Evaluation of GROW School for Oncology and Developmental Biology Maastricht University (2012-2017)

Final draft report of the External Review Committee
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Preface

In October 2018 an international external review committee visited GROW School for Oncology and Developmental Biology in Maastricht. GROW is one of the six graduate schools of the Faculty of Health, Medicine and Life Sciences (FHML) of Maastricht University. The site visit at GROW took place from October 8 till 10, 2018. The committee assessed the quality and relevance to society of research conducted from 2012 till 2017, the strategic targets of the School GROW, its four research programs, the school's viability, its research strategy, research integrity, diversity and the quality of research training.

The assessment was carried out using the Dutch Standard Evaluation Protocol 2015-2021[1] for the research assessment of public organizations in the Netherlands.
The site visit at GROW took place from October 8 till 10, 2018.

The committee highly appreciated the warm welcome and well-organized site visit at Maastricht University and wishes to thank the school's management board and the board of the faculty and the Executive Board of Maastricht University for the opportunity to conduct this review and to get an inside look in GROW. The committee also hopes that it has clearly understood all information that was presented in the review documents and during the site visit. All discussions took place in a very positive and constructive atmosphere. It was clear that there is a real sense of community spirit within the school.

We do hope that our recommendations can be used to further improve the collaboration within GROW and its performance.

Professor Stefan Sleijfer,
Chair

[1] The SEP protocol has been developed as an external evaluation procedure for all research conducted at Dutch universities, university medical centers, and NOW and Academy institutes. The Association of Universities in the Netherlands (VSNU), the Royal Netherlands Academy of Arts and Sciences (KNAW), and the Netherlands Organization for Scientific Research (NWO) adopted the protocol.

Contents

I General Section

The external review committee and scope of the assessment
This report presents the findings of the external review committee (further to be mentioned 'the committee') that assessed GROW School for Oncology and Developmental Biology (further to be mentioned 'GROW'). This international external review committee was appointed by the Executive Board of Maastricht University and formally installed by the Dean of the Faculty of Health, Medicine and Lifesciences, Professor Albert Scherpbier on October 8, 2018. This evaluation report has been drawn up in accordance with the SEP guidelines and format (p. 31 of the SEP protocol). This protocol aims to ensure a transparent and independent assessment process. All members of the committee signed a statement of impartiality before the start of the site visit.

The assessment committee consisted of:

Prof. dr. S. Sleijfer, chair
Prof. dr. P. Bossuyt
Prof. dr. F. Russel
Prof. dr. A. Giaccia
Prof. dr. A. De Paepe
Drs. P. Uittenbogaard, secretary

Additional information and a short curriculum vitae of the committee members can be found in annex 1. The program of the site visit is enclosed in annex 4.

The committee assessed the quality and relevance of the research conducted at the school and its four research programs from 2012 till 2017, its research strategy, and the quality of the research training, viability, research integrity and diversity.

Working procedure of the committee
The committee received well-documented and well-presented information that meets the standards of the SEP. Prior to the three-day visit, the committee received two extensive documents: 1) the Self Evaluation 2012-2017 Part A, containing the self-evaluation on the level of the school and 2) the Self Evaluation 2012-2017 Part B, on the program level. The committee received extra information during the site visit on the strategic plans to establish a Comprehensive Cancer Centre (Maastricht CCC)[2] and a Comprehensive Centre of Reproductive Health (EVA).
The day before the site visit, the committee had a private kick-off meeting where first impressions based on the self-assessment report were discussed. In this closed meeting the committee agreed on a division of tasks and research programs (see below).

Research Program	**GROW Program leader**	**Reviewer 1**	**Reviewer 2**
1. Prevention	M. Weijenberg	P. Bossuyt	F. Russel
2. Innovative Cancer Diagnostics & Therapy	M. Schmidt	A. Giaccia	S. Sleijfer
3. Basic and Translational Cancer Biology	M. Vooijs	A. Giaccia	S. Sleijfer
4. Reproduction and Perinatal Medicine	L. Zimmermann	P. Bossuyt	A. De Paepe

The two-day visit was concluded with public feedback session of the preliminary conclusions of the committee by Professor Sleijfer.

[2] Comprehensive Cancer Centre strategy plan Maastricht UMC+, March 2018

II Assessment of GROW

II.A Description of the school, its research strategy and targets

GROW is one of the six graduate schools of the Faculty Health, Medicine and Life Sciences (FHML) of Maastricht University. GROW combines two types of biomedical expertise: the fields of oncology and developmental biology. The bridge between both research areas can for example be found in the prevention of hereditary cancers, the treatment of female cancer patients with child-wish, and the use of lab techniques needed for both areas such as sequencing techniques.

As a result of the former external review in 2012, the program structure of GROW has been reorganized and simplified in the last four years. According to the self-evaluation report, this new structure, consisting of four programs headed by one program leader, provides more clarity, flexibility and better opportunities for interaction among scientists within and between these programs. A more effective and flexible governmental structure for these programs has been implemented, with a limited number of program leaders. For the organizational structure of GROW, we refer to annex 2 of this report. Annex 3 contains an overview of the financial position of the school and of the school's composition (research staff).

