

# **Science and Business**

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Utrecht University**

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This report was finalized on 23 January 2014.



# Report on the master's programme Science and Business of Utrecht University

This report takes the NVAO's Assessment Framework for Limited Programme Assessments as a starting point.

## Administrative data regarding the programme

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### Master's programme Science and Business

Name of the programme:	Natuurwetenschappen en Bedrijf
CROHO number:	60710
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Science & Business Management
Location(s):	Utrecht
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2014

The visit of the assessment committee Physics and Astronomy to the Faculty of Science of Utrecht University took place on 13 and 14 November 2013.

## Administrative data regarding the institution

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Name of the institution:	Utrecht University
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

## Quantitative data regarding the programme

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The required quantitative data regarding the programme are included in Appendix 5.

## Composition of the assessment committee

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The committee that assessed the master's programme Science and Business consisted of:

- Prof. dr. D. Lenstra is professor emeritus of Electrical Engineering at Delft University of Technology and fellow of Eindhoven University of Technology;
- Prof. dr. G. Borghs is professor emeritus of Physics at KU Leuven (BE) and senior fellow of the Interuniversity MicroElectronics Centre (IMEC);
- Dr. H.P. Blok is retired and was director of Education at the Faculty of Sciences VU University Amsterdam;
- Prof. dr. T. Theuns is reader in Astrophysics at Durham University (UK) and part-time professor Astrophysics at University of Antwerp (BE);

- Dr. J. Hoogenraad is owner of Spoorgloren BV;
- J.J.T. Wagenaar MSc, student member, is PhD candidate in Physics at Leiden University.

For the visit to Utrecht University the committee was extended with experts on the subject Science and Business:

- Prof. dr. ir. H.A. Rijken is professor of Corporate Finance at VU University Amsterdam;
- Prof. dr. H.C. Moll is professor Natural Resources for Sustainable Production and Consumption at the Centre for Energy and Environmental Sciences (IVEM) of the University of Groningen.

The committee was supported by dr. B.M. van Balen, who acted as secretary.

Appendix 1 contains the curricula vitae of the members of the committee.

## **Working method of the assessment committee**

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The assessment of the master's degree programme Science and Business was part of an assessment cluster. In total, the committee assessed 28 programmes from 9 universities: University of Groningen, Eindhoven University of Technology, Utrecht University, University of Amsterdam, VU University Amsterdam, Radboud University Nijmegen, Leiden University, Delft University of Technology and University of Twente.

The assessment committee Physics and Astronomy 2013 consisted of 10 members:

- Prof. dr. D. Lenstra is professor emeritus of Electrical Engineering of Delft University of Technology and fellow of Eindhoven University of Technology;
- Prof. dr. W. de Boer is professor of Physics of the University of Karlsruhe (DE);
- Prof. dr. G. Borghs is professor emeritus of Physics at KU Leuven (BE) and senior fellow of the Interuniversity MicroElectronics Centre (IMEC);
- Prof. dr. T. Theuns is reader in Astrophysics of Durham University (UK) and part-time professor Astrophysics of the University of Antwerp (BE);
- Prof. dr. E. Brinks is professor of Astrophysics of the University of Hertfordshire (UK);
- Dr. H. Tepper is chief strategy officer at the Dutch Forensic Institute;
- Dr. J. Hoogenraad is owner of Spoorgloren BV;
- Prof. dr. M.J. Goedhart is professor Education and Science University of Groningen;
- L. Coenen BSc is master student Applied Physics at Delft University of Technology;
- J.J.T. Wagenaar MSc is PhD candidate in Physics at Leiden University.

### *Preparation*

The committee held a preliminary meeting on October 8, 2013. During this meeting the committee was instructed about the accreditation framework and the programme of the upcoming assessments. A vice-chair for each visit was appointed and the Domain Specific Framework for Physics and Astronomy was set. The master's degree programme Science and Business provided its own Domain Specific Framework (see Appendix 2).

To prepare the contents of the site visits, the coordinator first checked the quality and completeness of the Critical Reflections prepared by the programmes. After establishing that the reports met the demands, they were forwarded to the participating committee members.

The committee members read the reports and formulated questions on their contents. The coordinator collected the questions and arranged them according to topic.

As well as the Critical Reflection, the committee members read a selection of eleven research projects reports and eleven internship reports. The reports and theses were randomly chosen from a list of graduates of the last two completed academic years within a range of grades.

#### *Site visit*

A preliminary programme of the site visit was made by the coordinator and adapted after consultation of the coordinator of Utrecht University. The timetable for the visit in Utrecht is included as Appendix 6.

Prior to the site visit the committee asked the programmes to select representative interview partners. During the site visit, meetings were held with panels representing the faculty management, the programme management, alumni, the programme committee and the Board of Examiners. Meetings were also held with representatives of the students and teaching staff.

During the site visit, the committee examined material it had requested; an overview of this material is given in Appendix 7. The committee gave students and lecturers the opportunity – outside the set interviews – to speak informally to the committee during a consultation hour. No requests were received for this option.

The committee used the final part of the visit for an internal meeting to discuss the findings. The visit was concluded with a public oral presentation of the preliminary impressions and general observations by the chair of the committee.

#### *Report*

Based on the committee's findings, the coordinator prepared a draft report. This report was presented to the committee members involved in the site visit. After receiving approval, the draft report was sent to the Faculty with the request to check it for factual inaccuracies. The comments received from the Faculty were discussed with the committee chairman. The final version of the report was sent to the committee members for a final check. Subsequently the definitive report was approved and sent to Utrecht University.

#### *Decision rules*

In accordance with the NVAO's Assessment Framework for Limited Programme Assessments (as of 22 November 2011), the committee used the following definitions for the assessment of both the standards and the programme as a whole.

#### **Generic quality**

The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

#### **Unsatisfactory**

The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

#### **Satisfactory**

The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

**Good**

The programme systematically surpasses the current generic quality standards across its entire spectrum.

**Excellent**

The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.



## Summary judgement

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The two-year master's degree programme Science & Business consists of two master's programmes: Science & Business Management and Energy Science. This assessment report focuses on the programme Science & Business Management, which is offered by the Faculty of Science. To avoid confusion, in this report the name of the master's programme Science & Business Management will be used for the master's degree programme. The programme is interdisciplinary and admits students with different science backgrounds.

### *Standard 1*

The master's programme in Science & Business aims to prepare students for bridging the gap between science and business. To accomplish this, students are educated to understand both worlds. The committee establishes that the programme provides a valuable option for students who do not want to pursue a career in research.

The committee has studied the intended learning outcomes of the programme and concludes that they indicate in a clear way that the programme is aiming at a master's degree level. The intended learning outcomes illustrate that the graduates achieve skills and knowledge in research and in business. Graduates are qualified for consultancy as well as for continuing their education with a PhD trajectory. The committee is positive about the possibilities for orientation on a career in business that this programme offers to science students.

### *Standard 2*

The focus of the programme gradually shifts from performing scientific research towards having a career in a science driven business environment. The programme starts off with a research project of 51 EC. The students can choose their own topic, but the research project should have an applied nature. Next to the research project, the students choose theoretical courses offered by the Graduate school of Natural Sciences or Life Sciences.

