

MSc Astronomy & Astrophysics

**Faculty of Science,
University of Amsterdam**

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This report was finalized on 24 June 2014

Report on the master's programme Astronomy & Astrophysics of University of Amsterdam

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

Administrative data regarding the programme

Master's programme Astronomy & Astrophysics

Name of the programme:	Astronomy & Astrophysics
CROHO number:	60230
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	- Astronomy & Astrophysics - GRAPPA (with MSc Physics)
Location(s):	Amsterdam
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 University of Amsterdam took place on 2, 3 and 4 April 2014.

Administrative data regarding the institution

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

Quantitative data regarding the programme

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

Composition of the assessment committee

The committee that assessed the master's programme Astronomy & Astrophysics consisted of:

- Prof. dr. D. (Daan) Lenstra, professor emeritus of Electrical Engineering at Delft University of Technology and fellow at Eindhoven University of Technology (chair);
- Prof. dr. E. (Elias) Brinks, professor of Astrophysics at the University of Hertfordshire (UK);
- Prof. dr. Martin Goedhart, professor of Mathematics and Science Education at University of Groningen;

- Dr. ir. H.L. (Harald) Tepper, Chief strategy officer at the Netherlands Forensic Institute;
- Lisanne Coenen BSc, master student Applied Physics at Delft University of Technology.

The committee was supported by T.G. (Terry) Verseput, MSc. , who acted as secretary.

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

Working method of the assessment committee

The assessment of the master's programme Astronomy & Astrophysics at University of Amsterdam is part of a cluster assessment. In the context of this cluster visitation, in the time period between November 2013 and April 2014, twenty eight programmes at nine different institutions were assessed.

Appendix 2 contains the framework of reference.

The committee Physics and Astronomy is composed of in total sixteen members:

- Prof. dr. Daan Lenstra, professor emeritus of Electrical Engineering at Delft University of Technology and fellow at Eindhoven University of Technology (chair);
- Prof. dr. Wim de Boer, professor of Physics at the University of Karlsruhe (DE);
- Prof. dr. Elias Brinks, professor of Astrophysics at the University of Hertfordshire (UK);
- Prof. dr. Tom Theuns, reader in Astrophysics at Durham University (UK) and part time professor of Astrophysics at University of Antwerp (BE);
- Prof. dr. Gustaaf Borghs, professor emeritus of Physics at KU Leuven (BE) and senior fellow at the Interuniversity MicroElectronics Centre (IMEC);
- Dr. ir. Jaap Flokstra, retired associate professor Nanotechnology at University of Twente;
- Prof. dr. ir. Guido van Oost, full professor Plasma Physics at the Department of Applied Physics of Ghent University (BE);
- Dr. Henk Blok, retired associate professor at the Faculty of Sciences of VU University Amsterdam;
- Prof. dr. Martin Goedhart, professor of Mathematics and Science Education at University of Groningen;
- Christianne Vink MSc, didactic coach, educational advisor/trainer and partner of Academic Factory;
- Dr. Jan Hoogenraad, owner of Spoorgloren BV for change management and quantitative service in public transport;
- Dr. ir. Harald Tepper, chief strategy officer at the Netherlands Forensic Institute;
- Sander Breur MSc., PhD candidate at Nikhef, University of Amsterdam;
- Lisanne Coenen BSc., master student Applied Physics at Delft University of Technology;
- Carmen van Schoubroek, bachelor student Mathematics and bachelor student Physics and Astronomy, Radboud University Nijmegen;
- Jelmer Wagenaar MSc., 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.

To prepare the contents of the site visit in Amsterdam, 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.

Apart from the critical reflections, the committee members read a selection of ten theses for each programme. The 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 University of Amsterdam. The time table for the visit in Amsterdam 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 Education 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. There were no requests 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 secretary 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. Subsequently, the definitive report was approved and sent to University of Amsterdam.

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

This report reflects the committee's findings and considerations of the master's programme Astronomy & Astrophysics at the University of Amsterdam. The evaluations are based on information provided in the critical reflection, on interviews conducted during the site visit and on a selection of theses, course files and additional material supplied during the site visit. In its assessment, the committee observed positive aspects as well as ones that could be improved.

The committee reviewed the intended learning outcomes, the teaching-learning environment, the assessment and the achieved outcomes of the programme and found them all to be satisfactory. It decided that the master's programme Astronomy & Astrophysics at the University of Amsterdam fulfils the requirements set by the NVAO for re-accreditation.

Standard 1: Intended learning outcomes

The committee has studied the Domain Specific Framework of Reference as established by the national council of programme directors. It agrees with the requirements the DSRK sets for the intended learning outcomes of the master's programme Astronomy & Astrophysics. The committee concludes that the intended learning outcomes of the master's programme meet the criteria for level and domain of an academic master's degree programme. The committee encourages the programmes to make the intended learning outcomes more specific and to prepare the students for other fields of research and non-academic careers as well.

The committee assesses Standard 1 as 'satisfactory'

Standard 2: Teaching-learning environment

The master's programme Astronomy & Astrophysics offers two tracks: 1. Astronomy & Astrophysics (A&A) and 2. Gravitation and AstroParticle Physics (GRAPPA). Within the A&A and GRAPPA tracks, students can choose from several majors: 1. a major Research (R-major), 2. a major Science Communication (C-major) and 3. a major Science and Software Engineering (S-major). Since September 2013, the major Education (E-major) is offered as well. The committee values the solid research oriented profile of the master's programme and it is enthusiastic about the academic and scientific skills taught. It concludes that students of the master's programme Astronomy & Astrophysics are well prepared for a scientific career. At the same time, the committee thinks that more attention should be paid to job orientation outside (academic) research.

The committee noted that the average student intake of the master's programme is low. It supports the goal of the Faculty of Science of an 85 % success rate of students within three years and advises the programme management to keep trying to achieve that goal. The committee values the open communication between lecturers and students, and appreciates the quality of the teaching staff members. In combination with the adequate system of study guidance and facilities, students find themselves in a stimulating environment.

The programme has an adequate system of programme specific quality control in place. The Programme Committee of the UvA is very active and takes its role seriously. The committee however, wants to emphasize that the results of all course evaluations have to be processed and assessed.

The committee assesses Standard 2 as 'satisfactory'

Standard 3: Assessment and achieved learning outcomes

The committee concludes that, after a few changes to the Board of Examiners, directly implemented after the site visit, the assessment policy and the quality control of assessments are now adequate. The exams in the programme are of a high level and match the learning objectives of the courses.

To assess the level achieved by the students, the committee examined a range of master's theses. In general, it was impressed with the theses and it agrees with the marks that have been given. The committee concludes that the level of the theses matches what can be expected of a graduate of an academic master's programme.

The committee assesses Standard 3 as 'satisfactory'

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: 24 June 2014



Prof. dr. D. (Daan) Lenstra, Chair



T.G. (Terry) Verseput MSc., Secretary

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

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

The committee studied and assessed the intended learning outcomes of the master's programme Astronomy & Astrophysics at the University of Amsterdam (UvA) with regard to content, level and orientation. It studied the domain-specific framework of reference (DSRK) (1.1.), the profile of the programmes (1.2.) and the level and orientation (1.3.).