II.B Qualitative and quantitative assessment

II.B.1 General remarks

The committee assessed the criteria 'research quality', 'relevance to society' and 'viability' both in qualitative terms and quantitative terms. The other aspects (PhD programs, research integrity and diversity) were only assessed in qualitative terms.

It is clear that there is huge potential within GROW given the presence of several very strong research groups and young talented investigators who might become research leaders in the future. Since the last review, significant progress has been made in the reduction of the number of research programs. In 2014, the number of research programs was reduced from sixteen to four.

The committee feels that there are more opportunities for cross-fertilization between the four different research programs than is currently the case. For example, the focuses of program 2 (innovative cancer diagnostics & therapy) and program 3 (basic and translational cancer biology) are different and it was not clear to the committee to what extent they work together. There is also room for improvement with respect to interaction with clinicians working at Maastricht UMC+ (MUMC). The establishment of the future Maastricht Comprehensive Cancer Center (Maastricht CCC) and the future Comprehensive Center for Reproductive Health (CCRH) form great opportunities to facilitate this.

Despite the intervention on the organizational level, leading to the reduction to four research programs, the committee feels that GROW's research is still more fragmented than it should be. Within the four research programs of GROW, the school has few large research groups and a lot of smaller programs headed by researchers, who are members of different departments at the MUMC. This structure, with GROW with its own mission, vision and strategy, and the departments with their own strategic plans has a restraining effect on the governance of the research institute as a whole. As a result of this structure, the committee feels that there are insufficient opportunities for the GROW management to mobilize research resources within the school, i.e. by limiting less productive research lines or research lines that do not fit into GROW, and to invest these resources in well performing or promising novel research lines.

Another point of attention is that it is also not clearly mentioned how program leaders are being selected, what their exact mandate is, and what impact they actually have on the (re)allocation of research resources within the programs. The definition of a principal investigator or a research line is not entirely clear; neither what criteria they have to meet to get financial support from GROW. It is also unclear what happens with a PI who does not meet these criteria and whether GROW really has the power to discontinue this line of research.

Furthermore, the committee heard from several researchers in GROW that the time available for research versus time dedicated to education and other activities are not well balanced.
The school also has to deal with some 'viability issues' in the near future. Although GROW's management is very well aware of this, the committee considers the vacancies within crucial departments and the management of these departments, e.g. Genetics and Toxicogenomics, a threat for the productivity of GROW as a whole.

II.B.2 Assessment of Program 1 Prevention
This program is solely dedicated to cancer prevention research. It was established in 2014 as a merger of the former GROW Epidemiology and prevention program and the Toxicogenomics program from NUTRIM School of Nutrition and Translational Research in Metabolism. Prevention is a priority for both the future Maastricht Comprehensive Cancer Center and the university medical center.

Research quality
The committee was in particular impressed by the strong research of the toxicogenomics group, its high-level earning capacity and the output they have generated. In addition, the Epidemiology program has established large population cohorts, which have resulted in many papers and grants. However, more focus on epidemiology programs seems appropriate. It is essential to ensure the sustainability of the most important population cohorts, which is currently dependent on incidental grants. Analysis of "big data" and biomarker development is key in this program and the committee wonders whether there would be room for collaboration with other groups of GROW also working with "big data", such as the Radiomics group in program 2.

Relevance to society
There are no doubts that all topics addressed in this program, all have great relevance to society. The number of patents generated by the toxicogenomics group is impressive, which also holds true for the number of advisory reports, for example on air quality or on life style interventions to prevent cancer.

Viability
GROW's epidemiology research is based on strong research, started several years ago. It has not really become clear to the committee how the prevention and epidemiology research will fit in the future MCCC and CCRH or how the research work will be connected with the research within NUTRIM. Anticipated retirements of crucial research leaders within the Departments of Toxicogenomics and Epidemiology require an urgent and clear action plan. The committee would like to emphasize that such a process does not happen automatically, but requires early and accurate planning with identification of potential new research leaders at an early time point and transfer of knowledge and existing networks to young scientific staff.

II.B.3 Assessment of Program 2 Innovative Cancer Diagnostics and Therapy
This program also started in 2014 and houses clinical departments: Radiotherapy, Radiology, Gastroenterology, Hematology, Medical Oncology, Oral and Maxillofacial Surgery, Dermatology, Plastic, Reconstructive and Hand Surgery, Respiratory medicine, Surgery and Transplantation Surgery. It is also the largest program in number of staff. Approximately 40% of the total GROW Research staff is appointed in this program and the majority of it is employed by the academic hospital (in 2017: 8.55 fte scientific staff hospital versus 1.85 fte scientific staff faculty). This program also has the highest number of PhD candidates.

Research quality
In this program there are some very strong research lines generating a lot of output, in terms of publications and PhD theses, and possessing high levels of external funding. Not limited to these, but examples of such strong research groups are those working on radiomics, on breast cancer, on skin cancer, and the group of plastic surgery. However, there are also a lot of much smaller, less productive research groups and the program overall lacks clear focus.

Relevance to society
Like in program 1, all topics addressed within this program have important clinical value. Exposure to media is clearly present. The number of patents and other spin-offs is impressive.

