine and Director of the Department of Hematology, Hemostasis, Oncology and Stem Cell Transplantation at Hannover Medical School, Hannover (Germany); board certified for “Laboratory Methods in Internal Medicine”.

He was Chairman of the Centre of Internal Medicine, Hannover Medical School (4/2009-4/2013) and Chairman of the MHH-Tumor Centre (since 2013). Arnold has received several scientific awards and has fulfilled several scientific functions a.o. Member of the Scientific Council of the German Society of Hematology and Oncology, Member of the Executive Committee of the American Society of Hematology, Member of the External Advisory Board of the Leukemia Section of the Swiss Cooperative Group of Cancer Research and Member of the committee “Early Detection of Cancer” of the German Cancer Aid (Deutsche Krebshilfe).

He has published more than 600 original publications in peer-reviewed scientific journals (N Engl J Med, Cancer Cell, Nature Genet, Ann Intern Med, Lancet, Blood, J Clin Oncol, J Clin Invest, J Exp Med, Br J Haematol, Leukemia, Exp Hematol, J Exp Med, Mol Ther, Gene Ther, Brit Med J, Ann Hematol, etc.) on the myelodysplastic syndromes, acute leukemia, aplastic anemia, stem cell transplantation, use of hematopoietic growth factors, alterations of hematopoiesis in AIDS. Review articles on the use of hematopoietic growth factors, supportive therapy, treatment of acute leukemia and myelodysplastic syndromes, stem cell transplantation.

GUIDE/GRIP subcommittee

**Prof. dr. Stephen T. Holgate**

Stephen Holgate is Medical Research Council Clinical Professor of Immunopharmacology at the Faculty of Medicine, Southampton, UK. After completing his medical training in London he spent 2 years at Harvard Medical School to acquire skills in allergic disease mechanisms. On returning to Southampton in 1980, he set up a research group focused on the mechanisms of asthma. He has utilised many approaches to study this disease including epidemiology, genetics, pathology, microbiology and immunology, pharmacology and experimental medicine. This

research has informed guidelines on asthma management and has identified and validated novel therapeutic targets. Notable research contributions include the role of mast cells and their mediators in asthma and allied disorders, the regulation and pharmacology of mast cells, placing inflammation at the core of asthma pathophysiology, uncovering the role of respiratory viruses, allergens and pollutants in asthma exacerbation, the discovery of defects in innate immune responses in asthmatic airways, mechanisms of airway wall remodelling and the discovery of novel asthma susceptibility genes such as ADAM33.

His current research focuses on stratified medicine, the role of the epithelium in orchestrating asthma and the evolution of asthma across the life course. His work has resulted in over 980 peer reviewed publications (H index 133), 60 Book editorships, 453 Book Chapters and Reviews, 48 Editorials, 76 Official and Government Reports. He holds an MRC programme grant focused on the pathogenesis of asthma.

He is a Past President of the British Society of Allergy and Clinical Immunology and British Thoracic Society, was Chair of the MRC Population and Systems Medicine Board (PSMB). Stephen is Chair of Main Panel A (Medicine, Health and Life Sciences) of the UK Research Excellence Framework 2014, Chairs the UK National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs), the British Lung Foundation Research Committee, the Hazardous Substances Advisory Committee (HSAC), and from 2014, will join the Science and Innovation Strategy Board of the Natural Environment Research Council (NERC). He is Chair of the European Respiratory Society Scientific Committee, Treasurer of the World Allergy Organisation and Member of the Medical Science Committee of Science Europe. In 2003 he cofounded of Synairgen a publically quoted respiratory drug development company with a particular focus on lung antiviral defence in asthma, COPD and severe viral infections. more information: [www.southampton.ac.uk/medicine/about/staff.page](http://www.southampton.ac.uk/medicine/about/staff.page).

### **Prof. dr. Hubert Leufkens**

Hubert Leufkens obtained his PharmD and PhD degree from Utrecht University. After academic work and advanced training at the Universities of Leiden and Minnesota (Fulbright Fellow), he joined Utrecht University again in 1987. In 1997 he was appointed as full professor at the Department of Pharmacoepidemiology of the same university. From 2003-2005 he was the Scientific Director of the Utrecht Institute for Pharmaceutical Sciences (UIPS), and during 2006-2007 the Dean of Pharmaceutical Sciences of the Faculty of Science in Utrecht. Since mid 2007 he has been appointed as Chair of Dutch Medicines Evaluation Board (MEB). Moreover, dr. Hubert is active at several (inter)national platforms on pharmacoepidemiology (e.g. since 2009 co-opted member for pharmacoepidemiology of the EMA CHMP, past- President of ISPE), pharmacovigilance (past-member EMA Pharmacovigilance Working Party), orphan drugs (past-Chairman of the Dutch Steering Committee on Orphan Drugs), pharma policy (since 2008 Director of the Utrecht WHO Collaborating Centre for Pharmaceutical Policy and Regulation) and regulatory science (since 2008 PI of the TI Pharma Escher project). He is (co) author of >400 papers in peer reviewed journals, book chapters and research reports. More information: [www.uu.nl/staff/HGMLeufkens/0](http://www.uu.nl/staff/HGMLeufkens/0).