1.1. Domain Specific Framework of Reference

The national council of program directors of the Physics and Astronomy programmes has established a domain-specific framework of reference (DSRK) for the assessment of the bachelor's and master's programmes in those disciplines. The program directors revised the framework that has been written for the assessment of Physics and Astronomy in 2007. That framework in turn was inspired by the intended learning outcomes as formulated in the European Tuning-project document *Reference points for the design and delivery of degree programmes in physics*, which has set an international standard. This document also uses the Dublin descriptors as guideline for differentiation between bachelor and master level. The current DSRK is furthermore based on the more recent documents *'A European Physics Bachelor Study'* en *'A European Physics Master Study'* (2009) by the European Physics Society. The DSRK for master's programmes can be found in Appendix 2. The committee agrees with the requirements the DSRK sets for the intended learning outcomes of the master's programme Astronomy & Astrophysics.

According to the critical reflection, the general objective of the master's programme is to provide students with the knowledge, abilities and insight that will enable them to work as professional researchers in the fields of astronomy, astrophysics and astroparticle physics. The skills taught in the curriculum also prepare students to pursue advanced training as a scientific researcher or jobs in several fields of business, finance and beyond. The intended learning outcomes (or general exit qualifications) of the master's programme Astronomy & Astrophysics of the UvA have been described in the critical reflection (Appendix 3). Also, the critical reflection contains an overview of how the curriculum enables students to meet the programme's intended learning outcomes.

The committee has studied the intended learning outcomes of the master's programme and compared them to the DSRK and to the curriculum of the master's programme (standard 2). The committee noted that the intended learning outcomes result in a generic description of the master's programme Astronomy & Astrophysics. The intended learning outcomes could have a more specific focus on the field of Astronomy & Astrophysics. The committee established that all the DSRK requirements are reflected in the intended learning outcomes.

However, the committee advises the programme management to make the intended learning outcomes more specific for the master's programme.

1.2. Profile

The master's programme Astronomy & Astrophysics offers two tracks: 1. Astronomy & Astrophysics (A&A) and 2. Gravitation and AstroParticle Physics (GRAPPA). According to the critical reflection, the A&A track is designed to allow students to tailor their curriculum to their individual interests within a wide variety of research available at the Anton Pannekoek Institute (API). The A&A track aims to give students a deep knowledge of Astronomy & Astrophysics on a par with other top level international academic institutions in the field. The GRAPPA track is a new excellence programme, and is a joint initiative between the API and the Institute of Physics (IoP). This interdisciplinary track focuses on the interface between fundamental physics and astrophysics from subatomic scales up through the largest scales of the universe as a whole.

Within the A&A and GRAPPA tracks, students can choose from several majors: 1. a major Research (R-major), 2. a major Science Communication (C-major) and 3. a major Science and Software Engineering (S-major). Since September 2013, the major Education (E-major) is offered as well.

The curriculum of the master's programme is based on the research specialisation of the API in Astronomy. The API is a leading institute in three main research lines: High Energy Astrophysics (HEA), Low-Energy Astrophysics (LEA) and Astroparticle Physics (APP). According to the critical reflection, the API is recognised as one of the top astronomical research institutes worldwide. Aside from courses taught by API staff, the master's programme also offers courses via additional lecturers from affiliated institutions as well as several courses from the master's programme Physics or at other Dutch astronomical institutes. According to the critical reflection, the master's programme strives to encourage three I's in students: 1. Independence, 2. Inquisitiveness and 3. Initiative.

The committee established, based on the critical reflection and conversations during the site visit, that the master's programme has a solid focus on research. Graduates gain a strong profile to continue their PhD at one of the API research groups. The committee, however, is of the opinion that students should be prepared for non-academic careers as well. The committee finds it disappointing that job orientation outside research is still a weakness in the programme. It is glad to see that the programme has recently taken new initiatives to make the necessary improvements here, such as the career day, jointly organized with the master's programme Physics.

1.3. Level and orientation

The programme intends to reach an academic master level. The committee has established that the programme's learning outcomes match the DSRK requirements, and confirms that the DSRK is based on the Dublin descriptors. Therefore, the committee concludes that the intended outcomes of the master's programme are indeed fitting and meet the criteria for level and domain of an academic master's degree programme.

Considerations

The committee has studied the Domain Specific Framework of Reference as established by the national council of programme directors. It agrees with the requirements the DSRK sets for the intended learning outcomes of the master's programme Astronomy & Astrophysics. The committee concludes that the intended learning outcomes of the master's programme meet the criteria for level and domain of an academic master's degree programme. The committee encourages the programmes to make the intended learning outcomes more specific and to prepare the students for other fields of research and non-academic careers as well.

Conclusion

Master's programme Astronomy & Astrophysics: 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

In this standard the curriculum (2.1), translation of intended learning outcomes in the curriculum (2.2) and study load and feasibility (2.3) is examined. In addition, the staff (2.4) and student support (2.5) are discussed.

2.1. Curriculum

The master's programme Astronomy & Astrophysics is a two-year fulltime programme of 120 EC, taught in English. Admission of students takes place at the beginning of September and February. The master's programme accommodates the tracks A&A and GRAPPA.

The committee established that the GRAPPA track is described in the critical reflection as an 'excellence track' due to the high quality research groups and the strict student selection. The committee noted that the GRAPPA has a strong focus on Astroparticle Physics.

Within the tracks a few majors are offered. The research major (R-major) consists of 60 EC of courses. The R-major within the track A&A includes two compulsory courses and the R-major within the GRAPPA track includes three compulsory courses. In both tracks, there are 3 EC of Academic skills required. Students also require 3 EC in English, unless they are native speakers, in which case the 3 EC can be made up with free choice of options. The students take 42 EC of courses within their track and 12 EC of courses are free electives. During the second year, students follow a research project and write a thesis (54 EC) and conclude with the final report and a presentation (6 EC). An overview of the curriculum of the master's programme is included in Appendix 4 and a short overview is depicted in the table below.

Components	R-Major	All Other Majors
	EC	EC
Compulsory subjects	12-18	Total 24
Elective subjects discipline	24	
Seminars, thesis and/or projects	6-12	
Final Research project	54	30
Final report and presentation	6	6
Free elective subjects	12	
Academic Skills + English	6	
Non R-major programmes		60
Total EC	120	120

The non-research majors consist of 60 EC specific to the major, combined with a 60 EC A&A or GRAPPA programme. The committee concludes that the non-research majors are of a fairly recent date (2012/2013). Usually, the scientific research-related component is taken

first and the major-specific component is taken in the second year. All non-research majors are shared with other master's programmes within the Faculty of Science and the requirements are not determined by the master's programme Astronomy & Astrophysics.

Since 2013, students can also choose the Tesla Track of the E-minor. The Tesla Track is a minor programme that enables students to apply their scientific knowledge and academic background in a project on the interface of science, business and society. During the first year of the E-major, core science courses and the research project will be conducted within the Graduate School of Science (GSS), while the second year will focus on pedagogy and will be taught for all master's programmes via the Institute for Teacher Education. It is possible but rare for students to do a double master's degree because it entails three years of study. The programme entails 180 EC: coursework in each of the two disciplines (45 EC each) and research and thesis work in two projects or a single, interdisciplinary project with two advisors (90 EC). These students receive a diploma with two master's programmes.