The second year contains an intensive half year of course work on business related topics: economic environment, management skills, organisation, marketing, quantitative methods for business, management accounting, human resources, business law, entrepreneurship and several workshops (30 EC). The last half-year is used to do a business internship (30 EC) outside the university. The students appreciate the structure of the curriculum and feel very well equipped for entering the labour market.

The committee is of the opinion that the programme is well organised and that the students are well prepared for obtaining their final qualifications. Apparently the master's programme Science and Business is an attractive programme that enables the students to achieve the intended learning outcomes and to develop both research and professional skills. The programme prepares the students for a career in business as well as for a continuation of their education in a PhD trajectory. The didactic vision underlying the curriculum is in line with the aims of the programme. The average study progress is good and the study load is considered to be adequate.

The committee has established that the quality of the teaching staff is good and the programme oriented facilities are adequate. The involvement of alumni with the programme could be strengthened.

*Standard 3*

The quality of examination and grading is ensured by the way the examinations are organised and by the assessment of the examinations by the Board of Examiners. The quality assurance of examinations consists of three elements: professionalization of the teaching staff regarding examinations; evaluation of the quality of examinations by the teaching staff and programme management; and independent evaluation of examinations by the Board of Examiners.

The committee has studied a selection of research project reports and internship reports. The reports show that the students have achieved the intended learning outcomes of the master's programme. The reports clearly indicate that the students are able to perform research in their field and that they are able to function effectively in a business environment.

The committee assesses the standards from the Assessment framework for limited programme assessments in the following way:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 23 January 2014



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Prof. dr. D. Lenstra



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dr. B.M. van Balen

## Description of the standards from the Assessment framework for limited programme assessments

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### Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

#### Explanation:

As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

### Findings

In this paragraph the findings of the committee in regard to the Domain Specific Requirements Framework and intended learning outcomes, the level and orientation of the programme are described. After considering the findings the committee comes to a conclusion on Standard 1.

The Master's degree programme in Science & Business aims to prepare students to bridge the gap between science and business. In the programme, students are trained in performing academic research and acquire knowledge and skills that enable them to apply this scientific knowledge in business and society. The Master's degree programme in Science & Business consists of two Master's programmes: Science & Business Management and Energy Science. In the Master's programme Science & Business Management, students can specialise in one of the natural sciences or life sciences and acquire business management skills. In the Master's programme Energy Science, students are trained to analyse energy systems, including energy technologies, and economic and policy aspects.

Recently, the institutional embedding of the two Master's programmes of the Master's degree programme has changed. Until 2012, both Master's programmes of the Master's degree programme Science and Business were offered by the Graduate School of Natural Sciences within the Faculty of Science at Utrecht University. Following restructuring of the Faculty of Sciences, several research groups were relocated and the staff responsible for the Master's programme Energy Science moved to the Faculty of Geosciences to become part of the Energy & Resources group in the Department of Innovation, Energy and Environmental Sciences. The degree programme Science & Business and the master's programme Science & Business Management has moved from the Graduate School of Natural Sciences to the Graduate School of Life Sciences.

This assessment report focuses on the master's programme Science and Business Management. To avoid confusion, in this report the name of the master's programme Science & Business Management will be used for the master's degree programme

The daily management of the master's programme is the task of a programme committee. This committee is headed by the programme leader. Furthermore there is a programme coordinator, who is the first contact person for the students and who coordinates the research traineeships within the first year.

### *Profile*

The master's degree programme in Science & Business aims to prepare students for bridging the gap between science and business. To accomplish this, students are educated to understand both worlds. Students build upon on their academic research skills and scientific knowledge, and also acquire business management skills. These will involve topics such as financial management, business plan development, managerial ICT matters and environmental issues, and also communication skills. The programme is specifically designed to provide students with ample experience with interdisciplinary group work, mimicking a multidisciplinary working environment they likely encounter during their careers. Therefore, the programme management strives to put together a group of students with different scientific backgrounds ranging from biology, chemistry, physics, and mathematics to pharmaceuticals and biomedical sciences.

The programme indicates in the Critical Reflection that there is a need for graduates who are able to convey in-depth knowledge in natural sciences and life sciences into business and companies. These graduates need both research and managerial and communicative skills. They must be able to extend and to apply knowledge.

The committee discussed the profile of the programme with the management, teachers and students during the site visit. It learned that comparable programmes exist at other universities in the Netherlands as specialisations in master's degree programmes and that the programme is established following instructions from the national government. The students told the committee that they are very happy with the programme and that it gives them the opportunity to extend their orientation on other work fields than research. The committee concurs with the management and teachers that it is a challenge to find a balance between a focus on research and a focus on business. According to the committee the programme provides a valuable option for students who do not want to pursue a career in research.

### *Intended learning outcomes*

The objectives of the degree programme are translated into programme-specific aims and learning outcomes, using the Dublin descriptors (see Appendix 3).

The research focus of the programme is e.g. reflected in the intended learning outcome 2: 'Has internalized the scientific methods' and 4: 'Is able to reflect on his/her research and the context of the research', while the application of research in business is reflected in intended learning outcome 6: 'Is able to analyse a problem from a subarea and is able to map a problem through systematic research. Is able to assess the relevancy of a theorem. Is able to define and substantiate a research question from both theory and recent literature. Has experience with drafting a scientific research question and with drafting a business or socially oriented research question.' Business oriented competencies are e.g. described in intended learning outcome 3: 'Has basic knowledge of aspects of economics and management such as marketing, organizational management, financial management, human resource management, quantitative decision making, management accounting, ICT for business'.

The committee has studied the intended learning outcomes and concludes that they are in line with the domain specific requirements. In the Domain Specific Framework of Reference (Appendix 2) is described that the programme should train students in performing academic research and understanding the scientific method, and in acquiring in depth business knowledge that enables them to combine science and business skills in a business environment. . The learning outcomes indicate in a clear way that the programme is aiming at a master's degree level and they surpass the bachelor's level. The intended learning outcomes illustrate that the graduates achieve skills and knowledge in research and in business.

Graduates are qualified for consultancy as well as for continuing their education with a PhD trajectory.

### **Considerations**

The committee has established that learning outcomes defined for the master's programme Science and Business are in line with the Domain specific Framework of Reference and with the level according to international requirements for academic master's degree programmes.

The committee is positive about the possibilities this programme offers to science students for orientation on a career in business.

### **Conclusion**

*Master's programme Science and Business:* the committee assesses Standard 1 as 'satisfactory'.

## Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

### Explanation:

The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

## Findings

The committee has studied the curriculum of the master's programme Science and Business Management (SBM), has seen the course material, the digital learning environment and results of course evaluations. In this standard the findings of the committee concerning the content and structure of the programme, intake and study load, the teaching staff and the facilities are discussed.

### *Content and structure of the programme*

The focus of the master's programme SBM gradually shifts from performing scientific research towards orientation on a career in a science driven business environment. That is why the programme starts off with a research project of 42-51 EC within one of the research groups in either the Faculty of Science or the associated research groups of the Graduate School Life Sciences. The students can choose their own topic, but the research project should have an applied nature. After the research project the students choose theoretical courses from the master courses offered by the Graduate school of Natural Sciences or Life Sciences.