Viability
The viability of this program might be helped by reduction of smaller research groups or their incorporation into larger groups where appropriate. With respect to the stronger groups, it is important to identify future research leaders at an early stage. It is not clear to the committee whether this has been done in all groups. Additionally, more involvement of clinicians is crucial for the viability of this program. The establishment of the future Maastricht CCC might be instrumental in this perspective.

II.B.4 Assessment of Program 3 Basic and Translational Cancer Biology
This program was established in 2014 as the result of a merger of three former GROW programs. There is a strong cohesion with the other programs as well, in particular with program 1 (Prevention) and Program 2 (Innovative cancer diagnostics and therapy). This collaboration will become more evident in the future in the Maastricht CCC.

Research quality
Program 3 has a strong leadership, empowerment of the PI's, and stands out in its research vision and strategy compared to the other groups. There are several examples of translating findings from more basis research performed in this program to clinical studies where the relevance of these findings can be assessed. The Mean Normalized Citation Score seems to be lagging behind other groups (1.27), but this is likely to be a matter of time given the quality of the people involved.

Relevance to society
At first glance, it looks like there are less opportunities to get media exposure due to the nature of the work, mostly fundamental research, compared to the other GROW programs. However, other fundamental research groups in the Netherlands are more successful in media exposure. The number of patents is good, in particular the patent on the use of methylation markers for colorectal cancer screening has great promise.

Viability
This program has a few strong young talented researchers on board, who have already been able to acquire personal grants, which is pivotal for this program. This program actively seeks collaboration with clinicians, who will hopefully work effectively together in the future MCCC. However, there seems to be a lack of people and infrastructure with respect to topics like fundamental molecular and cellular biology and onco-immunology. A strategy to get access to this knowledge and expertise (inside or outside Maastricht) should be developed. Better connection to large national research initiatives such as ONCODE needs attention. The arrival of a proton facility offers a lot of opportunities for novel research areas as well as further collaboration with other proton centers in the Netherlands.

II.B.5 Assessment of Program 4 Reproduction and Perinatal Medicine
The Reproduction and Perinatal Medicine Program was established in 2014 upon reorganization of the former division of Developmental Biology. Program 4 encompasses most aspects of developmental biology research within GROW and is strongly connected to the hospital, especially with the departments of Genetics, Gynecology and Obstetrics and Pediatrics.

From 2016 onwards the research strategy has been aligned with the strategic document for EVA (Erfelijkheid, Voortplanting en Aanleg (Genetics, Reproduction and Development). This hospital center largely overlaps with the goals for the GROW program in Reproduction and Perinatal Medicine. It is the ambition to get recognized as an international center for early child development, with a focus on the genetic and epigenetic factors that determine a child's development in 2020.

Research quality
The ethics research in this program is of top level and international stature. In addition, the animal work and mitochondrial work within this program are also of exceptional quality. The research on reproduction is mainly patient-related and less groundbreaking in the fundamental research area.

Relevance to society
The relevance to society of the activities conducted in this program is without any doubt obvious. Amongst others, this is reflected in media exposure and participation to important committees counselling the Dutch Government.

Viability
Maastricht UMC+ has held a strong profile in the area of reproduction for many years. Maastricht UMC+ is currently the only licensed center for Pre-implantation Genetic Diagnosis (PGD) in the Netherlands. Maastricht still has a monopoly position in PGD. The committee thinks it would be wise to broaden the scope by embedding PGD in reproductive genetics, combining it with preconception care, and (very) early prenatal diagnosis. This will strengthen the position of Maastricht in this field of research. Viability is at stake because nowadays IVF research is less competitive than it used to be.

The committee has some doubts whether it is wise to have a part-time external head of the department of Genetics, given its importance for this program. Despite the reorganization of research in 2014, program 4 still has a wide focus. There are certainly opportunities for more collaboration with the other programs present in GROW, in particular in terms of shared facilities and lab techniques, but these are not clearly used currently rendering it important to consider whether or not it would be wise to split from GROW and to get incorporated fully in the future Comprehensive Center for Reproductive Health (CCRH).

II.B.6 Assessment of GROW

Research quality
As mentioned - and as is evident from the descriptions of the individual four programs - there are some exceptionally strong research groups within GROW and there is a lot of potential. However, a number of groups perform less well and some of them are not at the international forefront in their field, a very wide range of topics is addressed, with limited resources. This invites the need to define an even stronger focus. In terms of governance, there is a lack of clarity about the exact roles of the four program leaders and their mandate. The latter specifically holds true for the mandate of the scientific director, in particular in relation to the (heads of) departments, the board of directors of MUMC+, and the board of FHML. These deficiencies hinder the execution of GROW's strategic plan and hampers its flexibility.

Relevance to society
Topics addressed have no doubt clinical and societal relevance. There is media exposure. Translation of research findings into daily clinical practice is strived for and patents have been acquired. These criteria for success are generated by a relatively limited number of groups.

