

# **Pharmacy RUG: UCP**

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Quality assessment of education and research in Dutch universities was until recently carried out by the Quality Assurance department of the VSNU. In 2004 the activities of this department were transferred to QANU, which assumes responsibility for completion of the VSNU activities initiated before 2004.

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# 1 Introduction

## 1.1 Scope and context of this review

This assessment covers the research as carried out at the University Centre for Pharmacy in the Faculty of Mathematics and Natural Sciences of the University of Groningen (RUG) since the previous external review in 1996. The assessment was commissioned by the Board of the University of Groningen, and organised by the VSNU, the association of universities in the Netherlands.

The self-study submitted by the Centre covered the period 1996-2001, but before and during the site-visit in December 2003 publication lists and other information regarding the years 2002 and 2003 were provided to the committee. The committee has taken all information into account.

This assessment is part of the assessment system for all Dutch university research, as organised by the universities in the Netherlands and follows the *Standard Evaluation Protocol 2003-2009 for Public Research Organisations (SEP)*.

The aims of the assessment system are:

- Improvement of the quality of research through an assessment carried out according to international standards of quality and relevance;
- Improvement of research management and leadership;
- Accountability to higher levels of the research organisations and funding agencies, government, and society.

The assessments take place at the level of research institutes and research programmes. The research institutes submit a description of the results that have been achieved in each research programme during the previous six years (including quantitative data about staff input, three key publications and a list of publications), a short outline of the mission statement of each programme, and developments anticipated in the context of the research profile of the faculty or institute. Important elements of all reviews are site visits, which include interviews with the management and the programme directors, and visits to various laboratories and facilities.

Parallel to this review, the same committee also reviewed the research of the Utrecht Institute for Pharmaceutical Sciences (UIPS) in the Faculty of Pharmacy of Utrecht University. The results of that review are published in a separate report.

The committee followed the specific requirements of the Discipline Protocol Pharmaceutical Sciences (see Appendix 4), prepared by the institutes involved and approved by the VSNU Discipline Committee for Nature and Technology.

## 1.2 The Review Committee

The Review Committee was appointed in June 2003 and consisted of:

- Prof. dr. E.J. (Joost) Ruitenbergh, chairman, emeritus professor of Immunology, Faculty of Veterinary Medicine, Utrecht University, and professor of International Public Health at the *Vrije Universiteit* Amsterdam
- Prof. dr. Peter J. Barnes, Imperial College, National Heart and Lung Institute, London, UK

- Prof. dr. Patrick Couvreur, Université Paris-Sud XI, Faculté de Pharmacie, Châtenay-Malabry, France
- Dr. Uli Hacksell, CEO of ACADIA Pharmaceuticals, San Diego, USA
- Prof. dr. Peter Roepstorff, University of Southern Denmark, Danish Biotechnology Instrument Center (DABIC), Odense, Denmark
- Prof. dr. Joachim Stöckigt, Johannes Gutenberg-Universität Mainz, Institut für Pharmazie, Lehrstuhl für Pharmazeutische Biologie, Mainz, Germany
- Prof. dr. Brian L. Strom, Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine, Philadelphia, USA
- Dr. Tyra S.C. Zetterström, De Montfort University, Leicester, UK

Drs. Roel Bennink of the bureau of the VSNU<sup>1</sup> was appointed secretary of the Review Committee. A short curriculum vitae of each of the members is included in Appendix 3.

### *Independence*

The composition of the Committee was officially approved by the Royal Academy of Arts and Sciences (KNAW). All members of the Committee signed a declaration and disclosure form to safeguard that:

- the panel members judge without bias, personal preference or personal interest, and
- the judgement is made without undue influence from the institute, the programme or other stakeholders.

Any existing professional relationships between committee members and programmes under review were reported and discussed in the committee meeting. The committee concluded that there was no risk in terms of bias or undue influence.

The committee regards the rules of conduct and the disclosure form a useful tool in safeguarding the independence of the committee.

### **1.3 Data provided to the Committee**

The Review Committee has received detailed self-evaluation reports provided by the institutes. For each programme, five key publications were specified in the reports and copies of three of these publications were provided to the Committee.

The documentation included all the information required by the Protocol and the Discipline protocol.

As a special experimental feature in this assessment, an extensive analysis of the academic and societal impact and networking of the institutes was carried out, using the Sci-Quest methodology, which involves a number of indicators (see section 1.6). The elaborate Sci-Quest reports served both as input for the institutes and programmes, and as additional information for the review committee.

The fact that during the preparations for this assessment, the new *Standard Evaluation Protocol* was being developed and drafted, has led to some delay in the procedure. Together with the experimental use of the Sci-Quest method for this assessment, this required a certain degree of pioneering on the part of the institutes.

<sup>1</sup> In March 2004 the quality assurance department of the VSNU was transformed into the independent QANU (Quality Assurance Netherlands Universities).

With a view to the time elapsed between the preparation of the self evaluation reports and the site visits, the institutes and programmes were asked to provide updated information as they deemed necessary, both before and during the site visits. The committee has included all information regarding the years 2002 and 2003 in the assessment as much as possible.

#### **1.4 Procedures followed by the Committee**

The Committee proceeded according to the *Standard Evaluation Protocol* and the Discipline Protocol (see Appendix 4). The assessments are based on the documentation provided by the institutes, the key publications of each programme, the interviews and the tours of the facilities. The interviews took place during the site visits in December 2003. In each institute time was provided for visits to the experimental and instrumental set-ups and for poster presentations and discussions with PhD-students.

The Committee members have all read the Self Evaluation Reports. The key publications of each programme were read by the first and the second reviewers of each programme, who independently gave a preliminary assessment, using the form provided in the Protocol (see Appendix 5). These preliminary assessments were compiled and sent to the members.

The preliminary assessments were discussed in the committee meeting on 8 December 2003, preceding the site visits. For each programme the preliminary scores were determined and a number of comments and questions were decided upon. The Committee also agreed upon procedural matters and aspects of the assessment as described in the following paragraphs. A presentation of the Sci-Quest method was included in this committee meeting.

At the formal dinners in Groningen and Utrecht, the committee had the opportunity to meet with representatives of the University Boards, the Faculty Boards and the Institute management.

The interviews with the management and programme directors took place during the site visits on December 9 (Groningen) and 10 (Utrecht), 2003. All interviews and discussions were held by the entire Committee, the tours of the facilities were conducted in separate groups where appropriate.

After the interviews, the Committee discussed the scores and comments for each programme and determined the final assessment.

Shortly after the site visits a meeting with the institute management was arranged, in which the main findings of the Committee were reported (see Appendix 1). A draft version of the report was sent to the institutes in February 2004 for factual corrections and comments. The comments have led to a number of clarifications and changes in the text. The report was subsequently submitted to the Board of the University. The comments of the Institute management are included as Appendix 2.

#### **1.5 Aspects and Assessment Scale**

The Protocol requires the Review Committee to assess the research on four main aspects, namely:

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

The elements taken into account in the assessment are illustrated by the assessment form used by the committee (see Appendix 5).