The second year contains an intensive semester of course work on business related topics: economic environment, management skills, organisation, marketing, quantitative methods for business, management accounting, human resources, business law, entrepreneurship and several workshops (30 EC). The last semester is used for a business internship (30 EC).

The transition from academic science towards a business-oriented career is reflected in the didactic concept. In the first year the focus is on application of scientific research, the second year the focus shifts to the business-side. At the same time there is also a change from individual approach to group work. On top of this there is the transition from a mono-disciplinary to an interdisciplinary approach.

Content and work forms are chosen in such a manner that students step-by-step become academic professionals. All courses combine lectures with activating teaching methods, such as tutorials, project-based work, in-class discussions.

The committee was somewhat surprised by the structure of the programme, in particular by the fact that it starts with the research project and that the course work is concentrated in the first half of the second year. During the site visit, it became clear that this structure is common in the Graduates School of Life Sciences. Furthermore, the teachers mentioned that the intensive half year course on business related topics in the second year can be considered as a mini MBA course. In their view the level achieved by the students in the MBA related subjects is comparable to a real MBA programme. Unfortunately, no clear academic end qualifications for this part were presented. The difference is mainly that the students have other (higher) entry qualifications. The committee noticed that the students appreciate the

structure of the curriculum and feel very well prepared for entering the labour market. The students have no problems with starting with a research project in the first year of their studies. Moreover they like cooperating with fellow students from different backgrounds and are very positive about the interdisciplinary character of the programme. The students mentioned that a lot of different aspects of business and sciences have been included in the programme. While these projects for a large part guarantee the academic master's level of the SBM programme, the committee recommends the management to closely monitor the quality of the projects.

Considering the explanation of the teachers and students, the committee concludes that the programme is well structured and that it enables the students to achieve the intended learning outcomes.

#### *Intake and study load*

For the SBM programme applicants must hold a bachelor's degree in Biology, Chemistry, Physics, Mathematics, Computer Science, Pharmaceutical Sciences, Biomedical Sciences or an equivalent qualification from either a Research University or a University of Applied Science (HBO), or a bachelor's degree of University College Utrecht or the Liberal Arts & Sciences programme, with a natural science profile. Some students must follow one or more premaster courses (30 EC maximum). The majority of the applicants with an appropriate background from Utrecht University are admitted to the degree programme. The annual inflow of students enrolling in the master's programme is between 25 and 40 students. A majority of the students in the SBM programme holds a BSc degree from Utrecht University. On average the students take slightly more than 2 years to graduate (see Appendix 5), which is for the Dutch situation relatively short and in the opinion of the committee very positive. The students note that they have to work hard, but do not report any specific obstacles. According to them the programme is do-able. The committee establishes that the programme is suited to the qualifications of the students who are accepted and that the study load of the programme is adequate. The study progress is on average good.

#### *The teaching staff*

The Critical Reflection gives an overview of the teaching staff that is directly dedicated to the SBM master's programme. This staff consists of a programme director, a professor of Finance, an internship coordinator and a coordinator. The research project in the first year can be carried out in a lot of different research groups within the Faculty of Science and furthermore students can choose from a list of theory courses suited to their interests. It is therefore not feasible to provide a complete list of staff involved. The Critical Reflection mentions that a considerable amount of staff in the Faculty of Science possesses a BKO (basis teaching qualification) and/or SKO (senior teaching qualification). In the business part of the programme a lot of staff is recruited from the Department of Economics and outside of Utrecht University. The committee has seen a list of the lecturers.

The students are enthusiastic about the quality and accessibility of the teachers. They feel challenged and sufficiently supervised. The course evaluations the committee has seen were all very positive about the quality of teaching. The committee was impressed by the dedication and enthusiasm of the teaching staff it has spoken to during the site visit. The committee was not able to get a comprehensive picture of the content expertise of all teaching staff, but takes into consideration that the research of the Faculties of Sciences and Life Sciences was recently assessed as very good to excellent.

Considering the information the committee was able to assess about the quality of the teaching staff, it concludes that the quality of the teaching staff is good.

#### *Facilities*

The programme coordinator supports students in their individual choices at the beginning and during their study. The programme coordinator and the study advisors keep an eye on the progress of students and their personal circumstances. The students mentioned a close contact with the coordinator and study advisors and feel that they are supported by scheduling their own programme. As mentioned before, the students appreciate the contacts with and involvement of the teachers. Students indicate that they are generally satisfied with the programme specific facilities. They report that all information about the programme can easily be found on the internet. A critical remark on the facilities could be that sometimes all computers are occupied, but students do not consider this a major problem. There is a thesis room, which can be used, but SBM students usually work on their thesis in the company.

The master's programme offers financial and organisational support to student initiatives, where students are in charge to organise several workshops and alumni-lectures. Currently, the programme websites are being improved. This will enable students to find information about the programme more easily.

The committee concludes that the programme specific facilities are adequate.

#### **Considerations**

The committee is of the opinion that the programme is well organised and that the students are well prepared for obtaining their final qualifications. Apparently the master's programme Science and Business is an attractive programme that enables the students to achieve the intended learning outcomes and to develop both research and professional skills. The programme prepares the students for a career in business as well as for a continuation of their education in a PhD trajectory. The didactic vision underlying the curriculum is in line with the aims of the programme. The average study progress is good and the study load is considered adequate. The committee has established that the quality of the teaching staff is good and the programme oriented facilities are adequate.

#### **Conclusion**

*Master's programme Science and Business Management:* the committee assesses Standard 2 as 'satisfactory'.



### Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

**Explanation:**

The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

### Findings

This section deals with the assessment system and the level achieved by the graduates of the master's programme Science and Business management of Utrecht University. These subjects will be described in sub sections. In order to establish an opinion about these subjects the committee studied the assessment system and policy of the programme, the test procedures, test regulations, the used test forms and several tests made by students. The committee also had a meeting and discussion with the Board of Examiners responsible for the master's degree programme.

The committee studied a selection of research project reports and internships reports to assess the achieved level of the graduates and had discussions with the students, teachers, and alumni about the qualifications of the graduates and the relation to the requirements of the labour market

#### *Assessment System*

The quality of examination and grading is ensured by the way examinations are organised and by the assessment of the examinations by the Board of Examiners. The quality assurance of examinations consists of three elements: professionalization of the teaching staff regarding examinations; evaluation of the quality of examinations by the teaching staff and programme management; and independent evaluation of examinations by the Board of Examiners.