Viability (including governance and leadership)
The committee found that GROW still seems to have a somewhat scattered composition, despite the thorough reduction of the number of research lines and programs in recent years. The absence of large research groups might be a threat to the goal-oriented and successful steering of the research. It is not really clear to the committee how program leaders are selected at present, and what impact they actually have on the strategic choices of the institute.
In all four programs, viability is at stake, either caused by (potential) difficulties in finding the right successor to head a department (especially in program 1, 3 and 4), or due to retiring principle investigators.
The establishment of the two comprehensive centers is a great opportunity to further focus research efforts, to foster multidisciplinary teams, and to strengthen collaboration with clinicians.

Taking all the previous mentioned arguments into account, the quantitative assessment for the school and its programs is the following

	GROW	Program 1	Program 2	Program 3	Program 4
Research quality	2	2	2	2	2
Relevance to society	1	1	1	1	1
Viability	3	3	3	3	3

II.C Research training

PhD training
Most of the PhD students in GROW would recommend GROW to their peers if these would consider persuing a PhD project, which is a favorable sign. A good tracking system to monitor the performance and progress of PhD students is in place. The committee is nevertheless worried about the non-mandatory character of the training program, for example courses on scientific integrity, basics in oncology, and statistics. Whereas all research master's students are offered a complete introductory course, no such event is organized for GROW's PhD students. The committee believes that the development of a common track for all PhD's (formal training and mandatory didactic courses) will enhance the quality of research in general and more specifically will improve the School's research integrity, data management and statistics.

The committee noticed that the number of so-called external PhD students being employed by the hospital or by hospitals in the region within the school is relatively large in GROW. The committee wonders to what extent these students can be monitored, especially concerning the training program, their progress and research integrity. Although the majority of these PhDs are employed by the hospital or by hospitals in the region, the committee has its doubts whether GROW is able to control dedicated research time versus clinical activities.

It is the committee's strong recommendation that every PhD student is supervised by at least two supervisors. If this principle is not strictly enforced, both quality of research training and research in itself will be at stake. The committee also advices the school to put more effort into monitoring the quality of supervision of PhD students and in training supervisors on a regular basis.

Young Investigators
There are many talented young researchers present within GROW. However, the number of successes in obtaining personal research grants is limited. Young researchers should be encouraged to apply for personal grants, and there should be resources available to guide and help them in the preparation of their proposals. The latter should be done for example by critical evaluation of the proposals' content, and by mock interviews to prepare researchers, who are invited for further selection, to defend their study proposal. It is also of great importance that GROW offers its (young) researchers career planning options, other than in research, such as mentorships from industry.

Talent scouting and management
Talented young researchers are essential for the viability of a research community. There is a scouting system in place for talented research master's students, which is not yet formalized. In contrast, such a system is unfortunately not present to identify talented PhD students, but should be formalized.

II.D Research integrity

The committee considered the school's policy on research integrity. In this policy, it was not clear what actions have been taken to prevent research integrity issues, for example to prevent researchers working in isolation. Courses in research integrity are not mandatory and it became clear that not every PhD student was aware of the existing procedures and rules within the school and the Faculty.

II.E Diversity
The committee bases its conclusions on how the school has described diversity in the self-evaluation and on what the committee has experienced during the site visit. Diversity not only has to do with gender, but also with age and ethnic background. The committee did not find a well-founded program on diversity on the school level. Nevertheless, the committee had the impression during their visit that there is a good balance in terms of gender, age, ethnic background and a substantial number of young investigators comes from abroad.

III Recommendations

The committee would like to make several recommendations on the organizational level, on preserving research quality, on the viability, including both governance and leadership of the school, and on the research training.

Research quality
1. Stimulate and organize better interaction and collaboration between the programs.
2. Create more synergy within the school
3. Ensure the sustainability of the most important population cohorts and explore if there is room for collaboration within GROW regarding research and methodology development based on “big data”.
4. Invest in young, successful researchers.
5. Install an internal scientific advisory board to help GROW researchers to be competitive in large grant applications.
6. Identify clinicians and link them to PIs within the programs.
7. Install an External Advisory Board that will act as a critical partner of the school management and that will visit the school at least once a year to keep track on the progress of the implementation of recommendations given by the external review committee.

Organization and research strategy
8. The committee sees that there are still too many topics being pursued, and strongly recommends the new scientific director, together with the Strategic Board, to define a comprehensive strategic plan, in which clear aims are set and all research and educational activities are aligned.
9. Further conceptualization of research aims and funding should be part of a ‘second phase’ research strategy of the school, in which the strategic plans of the two comprehensive centers should be integrated.
10. Reduce organizational complexity by further developing the plans for both comprehensive centers; the Comprehensive Cancer Center Maastricht and the Comprehensive Center for Reproductive Health (Moeder en Kind).
11. Make use of the natural moment of the development of these comprehensive centers to split uponcology research from the research mainly situated within program 4.
12. Get a critical look at the actual mandate of the program leaders, empower them by giving them more responsibilities.
13. (Re)define the position and profile of a principal investigator (PI) and set clear standards for the evaluation of their performances. Be specific about the tasks and responsibilities of a PI and, in addition to that, develop a tool to evaluate them on the added value of their research output for the strategic goals of the school.
14. A more visible planning and control cycle is recommended.