The Committee points out that the score for Productivity is not completely separate from the score for Quality, because the Committee did not choose to use a purely numerical calculation as an indicator. Wherever possible on the basis of the data provided, the Committee took into account the impact and prominence of the journals and publishers.

Note: The ratings specified in the *Standard Evaluation Protocol* differ from the ratings specified in the VSNU-Protocol which was valid until 2003. From 2003 a new rating “Very good” is added between “Excellent” and “Good”, and the rating “Poor” is abandoned.

When comparing scores with ‘old’ scores this must be taken into account!

VSNU 1992-2002		SEP 2003-2009	
5	Excellent	Excellent	5
		Very good	4
4	Good	Good	3
3	Satisfactory	Satisfactory	2
2	Unsatisfactory	Unsatisfactory	1
1	Poor		

## 1.6 The Sci-Quest reports

As a special experimental feature in this assessment, an extensive analysis of the academic and societal impact and networking of the institutes was carried out, using the Sci-Quest methodology which involves a number of indicators. The Sci-Quest reports served both as input for the institutes and programmes, and as additional information for the review committee. The Sci-Quest reports are available upon request at the University Centre for Pharmacy and UIPS.

### *Framework*

The Sci-Quest reports were produced within the framework of a project that was initiated and subsidized by the *Commissie van Overleg Sectorraden* (COS) This project constituted the further development of a methodology that was first used in measuring the societal value of agricultural sciences at Wageningen University (NRLO/COS, August 2000). Both VSNU and COS saw an opportunity to apply this methodology to the strategic orientation of the research groups in one of the assessments under the new Standard Evaluation Protocol. The University Centre for Pharmacy and UIPS were willing to participate in this project, because this would tailor the research assessment more specifically to the particular characteristics of the groups and their missions.

### *Method*

The Sci-Quest analysis weighs the different orientations of research toward its social environment. It includes feedback to the mission of a research group. The assumption is that research programmes develop not in a vacuum, but in mutual transactions with a relevant social environment. A main consequence of the interaction with the environment is that expectations, norms, values etc. in that environment come to influence the activities

of researchers, and therefore the research output. Factors that are important in this approach are the mobility of scientists and their overall interaction with the environment (because it is essential for cross-fertilization of knowledge and know how) and the way problems are selected in such a hybrid context.

Emphasis is laid upon a confrontation between the mission of the program and several empirical reconstructions of its profile and of its stakeholder environment.

These “reconstructions” of the profiles consist of three parts:

- (1) A general profile of the group in terms of its relations to the three main social domains: **academia, industry and policy/society**. This was accomplished by using three types of questions. First, the groups were asked to estimate what percentage of research time is devoted to actual work in these three domains (self image). Second, the groups were asked to estimate the influence of stakeholders in the three domains on the development of research (contextual influence). Third, the most important stakeholders mentioned in the questionnaire were counted and divided into the three social domains (stakeholder distribution). Together, these three images render an idea of the group’s activities in the three domains and thus a background for evaluation of its work.
- (2) A specific profile of each research programme is constructed via indicators representative for the specific forms of interaction/communication of the programme in a relevant environment. The outcome is graphically represented in a so-called research embedment and performance profile (REPP).
- (3) A stakeholder analysis is conducted consisting of two elements. First, the stakeholder environment is charted by identifying stakeholders in three domains: academia, industry and society/policy. Second, stakeholders are surveyed with regard to their involvement into the activities of the researchers. Furthermore the role in the innovation process and participation in diffusion and translation of knowledge is described. The survey focuses on processes of interaction and learning.

The REPP graph is based on the collection of a large amount of mostly quantitative data and renders a graphic representation of a research group in relation to its surrounding context. The user analysis is the product of a relatively simple survey and leads to a qualitative identification of the innovation context in terms of learning environments.

The Research Embedment and Performance Profiles of the programs are based on a review and analysis of several sources of information in which evidence is presented and ordered. The evidence was compiled from readily available data and from information gathered on specific aspects of research activity and use. This information is ordered according to three social domains of activity and performance:

- 1) Science and certified knowledge (academia);
- 2) Industry (market and professional domain);
- 3) Policy and Society (public policy and societal groups).

The hypothesis is that research programs will have different profiles depending on their activities in each of these domains, and that these profiles ultimately will link back to the mission of these programs. In other words, the profiles are in the first place provided as part of the self-evaluation process in which evidence is gathered regarding the empirical profile of the programme. They are intended to give a solid basis for internal discussions about research strategies and related performance.

### *Place in the assessment*

The Sci-Quest reports about the programmes were presented to the review committee as “background to the self evaluation reports”. As such, they are an implementation of section A.9 of the Standard Protocol: *“In analogy with a bibliometric analysis, a methodical analysis of the institute’s environment and its appreciation of the institute’s conduct and results may be added.”*

The review committee regards the Sci-Quest reports as useful and informative background material. The analyses and profiles add depth and context to the regular information as required by the Standard Protocol. The committee has not regarded it as their task to evaluate the Sci-Quest method, nor the outcomes in terms of the feedback they provide to the programmes. In other words, the committee has not tried to validate or verify the profiles.

### *Evaluative remarks*

Some evaluative remarks about the Sci-Quest reports from the viewpoint of the committee as a “consumer” of information about the programmes and institutes are as follows:

1. indicators should not become a standard in themselves; the institute should be able to adequately balance higher and lower scores across programmes, according to their respective missions.
2. perhaps the most important contribution of the analyses is that they “sensitize” the programmes and their staff to the issue of relevance towards different stakeholders.
3. the low response rate of the stakeholder survey raises questions as to its validity. The qualitative character of these results should be stressed.
4. the citations are related to the expected score within the domain of the group, because not all domains have equally good journals to publish in. This is an acceptable methodological choice, but it does not make comparison across programmes easy.
5. the 15 key publications are selected on the basis of the impact of the journals in which they are published. As such, they are not necessarily the most frequently cited publications, and therefore the citation rate may not be representative.
6. the presentation of the method and results can probably be simplified, in order to minimize the effort at understanding the validity of the underlying data and the calculations.

## 2 University Centre for Pharmacy

The University Centre for Pharmacy is part of the “Faculty of Mathematics and Natural Sciences” which is the largest Faculty of the University of Groningen (RUG) and the largest Faculty of Sciences in the Netherlands.

The research at the University Centre for Pharmacy is organised in two research institutes:

- the Groningen Research Institute of Pharmacy (GRIP) and
- the Centre for Behaviour and Neurosciences (CBN).

GRIP is embedded in the interfaculty research school “Groningen University Institute of Drug Exploration” (GUIDE), which is the largest research school for drug research in the country with about 150 PhD students, covering also a great part of the “Faculty of Medical Sciences”. CBN is embedded in the interfaculty Graduate School for Behavioral and Cognitive Neurosciences (BCN).

In this collaborating network for pharmaceutical, pre-clinical and clinical sciences, the Centre occupies an interdisciplinary key and bridging role between the faculties of Natural Sciences and Medical Sciences at RUG.