1. Professionalization is developed through the improvement of assessment skills, which is part of a staff member's BKO and SKO evaluation and qualification. Furthermore, during staff meetings and lunch seminars, (best) assessment practices are discussed. Statistical analysis of assessments is also part of the Basic Teaching Qualification trajectory and is used mostly by teachers of courses with many students.
2. As routine practice, the evaluation of the quality of assessment by teaching staff and programme management requires that all exams are reviewed by a colleague prior to the examination in order to ensure that the assessment correctly tests the performance of the students.
3. According to the WHW (*Wet op het Hoger Onderwijs*), the Board of Examiners is responsible for the quality assurance of the assessment system. In 2011 the Faculty of Science appointed a Committee of Assessments (*Toetsadviescommissie*) to advise and support the Boards of Examiners. The Committee of Assessments independently evaluates the quality of course assessments and the assessment of MSc theses. The selection of courses to be evaluated is partly random and partly based on signals received from lecturer or student evaluations. The Committee of Assessments gives feedback on best practices and possible areas for improvements to the Board of Examiners. Best practices are communicated to the entire faculty by means of education seminars. The assessment committee very much appreciates the establishment of the *Toetsadviescommissie* and recommends this as a good practice.

The lecturer is responsible for the manner in which a course is assessed and the design of a test that fulfils the criteria of validity, reliability and transparency. The examinations defined within each course's programme are planned and organised in such a way that peak self-study workloads at the end of the course are avoided and work is evenly distributed over the course period. A variety of assessment methods are used in the Science & Business Management programme, including written exams, individual reports and assignments, group reports and assignments, and oral presentations.

The committee had a meeting with representatives of the Board of Examiners (BoE) and has established that the BoE fulfils its task according to the law and the regulations of the university and the Faculty of Science.

The committee has seen that the examiners use an assessment form for research projects and internship reports. These forms give some information about the establishment of the final grade, but could be improved by providing argumentation in text.

#### *Achieved learning outcomes*

The committee has studied a selection of research project reports and internship reports. The reports show that the students have achieved the intended learning outcomes of the master's programme. The academic level is sufficient and the reports clearly indicate that the students are able to perform research in their field. In addition the internship reports show that these students are able to function effectively in a potential multidisciplinary team, to communicate research results to an audience of specialists and lay-men and to proof the relevancy of the research for questions and problems in the field of Natural Sciences and Life Sciences.

The committee would have graded one of the selected reports lower than the examiners. It was not clear to the committee why a certain report was graded higher than another report, this was also due to the lack of argumentation in the assessment form.

### **Considerations**

The committee has established that the Board of Examiners fulfils its tasks according to the regulations. The establishment of a *Toetsadviescommissie* can be seen as a good practice. The committee concluded that the students achieve the intended learning outcomes of the master's programme.

### **Conclusion**

*Master's programme Science and Business Management:* the committee assesses Standard 3 as 'satisfactory'.

### **General conclusion**

The committee concluded that the master's degree programme Science and Business Management of Utrecht University has the quality that can be expected in an international perspective from a higher education master's programme.

### **Conclusion**

The committee assesses the *master's programme Science and Business Management* as 'satisfactory'.

# Appendices



## Appendix 1: Curricula Vitae of the members of the assessment committee

**Prof. dr. D. (Daan) Lenstra** studied Physics at the University of Groningen and got his PhD at the Delft University of Technology on the subject 'Polarization effects in gas lasers'. Since 1979 his research is focuses on the broad area of quantum electronics. He was professor at the VU University Amsterdam from 1991-2006. Between 2000 and 2006 he was also professor at Eindhoven University of Technology. From 2004-2006 he was scientific director of the COBRA Research Instituut was. From November 2006 until his retirement in 2010 he was dean of the Faculty Electrical Engineering, Mathematics and Computer Sciences at Delft University of Technology. Since 2012 he is honorary advisor for the Faculty Electrical Engineering of Eindhoven University of Technology.

**Dr. H.P. (Henk) Blok** studied Experimental Physics at the VU University Amsterdam. He got his PhD in 1972 at the same university and stayed at this university as assistant professor and PI. He did experimental work with the VU cyclotron and the electronics accelerator of NIKHEF and other places (Boulder, Osaka, Darmstadt, Orsay, JLab, DESY). He taught and supervised undergraduate, graduate and PhD students. Between 1998 and 2004 he occupied the position of programme director Physics and educational director of the Faculty of Sciences at the VU University Amsterdam. He retired in 2005 from these functions but is still active in experimental work and teaching.

**Prof. dr G. (Gustaaf) Borghs** is professor emeritus at the Department of Physics and Astronomy, Leuven University, Belgium. He received his PhD in Nuclear Science from Leuven University in 1977. Since then he was involved in teaching and research at the Department of Physics and Astronomy, Leuven University, Belgium. He supervised more than 70 doctoral theses.

Since 1984, he is also working at the Inter-university Micro Electronics Center (IMEC), Belgium.

He was the initiator of the convergence laboratory at imec/University of Leuven/ Life Sciences Research Institute (VIB), Flanders, Belgium in 2004 for researchers of conjugated disciplines of bio-electronics. Since 2008 he is senior fellow at IMEC.

**Dr J. (Jan) Hoogenraad** did his master's degree in Physics and got his PhD in 1996 at the FOM Institute for Nucleair and Moleculair Physics (AMOLF) in Amsterdam. He was Research Scientist of the Philips Natuurkundig Laboratorium (1996-1998), System Engineer, Special Applications divisie, ASM Lithography (1998-1999), Product Development Manager Software Releases, ASM Lithography (1999-2004) and Manager Test and Quality, Nederlandse Spoorwegen (2003-2009). Since 2009 he has his own company, *Spoorgloren* for change management and quantative services in public transport.

He published 20 papers in acknowledged international Physics Journals and is member of the *Nederlandse Natuurkundige Vereniging*, The Institute of Physics (Londen), the American Physical Society and INCOSE (Association for Systems Engineering).

**Prof.dr. H. A. (Herbert) Rijken** is Full Professor Corporate Finance at the department of Finance at VU University Amsterdam. He obtained his PhD (1993) in Physics at Eindhoven University of Technology. His current research interests are corporate credit risk, structured corporate finance and economics of corporate governance.

**Prof. dr. H.C. (Henk) Moll** is professor Natural Resources for Sustainable Production and Consumption at the Centre for Energy and Environmental Sciences (IVEM), part of the

Energy and Sustainability Research Institute Groningen (ESRIG) of the University of Groningen. Moll studied theoretical high energy physics at the University of Groningen where he also received his PhD in 1993 in the field of energy and environmental sciences. He is chairman of IVEM, member of the political/juridical advisory committee of the Province of Groningen, and chairman of the advisory committee with regard to traffic and transport issues of the municipality of Groningen. The research tasks and challenges of Moll are related to resource use related to (sustainable) production and consumption and energy systems and scenario evaluation. Relevant present research issues are expanding the methodologies of resource analysis of consumption and energy systems and scenario analysis to countries in different world regions. He has acted as chairman in two visitation committees: for Industrial Ecology [Leiden and Delft] (2009, first accreditation) and for Sustainable Energy Technologies [3TU] (2011, renewal of accreditation).

**J.T.T. (Jelmer) Wagenaar, Msc** got his bachelor degree in Physics in 2011 at the University Leiden and his master's degree in 2013 at the same university. During his studies he was teaching assistant for two subjects. During 5 years he was active as member of the educational committee of Physics. At the moment he is PhD student at the University Leiden and teacher Physics and Chemistry for pupils who are preparing themselves for graduation in secondary school.