Viability
15. Get a quick and clear insight into the vacancies that are about to arise in the management of the school and develop a plan how to tackle potential succession problems in the near future. This can also be seen in relation with talent scouting within the YI group, Top Talent Program of Maastricht University, etc.
16. Build on the sense of trust and collective feeling that is already present within the school. Create a collective investment fund on the school or program level. For example: this can be done from profits made on particular projects from which 50% of the profit goes back to the PI, 50% goes into the investment funds.

17. Financing of the support staff is rather insecure. A strategy for this needs to be developed.
18. Reallocate money for strategic alliances and for the sustainability of those population cohorts important for the future.
19. Put high priority effort in strengthening data science within GROW, for example between activities done in program 1 and the Radiomics group.
20. Enhance the viability of program 2 by reducing the rather large number of smal(ler) research groups. With respect to the stronger groups, it is important to identify future research leaders at an early stage. Additionally, more involvement of clinicians is crucial for the viability of program 2. The establishment of the future Maastricht CCC might be instrumental in this perspective.
21. Develop a strategy to bridge the lack of people and infrastructure with respect to topics like fundamental molecular and cell biology and onco-immunology. A strategy to get access to this knowledge and expertise (inside or outside Maastricht) should be developed.
22. Pay attention to better connect to large national research initiatives such as ONCODE.
23. Broaden the scope and embed PGD in reproductive genetics, combine it with preconception care, and (very) early prenatal diagnosis.

Training and education

24. Design a common track for GROW PhD students, containing mandatory courses on important subjects such as scientific integrity (by analogy with the 8-week course in the second year of the Research Master's program.) Learn from other schools within or outside Maastricht University.
25. Increase the quality of PhD supervision by setting a standard for at least two supervisors per PhD student.
26. Evaluate the quality of the PhD supervision on a more structural (and anonymous) basis.
27. Pay more attention to the training of supervisors, to guarantee a high standard of supervision within the institute.
28. Issues of scientific integrity and good academic research, although formally well organized, require continuous attention and discussion.
29. Individual career-development plans and academic career coaching are to be more formalized within the school and its programs.
30. Organize career planning options other than in research, by arranging mentorships from industry.

Research integrity

31. Courses on research integrity should become mandatory during PhD training.
32. Prevent researchers to work in splendid isolation. Each PhD student should have at least two supervisors

Diversity

33. Develop a well-founded program on diversity on the school level.

IV Annexes

I Short curriculum vitae members ERC
II Organogram GROW
III Quantitative data on the school's composition and financing
IV Program External Review
V Explanation of the quantitative categories utilized

Annex 1 Short curriculum vitae members External Review Committee

Professor Stefan Sleijfer (Chair)
Stefan Sleijfer, MD, PhD, was born in Groningen (1970), The Netherlands, where he studied Medicine at the State University and graduated in 1996. He achieved his PhD at the same university in 1997 with the thesis "Clinical and Laboratory Studies on Chemo-Resistance and Sensitivity and the Role of TNF". He did the residency in Internal Medicine from 1998 to 2004 and from 2002 to 2004 the residency in Medical Oncology at the Erasmus University Medical Centre, Rotterdam, The Netherlands.

At the Erasmus MC he has since been a staff member of the Department of Medical Oncology; since 2008 a research coordinator in Cancer Genomics and Proteonomics, since 2011 as full professor in Medical Oncology and since 2013 as Head of the Department of Medical Oncology.
Professor Sleijfer is an active member of several scientific Societies, among which: chair of the Centre for Personalised Cancer Treatment (CPCT), Chair of Committee "Development and Implementation" of the Dutch Cancer Society, and Chair of the "route Personalized Medicine" of the Dutch Science Agenda advising the Dutch government for research funding. He is a Member of ASCO and ESMO and ESMO Faculty Member for Sarcoma and Developmental drugs.

Professor Sleijfer has been involved in the scientific organization of several conferences and workshops. He is the past scientific director of the AACR-ESMO-ECCO-EORTC workshop on Methods on Clinical Cancer Research (formerly known as the "Flims course"). He is section editor "Sarcoma, Endocrine and other Rare Tumours" for the *European Journal of Cancer*.

His research topics focus on: Translational Oncology - Establishment of prognostic and predictive markers in solid malignancies in particular circulating tumour cells, cell-free DNA and circulating endothelial cells and on soft tissue sarcomas.
He has authored and co-authored over 275 publications and has given over 150 presentations.

Professor Patrick Bossuyt
Patrick M. Bossuyt (1959) is professor of Clinical Epidemiology at the Amsterdam University Medical Centers, where he leads the Biomarker and Test Evaluation Research program. The BiTE Program aims to appraise and develop methods for evaluating medical tests and biomarkers, and to apply these methods in relevant clinical studies. In doing so, the program wants to strengthen the evidence-base for rational decision-making about the use of tests and testing strategies in health care. Bossuyt spearheaded the STARD initiative for the improved reporting of diagnostic test accuracy studies.

Professor Bossuyt has authored and co-authored over 900 publications in peer reviewed journals and serves on the editorial board of a number of these, including Radiology and Clinical Chemistry. He successful supervised 88 PhD students.

Professor Bossuyt chairs the Division of Clinical Methods and Public Health in the Amsterdam University Medical Centers (10 departments). He also chairs the Scientific Advisory Committee of the Dutch Health Insurance Board, which oversees the health care benefits covered in the national insurance program.