The University Centre for Pharmacy also harbours the “School of Pharmacy”, which is responsible for the three educational programmes “Bachelor in Pharmacy”, “Master in Pharmacy” and “Bachelor in Pharmaceutical Sciences”. The School with about 700 students assigns teaching to the twelve Departments (“basic units”) of the Centre, which are also responsible for the research to be performed. The School and the Research Institute are headed by a Management Team Pharmacy consisting of a director, a scientific coordinator, an officer for education and a business coordinator.

The scientific environment of the institute together with its good infrastructure and number of students, justify an important position for the Centre within the University and within the Faculty.

Research at the Centre is divided into nine programmes, each chaired by a full professor. The nine programmes are:

**RUG 1: Analytical Chemistry** - with

- subprogramme: Bioanalysis and Toxicology
- subprogramme: Pharmaceutical Analysis

Development of highly sensitive and selective analytical methods, also with combination of microtechnology and biochemistry (chip technology) and techniques to be applied in proteomic, biopharmaceutic and forensic research.

- RUG 2: Biomonitoring and Sensoring**  
Biomonitoring and biosensing of endogenous and exogenous agents to follow drug effects in intact organs (e.g. brain) of experimental animals and humans, including monitoring of neurochemical events in the central nervous system to develop new acting drugs.
- RUG 3: Medicinal Chemistry**  
Investigation and design of potential new receptor ligands being active in the central nervous system (e.g. Parkinson, Alzheimer) by organic chemical synthesis approaches and computer assisted modelling techniques.
- RUG 4: Molecular Pharmacology**  
Research on receptor pharmacology, cellular transduction systems and molecular aspects of function and dysfunction of receptors and receptor subtypes in neural and non-neural control of the respiratory tract (e.g. bronchial asthma).
- RUG 5: Pharmaceutical Biology and Biotechnology**  
Research on plant natural product biosynthesis, molecular biology, directed evolution of new biocatalysts and therapeutic peptide and protein expression systems with the aim to create new and effective drug products.
- RUG 6: Pharmaceutical Technology, Biopharmacy and Industrial Pharmacy**  
Development of optimum drug dosage forms by exploration of drug release and development of novel pharmaceutical formulations in order to enhance the therapeutic value of active substances.
- RUG 7: Pharmacokinetics and Drug Delivery**  
Innovative research into cell-specific targeting of drugs and therapeutic proteins. Fundamental studies on mechanisms of membrane transport, metabolism and toxicity of drugs.
- RUG 8: Social Pharmacy, Pharmacoepidemiology and Pharmaco-therapy**  
Basic research in order to assess benefit-risk profiles of drugs, to evaluate optimal drug application in daily pharmaceutical care (including costs profiling) and to generate data bases and computational tools for optimum health care settling.
- RUG 9: Therapeutic Gene Modulation**  
Development of systems for specific gene delivery and regulation with design of vector systems with target specificity and local release of expressed proteins.

Remarkable and most positive changes of several groups and situations within the institute have been realised since the last assessment by re-profiling the research, attracting funding and increasing the scientific output. These changes are clear evidence for its great capacities and flexibility but have not yet resulted in a perfectly well-rounded image. For that reason the committee feels that the leadership of the Centre could be more pronounced at the faculty level in order to strengthen and to make more visible the interdisciplinary research role taken by the institute. More pronounced leadership would help to optimize and to balance the financial situation of the Centre as far as support from RUG and the Faculty is concerned.

Drug design, development and drug use are the major scientific disciplines of Pharmacy in general and of the institute. The mission and goals of the Centre are diverse and broad, ranging from the development of innovating strategies in drug finding and development, drug action and metabolism up to drug utilisation in daily practice, but also involving new strategies in research (genomics, proteomics, drug and gene delivery and novel analytics).

These fields are in themselves necessary elements of Pharmaceutical Sciences and particularly in pharmaceutical education, but developments in the present research programmes will provide opportunities for further strengthening the institute's mission. The committee's recommendations on focusing and merging programmes are aimed at contributing to these developments.

The committee has suggested to the management of the Institute that it is worthwhile to consider merging the programmes 2, 3 and 4, as well as programmes 7 and 9.

The strategy and policy of the institute is impressive, especially if one considers the recent developments, and will become even more important for the near future. The final design and especially the realization of the future *leerstoeleplan* (2003 – 2008) will have great influence on further developments of the Centre, and on the scientific mission of the institute. The realization will need strong and concerted action of RUG, the Faculty and especially the management of the Institute. The embedment of the Centre in many research networks, centres (GUIDE, BCN, or Groningen Genomics- or Bioinformatics Centre) and through other diverse University groups, through a number of companies, and through national and international collaborations, demonstrates strategic strength which can be further developed.

The mission and strategy of the Centre to play a competitive and determining role in Pharmaceutical Sciences within the country but also on an international level, still requires strong efforts. The basic resources are adequate and can be considered suitable to reach that goal. However, the Centre is dependent on the policy of the Faculty of Mathematics and Natural Sciences. Both in terms of funding and in terms of thematic affinity, this presents certain problems.

The funding policies of the Centre at the institute level are excellent. Nearly doubling the total funding (1997 – 2001, table 6, page 43 of Self Evaluation Report) is a most impressive result of the institute's policy. There is still room to significantly increase the 2<sup>nd</sup> money flow (through national funding agencies). The Centre is fully aware of this situation and aspires

to more participation and representation in appropriate organizations (such as NWO, STW, KNAW, ESF).

Some groups have been granted projects by the European Union in the 5<sup>th</sup> Framework, Euregio etc. and more applications are being prepared, but this funding strategy can still be intensified and should include more groups of the Centre. In the view of the committee, this is a prerequisite to develop the University Centre for Pharmacy into a research centre with good scientific prestige in the Life Sciences area.

The facilities can be scored in general as excellent; the close proximity within one building favours successful internal collaboration, and the proximity of the Medical Faculty is of great advantage. Excellent lab facilities in terms of space and instrumental equipment (with certain exceptions in the case of RUG 1) put the institute into a very promising position for further international competition. There is an ample availability of standard and state-of-the-art facilities, and the excellent facilities within the Faculty and the research schools GUIDE and BCN are also accessible.

Therefore, the reputation of the institute can be regarded as high since the scientific output was recently greatly enhanced and because some of its groups became scientifically strongly competitive and much more visible at an international scale. To become one of the top drug research institutes in Europe, the Centre is on the way to further improving significantly the research programmes and disciplines.

The societal relevance of the Centre is very high and Pharmacy and Pharmaceutical Sciences have an important role and impact on society in general. The institute is intensifying this role. It is extending research areas in the fields of pharmacotherapy, pharmacoconomics, pharmaceutical care, in special diseases and patient-orientated research but also pays attention to providing excellent scientific and professional pharmaceutical education in both theory and practice and to connect basic health science with industrial application (as demonstrated by a remarkable increase of patents).