### **Dr. Ton Rijnders**

Ton Rijnders was appointed Scientific Director of Top Institute Pharma in November 2011. He holds a PhD in Molecular Biology. Before joining Top Institute Pharma, Ton Rijnders held

several management positions at Organon (1986-2011). His scientific expertise during that period included the development of new treatments for rheumatoid arthritis and development of new monoclonal antibody technologies, specific immunotherapy as well as pharmacological research for the therapeutic areas Hormone Replacement, Infertility, Contraception, Immunology and Cardiovascular. He headed the Departments of Immunology and Pharmacology prior to his appointment as Senior VP Research NV Organon. His responsibilities were further broadened with the inclusion of the Toxicology and Process Chemistry Departments in Riom (France). After the acquisition of Organon by Schering-Plough in 2007, Ton was appointed VP Discovery and Site Head Oss within the Schering-Plough Research Institute being also the local lead for the combined SPRI functions in The Netherlands and as such member of the local site management. After the merger of Merck with Schering-Plough he continued to head Discovery in Oss within the Merck Research Labs, maintaining also local responsibility for the entire MRL Oss organisation until September 2011.

Ton Rijnders is member of several scientific and professional societies. He has served as chairman of the executive board of TI Pharma and he is also a member of the supervisory board of the Netherlands Metabolomics Centre, the Netherlands consortium for Systems Biology and the Netherlands BioInformatics Centre, which are consortia of the Netherlands Genomics Initiative. He is also involved in the committee defining roadmaps for the governmental policy for the Dutch life sciences sector.

### **Prof. dr. Geoffry T. Tucker**

Geoff Tucker is Emeritus Professor of Clinical Pharmacology at the University of Sheffield, UK. He graduated in pharmacy (1964) with a Ph.D (1967) from the University of London and was awarded an honorary D.Sc (2006) from the University of Uppsala. He was at the Virginia Mason Research Centre (Seattle) and on the Department of Anesthesiology as Assistant Professor at the University of Washington (1968-72) before returning to the UK in 1972. He has published widely in the areas of clinical and theoretical pharmacokinetics, pharmacogenetics, drug metabolism, drug-drug interactions, bioequivalence and the pharmacology of drugs used in anaesthesia ('Highly Cited Author – Pharmacology': Institute of Scientific Information (ISI)).

Professional activities include Chairman of the Editorial Board of the British Journal of Clinical Pharmacology (1995-2002), Member of the Council of the British Pharmacological Society (1995-2002), Expert Advisor to the Committee on Safety of Medicines (UK) (2000-), Council Member of the Clinical Division of the International Union of Pharmacology (IUPHAR) (1995-2005), Vice-President (2005-2012) and Chairman (2012-2016) Board of Pharmaceutical Sciences of the International Pharmaceutical Federation (FIP), Councillor – International Society for the Study of Xenobiotics (ISSX)(1988-91; 2004-2012), Founding Member and Elder of the African Society for Drug Metabolism and Development (2007-), Visiting Professor at the Universities of Harvard, Cincinnati, Queensland and Otago and the US FDA.

Geoff is an Honorary Fellow of the Royal College of Anaesthetists and of the Royal College of Physicians of Edinburgh and Fellow of the Faculty of Pharmaceutical Medicine, Royal College of Physicians UK of the British Pharmacological Society and of the British Toxicological Society and Honorary Member of the Royal Pharmaceutical Soc of GB. He is a Co-Founder of Simcyp Ltd, a University of Sheffield spin-out company specialising in the prediction of

pharmacokinetics in populations based on in vitro - in vivo extrapolation and physiologically-based pharmacokinetic modelling.

#### Kolff Institute subcommittee

##### **Prof. dr. rer. nat. Klaus D. Jandt**

Klaus D. Jandt is a physicist and incumbent of Chair of Materials Science at the Friedrich Schiller University Jena, Germany's "City of Light". He worked as faculty member and Feodor-Lynen-Fellow at Cornell University in Ithaca, NY, USA in the area of polymer materials science and at the University of Bristol in the United Kingdom in the area of experimental polymer physics, dental materials and biomaterials. He invented and scientifically investigated LED LCUs and introduced them to dentistry. He was the host of the first Humboldt Research Awardee in the area of Biomaterials in Germany, Prof. David C. Watts. In 2012, Klaus Jandt received the Thuringia Research Award for applied research in the area of biomaterials-protein interfaces. Klaus D. Jandt is chairman and organizer of the international conference Euro BioMAT. His current research areas are biomaterials, including antimicrobial materials, polymer physics and nano composites. He is a member of the editorial boards of the scientific journals Acta Biomaterialia, Dental Materials, Colloids and Surfaces B: Biointerfaces and others as well as scientific speaker and board member of the German Materials Society (DGM).

##### **Prof. dr. Wenyan Shi**

Since 2002 a professor at the School of Dentistry and MBI and at the Department of Microbiology, Immunology and Molecular Genetics (School of Medicine, UCLA). Also since 2002 a director at the UCLA Dental Research Service Centre and since 2003 Director of the UCLA Oral Biology Ph.D programme. Guest professor (Chinese Academy of Science) and visiting Chang-Jiang professor (Peking University) since 2004 as well as Chairman of the Section of Oral Biology (UCLA School of Dentistry). Visiting Qianren Professor (Sichuan University) and Chairman of the Oversee Chinese Microbiology Society (Sino-Micro) since 2010. Shi uses multidisciplinary approaches to conduct cutting edge research in the field of microbiology and biotechnology. The research focus is to understand the signal transduction events during bacterial biofilm formation and inter-species interaction. His lab is also actively involved in the development of novel diagnostic and therapeutic tools against microbial infections.