The committee studied the master's programme and the tracks A&A and GRAPPA and it values the solid research-oriented profile of the master's programme. The committee noted that, because there are only two or three mandatory courses, the students can choose most of their courses themselves. During the site visit, it became evident that the students are enthusiastic about the flexibility of the current system. They feel they can benefit during the master's theses from choosing the courses of their interest in the curriculum. The committee appreciates the fact that the system is clear and insightful and that a staff member discusses the curriculum with the student. A disadvantage for students is that some courses are only offered once every two years, which limits the choice. During the site visit, the committee studied a selection of course materials. It concludes that the courses show the level that might be expected of master's courses in Astronomy and Astrophysics.

2.2. Translation of intended learning outcomes in the curriculum

In the critical reflection, the master's programme included a table that describes how and where the intended learning outcomes are realized in the curricula. The committee has studied this table and compared it with the course information and the DSRK. The committee established that all important skills and competences described in the intended learning outcomes are adequately translated into the courses of the curriculum. Professional skills, however, are currently underrepresented. In line with graduates' suggestions, the committee thinks that a compulsory internship could solve this problem, rather than the start of a new professional track.

According to the critical reflection, the goal of the master's programme is to prepare students for either an academic study at PhD level or a job in industry. The students feel closely involved with the research groups at API because of the small-scale education and the low threshold in contact with staff members. The students receive a good training in the specific Academic Skills course and practice these skills, such as giving oral presentations and writing, during all other courses as well. The students informed the committee that they feel prepared for starting a PhD trajectory. The committee established that the level of education is satisfactory and the committee is enthusiastic about the academic and scientific skills the students are taught. It concludes that students of the master's programme Astronomy & Astrophysics receive a good preparation for a scientific career.

The committee also assessed the preparation of students for a professional career. According to the critical reflection, students are taught skills such as analysis, IT/coding and problem

solving. During several courses, students are taught presentation and communication skills, teamwork, time- and project management. They are also made familiar with job application procedures. The students are taught via homework, in class exercises, in individual and group projects, class presentations and in the thesis project, where they are embedded in a research group. The committee members, as well as the students, are enthusiastic about the range of skills students are taught in the courses. The committee supports the Python programming course in the first year and the minor programming that recently has been introduced in the master's programme. It concludes that students of the master's programme Astronomy & Astrophysics receive adequate preparation for the labour market, however, with a strong focus on research.

During the site visit, the master's students expressed their appreciation for the two career days that are held by the master's programme every academic year. The committee is enthusiastic about the career days and the fact that students are aware of their career options outside research. Also, it advises the programme management to stimulate the participation of students in an external internship in either research or business. The committee concludes that there is a very adequate system of study guidance in place.

2.3. Study load and feasibility

The master's programme has a curriculum of two years and uses a semester system. The semesters both consist of two blocks of 8 weeks, followed by a 4 week block. A typical course in an 8 week block has 4 hours of lectures and 4 hours exercise components per week for 7 weeks. The 4 week block is often used for 3 EC courses and seminars. During the site visit it became evident that the staff members are not all appreciative of the block system. They noted that students do not have sufficient time to process the information provided during a course. The committee supports the wish put forward by the teaching staff to divide some of the courses into two periods. It found the curriculum of the master's programme feasible.

The current objective of the Faculty of Science is that 85 % of the master's students graduate within three years. Since 2006, the master's programme Astronomy & Astrophysics had a success rate of students within 3 years that fluctuates between 55 and 89%. The critical reflection states that since 2006 the student intake of the master's programme fluctuates between 6 and 15 students per academic year.

Between 2011 and 2013, four students enrolled in the GRAPPA track. According to the critical reflection, students must go through a separate intake procedure to be admitted for special programmes, for instance the S- and C-majors, within the master's programme. Students who want to apply to the GRAPPA excellence track have to apply via an essay and must have sufficiently high grades. The GRAPPA track coordinator determines the student selection. An additional component of the GRAPPA track is that students are required to attend a school or summer programme for a week, such as the ASTRON summer student programme or an astrophysics/cosmology related international school.

According to the critical reflection, the international API reputation is starting to attract international students to the master's programme. The selection of foreign students is based on research directions, international reputations of teachers, location and the availability of funding. The programme management hopes to attract students by the international reputation of Amsterdam and by making connections in China and India. Additionally, the international nature of the master's programme follows from the foreign teaching staff (35%) and foreign PhD and postdoc population (50%). There are 25% foreign students and the

number is increasing because of international recruitment efforts and increasing availability of scholarships.

The committee noted that the average student intake of the master's programme is low. During the site visit, it became evident that the programme management attempts to increase the number of students by attracting more international applicants. The programme management would like a maximum student intake of 20 students per academic year, to keep the master's programme small and unique. The committee noted that the student output is satisfactory and the students are taught well. Since 2007, the success rate of students within three years has increased. The committee supports the goal of the Faculty of Science of an 85 % success rate of students within three years and advises the programme management to keep trying to achieve that goal.

2.4. Staff

According to the critical reflection, there are fourteen registered students in the master's programme. The permanent scientific staff's teaching effort is calculated as 1.7 FTE. Thus, the student/staff ratio is $14/1.7 = 8.2$. The committee is satisfied with the student/staff ratio. According to the critical reflection, all teaching staff has a PhD degree and 32% of the staff members obtained their BKO (Basis Kwalificatie Onderwijs, BKO). The students are very positive about the small-scale education.

The Faculty of Science (FNWI) has set the goal that 90% of the FNWI faculty has to complete their BKO (Basis Kwalificatie Onderwijs) training by 2014. At the time of writing the critical reflection, 32% of the teaching staff members obtained their BKO. The committee asked for more recent numbers during the site visit: by that time, 61% of the teaching staff had obtained their BKO and 11% of the teaching staff was still in their BKO-trajectory. The remaining 28% of teaching staff without BKO training consists of two retired lecturers and one guest lecturer. The committee is glad to see the programme management is taking the goal of the FNWI faculty seriously, although it thinks that the current attention for teaching professionalization is rather late.

During the site visit, the alumni of the master's programme informed the committee that the staff members are easy to approach and that the good quality of education works motivating. The students noted that they benefit from the low threshold in approaching their supervisors and the positive peer pressure amongst students. The teaching staff as well as the students are appreciative of the small-scale education and the personal contact between them. The committee values the open communication between lecturers and students, and appreciates the quality of the teaching staff members.

2.5. Student support

According to the critical reflection, the director of the master's programme is the main point of contact for the students and acts as an advisor for all issues ranging from course choices to research projects. The new students have an intake interview with the director in which they are advised about the curriculum. Additionally, there is an intake procedure for the institute, where students are introduced to their fellow students, local facilities, receive their accounts and are added to the 'msc-astro' mailing list, via which the director can send information. Finally, new students have their photograph added to the institute photo board and introduce themselves to the institute members at the weekly 'info coffee' meeting. The committee is enthusiastic about these efforts to make students feel part of the group.

2.6. Programme specific quality assurance

The committee has verified to what extent students and lecturers are involved in the shaping and evaluation of the programme. The critical reflection makes a distinction between three types of evaluations of the programme: evaluations of individual courses, of the quality of the curriculum as a whole, and of each track. The first two evaluations are carried out by using automatically processable evaluation forms, the second one is done by means of meetings with supervisors of internships, employers of graduates (mostly PhD-supervisors) and the Programme Committee. The committee is enthusiastic about the fact that every course is evaluated by students. It wants to emphasize that the results of all evaluations have to be processed and assessed.