In terms of strengths and weaknesses, the Committee concludes that the strengths very clearly preponderate the weaknesses and that the Centre is already on a successful way to become a leading institution in Pharmaceutical Sciences.

<b>Human resources 2001</b>	
Academic sta	51.85 fte
Supporting sta	25.2 fte

### **3 Assessments per programme**

Programme RUG 1:	<b>Analytical Chemistry</b>	
Programme director:	Prof. dr. R.P.H. Bischoff	
Academic staff in 2001:	8.1	
Assessments:	Quality	: Good
	Productivity	: Very good
	Relevance	: Good
	Prospects	: Good

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**Subprogramme A: Pharmaceutical Analysis** (Prof. Verpoorte, from 2003, succeeding prof. dr. G.J. de Jong)

**Subprogramme B: Bioanalysis and Toxicology** (Prof. Bischoff, from 2001, succeeding prof. dr. R.A. de Zeeuw)

The mission of the programme is to develop sensitive methods to solve problems of relevance to medicine, to the development of new pharmaceuticals and to toxicology. The group is focusing on separation techniques and mass spectrometry as analytical tool and recently the goal has shifted from analysis of low molecular weight compounds to peptides and proteins (Proteomics). This shift is related to the advent of a new programme director in 2001. In the period 1996 to 2000 the main goal was the development of methods for identification and quantification of trace amounts of drugs and their metabolites in body fluids like urine serum and plasma, and for profiling and characterisation of drugs. Since 2001 the focus has been on profiling proteins and peptides to identify prognostic biomarkers for diseases and on affinity-based 'targeted proteomics'. This will be achieved with a proteomics approach based on development of high-resolution multi-dimensional separation techniques coupled to mass spectrometry. Since May 2003 a new professor, Dr. Verpoorte, is responsible for the subprogramme Pharmaceutical Analysis and will mainly focus on the development of microfluidics for separation and sample preparation.

#### Evaluation

Due to the extensive reorganisation of the programme and the appointment of new group leaders, a full assessment of the present activities would be premature. The change in the research programme is very reasonable considering the strongly growing importance of proteomics. The programme has good perspectives. However, the mass spectrometric equipment presently available consisting of a rather old MALDI instrument and three LC-ESI-Ion Trap instruments, is insufficient to fulfill the requirements in a contemporary proteomics facility. Substantial instrument investments will be needed to bring the facility on top level. The committee was informed that such funds are now available.

A very advanced activity aims at developing molecular imprinting on synthetic polymers to be used for selective purification of peptides and proteins. This concept, if combined with the now planned microfluidics programme, might result in exciting new analytical concepts.

The strength of the former programme has been the development and use of capillary separation techniques (capillary electrophoresis and electro-chromatography) combined with mass spectrometric detection, the use of solid phase micro extraction for sample clean-up, preconcentration and preparation and the use of advanced statistical analysis for data evaluation. The programme has had extensive collaborations with other academic research groups and with companies. The overall productivity of this programme in terms of scientific papers and Ph.D. students has been very good.

Programme RUG 2:	<b>Biomonitoring and sensing</b>	
Programme director:	Prof. dr. ir. B.H.C. Westerink	
Academic staff in 2001:	4.8	
Assessments:	Quality	: Very good
	Productivity	: Good
	Relevance	: Good to Very good
	Prospects	: Good

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The research area covers the development, application and mechanistic studies of in vivo monitoring techniques for animals and humans. The main focus is on monitoring of neurotransmitters and glucose levels.

The work continues to improve our understanding of the mechanisms underlying primarily central nervous function and drug action. It is particularly valuable that the group utilizes models providing the opportunity to study simultaneously biochemical and behavioural changes in experimental animals. The ongoing development of microsensor methods combined with extracellular recording is compelling but notoriously difficult.

The programme leader is a highly regarded scientist with a strong international reputation in the neuroscience area.

Although the relatively small group continues to do exceedingly well, the committee believes that the research as well as the technological aspects of the work might benefit from enhanced interactions with other faculties, such as the medical and technical faculties.

Programme RUG 3:	<b>Medicinal chemistry</b>	
Programme director:	Prof. dr. H.V. Wikström	
Academic staff in 2001:	3.35	
Assessments:	Quality	: Very good
	Productivity	: Good
	Relevance	: Good
	Prospects	: Satisfactory

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The research area covers neuromedicinal chemistry involving pharmacology, modelling and synthesis of drugs and research tools with activity in the central nervous system.

The programme leader and his group have a good reputation in the area of neuromedicinal chemistry. Their productivity and quality in terms of publications has been very good but the output is decreasing. Similarly, fewer dissertations are coming out of the group in the more recent years. Current efforts are focused too much on discovering new drugs and, being in academia, the group ought to focus more on solving fundamental problems in medicinal chemistry. It is obvious that the group is in need of additional members who can introduce new research themes and provide leadership for the future.

Because of the key-nature of medicinal chemistry in drug discovery research, it interfaces with a range of other disciplines some of which should preferably be represented within the group. For example: a molecular pharmacologist/chemist would enable the group to do site-directed mutagenesis experiments and would also be able to help the group to evaluate drug profiles in vitro. Such a competence would link the future of the group with its history.

Another interesting profile of a future leader in medicinal chemistry might be a chemist who is also a molecular biologist. Such a recruitment could, however, direct the group into completely different avenues of research.

Programme RUG 4:	<b>Molecular Pharmacology</b>	
Programme director:	Prof. dr. J. Zaagsma	
Academic staff in 2001:	3.3	
Assessments:	Quality	: Very good
	Productivity	: Good to Very good
	Relevance	: Very good
	Prospects	: Good to Very good

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The major focus of the group is on G-protein coupled receptor pharmacology relevant to airway disease, signal transduction pathways, mechanisms of airway hyperresponsiveness, autonomic regulation of airways and nitric oxide in airways.

The programme leader is an excellent and internationally respected receptor pharmacologist who has built up a small productive research group and one of the staff members has recently been promoted to a chair. The focus is on *in vitro* and *in vivo* animal studies of airway disease and since the last assessment they have successfully integrated relevant molecular techniques to complement the research. Sensibly they have now decided to focus more on airway disease, rather than pursuing the related work on vascular smooth muscle and lipolysis as this gives them more focus and depth.

The recent work on arginase as a regulator of airway hyperresponsiveness looks very promising. There is little work on human airways and cells, suggesting that there is scope for more collaboration with clinical researchers, particularly in Pulmonology.

They have a steady track record of publications in the leading specialty journals relevant to their field (Am J Respir Crit Care Med, Br J Pharmacol), but have no primary publications in high impact journals.

Although they have several good international collaborations, they need to strengthen their international profile. Prof. Zaagsma retires in 2005, so the long-term viability of the group is unpredictable, but the committee feels that it is vital to maintain a good pharmacology group within the Faculty.

The ratings reflect the international recognition, steady productivity and cohesion of this small group and show an overall improvement compared to the last assessment.