#### BCN Brain subcommittee

##### **Prof. dr. Paul Boon**

Paul Boon is the Chairman of the Department of Neurology at Ghent University Hospital (2004 – on-going) and Chairman of the Head, Neck and Nervous System Division at Ghent University Hospital overseeing the clinical departments of neurology, psychiatry, neurosurgery, ophthalmology, otorhinolaryngology, head and neck surgery and dentistry (2009 – ongoing). In 2011 he was also appointed as the director of the Institute for Neuroscience at Ghent University. Professor Boon is the leading epileptologist of the Reference Centre for Refractory Epilepsy (RCRE) at Ghent University Hospital that includes a large epilepsy and sleep disorders clinic and the recently established Centre for Neurophysiological Monitoring (CNM) at Ghent University Hospital. His main research interests are clinical epilepsy, quantitative EEG and MEG analysis, neuromodulation and functional neuroimaging. Professor Boon also heads the Laboratory for

Clinical and Experimental Neurophysiology, Neurobiology and Neuropsychology (LCEN3). This experimental research laboratory features different animal models for focal and generalised epilepsy and deals mainly with mechanisms-of-action-related research of pharmacological, neuromodulation and cell-therapy and neurogenesis-based therapies.

**Prof. dr. Marco Prinz**

Marco Prinz is director of the Institute for Neuropathology and head of the Innate immunity group, Institute for Neuropathology, Medical Centre - University of Freiburg (Germany). Marco is a leading scientist in the field of neurosciences/neuropathology. His main research interests are brain-specific immune functions during health and disease (autoimmune and neurodegenerative CNS disorders), the role of type I interferons in autoimmune inflammation and the origin, fate and function of microglia in the brain. Research within his group focuses on the role of the brain specific innate immune system and the important molecules involved, like chemokine receptors, Toll-like receptors (TLRs) and cytokines such as interferons. Another major player of this system within the brain are brain macrophages (microglia), which serve as the first barrier for invading pathogens. His group is currently investigating the mechanisms by which microglia contribute to the induction and resolution of brain damage using mouse models of multiple sclerosis (EAE, cuprizone model) and neurodegeneration, e.g. Alzheimer's disease.

SHARE subcommittee

**Prof. dr. Peter Allebeck**

Peter Allebeck is Professor of Social Medicine at the Department of Public Health Sciences at the Karolinska Institute in. He is Editor in chief of the European Journal of Public Health. He (co-) authored over 240 international publications in a broad variety of Web of Science subject fields. He has always been interested in how social conditions affect health and disease with a particular interest in alcohol and substance abuse issues and the comorbidity of substance abuse and other mental health problems. He is known for large epidemiological longitudinal studies. He is also a member of the Stockholm County Council.

**Prof. dr. Ronan O'Carroll**

Ronan O'Carroll is Professor of Psychology at the University of Stirling, broadly interested in behaviour, health, disease and medicine. He initially graduated from the University of Edinburgh with a BSc in Biological Sciences, with Honours in Psychology. He then completed a PhD on "The behavioural effects of androgens in man" in Edinburgh. His PhD thesis was awarded the Kinsey Institute prize for outstanding doctoral research. He then trained as a Clinical Psychologist in Edinburgh, and then worked in the UK National Health Service as a Clinical Psychologist before moving to Canada, to take up an Assistant Professor position at Memorial University, helping to run a Clinical Psychology post-graduate programme. He returned to Scotland to the post of Senior Scientist at the Medical Research Council Brain Metabolism Unit in Edinburgh, before accepting a position as Senior Research Fellow at the University of Stirling. He was then appointed Professor of Psychology at the University of St Andrews, before returning to take up his current position at University of Stirling in February 2003. He is Past President of the UK Society for Behavioural Medicine. In 2013 he was elected as a Distinguished International Affiliate of the Division of Health Psychology (Division 38) of the American Psychological Association and in 2014 he has elected as a Fellow of the European Health Psychology Society.

He is currently Associate Editor of Health Psychology, and the British Journal of Health Psychology. He also serves on the Editorial Boards of Psychology and Health, the British Journal of Clinical Psychology, and the Journal of Behavioural Medicine. He is a practising registered Health and Clinical Psychologist and has published approximately 200 papers in peer-reviewed journals. He is particularly interested in health behaviour change and the role that emotions play in our decision-making. His current research focuses on three main programmes of work; 1) understanding and overcoming barriers to registering as an organ donor, 2) improving adherence to medication and medical advice, and 3) understanding and overcoming barriers to screening uptake.