In addition to course evaluations with evaluation forms, the programme uses a specific way of evaluating courses after each block: the Semester Response System (SRS). After each semester, students and lecturers meet to discuss and evaluate all courses of the past months. The committee is enthusiastic about the set-up of the SRS-meetings and concludes that they can play a useful role in the process of quality control. The committee does concur with the lecturers that to have a fruitful and representative discussion it is important that a sufficient number of students are present. Therefore, SRS might work less well for master's courses that attract fewer students. Finally, the committee advises the programme to start evaluating the master's research project and to ask graduates to evaluate the programme as a whole.

According to the critical reflection, the master's programme Astronomy & Astrophysics has two rooms containing 20 desktops allowing access to relevant astronomical data analysis and mathematical/modelling software. The programme also offers the Anton Pannekoek Observatory (APO) on the roof of the institute. In the main dome, there is a 51 cm telescope, which can be used with a variety of instruments and filters for photometry, and is also equipped for spectroscopy. Additionally, there is a second, lower dome with a smaller telescope, and there are several 10cm telescopes with built-in stands on the roof. The committee has seen the observatory during a guided tour. It noted that there is a sufficient amount of instruments for the students, which are all up to date. The committee established that students know how to use the facilities. Overall, it was very impressed with the facilities of the master's programme Astronomy.

The Programme Committee of the UvA evaluates and provides solicited and unsolicited advice for the bachelor's programme Physics & Astronomy and the master's programmes Astronomy & Astrophysics and Physics. It consists of nine members: four lecturers, three master's students and two bachelor's students. The Programme Committee holds monthly meetings, whereby the first half of the meeting is closed door between the students and the chairperson. The chair is a staff member of Astronomy and the Programme Committee is supported by a secretary. Most meetings are also attended by the programme director and programme coordinator. At present, no international students are represented in the Programme Committee. The committee encourages the Programme Committee to include at least one international student. It also advises the Programme Committee to strengthen its independence by not having the programme director and programme coordinator present at every meeting. It struck the committee as positive that the lecturers represent the various research institutes well.

Considerations

The committee values the solid research oriented profile of the master's programme. It appreciates the fact that the system is clear and insightful and that staff members discuss the personal selection of courses with the students. The committee established that the level of the programme as illustrated in its courses is satisfactory. It is enthusiastic about the academic and scientific skills the students are taught. It concludes that students of the master's programme Astronomy & Astrophysics are well prepared for a scientific career. However, more attention could be paid to job orientation outside (academic) research.

The committee noted that the average student intake of the master's programme is low. It supports the goal of the Faculty of Science of an 85 % success rate of students within three years and advises the programme management to keep trying to achieve that goal. The committee values the open communication between lecturers and students, and appreciates the quality of the teaching staff members. In combination with the adequate system of study guidance and facilities, students find themselves in a stimulating environment.

The programme has an adequate system of programme specific quality control in place. The Programme Committee of the UvA is very active and takes its role seriously. The committee however, wants to emphasize that the results of all course evaluations have to be processed and assessed.

Conclusion

Master's programme Astronomy & Astrophysics: 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

In this standard, the findings on the assessment system and methods used are described (3.1), followed by the achieved learning outcomes (3.2). The assessment committee has read the programme's education and examinations regulations (OER), has spoken with members of the Board of Examiners, and has evaluated assignments, exams, and final projects.

3.1. Assessment system and methods

In accordance with statutory regulations, the master's programme Astronomy & Astrophysics has laid down its assessment system in the Teaching and Examination Regulations (OER) of the programme. This document provides students with information on, for instance, the admission criteria for exams, exam dates and assessment forms. The individual assessment procedure for each course is made clear in the course manual on Blackboard and can also be found in the study guide. Results have to be reported to the students within fifteen working days. The Board of Examiners is responsible for drawing up and enforcing the rules and regulations, and monitors the quality of exams and assessments within the programme.

The programme makes use of various assessment forms. Most courses are concluded with a written exam at the end of the course, but oral presentations and assignments are also used. Research skills are assessed on the basis of research performance and attitude. The committee has seen course exams and assessment forms, such as research training contracts, and concludes that the various ways in which the programme tests knowledge and skills match the learning aims of the courses.

The Board of Examiners is responsible for checking the quality of the exams and it guarantees that graduates have acquired the intended learning outcomes of the programme and meet the requirements to obtain their master's certificate. It is responsible for the bachelor's programme Physics & Astronomy and the master's programmes Astronomy & Astrophysics and Physics.

During the site visit, the Board of Examiners explained that most of its meetings are taken up with discussing whether to approve students' individual study programmes. It checks for each student whether the courses they have followed or wish to follow form a coherent set, and deals with individual requests. In addition, the Board of Examiners checks the quality of exams with exceptionally high or low success rates. Finally, it checks whether students have acquired the intended learning outcomes of the programme by reading all master's theses.

The committee reached the conclusion that the Board of Examiners does not exert all of its legal tasks. It did not yet systematically and proactively check the quality of testing and assessment in the programme. Also, the Board of Examiners had not yet adopted a policy to

detect fraud and/or plagiarism. Finally, in carrying out its task, the Board of Examiners was hindered by not having a 'toetsplan' or model answers at its disposal, because both were still in development at the time of the visit.

After talking to the Board of Examiners, the committee concluded that it was understaffed, and did not seem fully aware of its legal tasks. The committee is convinced that the Board of Examiners wishes to fulfil its tasks well and in a conscientious matter, but also thinks that it is spending too much time discussing individual cases. The Board of Examiners structurally had insufficient time to carry out all its tasks and had postponed taking on board new responsibilities until the formation of the Amsterdam Faculty of Science, now abandoned.

The assessment committee has shared its concerns with the programme and faculty management of the UvA. The programme management agreed with the committee and promised to take immediate action to support the Board of Examiners in carrying out its tasks. In the process of drawing up the assessment reports, this commitment has been made explicit in a plan of action, which the committee has read with approval. The plan of action contains the following measures:

- The Board of Examiners has mandated the systematic check on testing and assessment to a newly installed 'Toetscommissie' (Assessment Committee) consisting of four members who will devote their time to the quality check of exams and the drawing up of a 'toetsplan'.
- One member of the Board of Examiners of the VU has been appointed advisor of the Board of Examiners of the UvA. He will advise on the interpretation of the tasks of both committees.
- The Board of Examiners has been expanded with two new members, who will also be made member of the Toetscommissie.
- The Rules and Regulations of the Board of Examiners will be amended to make clear the position of the Board of Examiners and the Toetscommissie.
- The Board of Examiners can consult an expert in the field of assessment/exams, appointed by the faculty.
- The chair and vice-chair of the Board of Examiners will form a 'fraud and plagiarism' committee which will adopt a policy for proactively detecting fraud and plagiarism.

The committee is impressed and pleased with the swift and adequate actions to deal with the issues it had identified. Due to these solid measures of improvement, the quality of testing and assessment is properly secured and meets the required standard. The committee is confident that the programme management will proceed to further improve the quality assessment of exams in the near future.