## **Appendix 2: Domain-specific framework of reference**

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### **Science, Business and Societies**

Today advanced societies are dependent on science and technology. Science and technology intensive enterprises and institutions provide societies with the tools and technology needed for such societies to thrive. Knowledge produced mostly by universities and research institutions is the starting point for established and novel enterprises for technological innovations that benefit societies. Enterprises and institutions in such societies have a need for professionals with a science or engineering education that also have professional business skills.

Most science related Master's degree programmes prepare students for a scientific career only, whereas the career path of most graduates often rapidly shift from science-driven to business-driven. The Master's degree programme Science and Business from the outset prepares science and engineering students for a business career.

### **The importance of S&B Master's education**

The Master's degree programme in Science & Business educates students that hold a BSc degree in one of the natural sciences, life sciences or engineering disciplines for a career in science-driven enterprises and institutions. In the programme, students are being trained in performing academic research and understanding the scientific method, and in acquiring in depth business knowledge that enables them to combine science and business skills in a business environment. In the Master's programme, students can specialise in one of the natural sciences, life sciences or engineering disciplines and are trained in business management skills, or, as a further specialization, are trained to analyse energy systems, including energy technologies, and economic and policy aspects.

### **Position**

Organisational changes at Utrecht University, implemented since September 2012 have recently repositioned the degree programme Science & Business (S&B). The Master's programme Science & Business Management (SBM) is now part of the Graduate School of Life Sciences and the Master's programme Energy Science (ES) has moved to the Graduate School of Geosciences.

S&B with CROHO registration number 60710 will continue with the SBM Master's programme whereas ES moved to the different Science and Innovation Management degree programme (CROHO number 60709). This S&B domain specific framework of reference covers both programmes but SBM or ES specific issues are addressed separately where needed.

### **S&B at the national level**

A number of SBM and ES related educational programmes are presented at different Dutch universities but the S&B (SBM and ES) education at Utrecht University is unique in that it represents a separate degree programme leading to an independent MSc degree. S&B like programmes at other Universities are specialisations within existing disciplinary science Master's. Content-wise there is some overlap between these specialisation programmes and S&B but all have a rather unique emphasis and teaching philosophy.

Several master programmes exist with a full or partial focus on energy. Some emerge from engineering, and have a strong technology focus (e.g. Sustainable Energy Technology), others emerge from environmental sciences, and have a strong focus on the relation between energy systems and their environmental impacts (e.g. Energy and Environmental Sciences).

### **S&B related educational programmes**

Most universities in The Netherlands have programmes that teach managerial skills to science students at different levels. However, only a few universities have specialisation programmes that have similarity with the S&B programme at Utrecht University. These programmes are mentioned in the table below.

Science & Business	Utrecht	Independent Master's degree 120 EC
Science & Research based business	Leiden	Specialisation programme 40-60 EC
Science, Business & Policy	Groningen	Specialisation programme 60 EC
Sustainable Energy Technology	Delft Eindhoven Twente	Master's programme 120 EC
Energy and Environmental Sciences	Groningen	Master's programme 120 EC

The Utrecht S&B programme stands out in that it prepares SBM students already in their first year for a business career. In addition the Fundamentals of Business Economics courses of 30 EC in the second year are intense training courses taught by most experienced and senior staff member, often from other organisations (e.g. Nyenrode Business University, Rotterdam School of Management, Erasmus University). In the energy specialisation, the S&B programme prepares ES students for careers in the energy sector where they can operate from a strong knowledge basis. The programme stands out because of the solid foundation in science and technology, which nevertheless is integrated in a broad energy systems approach.

### **S&B at the international level**

International business degree programmes, in particular the Masters of Business Administration programmes generally do not require a science background, or a science traineeship. Entrance requirements for such MBA programmes are quite different and usually several years of working experience is required. Such MBA programmes prepare mostly for general management positions. S&B graduates have strong analytical skills and are trained in solving complex scientific problems in the natural or life sciences.

For the energy specialisation, the Master's programme that is most closely related is the Energy Science and Technology programme of ETH Zürich. The content is comparable, but the educational set-up is different. Many other Master's programmes that have an energy component, are content-wise substantially different from Energy Science, e.g. they either have a strong social science component (Energy & Resources, UC Berkeley), have a strong focus on engineering or have a strong environmental component (both comparable to Dutch examples mentioned before).



## Core body of knowledge

Management in a science-driven corporate context is at the core of the SBM Master's programme. Students are educated in an advanced scientific environment and in practical business skills. Students have diverse science related disciplinary backgrounds on which they build in the Master's science training part of the programme. In this part of the programme they receive high level training of specialized research scientists in their discipline of interest, mostly in the area of their BSc disciplinary education. This training includes specialized coursework during which students obtain contemporary knowledge of the scientific field and literature. In the business part of the programme all SBM students receive intense training in practical business skills, including financial management, business plan development, entrepreneurship, general managerial processes, information technology and communication skills. Students gain experience with multidisciplinary group work as they study together with students of diverse scientific backgrounds. Scientific knowledge and business skill are needed in the business internship for which students usually choose an enterprise or organisation related to their scientific background and business interest. The business internship acquaints students with the business environment and is concluded by writing a thesis on a business case and oral presentations.

Energy systems are the central concept in the energy specialisation. Energy systems consist of many components which include production, conversion and use. They exist on various levels, e.g. the energy supply and demand of an individual building, an industrial complex, regional energy infrastructures, the energy demand and supply system of a country, or of the entire world. Learning to analyse energy systems at different levels and using different analytical tools is therefore a core objective.

At the same time, energy systems are analysed in an interdisciplinary way, taking into account science and technology, markets and policies. Analysing energy systems requires therefore a thorough knowledge of the underlying science and technology; more specifically it is needed to understand how basic characteristics of technologies determine their performance. Also, energy systems evolve in a market and policy context. This requires an adequate knowledge of relevant economics and policy analysis tools.

### General competences of S&B MSc Graduates

#### *Knowledge and understanding*

- Graduates have acquired general knowledge of science and the scientific method.
- Graduates have specialized and up to date knowledge of one of the areas of the natural or life sciences or engineering. Graduates understand the theories, concepts and techniques in this area at an academic level.
- Graduates know how to use and critically interpret specialized literature.

#### *Application of knowledge and understanding*

- Graduates understand how scientific method can be applied to solve complex problems. Graduates can apply specialized scientific theories, concepts and methods to solve such problems.
- Graduates can collaborate and communicate productively with other specialists in a multidisciplinary working environment.
- Graduates have acquired business, economics and management skills and attitudes that allow them to operate in a business or institutional environment (SBM).

- Graduates have acquired energy technology and energy systems analysis skills and attitudes that allow them to operate in the energy-related organisations (ES).

#### *Making judgements*

- Graduates understand the strengths and weaknesses of scientific methods and can critically interpret research finding. Students can interpret novel findings in the context of scientific theories and the contemporary body of knowledge.
- Graduates can critically assess a variety of procedures in business and economics.