Professor Frans Russel
Frans Russel (1957) is full professor and chair in Pharmacology and Toxicology at Radboud University Medical Center (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), obtained a PhD in Pharmacology (1988) from Radboud University and is European registered toxicologist (ERT). 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 pharmacology of therapeutic and off-target mitochondrial drug effects, 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 350 papers in peer-reviewed journals and book chapters.

Professor Amato Giaccia
Amato Giaccia is currently Professor of Radiation Oncology, Associate Chair for Research & Director of the Division of Radiation & Cancer Biology in the Department of Radiation Oncology at Stanford University School of Medicine. He is also the Associate Director for Basic Science and also head the Radiation Biology Program in Stanford Cancer Institute. He has also served as the Director of the Cancer Biology Interdisciplinary Graduate Program.

Professor Giaccia was awarded an American Cancer Society Junior Faculty Research Award, Howard Hughes Junior Faculty Research Award, and the Michael Fry Award from the Radiation Research Society for outstanding contributions on understanding the molecular mechanisms of resistance promoted by the tumor microenvironment. Additionally, he was the recipient of the 2013 ASTRO Gold Medal. In 2015, he was awarded a NIH R35 Outstanding Investigator Award and was inducted into the National Academy of Medicine. He has co-authored the sixth & seventh editions of the textbook, “Radiation Biology for the Radiologist,” with Professor Eric Hall from Columbia. Professor Giaccia is currently the “Jack, Lulu and Sam Willson Professor in Cancer Biology” in the Stanford University School of Medicine.

Professor Anne De Paepe
Anne De Paepe graduated as an MD from Ghent University in 1980. She completed a residency in internal medicine (1985) and subsequently a fellowship in human genetics (including a training at the MRC, Dermatology Research Group, Northwick Park Hospital, London, UK). She joined the Center for Medical Genetics from the Ghent University Hospital, where she started a clinical and laboratory research setting for her studies on Heritable Connective Tissue Disorders. She obtained a PhD in human genetics at Ghent University in 1987 and an ‘aggregation’ in Higher Education in 1992.

In 1993 Anne De Paepe was appointed as Chair of the Center for Medical Genetics and as associate professor of human and medical genetics at Ghent University. She was promoted to full professor in 1997. Under her direction the Center for Medical Genetics developed into a multidisciplinary and renowned department and her research activities gained international recognition as witnessed by her many assignments in national and international scientific boards, her invited contributions in international meetings, large scientific output with over 380 peer reviewed publications and scientific prizes and awards. In 1999 she became (the first female) member of the Royal Academy of Medicine. She engaged in several functions and positions at Ghent University (e.g. in the research board of the university and as a Vice-Dean of the Faculty of Medicine and Health Sciences) as well as in several national and international Advisory Boards and Committees. In 2012 she was elected as the first female Rector of Ghent University (in its 200 years history), a position she took for a term of 4 years (till October 2017).

She now has several assignments as former Rector in the university, and the university hospital (e.g. Chair of the Board for Academic research coordination) and is still affiliated with the Department of Medical Genetics. In july 2018 she was appointed as President of the Board of the Ghent University Association (university and university colleges).

Petra Uittenbogaard (Secretary)
In 2007 Petra Uittenbogaard (1974) received a Master’s degree in Health Sciences at Maastricht University. After having worked as a quality manager in the Sint Antonius Hospital in Nieuwegein from 1997 till 2000, she moved back to Maastricht and worked as a policy advisor and organizational consultant in a large organization for elderly care in Heerlen, and as a strategic consultant in various health care organizations.
In 2002 she was contracted as an advisor to the Executive Board of the academic hospital in Maastricht, nowadays Maastricht UMC+. Her project portfolio mainly consisted of projects in the field of strategic alliances, academic cooperation with other regional hospitals and care suppliers in the Maastricht region, organizational development, and projects shared by both hospital and the medical

faculty on translational medicine and the development of a university medical center in Maastricht. From July 2011 she runs her own company. February 2018 she started to obtain a Bachelor degree in primary education at Inholland University of Applied Sciences in The Hague. In the near future she hopes to successfully combine her advisory skills and experience, with the meaningful work in primary education.

Annex 2 Organogram GROW

Annex 3 Quantitative data on the school's composition (A) and financing (B)