### **Prof. dr. Guy Vanderstraeten**

Guy Vanderstraeten is a specialist in Physical Medicine and Rehabilitation. He is Head of 3 departments within the Ghent University Hospital, the department of Physical and Rehabilitation Medicine, the Rehabilitation centre for locomotor and neurological disorders, and the Centre of Sports Medicine. At Ghent University, he is Dean of the Faculty of Medicine and health Sciences since 2011. He is also a member of the Physical Therapy and Rehabilitation Sciences department and the Physical Medicine, Rehabilitation, Orthopedics and Traumatology department. In addition, he is President of the Royal Belgian Society of Physical and Rehabilitation Medicine. On a European level, Prof Vanderstraeten is President of the European Academy of Rehabilitation Medicine (2011-2014), former President of the European Federation of PRM and former President of the European Board of PRM. He is also part of different national, European and international societies and organisations and a member of different editorial boards of international journals. Furthermore, he is an ISPRM member and former chairman of the Congress committee.

His scientific research covers the broad domain of Physical and Rehabilitation Medicine, with a focus on locomotor disorders (especially low back pain). His special interest goes to diagnostics and conservative treatment, including the evaluation of specific exercise protocols. More in general, he is interested in Evidence Based Medicine within physical rehabilitation of a variety of musculoskeletal disorders.

GSMS subcommittee + GUIDE/GRIP subcommittee

### **Prof. dr. Michael J Mulvany**

Michael is emeritus professor at the department of Biomedicine at Aarhus University, where he also obtained his PhD (1978) and DMSc (1983) degrees. Except for a two year stay at the University of Vermont (1974-1976) he continued his academic career in Aarhus until his retirement as full professor in 2011.

His main research focused on the structure and function of small arteries, their role in the development of high blood pressure (hypertension) and drug treatments to normalize their abnormal structure.

From 2003-2010 Michael headed the Aarhus Graduate School of Health Sciences and he represented Aarhus' Faculty of Health Sciences in the Organisation for PhD education for PhD education in biomedicine and health sciences in the European system (ORPHEUS) from 2005-

2010. He was ORPHEUS vice-president from 2010-2014 and has chaired its Labelling Board since 2013.

Michael published 259 (Medline) publications (49 since 2003) and ca. 60 book chapters and supplements. See for a selection: <http://pure.au.dk/portal/da/mjm@biomed.au.dk>. He was awarded the Malpighi award of the European Society of Microcirculation (2002) and the BCPT Nordic prize in Basic and Clinical Pharmacology (2013).

**Prof. dr. Frans G.M. Russel**

Frans Russel is full professor and chair in Pharmacology and Toxicology at Radboud University Medical Centre (Radboudumc) and the Faculty of Science. In addition, he is director of the bachelor's and international master's programme in Biomedical Sciences and a principal investigator of the Radboud Institute for Molecular Life Sciences (RIMLS). He received his master's degree of Pharmaceutical Sciences and PharmD from the University of Groningen (1983) and obtained a PhD in Pharmacology (1988) from Radboud University. Frans Russel is elected fellow of the American Association of Pharmaceutical Scientists, and a member of the Health Council of the Netherlands and the Dutch Medicines Evaluation Board. His research focuses on systems toxicology of adverse bioenergetics drug effects, physiologically-based pharmacokinetic modelling, and the role of transporters in drug efficacy and safety. An important goal is to translate molecular-based knowledge of drug transport and selective toxicity to the clinical setting, to assist in the development of more effective and safer drug therapies. He has published over 300 publications in peer-reviewed journals and books.

## **Annex C – Statement of impartiality and confidentiality**

The Standard Evaluation Protocol aims to ensure a transparent and independent assessment process. The members of the assessment committees should be experts who are well acquainted with the unit's research field. There is a strong possibility that an expert will have a working relationship with the unit to be assessed; that relationship should not, however, lead to bias in the assessment process.

We have confidence in the integrity of the assessment committee members. Committee members are kindly asked to reflect on affiliations or relationships that could lead to a biased assessment. What is essential is for committee members to feel that they will be able to conduct an independent and impartial review. Committee members will be asked to sign a statement with regard to impartiality and confidentiality, as included below.

Forms of involvement with the members of staff, management or board of the unit that committee members must report include the following (this list is not exhaustive):

- Having a personal relationship, such as:
  - a family relationship (up to and including the 3rd degree of consanguinity);
  - friendship;
  - a personal conflict.
- Having a professional relationship, such as:
  - supervising or having supervised (doctoral) work;
  - collaborating on research projects and/or publications and/or applications, or having done so in the past three years, or planning to do so in the near future;
  - being colleagues in the same section/department or similar organisational unit, or planning to be so in the near future;
- Having a hierarchical relationship with any member of staff, management or board, or planning to have such a relationship in the future;
- Having a professional conflict.
- Having an economic interest, such as being in a position to derive any material advantage from the unit to be assessed.

### **Statement of impartiality and confidentiality**

Undersigned (first name, last name):

Organisation:

Participating in the assessment of (name of research unit to be assessed):

- I have read and understand the principles with regard to impartiality and confidentiality as explained above;
- I declare that I will not use any information furnished to me during the assessment process for the benefit of myself or others;
- I declare that I fully understand the confidential nature of the assessment process and that I will not disclose or discuss the materials associated with the assessment, my own review, or the assessment meeting with any other individual, either during the evaluation process or thereafter;
- I declare that to the best of my knowledge I have no affiliation or relationship to the entity to be assessed that could lead to a biased assessment;
- I declare that I have no conflict of interest regarding the research unit to be assessed. If a conflict of interest arises during my term I will have to declare this and inform my contact person on the board of the institution responsible for the assessment.