#### *Communication*

- Graduates can effectively communicate (presentations and writing) on scientific and business related issues to a diverse audience in different contexts (scientific and business).
- Graduates can communicate and collaborate in a diverse professional context (e.g. project teams, group reports).

#### *Learning skills*

- Graduates can effectively acquire novel knowledge and professional skills both in the science and business disciplines. Graduates are aware of the importance of professional development.

## Appendix 3: Intended learning outcomes

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### Science and Business Management

1. Has by performing a research internship at one of the affiliated departments within the Natural (or Life) Sciences deepened his/her knowledge in this area. During this period, the graduate has learned to apply scientific methods and concepts in a scientific research setting.
2. Has internalized the scientific methods.
3. Has basic knowledge of aspects of economics and management such as marketing, organizational management, financial management, human resource management, quantitative decision making, management accounting, ICT for business.
4. Is able to reflect on his/her research and the context of the research. Has during the course “Introduction, return meetings and essay” (AS-SP401M) written an essay, interviewed an expert and has given a presentation on the applications of the research which is carried out during the research internship.
5. Has actual knowledge of the research field and is able to adequately use this knowledge in the field of applied research.

Is able – by using research experience gained during the internship – to analyse a problem from a subarea and is able to map a problem through systematic research. Is able to assess the relevancy of a theorem. Is able to define and substantiate a research question from both theory and recent literature. Has experience with drafting a scientific research question and with drafting a business or socially oriented research question.

Is able to take the rules of experimental practice and other ethical aspects into account and is sufficiently independent, persistent and organized to carry out the research plan.

Possesses the necessary experimental skills for research and is aware of the different methods used in the research group where the research internship is carried out.

Is also able to carry out a research during the business internship in the field of business management by using methods offered in the FBE course.

Has processed the results of the research internship into a scientifically sound research report which also includes background information on the current state of affairs.
11. Has during the course “Introduction, return meetings and essay” (AS-SP401M) written an essay, interviewed an expert and has given a presentation on the applications of the research.
12. Has reflected during the course “Introduction, return meetings and essay” (AS-SP401M) on his/her efforts. Has acquainted himself/herself with Social Responsible Entrepreneurship during the course “Idea & Start”.
13. Has during the course “Introduction, return meetings and essay” (AS-SP401M) written an essay and has given a presentation in which he/ she explained the relevance and results of the research to lay men.
14. Has worked on cases groups of students with varying compositions amongst others during the FBE course.
15. Is able to study in a largely self-directed and independent way.
16. Has acquainted himself/herself during the course FBE with a system without a possibility to repair, comparable to the labour market. This system encourages effective and result-oriented learning.
17. Is able to carry out research independently in the field of research of the internship.
18. The programme trains for positions in the labour market in particular not so much for a PhD position, although that option is not excluded. The Business Traineeship is in that respect an excellent preparation for the labour market.



## Appendix 4: Overview of the curriculum

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### Programme structure Science & Business Management

year 1		
Research courses (5 ECTS)	Research Project (51 ECTS)	
Introduction, return meetings, exec. sum. (4 ECTS)		
year 2		
FBE (15 ECTS)	Entrepreneur (7.55 ECTS)	Business Internship (30 ECTS)
	FMA (7.5 ECTS)	

### List of courses Master Science & Business Management

- Research Project (with applied component)
- Theoretical Courses (research project related)
- Introduction, Return Meetings and Essay
- Fundamentals of Business and Economics
- Finance and Management Accounting/Idea and Start
- Business Traineeship

### Contact hours Master Science & Business Management

	Contact hours
Research Project (with applied component)	300
Theoretical Courses (research project related)	Various
Introduction, Return Meetings and Essay	20
Fundamentals of Business and Economics	200
Finance and Management Accounting/Idea and Start	200
Business Traineeship	40



## Appendix 5: Quantitative data regarding the programme

### Data on intake, transfers and graduates

Cohortomvang en onderwijs-herkomst masterinstroom (voltijds instroom)

Jaar	Eigen universiteit	Andere universiteiten			
		NL	HBO	Buiten HO	Totaal
08/ 09	29	9	4	8	50
09/ 10	47	2	1	8	58
10/ 11	45	12	4	7	68
11/ 12	51	8	8	17	84

Samengesteld op basis van KUO-gegevens

Rendement

Cohort	2007	2008	2009
Rendement	74%	80%	84%

Bron : KUO gegevens voor de opleiding Natuurwetenschap en Bedrijf

Voortgang mastercohort, rendement (exclusief na-instroom) (voltijds instroom)

Cohort	1 okt. Cohort	% van totale cohort	Diploma behaald voor opleiding (cumulatief)				Diploma behaald aan instelling (cumulatief)			
			na 1 jaar	na 2 jaar	na 3 jaar	na 4 jaar	na 1 jaar	na 2 jaar	na 3 jaar	na 4 jaar
08/ 09	35	70	6	54	80	86	6	54	80	86
09/ 10	43	74	2	53	84		2	56	86	
10/ 11	48	71	2	40			2	40		
11/ 12	66	79	2				2			

Samengesteld op basis van KUO-gegevens

NB!: Een deel van de masterinstroom vindt plaats na 1 oktober. Deze zijn niet in het onderstaande overzicht meegenomen omdat bij deze studenten op de voor het rendement gebruikte peildatum sprake is van een onvolledig jaar.

Studieduur masteropleiding naar onderwijs-herkomst (voltijds instroom)

Afstudeer-cohort	Eigen universiteit		Andere universiteit NL		HBO		Buiten HO	
	Geslaagd absoluut	Duur opl. gemiddeld in maanden	Geslaagd absoluut	Duur opl. gemiddeld in maanden	Geslaagd absoluut	Duur opl. gemiddeld in maanden	Geslaagd absoluut	Duur opl. gemiddeld in maanden
08/ 09	27	26	1	24	1	26	5	24
09/ 10	32	25	4	24	6	31	4	31
10/ 11	30	24	4	30	1	30	11	28
11/ 12	34	27	5	30			2	43

Samengesteld op basis van KUO-gegevens

Instellingsverblijfsduur mastergeslaagden naar onderwijs-herkomst M Natuurwetenschappen en bedrijf (60710) (voltijds instroom)

Afstudeer-cohort	Eigen universiteit		Andere universiteit NL		HBO		Buiten HO	
	Aantal geslaagd	Verblijfs-duur (gem)	Aantal geslaagd	Verblijfs-duur (gem)	Aantal geslaagd	Verblijfs-duur (gem)	Aantal geslaagd	Verblijfs-duur (gem)
08/ 09	27	70	1	24	1	26	5	24
09/ 10	32	80	4	24	6	31	4	31
10/ 11	30	72	4	30	1	30	11	28
11/ 12	34	72	5	30			2	43

Samengesteld op basis van KUO-gegevens

### Teacher-student ratio achieved

Student-docentratio 2013

<b>Ratio</b>	16:1
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Bron: OSIRIS voor het masterprogramma Science and Business Management