3.2. Achieved learning outcomes

The final year is concluded with a research project and a master's thesis. The student and the supervisor agree to a project plan and schedule in a Research Project Contract (RPC). The RPC forms the guideline for the project and changes in the RPC are discussed with the master's director. All students write their thesis about the research project and give an oral presentation. The final assessment is done by the supervisor(s), including a second reader. They use a specific assessment form with criteria such as accuracy, originality and independence. The oral presentation is graded by the supervisor and a small jury of faculty members.

Prior to the site visit the assessment committee has studied ten theses of the master's programme Astronomy & Astrophysics to check whether students have achieved the intended learning outcomes. In general, the committee agrees with the grading of the theses. The committee concludes that the quality of the theses and the academic level matches what may be expected of a master's thesis. It appreciated that every thesis came with a filled in assessment form.

According to the critical reflection, most master's students choose to start a PhD project after their graduation. Since 2006, 31 of the 47 graduated students started a PhD. Of the remaining graduates, five were employed as a teacher and seven found positions at a company or business. One graduate (of the cohort 2011-2012) is searching for a job and for three graduates there is no information. On the basis of these numbers the committee concludes that graduates clearly meet the expectations of the job market.

Considerations

The committee concludes that, after a few changes to the Board of Examiners, directly implemented after the site visit, the assessment policy and the quality control of assessments are now adequate. The exams in the programme are of a high level and match the learning objectives of the courses.

To assess the level achieved by the students, the committee examined a range of master's theses. In general, it was impressed with the theses and it agrees with the marks that have been given. The committee concludes that the level of the theses matches what can be expected of a graduate of an academic master's programme.

Conclusion

Master's programme Astronomy & Astrophysics: the committee assesses Standard 3 as 'satisfactory'.

General conclusion

In the committee's judgement, the master's degree programme Astronomy & Astrophysics at the University of Amsterdam fulfils the criteria for accreditation. It has noted many positive aspects and suggested several points for improvement. Weighing up those points and the individual assessment of each standard, the committee concludes that the programme "meets the current generic quality standards and shows an acceptable level across its entire spectrum" and consequently can be assessed as 'satisfactory'.

Conclusion

The committee assesses the *master's programme Astronomy & Astrophysics* 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 focuses on the broad area of quantum electronics. He was professor at the VU University Amsterdam from 1991-2006. Between 2000 and 2006 Lenstra 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 Lenstra is honorary advisor for the Faculty Electrical Engineering of Eindhoven University of Technology.

Prof. dr E. (Elias) Brinks earned his doctorate in 1983 at Leiden University with a study of the neutral hydrogen distribution in Messier 31, the Andromeda galaxy. Following a postdoctoral fellowship at the European Southern Observatory (ESO) in Garching and an employment as Senior Research Associate at the former Royal Greenwich Observatory in the UK, he spent nearly six years as Associate Scientist at the National Radio Astronomy Observatory’s Very Large Array (NRAO-VLA) in Socorro, New Mexico (USA). He then moved to “Old” Mexico to help set up the Department of Astronomy at the University of Guanajuato and subsequently was appointed as staff scientist at the Instituto Nacional de Astronomía, Óptica y Electrónica (INAOE) in Puebla, where he contributed to efforts to build the Large Millimeter telescope. Since September 2004 he is back in Europe, as Full Professor at the University of Hertfordshire. Upon returning to the UK he was elected Secretary of the European Astronomical Society (2006-2012). His research focuses on nearby normal and dwarf galaxies, galaxy interactions, and their formation and evolution.

Prof. dr. M.J. (Martin) Goedhart is trained as a biochemist and, from 1982 to 1992, worked as a teacher in chemistry in vocational education. In 1990, he got his PhD at Utrecht University with a thesis on chemical didactics. Between 1992 and 2004, he was teacher and primary teacher at the University of Amsterdam (UvA), as course didactic of chemistry at the academic teacher training, among other things. Since 2004, he has been a professor of Didactics of Math and Natural Sciences at University of Groningen and as head of education, responsible for the master’s programme Education and Communication in Math and Natural Sciences. He leads the research group IDO (Institute for Didactics and Development of Education), which researches the didactics of math and natural sciences in secondary education and University. He is editor and member of the editorial committee of national and international magazines, member of the programme committee DUDOC (programme focussed on PhD research by secondary education teachers in beta subjects), coordinator of the network chemistry/pharmacy of ICAB (Innovation Centres Academic Beta Education) and chair of the faculty BKO assessment committee. He was a member of the visitation committee of the master’s programme Science Education and Communication at the 3TU.

Dr ir. H.L. (Harald) Tepper studied Chemical Technology at the University of Twente and in 2001 got his PhD in ‘computational physics’ at the same university. From 2002 until 2007, Tepper was postdoctoral researcher at the University of Utah (USA), and VENI-researcher at the AMOLF Institute in Amsterdam. Since 2007 he has worked in industry. He was management consult at the consultancy firm McKinsey & Company, where he worked, among other things, at large scale change processes, audits and benchmarking of organizations, and the strategy of an academic business school. Since September 2013 he works as Chief Strategy Officer at the Netherlands Forensic Institute. During his studies, he also obtained a diploma as teaching musician (clarinet) at the conservatoire. Tepper was co-

founder and chairman of 'De Nationale DenkTank', a foundation which adds a multidisciplinary experience to the curricula for students and PhD students.

L. (Lisanne) Coenen BSc graduated from the bachelor's programme Applied Physics at Delft University of Technology in 2013. At the same time, she finished her pre master Philosophy of Natural Sciences at Leiden University. Since September 2013, she follows the master's programme Applied Physics (track 'Quantumnanoscience'), also at Delft University of Technology. Additionally, she follows the master's programme Philosophy of Natural Sciences at Leiden University. During her bachelor's programme, she was a board member of the student union for Applied Physics in Delft and in 2012 she was a member of the educational committee for Applied Physics.

Appendix 2: Domain-specific framework of reference

Introduction

The goal of a university programme is to prepare students for an independent practise of the profession of the relevant discipline, and to give them the ability to apply the knowledge and skills they have acquired. Dutch university programmes in the domain of (applied) physics and astronomy are required to reach a level which allows the graduate to be competitive in the international research or job market, in particular with respect to countries which have a high profile in these areas. The domain specific reference frame is meant to be a gauge for reaching this goal.

The framework is based on the one used in the Teaching Programme Assessment (Onderwijsvisitatie) of 2007. The basis for that framework was derived from the qualifications as formulated in the document ‘Reference points for the design and delivery of degree programmes in physics’, which was a product of the so-called Tuning Project. The frame of reference to be presented below has been updated by also making use of the more recent ‘A European Specification for Physics Master Studies’ of the European Physical Society (2009). The descriptors for the programmes have been formulated in terms of competences acquired by the graduating student, which leads to specific requirements for the curriculum. Programmes with the same name at different (Dutch) universities will in general not be identical. Different specialisations in the research staff or focus on particular subjects leads to differences in the eligible part of the programmes, and there is a structural difference between (the goals of) general universities and universities of technology. As a consequence, there are different ways to comply with the requirements of the reference frame. Essential is that the local choices for, and colouring of the programme fits the internationally accepted standards.

Programme descriptors

Very similar to the BSc programmes, the descriptors for the MSc programmes can be described with three types of competences, as is done below. The sequence within each category is, with few exceptions, taken from what is called the ‘Rating of Importance Order’ in the Tuning document. The basic difference with the descriptors for the BSc programmes is the different emphasis. Where a BSc programme aims at including some aspects of the forefront of knowledge, an MSc programme aims at providing a basis (or opportunity) for originality.