Programme RUG 5:	<b>Pharmaceutical Biology and Biotechnology</b>	
Programme director:	Prof. dr. W. J. Quax (since the end of 1997)	
Academic staff in 2001:	10	
Assessments:	Quality	: Very good to Excellent
	Productivity	: Excellent
	Relevance	: Excellent
	Prospects	: Excellent

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To explore the application of living cells as a factory but also as target of pharmaceutically valuable products is the final mission of the research group. To reach that goal, micro-organisms, medicinal plants and cultivated plant cells are studied as sources of natural products e.g. by improving and designing product biosynthesis and pathways. Selected animal cells and cell receptors are used to investigate interactions with pharmaceutically important compounds.

Plant biotechnology research will be explored for optimization of production of bioactive natural products. Techniques of molecular biology will be applied to control and to engineer biosynthetic routes in order to make use of the natural diversity of active compounds. Molecular biology is applied to concentrate mostly on the production of proteins, enzymes and receptors of pharmaceutical and therapeutic relevance. The combination of both, the natural diversity and the directed diversity, is finally expected to create a molecular diversity which can be of high value to develop better therapeutics in the near future.

#### Evaluation

The programme has developed excellently after the last evaluation. This development is due to the perfect “in-group” combination of the most advanced research in the fields of Microbiology, Biotechnology and Plant Biochemistry, all covered by successful application of a wide variety of methodologies of Molecular Biology. The group has accumulated a great diversity of scientifically well balanced projects of which three major lines are the plant research, represented by phytochemical analysis of medicinal plants, plant cell suspension cultures and the elucidation of biosynthetic pathways, but also the directed evolution approach leading to novel biocatalysts (e.g. industrially important enzymes acting on antibiotics) and the development of efficient expression systems for the production of pharmaceutically valuable peptides and proteins.

In case that the plant biotech research line will consequently be followed, this unique scientific situation should allow the department to compete worldwide with the best research groups in Pharmaceutical Biology and Biotechnology.

The group has an impressively increasing output of publications in highly ranked international journals, especially in 2002 and 2003. The top quality and productivity of the group is still increasing but the high 3<sup>rd</sup> money flow cannot always guarantee a stable overall situation.

This excellence of science can only be continued if a solid support in technical staff (tenure positions) and higher budgets for consumable materials will be provided by the 1<sup>st</sup> money flow. The Committee strongly suggests that the department – in addition to the full professor – should harbour two further professorships, an associate *and* an assistant professor, in order to develop to an international leader in Pharmaceutical Biology and Biotechnology.

Programme RUG 6:	<b>Pharmaceutical technology, biopharmacy and industrial pharmacy</b>	
Programme director:	Prof. dr. H.W. Frijlink	
Academic staff in 2001:	5.8	
Assessments:	Quality	: Satisfactory
	Productivity	: Good
	Relevance	: Satisfactory
	Prospects	: Satisfactory

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This group is performing research in the field of the dosage forms, their production and interaction with living organisms. Although it has been decreased since the last review, the number of subjects is still rather large: inhalation technology, sugar glass technology, tableting technology and powder technology. Pharmaceutical powder technology is too diverse a terrain in itself to ensure coherence and synergy between these topics.

The programme has many partners from industry, it is involved in numerous applications of patents and has an active licensing policy. It has put a new inhaler and two new excipients on the market. The committee recognises that the group shows a high profile in the industrial and market domain, but from the Sci-Quest data about the relative citation impact, the productivity in terms of scientific publications and the international visibility, the committee concludes that the group does not have a very strong international orientation.

The group has established valuable strategic alliances with industry, as was recommended by the previous review committee. On the other hand, the production of scientific publications is recently increasing, although the impact factor of the journals is not high. The balance between fundamental research and applied research is entirely a matter of the group's mission, and the committee recognises that the interest from industry is often related to the fundamental scientific or clinical expertise in a group. Nevertheless, the committee has some reservations regarding the balance between fundamental research and applied research in this group at present. In the opinion of the committee, the research of the group should be more focused on questions arising from fundamental science than from the pharmaceutical industry. A multidisciplinary and fundamental problem-approach is necessary for drug delivery research. In view of the valuable input that rheology and biophysics can have in this type of topics, the committee feels that the viability of the programme can be increased by focusing on inhalation but with a deeper approach in physico-chemistry. This could be done by attracting a professor or an associate professor with a strong biophysical background (i.e. in rheology) or perhaps by strengthening the existing collaboration with the department of Chemical engineering.

To further increase the academic focus without sacrificing the links with industry, the Institute could consider moving the powder and tablet subjects away from the programme, for instance by creating a spin-off company.

Programme RUG 7:	<b>Pharmacokinetics and drug delivery</b>	
Programme director:	Prof. dr. D.K.F. Meijer	
Academic staff in 2001:	10.5	
Assessments:	Quality	: Excellent
	Productivity	: Excellent
	Relevance	: Excellent
	Prospects	: Good to Very good

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This remarkable programme deals with innovative research into cell-specific targeting of drugs and therapeutic proteins, and with fundamental studies on mechanisms of membrane transport, metabolism and toxicity of drugs. The main challenge is the cell-biological characterisation of carrier-mediated and receptor-mediated membrane transport of drugs, oligopeptides and proteins. The basic findings from the studies are employed for the development of sugar- and peptide-modified proteins as drug carriers, in relation to anti-infective, anti-tumour and anti-inflammatory diseases.

The programme has a high profile in all domains (science, industry and societal). The overall quality of the research is excellent and the impact of the publications is very high. The laboratory has a wide national and international recognition.

In conclusion, this group scores admirably in almost every respect. The amount as well as the choice of stakeholders is impressive. This laboratory can be described as holding a great deal of prestige in the world.

To keep the programme at its actual top level, the replacement of the programme leader after his retirement by a personality at the full professorship level is of strategic importance.

Programme RUG 8:	<b>Social pharmacy, pharmacoepidemiology and pharmacotherapy</b>	
Programme director:	Prof. dr. L.T.W. de Jong-van den Berg	
Academic staff in 2001:	4.3	
Assessments:	Quality	: Satisfactory to Good
	Productivity	: Good
	Relevance	: Good
	Prospects	: Satisfactory

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The group conducts research to assess benefit-risk profiles of drugs, to investigate the mechanisms of optimal application of these drug profiles in medical and pharmaceutical care and to develop methods to implement accepted guidelines/protocols. The overall aim is to study rational and cost-effective drug use for clients of pharmacy practices (in and outside the hospital). The research goals are:

- Generation and optimisation of dynamic databases and computational tools for the assessment of benefit-risk profiles of drugs, adherence to guidelines, rational pharmacotherapy and pharmaco-economic profiles.
- Design and evaluation of protocols for optimal delivery of pharmaceutical care in the health-care setting.

The general methodological approach of the research programme is multi-disciplinary, using methods and techniques from epidemiology, social and business sciences, (pharmaco-)economics, statistics and communication science. Both qualitative and quantitative approaches are used. The Sci-Quest report indicates that the group puts much effort in communicating results to society and policy, to influence the research agenda and to stimulate research that is relevant for policy and the professional practice of pharmacists.