Docentkwaliteit

Graad	Ma	PhD	BKO
Percentage	60%	40%	17%

Bron: OSIRIS voor het masterprogramma Science and Business Management

### Average amount of face-to-face instruction per stage of the study programme

Contacturen

Studiejaar	1	2
Contacturen	350	440

Bron: Osiris voor het masterprogramma Science and Business Management



## Appendix 6: Programme of the site visit

<b>Dag 1: 12 november 2013 – ALLEEN COMMISSIE!</b>		
12.30	13.30	Aankomst en lunch commissie
13.30	14.30	Presentatie visitatie aan expertleden en nieuwe commissieleden Uitleg CROHO-labelwijziging
14.30	17.30	Internoverleg en voorbespreking commissie Bestuderen documenten
19.00		Diner (commissie)

<b>Dag 2: 13 november 2013</b>		
8.30	11.00	Voorbereidend overleg commissie + inzage documenten
11.00	12.00	Management 1: - opleidingsdirecteur BA natuur- en sterrenkunde, dr. A.M. Vredenberg - onderwijsdirecteur, prof.dr. G.I. Barkema - programmaleiders: Theoretical physics, prof.dr. R.H.H.G. van Roij Experimental physics, prof.dr. R.J.M. Snellings Meteorology, physical oceanography and climate, prof.dr. W.P.M. de Ruijter
12:00	12:45	Management 2: programmaleiders Science and Business Management (SBM) en Energy science, prof. dr. J.C.M. Smeekens, dr. W. van Sark, onderwijsdirecteur departement IMEW dr. M.C. Bootsma coördinator FBE Master Science and Business Management, prof.dr. A.Buijs 1 programmaleider History and Philosophy of Sciences, prof.dr. L.T.G. Theunissen
12:45	14:30	Lunch
14:30	15:30	Studenten BA: K.I. van der Wijst; R. van der Vaart; J. Smits; T. Figiel Studenten MA THPH: T. Drwesnki; T. Sikkenk Student MA EXP: A. Veen Studenten MA MPOC: F. van der Burgt; E. Lambert
15:30	16:30	Studenten SBM: P.Frijters BSc; A. van Muijden BSc.; R.Ruitenbeek BSc; Studenten ES: A.Boonstra BSc; ing. P. Claassens; D.Klip BSc; Studenten HPS: M. Walker BSc; T. Hagendijk BSc; L. van Zuijlen BSc

### Parallelsessie

16:45	17:15	Alumni THPH: E. van der Bijl MSc; I. Lodato MSc EXP: M. Veldhoen MSc; R. Bertens MSc; MPOC: W. Ridderinkhof MSc; E. Tuenter, MSc.	Alumni SBM: M. Schuchardt MSc; N. Thuss MSc; ES: J. Braslawsky MSc; drs. O. Edelenbosch MSc HPS: P. Acuna Luonga MSc; S. Heijmens MSc
17:15	18.00	Intern overleg commissie	
19.00		Diner (commissie)	

Dag 3: 14 november 2013				
8:30	9:30	<p>Examencommissies en studie-adviseur</p> <ul style="list-style-type: none"> <li>-voorzitter examencommissie Graduate school of Natural Sciences (HPS, MPOC, THPH, EXP): dr. C. De Mello-Donaga;</li> <li>- voorzitter examencommissie Undergraduate School: dr. G.M.H.Engels;</li> <li>- voorzitter examencommissie Graduate School of Life Sciences (SBM): dr. M.L. Zonderland;</li> <li>- voorzitter Graduate School Geosciences (ES): dr. E. Nieuwlaar;</li> <li>- voorzitter van de deexamencommissie Ba + MA natuurkunde: prof.dr. M. van den Broeke;</li> <li>- voorzitter van de deexamencommissie HPS; prof.dr. D.G.B.J. Dieks;</li> <li>-studieadviseur BA en MA natuurkunde: prof.dr.H.C. Gerritsen.</li> </ul>		
9:30	10:15	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Opleidingsadviescommissies BA en MA Natuurkunde:</p> <ul style="list-style-type: none"> <li>- voorzitter: dr. R. Duine;</li> <li>- lid: dr. G. Blab;</li> <li>- masterstudentlid: S. van der Meijden, BSc;</li> <li>- bachelorstudent: F. Nolet;</li> <li>- voorzitter UGS OC: prof.dr. L.W. Jenneskens.</li> </ul> </td> <td style="width: 50%; vertical-align: top;"> <p>Opleidingsadviescommissies SBM, ES en HPS:</p> <ul style="list-style-type: none"> <li>-voorzitter GSLS SBM: prof.dr. J. Boonstra;</li> <li>-student GSLS SBM: L. van der Wal, BSc;</li> <li>-voorzitter MA OC IMEW: dr. A. Ramirez;</li> <li>-student MA OC IMEW B. Vermeer, BSc;</li> <li>- student MA ES: L. Helper, BSc;</li> <li>- voorzitter HPS: drs. L.C.Palm;</li> <li>- student HPS: R.M. Bertnes, BSc.</li> </ul> </td> </tr> </table>	<p>Opleidingsadviescommissies BA en MA Natuurkunde:</p> <ul style="list-style-type: none"> <li>- voorzitter: dr. R. Duine;</li> <li>- lid: dr. G. Blab;</li> <li>- masterstudentlid: S. van der Meijden, BSc;</li> <li>- bachelorstudent: F. Nolet;</li> <li>- voorzitter UGS OC: prof.dr. L.W. Jenneskens.</li> </ul>	<p>Opleidingsadviescommissies SBM, ES en HPS:</p> <ul style="list-style-type: none"> <li>-voorzitter GSLS SBM: prof.dr. J. Boonstra;</li> <li>-student GSLS SBM: L. van der Wal, BSc;</li> <li>-voorzitter MA OC IMEW: dr. A. Ramirez;</li> <li>-student MA OC IMEW B. Vermeer, BSc;</li> <li>- student MA ES: L. Helper, BSc;</li> <li>- voorzitter HPS: drs. L.C.Palm;</li> <li>- student HPS: R.M. Bertnes, BSc.</li> </ul>
<p>Opleidingsadviescommissies BA en MA Natuurkunde:</p> <ul style="list-style-type: none"> <li>- voorzitter: dr. R. Duine;</li> <li>- lid: dr. G. Blab;</li> <li>- masterstudentlid: S. van der Meijden, BSc;</li> <li>- bachelorstudent: F. Nolet;</li> <li>- voorzitter UGS OC: prof.dr. L.W. Jenneskens.</li> </ul>	<p>Opleidingsadviescommissies SBM, ES en HPS:</p> <ul style="list-style-type: none"> <li>-voorzitter GSLS SBM: prof.dr. J. Boonstra;</li> <li>-student GSLS SBM: L. van der Wal, BSc;</li> <li>-voorzitter MA OC IMEW: dr. A. Ramirez;</li> <li>-student MA OC IMEW B. Vermeer, BSc;</li> <li>- student MA ES: L. Helper, BSc;</li> <li>- voorzitter HPS: drs. L.C.Palm;</li> <li>- student HPS: R.M. Bertnes, BSc.</li> </ul>			
10:30	11.30	<p>Docenten 1:</p> <ul style="list-style-type: none"> <li>-BA Natuurkunde: dr. P.J.S. van Capel, dr. A. Imhof;</li> <li>-MA THPH: prof.dr. S.G.J. Vandoren;</li> <li>-MA EXP en MPOC: dr. R.S.W. van der Wal, dr. A.S. von der Heydt, dr. D. van Oosten;</li> </ul>		
11.30	12.30	<p>Docenten 2</p> <ul style="list-style-type: none"> <li>-MA SBM: prof.dr. J. Wempe, drs. P. van der Meer;</li> <li>- MA ES: dr. M. Junginger, dr. E. Nieuwlaar;</li> <li>- MA HPS: prof.dr. W.Mijnhardt, prof.dr. L.Dorsman.</li> </ul>		
12.30	13.00	Open spreekuur/rondleiding		
13.00	15.00	Lunch en voorbereiden eindgesprek		
15.00	15.45	<p>Eindgesprek management 1 met bestuurders -1 opleidingsdirecteur BA Management 1:</p> <ul style="list-style-type: none"> <li>- opleidingsdirecteur BA natuur- en sterrenkunde, dr. A.M. Vredenberg</li> <li>- onderwijsdirecteur, prof.dr. G.I. Barkema</li> <li>- hoofd afdeling Natuur- en Sterrenkunde: prof.dr. J.I. Dijkhuis</li> <li>- programmaleiders:</li> <li>Theoretical physics, prof.dr. R.H.H.G. van Roij</li> <li>Experimental physics, prof.dr. R.J.M. Snellings</li> <li>Meteorology, physical oceanography and climate, prof.dr. W.P.M. de Ruijter</li> <li>Voorzitter Graduate School Natural Sciences: prof.dr. L.A.C.J. Voesenek;</li> <li>Voorzitter Undergraduate School: prof.dr. H.E. de Swart; dr. G.W. Heil</li> </ul>		