The descriptors for the master degree programmes can be described with three types of competences, as is done below. The sequence within each category is, with few exceptions, taken from what is called the ‘Rating of Importance Order’ in the Tuning document.

(a) Discipline-related cognitive competences.

	Specific competence	Description. On completion of the degree course, the student should
1	Modelling skills	be able to identify the essentials of a process/situation and to set up a working model of the same; be able to perform the required approximations; i.e. critically think about how to construct physical models.
2	Problem solving skills	be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems.

3	Knowledge and understanding of Physics	have a good understanding of the important physical theories (logical and mathematical structure, experimental support, physical phenomena described).
4	Familiarity with basic and applied research	acquire an understanding of the nature and ways of physics research and of how physics research is applicable to many fields other than physics, e.g. engineering; be able to design experimental and/or theoretical procedures for: (i) solving current problems in academic or industrial research; (ii) improving the existing results.
5	Frontier research	have a good knowledge of the state of the art in (at least) one of the presently active topics in physics research.
6	Human / professional skills	be able to develop a personal sense of responsibility; be able to gain professional flexibility through the wide spectrum of scientific techniques offered in the curriculum.
7	Physics culture	be familiar with the most important areas of physics and with the common approaches, which span many areas in physics.
8	Absolute standards	have become familiar with highly regarded research in the field thus developing an awareness of the highest standards.

(b) Discipline-related practical skills.

	Specific competence	Description. On completion of the degree course, the student should
9	Mathematical skills	be able to understand and master the use of the most commonly used mathematical and numerical methods.
10	Computer skills	be able to perform calculations independently, even when a small PC or a large computer is needed, including the development of software programmes.
11	Experimental skills	have become familiar with most important experimental methods and be able to perform experiments independently, as well as to describe, analyse and critically evaluate experimental data; and to be able to scientifically report the findings.

(c) Discipline-related generic competences.

	Specific competence	Description. On completion of the degree course, the student should
12	Literature search	be able to search for and use physical and other technical literature, as well as any other sources of information relevant to research work and technical project development; have good knowledge of technical English.
13	Learning ability	be able to enter new fields through independent study.
14	Ethical behaviour (relevant to physics)	be able to understand the socially related problems related to the profession, and to comprehend the ethical characteristics of research and of the professional activity in physics and its responsibility to society.
15	Specific communication skills	be able to listen carefully and to present difficult ideas and complex information in a clear and concise manner to

		professional as well as to lay audiences; be able to work in an interdisciplinary team.
16	Managing skills	be able to work with a high degree of autonomy, even accepting responsibility in (project) planning, and in the managing of structures.
17	Updating skills	enjoy the facility to remain informed of new developments and methods, and be able to provide professional advice on their possible impact or range of applications.
18	Foreign language skills	have improved command of foreign languages through participation in courses taught in foreign language.

Note that in the generic competences in particular, learning ability and managing and updating skills receive more attention than in the description for the BSc programmes.

Programme

The variation in MSc programmes within the domains of Physics, Applied Physics, or Astronomy can be substantial. A general requirement is that the programme aims at teaching the student how to practice their profession in an independent manner. Central to the programme is therefore the individual research assignment, in which the student becomes acquainted with the daily research practice at a frontier of science. Similar requirements apply to Applied Physics programmes, with the understanding that the individual assignment can have a more applied character, and that a project can also have a focus on design. In all cases, the graduation assignment should preferentially be performed within a research group, and the student should be able to function as a fully-fledged member of the group. This requires a workplace which allows daily (social) contacts, and regular exchange of ideas, questions and thoughts with colleagues. This ensures the acquisition of a broad range of research skills.

Physics and astronomy are disciplines which in their very essence are practiced in an international setting. The required level can therefore be indicated by referring to the exchange of information as occurs at scientific conferences and in scientific journals. The graduation work, delivered in the form of a thesis, should therefore link to that level. It should enable the student to enter the international market in a credible way, and research performed during the Master should regularly lead to, or be part of, a scientific publication. Apart from that, the research has to be presented both written and oral.

In view of their future practicing of a profession, it is important that students learn to work with time constraints. The traditionally large freedom which Dutch students had and partly still have, can easily lead to the neglect of this aspect in study programmes. As this freedom is currently becoming less, it is the more important that the programmed safeguards and stimulates the progress of the student. Time management should be an explicit part of elements of the programme, in particular for a research project or an internship.

Apart from the research practice, the student should deepen his knowledge of physics by studying more specialised subjects, often through formal lecture series or study groups. Study programmes will probably want to offer a common core, but much of the direction for study will be furnished by the local research specialisations, and can therefore be quite different in focus.

An increasingly important facet of a disciplinary Master programme is that it can be combined with a different specialization in order to broaden the scope of professions which

are open to the graduated student. Prime examples are specializations in the direction of education (leading to the profession of high school teacher, among others), science communication, or science-based business. In the latter case, study elements aiming more specifically at management or governance may be important. It can be expected from a programme that it allows students to orient themselves on the possibilities and ways to match their talents and interests with the job market. In the current Dutch system of a 2-year (120 EC) programme, the minimal requirement for a Master degree in Physics, Applied Physics or Astronomy is deemed to be one year of disciplinary studies. This leaves up to a year for such other specializations.

Appendix 3: Intended learning outcomes

A graduate from the MSc A&A programme:
a. has a thorough theoretical and practical knowledge of modern astronomy, including the necessary knowledge of other disciplines required for that purpose.
b. has a thorough knowledge of theoretical and/or observation methods and research experience in at least one sub-area within the astronomy discipline.
c. is able to become acquainted with other sub-areas of the astronomy discipline within a reasonable period of time.
d. is able to formulate a research plan of action based on a realistic problem within the astronomy discipline.
e. is able to analyse research results and to draw conclusions there from.
f. is able to write a report or an internationally accessible scientific publication, and to participate in discussions on a topic in the field of study.
g. is able to consult and apply (international) professional literature in the relevant sub- areas.
h. is able to apply their knowledge of astronomy in a broader (multidisciplinary) context.
i. is employable in those positions for which knowledge and research skills in the field of astronomy are a prerequisite.
j. has sufficient knowledge of, and insight in the social role of astronomy in order to be able to make a sound choice regarding their profession, as well as in the exertion of this profession.
k. is able to cooperate with, and to convey knowledge to other people and to give a presentation both to discipline specialists and to a broader audience.