#### Evaluation

This is a renewed and improved programme. Productivity is notable, with a large number of papers per faculty member. Considering its small size, the committee feels that the programme has too broad a mission and needs more focus. The academic impact is limited, much of the work is descriptive, rather than hypothesis-driven, and it concerns the application of methods from elsewhere to answer local questions. For a successful contribution to international knowledge, the group has too many papers in national rather than international journals. On the other hand, if the goal is to affect local policy, there should be intervention studies showing the effects.

In the view of the Committee, the programme's long-term viability is uncertain because the interaction with the relevant basic sciences, such as epidemiology and biostatistics, does not seem strong enough. A key point seems to be the lack of formal expertise in epidemiology, either in the group or at the Institute. In the opinion of the Committee, either major strength needs to be recruited, or the programme needs to be refocused in its direction.

Programme RUG 9:	<b>Therapeutic gene modulation</b>	
Programme director:	Prof. dr. H.J. Haisma	
Academic staff in 2001:	1.7	
Assessments:	Quality	: Good
	Productivity	: Good to Very good
	Relevance	: Good
	Prospects	: Good to Very good

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This programme focuses on the development of systems for the specific delivery and regulation of genes. It aims to develop vector systems with target cell specificity as well as for local spread of the expressed protein.

This group is young (it started in October 2000) and has good potential for further development and growth, especially because they have a stimulating multidisciplinary research environment. They also address a real challenge in drug delivery.

The leadership seems good, active and motivating. The group has a clear and objective view of their weaknesses: moderate presence in the international scene due to a very competitive environment in the field and difficulties in raising money and to recruit good qualified PhD students.

The level of the publications and scientific production are medium to good and increasing in the last year. The number of scientific topics is probably too large in relation to the number of permanent staff members. Relations with industry are limited.

For the future, the Committee suggests to bring programme 9 closer to programme 7 because these two programmes should definitely enrich each other.

## APPENDIX 1      **Management letter**

*This management letter is a summary of the findings of the committee as reported by the committee chairman to the management of the Centre on December 15, 2003. The management letter is added to the report at the request of the Centre.*

### **1. Scores**

The committee has scored the aspects of the checklist of the Standard Evaluation Protocol as follows:

1.	Leadership	3
2.	Mission and goals	3
3.	Strategy and policy	3
4.	Adequacy of the resources	4
5.	Funding policies	5
6.	Facilities	5
7.	Academic reputation of the institute	4
8.	Societal relevance of the institute	4
9.	Balance of the strengths and weaknesses of the institute	4

### **2. Strategy**

Since the last review many adequate measures have been taken, fully in line with the recommendations of the previous review committee, but a number of new developments make it necessary not only to reinforce those measures, but also to add further steps. The committee feels that the Centre must concentrate on further strengthening the coherence between the groups and reinforcing the leadership profile. The committee report will contain evaluations and recommendations per programme, and the overall picture is based on those assessments. The broad outline of this picture can now be sketched as follows:

- a. the committee will recommend to merge programmes 2, 3 and 4, on grounds of content and leadership
- b. the committee will recommend to merge programmes 7 and 9, to secure continuity after the retirement of one of the programme leaders.
- c. the committee will recommend to pay special attention to the adequacy of the equipment which is necessary to realise the aims of programme 1b; extra investments might be necessary.
- d. the committee will recommend to strengthen the academic focus of programmes 6 and 8 and to switch the regional and/or industrial accents to a more specifically scientific and (inter)nationally relevant orientation.

### **3. Faculty policy**

The institute is dependent on the policy of the Faculty of Mathematics and Natural Sciences. Both in terms and funding and in terms of thematic affinity, this presents certain problems. The committee will pay attention to these points in the report.

#### **4. Unilocality**

The committee agrees that the close proximity of the different groups favours exchange and collaboration. Advantage is also taken of the proximity of the medical faculty.

## COMMENTS ON THE REVIEW REPORT

The management of the University Centre for Pharmacy and the individual programme leaders accept the VSNU report reviewing research in the pharmaceutical sciences in Groningen over the period 1996-2001. The independence and objectivity of the review committee and of the entire assessment procedure, under the auspices of the KNAW and carried out by the VSNU, is highly appreciated.

For most of the research programmes and for the management of the Centre, the outcome of the assessment is a stimulus to pursue current research lines and policy. The recommendations made by the committee will be fully taken into account, and future changes will be implemented in conjunction with the plans described in the *Leerstoelenplan 2003-2008* of the Centre.

This VSNU review process differed from earlier reviews in that it adopted a new methodology, designed by Van Bommel. This approach uses several performance indicators for the three domains which define today's research environment, namely academia, policy and society, and industry. The Sci-Quest background study of the Groningen pharmaceutical science research programmes included with the self-evaluation report implemented this methodology. Unfortunately, it appears that in the review committee's evaluation of programmes RUG 6 (*Pharmaceutical technology, biopharmacy and industrial pharmacy*) and RUG 8 (*Social pharmacy, pharmacoepidemiology and pharmacotherapy*), the importance of certain performance indicators was underrated. It is true that both programmes have deliberately chosen to direct their academic research along more applied lines. In the case of RUG 6, this has led to research characterized by strong collaboration with industry, while in the case of RUG 8, a more socially oriented research profile has resulted. Though arguably "less academic", we believe that in the context of this new review approach, these aspects of RUG 6 and RUG 8 should have received more weight in their overall evaluation. This criticism was voiced in our response to the draft version of the evaluation report in February 2004. Our hope was that more attention would be paid in the final report to performance in the industrial and social domains when rating these programmes. Unfortunately, it appears that this issue has again not received adequate attention in the final version of the review report. The University Centre for Pharmacy management will continue to support the more applied research direction of both programmes 6 and 8, while encouraging further development of their academic profiles.