<b>Dag 3: 14 november 2013</b>		
15:45	16:30	Eindgesprek management 2 met bestuurders programmaleiders Science and Business Management (SBM) en Energy science, prof. dr. J.C.M. Smeekens, prof. dr. K. Blok, onderwijsdirecteur GEO: dr. M.C. Bootsma; programmaleider History and Philosophy of Sciences, prof.dr. L.T.G. Theunissen; voorzitter Graudate School of Life Sciences: prof.dr. D. Bär; vice-decaan onderwijs Geofaculteit: prof.dr. P. Hoekstra.
16.30	17.00	Opstellen eerste bevindingen
17.00	17.30	Mondelinge rapportage



## Appendix 7: Theses and documents studied by the committee

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Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Research projects:

3116662	3732916	3287637
3727033	3239686	3212998
3349217	3344231	3796507
3220303	3020231	

Business Internships

3374394	3456145	3179990
3577184	3022838	3230449
3094901	3257673	467928
3315495	310085	

During the site visit, the committee studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Minutes and reports of relevant committees (Educational Committee, Board of Examinors, Committee of Assessments);
- Tests and assignments with the assessment criteria and of etsopgaven met bijbehorende beoordelingscriteria and standard answers;
- Summary and analysis of evaluation results;
- Regulations and manuals for internships and thesis;
- Course material;
- Information and documentation for students.



## Appendix 8: Declarations of independence

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### ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: D. LENSTRA

PRIVÉ ADRES: HAIZERWEG 58  
1261 AZ BLARICUM

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

DESKUNDIGE

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVINGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden kunnen beïnvloeden;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: *UTRECHT*

DATUM: *8 oktober 2013*

HANDTEKENING:

A handwritten signature in black ink, appearing to be 'J. J. J.', written over the printed text 'HANDTEKENING:'.



## ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

Gustaaf Borghs

PRIVÉ ADRES:

KV Leuven Blok D  
Celestijnenlaan 3000 Leuven  
België

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

\_\_\_\_\_  
\_\_\_\_\_

AANGEVRAAGD DOOR DE INSTELLING:

\_\_\_\_\_  
\_\_\_\_\_

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:

*Utrecht*

DATUM:

*8 oktober 2013*

HANDTEKENING:

## ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

*H. P. Bok*

PRIVÉ ADRES:

*Prinses Ireneplantsoen 18*

*1191CB Oudekruis aan de Anstel*

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:

DATUM:

*Nijmegen*

*3 nov. 2013*

HANDTEKENING:

*H. P. Bloel*



## ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Tom Theuns

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PRIVÉ ADRES:

16 Clarendon House, Clayton St West, Newcastle NE1 5EE, UK

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IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Natuur en sterrenkunde

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AANGEVRAAGD DOOR DE INSTELLING:

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VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden kunnen BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:

DATUM:

Durham

21 November 2013

HANDTEKENING:

A handwritten signature in black ink, consisting of a series of connected, stylized letters and lines, positioned below the 'HANDTEKENING:' label.



**ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING**

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: J. H. HOOGENRAAD

PRIVÉ ADRES:  
POSTBUS 2717  
3500 GS UTRECHT

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

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\_\_\_\_\_

AANGEVRAAGD DOOR DE INSTELLING:

\_\_\_\_\_  
\_\_\_\_\_

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOULDEN KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:

UTRECHT

DATUM:

8 OKTOBER 2013

HANDTEKENING:





**ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING**

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Jelmer J.T. Wagenaar

PRIVÉ ADRES: Ruysdaelhof 32  
2251JK Voorschoten

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

\_\_\_\_\_  
\_\_\_\_\_

AANGEVRAAGD DOOR DE INSTELLING:

\_\_\_\_\_  
\_\_\_\_\_

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht

DATUM: 8-10-'13

HANDTEKENING:

A handwritten signature in black ink, appearing to be 'J. van der...' or similar, is written over the 'HANDTEKENING:' label.

## ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

H.A. Pyker

PRIVÉ ADRES:

Pommes Mandlaan 31,  
3743 JA Baarn

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Science in Business (UU)

AANGEVRAAGD DOOR DE INSTELLING:

Universiteit Utrecht

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden kunnen beïnvloeden;

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS:

Boarn

DATUM:

22-jan-'14

HANDTEKENING:





## ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: H. C. Moll

PRIVÉ ADRES: Taco Mesdagstraat 50  
9718 KN Groningen

IS ALS DESKUNDIGE / ~~SECRETARIS~~ GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Energy Science

AANGEVRAAGD DOOR DE INSTELLING:

Utrecht University  
Faculty of Sciences and Geosciences

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE Zouden KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN  
WÓRDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: *Groningen*      DATUM: *23/12/2013*

HANDTEKENING: 

**ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING**

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: BARBARA VAN BALEN

PRIVÉ ADRES: kl. Houtweg 8 2012 CH  
HAARLEM

IS ALS ~~DESKUNDIGE~~ SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Science and Business Management

AANGEVRAAGD DOOR DE INSTELLING:

Universiteit Utrecht

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOULDEN KUNNEN BEÏNVLOEDEN;



VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE  
AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN  
VERBAND MET DE BEOORDELING AAN HEM/HAAAR BEKEND IS GEWORDEN EN  
WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER  
REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: *Utrecht* DATUM: *23-1-2014*

HANDTEKENING: 