Appendix 4: Overview of the curriculum

		Semester 2						
Semester		Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Total
		Course	Course	Course	Course	Course	Course	EC
		EC	EC	EC	EC	EC	EC	EC
2012-2013	Compulsory	Stellar Atmospheres	6			Structure and Evolution of Stars	6	12
	Electives in	Open Problems in Modern Astrophysics	6	Interferometry	6	Interstellar and Circumstellar Matter	6	
				HEA: Accretion onto Compact Objects	6	Inter-University Lectures	6	30
						Radio Astronomy	6	
Project / Lab		Observation Project	6			Computational Astrophysics	6	12
						Cosmology	6	
Other (Physics)		Particle Physics I	6	Quantum Field Theory	6	Astro Particle Physics)	6	6
				General Relativity	6	Particles and Fields	6	
				Programming C++	3	Gravitational Waves	3	39
Academic Skills		Academic English	3	Academic English	3	Academic English	3	6
						Academic Skills	3	

Appendix 5: Quantitative data regarding the programme

Data on intake, transfers and graduates

Cohort	Total	Gender		Prior Education			A&A/Grappa Track
		M	F	UvA	Other	Foreign	
06/07	9	9	0	6	1	2	9/—
07/08	6	5	1	5		1	6/—
08/09	11	8	3	7	1	3	11/—
09/10	12	11	1	9	2	1	12/—
10/11	8	5	3	7	1	—	8/—
11/12	8	7	1	2	4	2	5/3
12/13	15	9	6	6	4	5	14/1

Cohort	Total	Success rate			Still active	Disenrolled
		Max 2	Max 3	Total *		
06/07	9	67%	89%	89%		11%
07/08	6	33%	67%	100%		
08/09	11	27%	55%	64%	18%	18%
09/10	12	75%	83%	83%	8%	8%
10/11	8	50%		63%	25%	13%
11/12*	8				88%	13%
12/13*	15					7%

*preliminary

Quality of teaching staff

Function	Fte	% PhD	% BKO
Hoogleraar	0,4	100%	
UHD	0,9	100%	
postdoc	0,1	100%	
promovendus	0,3	Nvt	
totaal	1,7	82.4%	32%

Teacher-student ratio achieved

Ratio	1:8.2
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Average amount of face-to-face instruction per stage of the study programme

Year	Lectures/practica	Independent study/homework	Thesis-related work	Total
1	400-500	980-1180	100-200	1680
2	80-200	250-400	1400-1600	1680

Appendix 6: Programme of the site visit

Dag 0:																				
18.00	21.00	Voorbereidend overleg commissie UvA																		
Dag 1:																				
9.00	10.30	Leestafel UvA, intern overleg																		
10.30	11.30	Opleidingsmanagement UvA <table border="1"> <thead> <tr> <th>Naam</th> <th>Functie</th> <th>Universiteit</th> </tr> </thead> <tbody> <tr> <td>dhr. dr. M. (Marcel) Vreeswijk</td> <td>Opleidingsdirecteur Natuur- & Sterrenkunde</td> <td>UvA</td> </tr> <tr> <td>dhr. prof.dr. H.B. (Ben) van Linden van den Heuvell</td> <td>Opleidingsdirecteur Physics</td> <td>UvA</td> </tr> <tr> <td>mevr. dr. S (Sera) Markoff</td> <td>Opleidingsdirecteur Astronomy and Astrophysics</td> <td>UvA</td> </tr> <tr> <td>dhr.dr. W. (Wim) Vassen</td> <td>Opleidingsdirecteur Natuur- & Sterrenkunde</td> <td>VU</td> </tr> <tr> <td>dhr. prof.dr. P (Piet) Mulders</td> <td>Coordinator master Physics</td> <td>VU</td> </tr> </tbody> </table>	Naam	Functie	Universiteit	dhr. dr. M. (Marcel) Vreeswijk	Opleidingsdirecteur Natuur- & Sterrenkunde	UvA	dhr. prof.dr. H.B. (Ben) van Linden van den Heuvell	Opleidingsdirecteur Physics	UvA	mevr. dr. S (Sera) Markoff	Opleidingsdirecteur Astronomy and Astrophysics	UvA	dhr.dr. W. (Wim) Vassen	Opleidingsdirecteur Natuur- & Sterrenkunde	VU	dhr. prof.dr. P (Piet) Mulders	Coordinator master Physics	VU
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dhr. prof.dr. R (Ralph) Wijers	Docent (API)																			
13.00	14.00	Lunch/intern overleg commissie																		
14.00	14.45	Studenten Master Physics (gedeeld) <table border="1"> <thead> <tr> <th>Naam</th> <th>Rol</th> </tr> </thead> <tbody> <tr> <td>mevr. C. (Cyriana) Roelofs</td> <td>Master student Physics VU</td> </tr> <tr> <td>mevr. J. (Judith) van Santen</td> <td>Master student Physics VU</td> </tr> <tr> <td>dhr. J. (Jonas) Voorzanger</td> <td>Master student Physics VU</td> </tr> <tr> <td>dhr. L. (Ludo) Nieuwenhuizen</td> <td>Master student Physics UvA</td> </tr> <tr> <td>dhr. T. (Tony) Hubert</td> <td>Master student Physics UvA</td> </tr> <tr> <td>mevr. A. (Annemarie) Berkhout</td> <td>Master student Physics UvA</td> </tr> </tbody> </table>	Naam	Rol	mevr. C. (Cyriana) Roelofs	Master student Physics VU	mevr. J. (Judith) van Santen	Master student Physics VU	dhr. J. (Jonas) Voorzanger	Master student Physics VU	dhr. L. (Ludo) Nieuwenhuizen	Master student Physics UvA	dhr. T. (Tony) Hubert	Master student Physics UvA	mevr. A. (Annemarie) Berkhout	Master student Physics UvA				
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dhr. prof.dr. M.S. (Mark) Golden	Docent Physics UvA																			

		dhr. dr. R.J.C. (Robert) Spreeuw	Docent Physics UvA
		dhr. prof.dr. J-S. (Jean-Sébastien) Caux	Docent Physics UvA
15.30	16.15	Spreekuur/Intern overleg commissie	
16.15	16.45	Studenten M Astronomy & Astrophysics UvA	
		Naam	Rol
		dhr. Emmanouil Zapartas	Masterstudent A&A
		mevr. Laura Ootes	Masterstudent A&A
		dhr. Abel Schootemeijer	Masterstudent A&A
		mevr. Samayra Straal	Masterstudent A&A
		mevr. Mieke Paalvast	Masterstudent A&A
		dhr. Omer Tzuk	Masterstudent A&A
16.45	17.15	Docenten M Astronomy & Astrophysics UvA	
		Naam	Rol
		dhr. dr. D. (David) Berge	Docent A&A
		dhr. dr. P. (Phil) Uttley	Docent A&A
		dhr. prof.dr. C. (Carsten) Dominik	Docent A&A
		dhr. dr. J. (Jason) Hessels	Docent A&A
		dhr. prof.dr. A. (Alex) de Koter	Docent A&A
17.15	17.30	Pauze	
17.30	18.00	Alumni UvA	
		Naam	Rol
		Vincent Dekker	Alumnus AA
		Peter van Ham	Alumnus AA
		Arthur La Rooij	Alumnus Physics
		Auke Akkerman	Alumnus Physics
		Paul Voskuilen	Alumnus Physics
19.00		Diner (alleen commissie)	

Dag 2:

9.00	9.30	Intern overleg commissie	
9.30	10.15	Opleidingscommissie UvA	
		Naam	Rol
		dhr. prof.dr. L. (Lex) Kaper	Voorzitter
		dhr. dr. A.P. (Auke Pieter) Colijn	Docent
		dhr. dr. G.F. (Gerard) Helminck	Docent
		dhr. dr. N.J. (Klaasjan) van Druten	Docent
		dhr. Tim Barenbrug	Masterstudent
		mevr. Sidoeri Dekker	Masterstudent
		dhr. Danne van Roon	Bachelorstudent
		mevr. Chelsea Kaandorp	Bachelorstudent
		dhr. Manus Visser	Vice-voorzitter / masterstudent
		dhr. Yuri van Nieuwkerk	Ambtelijk secretaris
10.15	11.15	Examencommissie + studieadviseur(s) UvA	
		Naam	Rol
		dhr. dr. R.A.D. (Rudy) Wijnands	Voorzitter
		dhr. prof. dr. ir. P.J. (Paul) de Jong	Vice-voorzitter
		dhr. dr. R. (Rudolf) Sprik	Lid
		mevr. M.E. (Margaret) Jans	Ambtelijk secretaris
		mevr. drs. I. (Iris) Weitjens-Hettelingh	Studieadviseur bachelor
		mevr. drs. A.M.L. (Anja) Zoomer	Studieadviseur master