Management Team Pharmacy

Groningen, May 2004



- **Prof. dr. Joost Ruitenber**g is professor for International Public Health at the Institute for Innovation and Transdisciplinary Research of the Vrije Universiteit Amsterdam. From 1989 until 2001 he was the general director of research of the Central Laboratory for Blood-Transfusion of the Dutch Red Cross (now CLB-Sanquin). From 1984 he was professor of Veterinary Immunology at the faculty of Veterinary Sciences, University of Utrecht and from 1985 he is a member of the Royal Academy of Arts and Sciences (KNAW). From 1962 until 1986 he worked for the Dutch National Institute for Public Health and the Environment (RIVM), from 1970 as head of the Laboratory for Pathology, from 1980 as director responsible for vaccine-production and research, and from 1986 as deputy director-general. He is a member of the Standing Committee on Infection and Immunity of the Health Council.
- **Prof. dr. Peter J. Barnes** is Professor and Head of the Department of Thoracic Medicine and Chairman of Respiratory Sciences at the National Heart and Lung Institute (Imperial College School of Medicine, London, UK). From 1985-87 he was professor of Clinical Pharmacology at the Cardiothoracic Institute, London. He has produced over 1000 peer review papers. He is editor or co-editor of over 30 books on asthma, lung pharmacology and related topics, and editor of several international scientific journals. He is the most highly cited clinical scientist in UK over the last 20 years (ISI).
- **Prof. dr. Patrick Couvreur** is professor of Pharmacy at the University of Paris-Sud and director of the multidisciplinary CNRS-research group “Physico-Chimie, Pharmacotechnie, Biopharmacie” with more than 100 scientists. He is also the director of the Doctoral school “Therapeutic Innovation”, a network of 92 laboratories of the University of Paris-Sud. He has published more than 300 research and review articles in international journals and is the recipient of 36 patents. He received several international awards and is member of the editorial board of numerous international scientific journals. Since 2000, he is a member of the French National Committee for Sciences. He was elected in 2000 as a member of the “Académie des Technologies” (France), in 1999 as member of the Royal Academy of Medicine (Belgium) and in 2000 as member of the “Académie de Pharmacie” (France).
- **Dr. Uli Hacksell** is the Chief Executive Officer of ACADIA Pharmaceuticals, a San Diego based biopharmaceutical company, since 2000. Earlier in his carrier he held various senior executive positions at Astra AB in Sweden and before that he was a Professor of Organic Chemistry and Chairman of the Department of Organic Pharmaceutical Chemistry at Uppsala University also in Sweden. He received a Master of Pharmacy in 1976 and a PhD in Medicinal Chemistry in 1981 from Uppsala University. He has authored about 200 scientific articles, served as Chairman of the European Federation of Medicinal Chemistry and has been on the Advisory Board of the Medical Products Agency in Sweden. Dr. Hacksell is currently a Director of the Board of ACADIA Pharmaceuticals Inc and he is also on the Board of Scandinavian Life Science Venture in Sweden. In addition, he is the Chairman of the Board of Action Pharma A/S in Denmark and member of the Advisory Board of Carlsson Research AB in Sweden.

- **Prof. dr. Peter Roepstorff** is professor in Protein Chemistry at the Department of Biochemistry & Molecular Biology, University of Southern Denmark, since 2000, and director of the Danish Biotechnology Instrument Center (DABIC) which comprises fifteen research groups from five different universities. From 1975 he was professor at the Department of Molecular Biology, Odense University. From 1991-1995 he directed the Protein Engineering Research Centre under the Danish Biotechnology Programme and from 1995-1999 the research unit for Studies of Interaction, Structure, Function and Engineering of Macromolecules by NMR Spectroscopy under the same programme. He has produced more than 300 scientific papers and 300 conference contributions and guest lectures. Since 2001 he is member of the international Scientific Advisory Board for the Bijvoet Centre for Biomolecular Chemistry, Utrecht.
- **Prof. dr. Joachim Stöckigt** is professor and director of the Department for Pharmaceutical Biology at the Johannes Gutenberg-Universität in Mainz, Germany, since 1990, and former director of the Pharmacy Institute. He is chairman of the German Pharmaceutical Society (DPhG) in Rheinland-Pfalz. He received the European Science Award for Phytochemistry (Tate and Lyle Award) in 1988. After his dissertation at the University of Munster, he held positions at the University of Bochum and the University of München.
- **Prof. dr. Brian L. Strom** is George S. Pepper Professor of Public Health and Preventive Medicine, director of the Center for Clinical Epidemiology and Biostatistics, and Chair and Professor of Biostatistics and Epidemiology, Medicine and Pharmacology, at the University of Pennsylvania School of Medicine, Philadelphia, USA. He was President of the International Society of Pharmacoepidemiology, member of the Board of Regents of the American College of Physicians; he is member of the American Epidemiology Society, and elected member of the American Society of Clinical Investigation, the American Association of Physicians and the National Academy of Sciences. Recent grants include an NCI Program Project Grant on Molecular Susceptibility to Hormone-Induced Cancer and an award from the Agency for Health Care Research and Quality for a Center for Education and Research in Therapeutics.
- **Dr. Tyra S.C. Zetterström** is principal lecturer in Pharmacology at the Faculty of Health and Life Sciences, Leicester School of Pharmacy, De Montfort University, Leicester, UK. She graduated in Pharmacy at the University of Uppsala, Sweden, and holds a PhD from the Karolinska Institute. Her main research interest is in antidepressant treatment and neurotrophism.

**Discipline protocol for the review of *PHARMACEUTICAL SCIENCES*****Introduction**

This research assessment covers the discipline of Pharmaceutical Sciences. The University of Groningen and Utrecht University will participate in this research assessment through the University Centre for Pharmacy, Faculty of Mathematics and Natural Sciences, and the Utrecht Institute for Pharmaceutical Sciences (UIPS), Faculty of Pharmacy, respectively.

The research assessment is directed at the evaluation of Pharmaceutical Sciences in its widest scope. The assessment will cover the fields of: Analytical Chemistry, Analytical and Clinical Drug Toxicology, Bioanalysis, Biomolecular Mass Spectrometry, Biomonitoring and Sensoring, Biopharmacy, Drug Targeting and Delivery, Human and Animal Psychopharmacology, Immunopharmacology, Medicinal Chemistry, Molecular Pharmacology, Pharmaceutical Biology, Pharmaceutical Biotechnology, Pharmaceutical Technology, Pharmacoepidemiology, Pharmacokinetics, Pharmacotherapy, Proteomics, Psychopharmacology, Receptor Pharmacology, Separation Technology, Social Pharmacy, Therapeutic Gene Modulation, Industrial Pharmacy.

The main objective of this assessment is twofold: first, to enhance the quality of the individual research programmes, and second, to contribute to the accountability of the research carried out at the participating institutes during the period under review. In addition to an evaluation and assessment of past performance, also future research plans with anticipated results are to be considered.

This assessment should also contribute to the improvement of fundamental and applied research in the field of pharmaceutical sciences on a high international level and to the development of better and safer drugs and vaccines.

The research management at an institutional level will also be evaluated. This will include leadership and management of processes, research policy and strategies, management of people, formation and human resources policy, available means, appreciation by peers, appreciation by society (societal value of research). Proper attention must be given to postgraduate education and training programmes. The evaluation should be carried out in view of the multidisciplinary context of pharmaceutical research.

By decree of the Executive Board of the Association of Universities in the Netherlands (VSNU 01/1167 U) the VSNU-assessment of Pharmaceutical Research at the Universities of Utrecht and Groningen will serve as a pilot project. The assessment will be part of the development of a new standard evaluation protocol for the publicly funded research organisations in the Netherlands. The Protocol 1998, which has been the basis of VSNU-assessments of scientific research, will not be used. For the current assessment the Preliminary Evaluation Protocol 2002 and this Discipline Protocol Pharmaceutical Research 2002 will delineate the boundaries of the assessment procedure.

### **Delineation and required expertise of committee members**

The members of the review committee should have a positive attitude towards fundamental and applied aspects of pharmaceutical research, and the multidisciplinary character of the discipline of Pharmaceutical Sciences.