Table 3A Composition: research staff at GROW

Table 1: Research staff at School level

		2012	2013	2014	2015	2016	2017
Scientific Staff FHML[1]	#/FTE	33 / 11,30	39 / 13,15	42 / 15,65	44 / 14,20	44 / 15,00	49 / 15,14
Scientific Staff academic hospital	#/FTE	63 / 17,73	58 / 17,73	58 / 17,73	58 / 17,73	72 / 17,78	70 / 17,50
Post Docs[2]	#/FTE	35 / 32,06	35 / 30,85	30 / 25,95	34 / 29,90	29 / 23,34	37 / 27,86
Internal PhD-students[3]	#/FTE	53 / 53,60	53 / 53,10	57 / 54,45	51 / 48,05	73 / 71,35	68 / 64,98
Total Research Staff	**#/FTE**	**184 / 114,69**	**185 / 114,83**	**187 / 113,78**	**187 / 109,88**	**218 / 127,47**	**224 / 125,48**
Support Staff (research)[4]	#/FTE	50 / 36,45	44 / 31,99	43 / 31,01	40 / 30,10	40 / 29,20	40 / 29,70
Support Staff (managerial)[5]	#/FTE	2 / 1,45	2 / 1,75	2 / 1,75	3 / 1,84	3 / 2,00	3 / 2,15
Total Staff incl academic hospital	**#/FTE**	**236 / 152,59**	**231 / 148,57**	**232 / 146,54**	**230 / 141,82**	**261 / 158,67**	**267 / 157,33**
Total Staff excl academic hospital	**#/FTE**	**173 / 134,86**	**173 / 130,84**	**174 / 128,81**	**172 / 124,09**	**189 / 140,89**	**197 / 139,83**
External PhD candidates[6]	#	104	124	140	143	148	154
Visiting fellows/professors[7]	#	1	1	1	4	2	2

#: Number of persons active on the research programme on 31-dec of any year/average MYE (man year equivalents)
FTE: Sum of actual fte-factors (in fulltime equivalents) labelled on the research programme on 31-dec on any year/average

(1) Comparable with WOPI-categories (HGL, UHD and UD; tenured and non-tenured staff appointed at the FHML
(2) Comparable with WOPI-category 'Onderzoeker' (1, 2, 3, 4), with completed PhD, not belonging to scientific staff (with WOPI-categories HGL, UHD and UD)
(3) Standard PhD (employed)
(4) All support staff working on research (research assistants, lab technicians, and other support staff not working at the management office)
(5) Support staff working at the School's management office including the scientific director
(6) External PhD candidates (externally or internally funded but not employed)
(7) Visiting fellows are researchers/professors who visit the research programme for a period of typically one week up to three months to work with research programme staff members

Table 3B Financing and facilities: funding of GROW

Table 2 Funding at the School level

	2012		2013		2014		2015		2016		2017	
Funding	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Direct funding[1]	31,20	32	34,85	36	32,85	34	26,44	29	33,95	31	33,07	31
Research funds[2]	14,20	15	14,10	15	9,20	10	5,50	6	8,60	8	8,73	8
Contract research[3]	51,56	53	48,15	50	54,00	56	60,21	65	67,14	61	66,18	61
Total funding (excl. hospital)[4]	**96,96**	**100**	**97,10**	**100**	**96,05**	**100**	**92,15**	**100**	**109,69**	**100**	**107,98**	**100**
Expenditure	k€	%	k€	%	k€	%	k€	%	k€	%	k€	%
Personnel costs	7.560	66	8.047	70	7.675	70	7.983	72	7.982	72	9.240	72
Other costs	3.962	34	3.478	30	3.216	30	3.158	28	3.158	28	3.516	28
Total expenditure	**11.521**	**100**	**11.525**	**100**	**10.891**	**100**	**11.141**	**100**	**11.140**	**100**	**12.756**	**100**

* The sum of the FTEs of the programmes is less than the total of the School, because some FTEs cannot be allocated to one of the programmes.

(1) Direct funding by FHML/Maastricht University ('basis financiering'/lumpsum budget).
(2) Research grants obtained in national scientific competition (e.g. grants from NOW, ZonMw and KNAW).
(3) Research contracts for specific research projects obtained from external organisations, such as industry, governmental ministries, European organisations, including ERC, and charity organisations.
(4) The total funding in FTE includes the research staff but excludes the staff from the academic hospital. The total funding in % in the research programme should be compared to the total within each research programme.

Annex 4 Program External Review GROW

Monday, October 8, 2018

Location: NH-Hotel, Forum 110, Maastricht

Afternoon	Arrival members external review committee in Maastricht NH Hotel, Forum 110, 6229 GV Maastricht.
16.00-18.00	**Closed session** of the External Review Committee NH Hotel Teak Room Committee Members: • Prof. dr. S. Sleijfer • Prof. dr. P. Bossuyt • Prof. dr. F. Russel • Prof. dr. A. Giaccia • Prof. dr. A. De Paepe • Drs. P. Uittenbogaard (Secretary)
18.00	Departure to Chateau St. Gerlach Joseph Corneli Allée 1, 6301 KK Valkenburg a/d Geul
18.30-19.00	Installation External Review Committee members by Prof. Dr. Albert Scherpbier, dean of the Faculty of Health, Medicine and Life Sciences (FHML)
19.00–22.30	Dinner at Chateau St. Gerlach Invitees: • Prof. dr. Albert Scherpbier, dean FHML • Prof. dr. Manon van Engeland, scientific director GROW • Prof. dr. Frans Ramaekers, former scientific director • Judith Doomen, managing director GROW
22.30	Taxi to NH-Hotel

Tuesday, October 9, 2018
Location: NH-Hotel (Forum 110, Maastricht)