Date:

Place:

Signature:

## Annex D – Key characteristics of the research units assessed

Research Institute/Research Programme	Total research staff 2014 (in FTE)	Tenured staff 2014 (in FTE)	Post docs 2014 (in FTE)	Number of PhD's 2014	Total funding 2014 (in FTE)	Direct funding 2014 (in FTE)	Research grants 2014 (in FTE)	Contract research 2014 (in FTE)	Self-supporting researchers 2014 (in FTE)	External researchers 2014 (in FTE)	Other – unknown 1014 (in FTE)
<b>CRCG</b>	<b>37.5</b>	<b>24.2</b>	<b>13.3</b>	<b>158</b>	<b>130.7</b>	<b>60.7</b>	<b>5.6</b>	<b>53.3</b>	<b>5.3</b>	<b>5.8</b>	
Damage and Repair in Cancer Development and Cancer Treatment (DARE)	6.8	5.4	1.4	43	33.6	20.1	3.3	8.6	1.4	0.2	
Guided Treatment in optimally Selected Cancer Patients - Translational and Clinical research in Oncology (GUTS)	9.6	9.6	0.0	63	45.1	20.7	2.3	16.3	0.9	4.9	
Stem cells, Aging, Leukemia and Lymphoma (SALL)	16.8	5.8	11.0	37	39.8	14.6	0.0	22.6	1.9	0.7	
Targeted Gynaecologic Oncology (TARGON)	4.3	3.4	0.9	15	12.2	5.3	0.0	5.8	1.1	0.0	
<b>GUIDE</b>	<b>97.0</b>	<b>58.8</b>	<b>38.2</b>	<b>458</b>	<b>361.0</b>	<b>156.2</b>	<b>30.8</b>	<b>124.0</b>	<b>30.5</b>	<b>19.5</b>	
Groningen Institute for Gastro Intestinal Genetics and Immunology (3GI)	5.1	4.2	0.9	28	20.6	7.3	2.8	10.2	0.2	0.1	
Biopharmaceuticals, Discovery, Design and Delivery (BDDD)	13.2	3.8	9.4	47	44.5	10.2	5.5	20.0	7.0	1.8	
Critical care, Anesthesiology, Peri-operative and Emergency medicine (CAPE)	3.1	3.1	0.0	19	8.6	7.2	0.0	0.0	0.7	0.7	
Center for Liver, Digestive and Metabolic Diseases (CLDM)	6.3	5.4	0.9	49	36.2	14.2	5.5	12.1	3.3	1.1	
Preservation of Cardiac Function over Time (CVC)	7.4	6.5	0.9	56	39.9	21.4	2.1	12.2	2.1	2.1	
Groningen Institute for Organ Transplantation (GIOT)	2.0	2.0	0.0	27	17.0	11.1	2.1	2.6	0.7	0.5	
Groningen Kidney Center (GKC)	5.8	4.7	1.1	44	28.0	14.6	0.4	10.1	1.8	1.1	
Groningen Research Institute for Asthma and COPD (GRIAC)	16.8	8.1	8.7	42	40.7	16.7	2.3	19.4	0.7	1.6	
Medicinal Chemistry & Bioanalysis (MCB)	9.9	3.1	6.8	26	26.6	5.4	4.8	8.5	6.5	1.4	
Microbes in Health and Disease (MHD)	12.6	6.3	6.3	45	38.6	16.8	3.2	9.4	3.6	5.6	
Translational Immunology Groningen (TRIGR)	8.0	5.7	2.3	37	29.2	13.9	0.0	13.5	1.1	0.7	
Vascular Ageing Program (VAP)	6.8	5.9	0.9	38	31.1	17.4	2.1	6.0	2.8	2.8	