The following expertise is required of the members of the review committee:

- Excellent expertise in, and overview of at least one of the following clusters of fields: Analytical Chemistry, Analytical and Clinical Drug Toxicology, Bioanalysis, Biomonitoring, Biomolecular Mass Spectrometry, Proteomics and Separation Technology; Biopharmacy, Technology and Drug/Gene Targeting/Delivery; Immunopharmacology; Medicinal Chemistry and Receptor Pharmacology (central and peripheral); Pharmaceutical Biology and Biotechnology; Psychopharmacology; Social Pharmacy, Pharmacoepidemiology and Pharmacotherapy.
- Preferably reasonable expertise in one or more fields other than his/her own specialisation.

The review committee needs to consist of as many members as necessary to cover all fields mentioned above, with a maximum number of 6-8, the chair included. The chairman should have a helicopter view of the entire research area.

### **Information for the committee and procedures**

The research assessment Pharmaceutical Sciences will cover the research published in the 6-years-period 1996-2001. The review committee is independent and will determine its own method of working within the framework of this discipline protocol. The assessment will be performed on the basis of a self-evaluation report provided by the research programme leaders and the institute involved. The committee, or individual committee members, will have meetings with all the local programme leaders, and if desired by the committee, other participants in the research programmes (e.g. PhD students and postdocs). Site visits to the pharmacy divisions of the participating universities are required and sufficient time has to be taken for visiting the facilities and for face-to-face discussions with programme leaders and/or other participants in the research programmes. The committee will announce the topics and the goal of the discussions that it will hold with the faculty board or an equivalent council, and the separate groups during the site visits.

Sci-Quest will carry out an independent evaluation of the societal value of pharmaceutical research. The methodology encompasses the construction of a Research Embedment and Performance Profile (REPP) of the research groups (or programmes) and a study among stakeholders. In the REPP five items with specific indicators will be distinguished, representing the complete palette of activities of the research groups: scientifically, in the field of education and training, towards innovation and professionals, the policy and attitude to societal questions, the collaboration and visibility in institutional, national and international surroundings. In the study among stakeholders the interaction of research groups with the users and the users' judgement of the research groups is depicted. The resulting document will also include a bibliometric analysis of all publications per programme (published during the specified period 1996-2001), to provide supportive information on the research quality and relevance of each research programme. The review committee is kindly asked to lay

emphasis on the future perspective of research programmes, and to use the results of the bibliometric analyses with caution.

### **Level of aggregation**

A research programme is defined as ‘a coherent set of research activities having a common mission and being the work of a group of people who more or less work together’. This can be a single research group with its full-time professor and staff, or a larger programme with a joint research mission. In the latter case, each participating professor is responsible for the substantive and detailed outline and interpretation of his/her part. Generally, the results within the framework of the entire research programme will be provided on the level of individual programme leaders. This will allow an evaluation on the level of the entire research programme as well as on the separate participating research groups. In principle, all research groups operating in the field of Pharmaceutical Sciences within the participating disciplines will be part of this evaluation. For groups that have experienced a significant switch in the research during the period 1996-2001 and for new groups that have started functioning only recently, emphasis should be laid on the future perspective of the programme. The multidisciplinary character of Pharmaceutical Sciences will be shown by describing the embedment in and interfacing with other research institutes and graduate research schools.

### **Programme members**

In the self-evaluation report, the list of programme members of each programme shall include the following ranks: professors (‘hoogleraar’), associate professors (‘universitair hoofddocent, UHD’), assistant professors (‘universitair docent, UD’), fellows (e.g. KNAW-fellows, EU-fellows) and others with a PhD degree involved in research such as postdocs. The list will include all members involved in the programme during the assessment period, and will state during which period of time the members were involved. Only the period during which the programme members were appointed by or paid for research at the institution (either through direct or indirect governmental funding (‘1<sup>e</sup> and 2<sup>e</sup> geldstroom’) or through industrial, charitable funds, or European Union funding (‘3<sup>e</sup> geldstroom’) shall be taken into account.

### **Research input of academic staff**

In the tables concerning research input, all staff members at the postgraduate level who have not (yet) obtained a PhD-degree are considered as junior researchers (including AIO/OIO’s). In the table concerning the research output over six years, the programme members as mentioned above are considered as ‘others’. Technical and supporting staff shall not be included. In this assessment the research input of professors, associate professors, assistant professors, fellows and postdocs will be quantified on the basis of an individual estimate of the research input (after deduction of their teaching input). In the self evaluation the exact teaching load of senior and junior staff members of the University Centre for Pharmacy Groningen and the Utrecht Institute for Pharmaceutical Sciences should be specified. The research input will be calculated in proportion to the size of the appointment of the researcher involved (i.e. FTE).

### **Contents of the documentation**

To prepare for an evaluation – self-evaluation and external evaluation - the institute is asked to provide a set of documents containing all the relevant information. This documentation, stored in a national information system, reflects both the level of the institute as a whole and the research programmes or research groups that work within the jurisdiction of the institute. Research conducted outside the scope of a programme and other work within the institute may be added separately. Both the level of the institute and the level of the programmes or groups are specified comprehensively in annual units, which means that the factual data of the research programmes and other research add up to the institute's data.

The VSNU-KNAW-NWO “Standard Evaluation Protocol 2003-2009 for Public Research Organisations” describes the required data and formats.

Preliminary assessment

Programme nr.:

(only for internal use by the committee)

Reviewer:

Programme title (short): .....

5 = excellent, 4 = very good, 3 = good, 2 = satisfactory, 1 = unsatisfactory

**Research Programme**

How do you evaluate the programme with respect to:		5	4	3	2	1
1.	Leadership					
2.	Mission and goals					
3.	Strategy and policy					
4.	Adequacy of the resources					
5.	Funding policies					
6.	Facilities					
7.	Academic reputation					
8.	Societal relevance					
9.	Balance of the strengths and weaknesses					
Overall						

**Quality**

How do you evaluate the quality with respect to:		5	4	3	2	1
1.	originality of the approach and ideas					
2.	significance of the contribution to the field					
3.	coherence of the programme					
4.	publication strategy					
5.	prominence of the programme director					
6.	prominence of the other members of the research group					
7.	quality of scientific publications (scientific impact)					
8.	quality of other results					
Overall assessment of quality						

### Productivity

Considering the number of staff, how do you evaluate the productivity with respect to:		5	4	3	2	1
1.	number of PhD-theses					
2.	number of scientific publications					
3.	number of professional publications					
4.	other results (if applicable)					
4.	distribution of published output within the group					
Overall assessment of productivity						

### Relevance

Considering the stated mission of this programme, how do you evaluate the relevance of the research with respect to		5	4	3	2	1
1.	the advancement of knowledge					
2.	the dissemination of knowledge					
3.	the implementation of knowledge					
Overall assessment of relevance						

### Vitality and feasibility

Considering the present status and future developments (if known) of staff and facilities, how do you evaluate the long-term viability of the programme		5	4	3	2	1
1.	in view of the past scientific performance					
2.	in view of future plans and ideas					
3.	in view of staff age and mobility					
Overall assessment of vitality						