09.00 – 09.30	**Closed session** on working procedure and reporting Teak Room
	Public sessions: GROW Research: presentations, posters and site visits Chair: Prof. dr. S. Sleijfer
09.30-09.45	Introduction to GROW by Prof. dr. Manon van Engeland
09.45-10.05	Discussion
10.05-10.20	Introduction to Programme 1 Prevention Prof. Dr. M. Weijenberg
10.20-10.40	Discussion
10.40-10.55	Introduction to Programme 2 Innovative Cancer Diagnostics & Therapy Dr. M. Smidt
10.55-11.15	Discussion
11.15-11.30	Coffee break
11.30-11.45	Introduction to Programme 3 Basic and Translational Cancer Biology Prof. dr. M. Vooijs
11.45-12.05	Discussion
12.05-12.20	Introduction to Programme 4 Reproduction and Perinatal Medicine Prof. dr. L. Zimmermann
12.20-12.40	Discussion
12.45-14.00	Lunch break at NH Hotel:
14.15–15.30	First poster session per scientific programme and discussion with programme leaders, senior staff and junior staff
15.30-17.20 15.30-15.40 15.40-16.05 16.05-16.15 16.15-16.40 16.40-16.45 16.45-17.10 17.10–17.20	Site visits at Maastricht University Medical Centre and discussions with scientific staff, technical staff, and PhD students. Transfer Demonstration Radiomics, Decision Support, Distributed Learning (euroCAT) & Super computer-GPU-Farm, Prof. dr. P. Lambin, Prof. dr. A. Dekker, Prof. dr. J. Wildberger Verheylaan 10 – MRI Center – Level 0 Transfer Lamb Intensive Care Unit (LICU) Prof. dr. B. Kramer, Dr. T. Wolfs CPV – side entrance UNS 50 – Level 0 Transfer M4I, Prof. dr. B. Kremer, Dr. T. Porta, Phd Student P. Vaysse H 5.337 – UNS 50 – Level 5 Transfer
17.20-18.30	**Closed session of the External Review Committee** Reflection on the programme and preliminary conclusions Teak Room
19.15	Taxis from NH Hotel to Restaurant Mediterraneo, Rechtstraat 73, 6221 EH Maastricht
19.30–22.30	Informal dinner

Wednesday, October 10, 2018
Location: NH-Hotel (Forum 110, Maastricht)

	Closed morning session: Pine Room Training, Talent scouting and Career Opportunities Chair: Prof. dr. S. Sleijfer
09.00-09.20	Master Molecular Life Sciences and Master Medicine Dr. Jan Theys, Dr. K. Smits, Dr. S. Al Nasiry Participants: K. Lommen, M. Hendrix, J. Beugels
09.20–09.30	Discussion
09.30–10.00	Coordinators of PhD-Programme Dr. Ton Hopman and Prof. dr. Theo de Kok, the PhD representatives Drs. E. Villamor, C. Wolfs Participants: Dr. E. van Roekel, former PhD-Student representative. PhD-Students: Cecile Wolfs – Radiotherapy Jop Beugels – Reconstructive Surgery Alexander van der Wiel – Radiotherapy Khava Ibragimova – Medical Oncology Judith Hounjet - Radiotherapy Damienne Marcus - Radiotherapy Ananya Choudhury - Radiotherapy Lidewij Neeter - Radiology Eduardo Villamor - Peadiatrics Kim Lommen - Pathology Manouk Hendrix – Obstetrics & Gynaecology Jorne Ubachs – Obstetrics & Gynaecology Rajinder Gupta - Toxicogenomics Nicky Beelen – Transplantation Immunology Femke Ehlers – Transplantation Immunology Ana Pereira Daoud - Ethics Maikel Verduin – Radiotherapy/Medical Oncology Wiesje van de Wetering - Gastroenterology Jobran Moshi – Genetics & Cell Biology Jeroen van der Pol - Epidemiology Tom Theunissen - Genetics & Cell Biology/Dermatology Romy Aarnoutse – Surgery
10.00-10.45	Young Investigators GROW Dr. V. Melotte, Dr. L. Dubois, Dr. L. Wieten Participants: Grants office: Dr. E. Rijkers, Young Investigators: Dr. M. Bours, Dr. C. Simons, Dr. K. Rouschop, Dr. T. van den Beucken, Dr. K. Smits, Dr. T. Wolfs
10.45–12.00	Second poster session per scientific programme and discussion with programme leaders, senior staff and junior staff
	Closed session of the External Review Committee: **Teak Room**
12.00–12.30	Meeting with the MUMC+ Board. Prof. dr. Albert Scherpbier, dean FHML
12.30–13.00	Meeting with the Scientific Director and the Managing Director
13.00–14.00	Lunch break at NH Hotel
14.00–17.00	Closed session of External Review Committee. Discussion and formulation of preliminary conclusions
17.15–18.00	**Public session: Pine Room** Presentation of preliminary conclusions of External Review Committee by Prof. dr. S. Sleijfer

Annex 5 Explanation of the quantitative categories utilized

Meaning of categories in SEP 2015-2021

Category	Meaning	Research quality	Relevance to society	Viability
1	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.
2	Very good	The research unit conducts very good, internationally recognized research.	The research unit makes a very good contribution to society.	The research unit is very well equipped for the future.
3	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.
4	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.

Colophon

Edited by
Professor Stefan Sleijfer, Chair
Petra Uittenbogaard, MSc, Secretary to the External Review Committee

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