<b>KOLFF</b>	<b>16.9</b>	<b>10.6</b>	<b>6.4</b>	<b>90</b>	<b>70.6</b>	<b>36.8</b>	<b>6.3</b>	<b>12.6</b>	<b>11.8</b>	<b>3.1</b>	
Bioadhesion, Biocompatibility and Infection (BIOBI)	5.9	2.5	3.4	21	17.0	10.9	0.0	3.0	2.1	1.0	
Maintaining Oral Health and Oral Function (MOHOF)	3.2	2.8	0.5	20	15.4	13.3	0.0	0.0	0.7	1.4	
Nanobiotechnology and Advanced Therapeutic Materials (NANOBIOMAT)	4.4	2.8	1.6	34	25.2	7.3	5.8	5.2	6.9	0.0	
Restoring Organ Function by Means of Regenerative Medicine (REGENERATE)	3.4	2.5	0.9	15	13.0	5.3	0.5	4.4	2.1	0.7	
<b>SHARE (Excl. ICPE)</b>	<b>44.1</b>	<b>21.6</b>	<b>22.5</b>	<b>237</b>	<b>188.1</b>	<b>71.3</b>	<b>10.2</b>	<b>53.3</b>	<b>9.5</b>	<b>43.8</b>	
Extremities, Pain & Disability – SMART movements (EXPAND-SMART)	6.0	5.1	0.9	68	45.4	15.7	0.9	11.2	0.9	16.7	
Health Psychology Research (HPR)	5.2	2.0	3.2	31	24.6	11.5	2.3	3.3	1.6	5.9	
Methods in Medicines Evaluation & Outcomes Research (M2O) and Life Course Epidemiology (LCE)	14.3	6.6	7.7	65	54.7	19.0	5.2	15.8	5.6	9.1	
Public Health Research (PHR)	12.7	3.8	8.9	53	44.2	13.1	0.0	19.7	1.4	10.0	
Reproductive Origins of Adult Health and Disease (ROAHD)	5.9	4.1	1.8	20	19.2	12.0	1.8	3.3	0.0	2.1	
<b>SHARE/BCN-BRAIN</b>	<b>15.5</b>	<b>4.9</b>	<b>10.6</b>	<b>52</b>	<b>46.0</b>	<b>22.5</b>	<b>8.9</b>	<b>5.2</b>	<b>1.4</b>	<b>8.0</b>	
Interdisciplinary Center Psychopathology and Emotion Regulation (ICPE)	15.5	4.9	10.6	52	46.0	22.5	8.9	5.2	1.4	8.0	
<b>BCN-BRAIN (excl. ICPE)</b>	<b>21.9</b>	<b>16.9</b>	<b>5.0</b>	<b>127</b>	<b>97.5</b>	<b>49.9</b>	<b>14.1</b>	<b>15.4</b>	<b>7.1</b>	<b>7.2</b>	<b>3.8</b>
Abnormal Neurological Development – Early Diagnosis and Intervention (ANDDI)	3.0	3.0	0.0	21	16.0	9.1	2.5	3.5	0.0	0.9	0.0
Center for Medical Imaging (CMI) – UMCG											
Molecular Neuroscience and Ageing Research (MOLAR)	8.5	5.8	2.7	47	36.2	19.0	7.2	4.0	3.2	1.5	1.3
Perceptual and Cognitive Neuroscience (PCN)	5.2	2.9	2.3	23	18.8	9.6	2.3	2.1	1.6	0.7	2.5
Translational Neuroscience (TN)	5.2	5.2	0.0	36	26.5	12.2	2.1	5.8	2.3	4.1	0.0

## Annex E – Programme of the site visit

### Sunday evening February 14<sup>th</sup>, 18:00h GUIDE work dinner

Meeting of the chairman of the PRC with the GUIDE Committee for instructions for the evaluation

At 19:00h Prof D de Zeeuw, Prof WJ Quax, Prof F Kuipers, Prof J Knoester and Prof E Boddeke join the committee

Location: Academy Building, University of Groningen

<b>Day 1 – Monday February 15<sup>th</sup> 2016</b>		
9:00 – 9:30	Presentation by Prof D de Zeeuw (director institute GUIDE; 15 min + 15 min discussion)	Prof WJ Quax (Director GRIP)
9:30 – 10:00	Presentation GUIDE Programme 1 (BDDD) (10 min and 20 min discussion)	Programme leaders BDDD: Prof HW Frijlink and Prof G Poelarends
10:00– 10:15	Deliberation by the Committee	
10:30– 11:00	Presentation GUIDE Programme 2 (CVC) (10 min and 20 min discussion)	Programme leaders CVC: Prof RA de Boer and Prof IC van Gelder (Prof WH van Gilst will stand in for Prof IC van Gelder)
11:00– 11:15	Deliberation by the Committee	
11:15 –11:45	Presentation GUIDE Programme 3 (CLDM) (10 min and 20 min discussion)	Programme leaders CLDM: Prof HJ Verkade and Prof SCD van IJzendoorn
11:45– 12:00	Deliberation by the Committee	
13:00– 13:30	Presentation GUIDE Programme 4 (CAPE) (10 min and 20 min discussion)	Programme leaders CAPE: Prof AMGA de Smet and Prof MMRF Struys
13:30– 13:45	Deliberation by the Committee	
13:45– 14:15	Presentation GUIDE Programme 5 (3GI) (10 min and 20 min discussion)	Programme leaders 3GI: Prof R Weersma and Prof C Wijmenga (Dr JJ Fu will stand in for Prof C Wijmenga)
14:15– 14:30	Deliberation by the Committee	
14:30– 15:00	Presentation GUIDE Programme 6 (GIOT) (10 min and 20 min discussion)	Programme leaders GIOT: Prof HGD Leuvenink, Prof SJL Bakker and Prof R Porte
15:00– 15:15	Deliberation by the Committee	
15:15– 15:45	Presentation GUIDE Programme 7 (GKC) (10 min and 20 min discussion)	Programme leaders GKC: Prof CAJM Gaillard,

		Prof H van Goor and Prof HJ Lambers Heerspink
15:45– 16:00	Deliberation by the Committee / Break	
16:00– 16:45	Meeting of the PRC and Prof J Knoester (Dean FMNS)	PRC GUIDE Prof WJ Quax (director GRIP) and Prof P Rudolph (director Graduate School Science) will join
16:45-17:15	Instruction by Prof D Crommelin (30 min pres)	PRC SHARE
17:15 -17:50	Presentation SHARE Theme M2O/LCE Attendees: SHARE committee + Prof B Leufkens (15 min pres and 20 min discussion)	Programme leaders Theme M2O/LCE: Prof P Denig, Prof E Hak and Dr H Burger
17:50– 18:05	Deliberation by the Committee	
18:30	Work dinner at the Academy Building: Meeting of the chairman of the PRC with the committee members of BCN-BRAIN, Kolff and CRCG : instructions for the evaluation.  At 19:30h the committee members of SHARE, the directors of CRCG, BCN BRAIN, SHARE and KOLFF (resp. Prof E Vellenga, Prof HPH Kremer, Prof MJ Postma and Prof Y Ren) plus Prof HWGM Boddeke and Prof F Kuipers join the committee	
19:00	GUIDE Committee members will have a dinner at Restaurant ‘Diep’	PRC members Prof T Rijnders, Prof F Russel, Prof HGM Leufkens, Prof S Holgate, Prof GT Tucker and Prof MJ Mulvany and directors Prof D de Zeeuw and Prof WJ Quax

<b>Day 2 – Tuesday February 16<sup>th</sup> 2016</b>		
08:45 - 09:15	General introduction by Prof F Kuipers about the UMCG	PRC, Dean UMCG, Dean of Research UMCG, directors
09:15 - 09:45	Presentation by Prof E Boddeke about UMCG Research (goals, institutes, relation to Healthy Ageing, Scientific Integrity, evaluation of the PRC last time etc.) and technical details of SEP	PRC, Dean UMCG, Dean of Research UMCG, directors
09:45 - 10.00	Deliberation by the committee	PRC
10:00 - 10:30	Presentation by Prof D de Zeeuw about GUIDE at institutional level (15 min + 15 min discussion)	PRC, Dean of Research UMCG, directors
10:45 - 11:15	Presentation by Prof HPH Kremer about BCN-BRAIN at institutional level (15 min + 15 min disc)	PRC, Dean of Research UMCG, directors

11:15 - 11:45	Presentation by Prof MJ Postma about SHARE at institutional level (15 min + 15 min disc)	PRC, Dean of Research UMCG, directors
11:45 - 12:15	Presentation by Prof Y Ren about WJ Kolff at institutional level (15 min + 15 min disc)	PRC, Dean of Research UMCG, directors
12:15 - 12:45	Presentation by Prof E Vellenga about CRCG at institutional level (15 min + 15 min disc)	PRC, Dean of Research UMCG, directors
12:45 - 13:30	<i>Lunch + deliberation</i>	<i>PRC, Dean of Research UMCG, directors</i>
13:30 - 14:15	Parallel presentations programmes and deliberation (10 min presentation, 20 min discussion, 15 min deliberation)	
	GUIDE Programme 8 (GRIAC)	Programme leaders GUIDE/GRIAC: Prof GH Koppelman, Prof HM Boezen and Prof R Gosens
	BCN-BRAIN Programme 1 / SHARE Programme 2 (ICPE) <i>(both committees required)</i>	Programme leaders BCN-Brain-SHARE/ICPE: Prof AJ Oldehinkel and Prof P de Jonge
	CRCG Programme 1 (DARE)	Programme leaders CRCG/DARE: Prof GH de Bock, Prof RP Coppes and Prof MATM van Vugt
	Kolff Programme 1 (BIOBI)	Programme leaders: Kolff/BIOBI: Prof HJ Busscher and Dr PC Jutte
14:15 - 15:00	Parallel presentations programmes and deliberation (10 min presentation, 20 min discussion, 15 min deliberation)	
	GUIDE Programme 9 (MCB)	Programme leaders GUIDE/MCB: Prof RPH Bischoff and Prof EMJ Verpoorte (PI Prof A Dömling will join)
	SHARE Programme 3 (HPR)	Programme leaders SHARE/HPR: Prof M Hagedoorn (PI Prof R Sanderman will join)
	BCN-BRAIN Programme 2 (Theme MOLAR + ANDDI) (Theme 15 min pres, 20 min discussion, 15 min deliberation)	Programme leaders BCN-BRAIN/MOLAR-ANDDI: Prof JD Laman, Prof EGE de Vries, Prof CW van Ravenswaaij-Arts and
Theme: 14.15-15.05		

		Dr TJ de Koning
	CRCG Programme 2 (GUTS)	Programme leaders CRCG/GUTS: Prof GM van Dam and Prof JA Gietema
	Kolff Programme 2 (MOHOF)	Programme leaders Kolff/MOHOF: Prof HJA Meijer and Dr PK Sharma
15:05 - 15:50	Parallel presentations programmes and deliberation (10 min presentation, 20 min discussion, 15 min deliberation)	
	GUIDE Programme 10 (VAP)	Programme leaders GUIDE/VAP: Prof MC Harmsen and Prof CJAM Zeebregts
	SHARE Programme 4 (ROAHD)	Programme leaders SHARE/ROAHD: Dr H Groen and Dr A Hoek
	CRCG Programme 3 (SALL)	Programme leaders CRCG/SALL: Prof JJ Schuringa and Prof (JHM) van den Berg
	Kolff Programme 3 (NanoBioMat)	Programme leaders Kolff/NanoBioMat: Prof A Herrmann and Dr P van Rijn
15:50 - 16:35	Parallel presentations programmes and deliberation (10 min presentation, 20 min discussion, 15 min deliberation)	
	GUIDE Programme 11 (TRIGR)	Programme leaders GUIDE/TRIGR: Prof AHM Boots and Prof P Heeringa
	SHARE Programme 1 (PHR)	Programme leaders SHARE/PHR: Prof SA Reijneveld and Prof U Bültmann
Platform 15:50 - 16:40	BCN-BRAIN Programme 4 (platform programme CMI) (Platform 15 min pres, 20 min discussion, 15 min deliberation)	Programme leaders BCN-BRAIN/CMI: Prof RAJO Dierckx and Prof M Oudkerk
	CRCG Programme 4 (TARGON)	Programme leaders CRCG/TARGON: Prof S de Jong and Prof HW Nijman
	Kolff Programme 4 (REGENERATE)	Programme leaders Kolff/REGENERATE:

		Prof RA Bank and Prof SK Bulstra
16:40 - 17:25	Parallel presentations programmes and deliberation (10 min presentation, 20 min discussion, 15 min deliberation)	
Theme: 16:40 -17:30	GUIDE Programme 12 (MHD)	Programme leaders GUIDE/MHD: Prof JM van Dijl, Dr Y Stienstra and Prof AW Friedrich
Theme: 16:40 -17:30	SHARE Programme 6 (Theme Movement: EXPAND + SMART) (Theme 15 min pres, 20 min discussion, 15 min deliberation)	Programme leaders SHARE/theme Movement: Prof JHB Geertzen and Prof C Visscher. Dr J Smith (Research Coordinator) will present
	BCN-BRAIN Programme 3 (Theme TN + PCN) (Theme 15 min pres, 20 min discussion, 15 min deliberation)	Programme leaders BCN-BRAIN/theme TN-PCN: Prof NM Maurits, Dr J van der Naalt, Dr FW Cornelissen and Prof D Baskent
18:00 - 18:45	Hand in drafts to the secretary for the final discussion on Wednesday	
19:00	Dinner at restaurant 'de Prinsenhof' Attendees: all PRC members, Prof E Sterken (Rector Magnificus of the Groningen University), Prof F Kuipers, Prof J Knoester, Prof E Boddeke, Dr MJ Smit, Prof WJ Quax, Prof MJ Postma, Prof HPH Kremer, Prof Y Ren, Prof D de Zeeuw, Prof E Vellenga and a small selection of Tenure Track Staff	

<b>Day 3 – Wednesday February 17<sup>th</sup></b>		
08:30 - 09:30	GUIDE and SHARE/GRIP PRC members only: Meeting on GRIP management with the chairman and the PRC subcommittee (20 min pres, 20 min discussion, 20 min deliberation)	PRC members GUIDE and SHARE, chairman PRC, Prof WJ Quax, Prof D de Zeeuw, Dr KE Voskamp, Prof J Knoester (optional)
08:30 - 10:30	DRAFT Final report for BCN-BRAIN (1 ppt per programme)	PRC members BCN-BRAIN, director BCN-BRAIN
	DRAFT Final report for CRCG (1 ppt per programme)	PRC members CRCG, director CRCG
	DRAFT Final report for Kolff (1 ppt per programme)	PRC members Kolff, director Kolff
9:30 - 10:30	DRAFT Final report for GUIDE (1 ppt per programme)	PRC members GUIDE/GRIP, directors GUIDE/GRIP
	DRAFT Final report for SHARE (1 ppt per programme)	PRC members SHARE, director SHARE
10:30 - 11:30	Graduate School of Medical Sciences (GSMS)	PRC, Dean of Research UMCG, directors, director GSS

	<p>Presentation of Dr MJ Smit (Director GSMS) about the organisation of the GSMS, goals, internationalisation, MD/PhD programme and education. In the presence of Prof LFMH de Leij (Dean of the Groningen Graduate Schools) (30 min pres, 30 min discussion)</p>	
11:30 - 12:00	PRC discussion: evaluation of GSMS	
13:00 - 15:00	Preparation evaluation by the PRC (main findings in DRAFT form)	
15:15 - 16:15	<p>Preliminary evaluation presented for UMCG – FWN (GRIP) by the PRC Attendees: PRC members, Prof F Kuipers, Prof J Knoester, Prof E Boddeke, Dr MJ Smit, Prof WJ Quax, Prof MJ Postma, Prof HPH Kremer, Prof Y Ren, Prof D de Zeeuw, Prof E Vellenga and programme leaders This evaluation should be attended by the majority of the PRC</p>	

## **Annex F – Dissenting opinion from Prof. Jandt and Prof. Shi**

Statement from Prof. Jandt and Prof. Shi:

The international reviewers for the KOLFF Institute and KOLFF NANOBIOIMAT feel that the scores for viability in these two cases should be '1'. This is based on i) the fast growing fields which has huge potential for future development in terms of both basic and translational research, ii) the importance for social benefits and healthy ageing is very obvious and clear and iii) the new leadership of the KOLFF Institute that provides a lot of dynamics and perspectives for the future.

In addition, the international reviewers believe that the viability score for KOLFF REGENERATE should be '2'.