11.15	12.45	Slotvergadering commissie UvA														
12.45	13.30	[Reistijd]														
13.30	16.00	Vorbereidend overleg commissie, leestafel VU														
16.00	17.00	Opleidingsmanagement VU														
		<table border="1"> <thead> <tr> <th>Naam</th> <th>Rol</th> </tr> </thead> <tbody> <tr> <td>dhr. ir. Johan Vermeer</td> <td>Onderwijsdirecteur FEW</td> </tr> <tr> <td>dhr. dr. Wim Vassen</td> <td>Opleidingsdirecteur afdeling Natuur- en Sterrenkunde</td> </tr> <tr> <td>dhr. dr. Rick Bethlem</td> <td>Bachelorcoördinator</td> </tr> <tr> <td>dhr. drs. Jaap Buning</td> <td>Coördinator Practicum en Didactiek</td> </tr> </tbody> </table>	Naam	Rol	dhr. ir. Johan Vermeer	Onderwijsdirecteur FEW	dhr. dr. Wim Vassen	Opleidingsdirecteur afdeling Natuur- en Sterrenkunde	dhr. dr. Rick Bethlem	Bachelorcoördinator	dhr. drs. Jaap Buning	Coördinator Practicum en Didactiek				
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17.00	17.45	Studenten B Natuur- en Sterrenkunde VU														
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Drs. Guus Harms	Student MSc															
Drs. Joris van Leeuwen	Student MSc															
Dr. Sven de Man	Student MSc, PhD Physics															
19.00		Diner (alleen commissie)														

Dag 3:																
9.00	9.30	Intern overleg commissie														
9.30	10.15	Docenten B Natuur- en Sterrenkunde VU														
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Naam	Rol															
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dhr. prof.dr. Kjeld Eikema	Docent Natuurkunde en Sterrenkunde															
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dhr. prof.dr. Piet Mulders	Docent Natuurkunde en Sterrenkunde															
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dhr. prof.dr. Gijs Wuite	Docent Natuurkunde en Sterrenkunde															
10.15	11.00	Spreekuur, intern overleg commissie														
11.00	11.45	Opleidingscommissie VU														
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dhr. Ruud van der Beek	Studentlid															
dhr. Bram Mooij	Studentlid															
mevr. Manon Wigbers	Studentlid															
11.45	12.30	Lunch														
12.30	13.30	Examencommissie + studieadviseurs VU														

		Naam	Rol
		Prof.dr. Jaap Heringa	Voorzitter Examencommissie FEW
		Dr. Ivo van Stokkum	Voorzitter Examencommissie onderdeel Natuurkunde en Sterrenkunde
		Prof.dr. Gerhard Raven	Secretaris Examencommissie onderdeel natuurkunde en Sterrenkunde
		Dr. Aniel Bhulai	Stuadeadviseur Natuurkunde en Sterrenkunde
13.30	14.00	Intern overleg commissie	
14.00	15.00	Management UvA/VU	
		Naam	Rol
		mevr. prof.dr. Karen Maex	Decaan VU – UvA Beta Faculteit
		dhr. prof.dr. Hubertus Irth	Vice Decaan FEW, VU
		dhr. prof.dr. Wim Ubachs	Afdelingshoofd Natuurkunde en Sterrenkunde, VU
		dhr. ir. Johan Vermeer	Onderwijsdirecteur FEW, VU
		dhr.dr. Wim Vassen	Opleidingsdirecteur Natuur- & Sterrenkunde en Physics, VU
		dhr. prof. dr. M.A. (Michel) Haring	Portefuilehouder onderwijs FNWI, UvA
		dhr. prof. dr. J. (Jan) de Boer	Onderwijsdirecteur Graduate School of Science, UvA
		dhr. dr. J.B. (Jeroen) Goedkoop	Onderwijsdirecteur College of Science, UvA
		dhr. dr. M. (Marcel) Vreeswijk	Opleidingsdirecteur Natuur- & Sterrenkunde, UvA
		dhr. prof.dr. H.B. (Ben) van Linden van den Heuvell	Opleidingsdirecteur Physics, UvA
		mw. dr. Sera Markoff	Opleidingsdirecteur Astronomy and Astrophysics, UvA
		dhr. prof.dr. R (Ralph) Wijers	Insituutsdirecteur API, UvA
		dhr. prof. dr. D. (Daniel) Bonn	Insituutsdirecteur IoP, UvA
15.00	17.45	Slotvergadering commissie VU, voorbereiding eindpresentatie	
17.45	18.15	Eindpresentatie (alle opleidingen)	

Appendix 7: Theses and documents studied by the committee

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

Master's programme Astronomy and Astrophysics:

8702	8672	6182976	6205194	10252681
520535	6128882	5622700	10425012	10341064

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):

- Faculty guide lines for Binding Study advice
- Yearly report and plan of the Boards of Examiners
- Rules and regulations of the Boards of Examiners
- Organogram of the organisation of education
- Information about the TESLA minor
- Example of the Semester Response System-discussions, final report
- Minutes of the Programme committee and the Education Quality committee
- Minutes of the SRS meetings

MSc Astronomy & Astrophysics courses:

Stellar Atmospheres
Open Problems in Modern Astrophysics
Survival skills for Scientist
Critical Thinking

Appendix 8: Declarations of independence



ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: D. LENSTRA

PRIVÉ ADRES: HAIZERWEG 58
126 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 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:

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: ELIAS BRINKS

PRIVÉ ADRES: CENTRE FOR ASTROPHYSICS RESEARCH

UNIVERSITY OF HERTFORDSHIRE, COLLEGE LANE
HATFIELD AL10 9AB, UNITED KINGDOM

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

NATUUR - EN STEERREKUNDE

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;



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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:

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

H. L. Tepper

PRIVÉ ADRES:

Pla. Nederlands Forensische Instituut
Laan van Ypenburg 6
2497 GB Den Haag

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

Natuurkunde / Sterrenkunde

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;



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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, consisting of several overlapping loops and a long horizontal stroke extending to the right.

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

M. J. Goelhart

PRIVÉ ADRES:

Botanicuslaan 55

9751 AB Haren

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

natuurkunde (B + M)

sterrenkunde (B + M)

AANGEVRAAGD DOOR DE INSTELLING:

Universiteit Leiden

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;



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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:

Groningen

DATUM:

10 - 12 - 2013

HANDTEKENING:

[Handwritten signature]



Q436

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Lisanne Coenen

PRIVÉ ADRES:

Stil Gericht 9, 2612 RV Delft

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

natuurkunde bij verschillende universiteiten

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: Delft

DATUM: 30/10/13

HANDTEKENING:

A handwritten signature in black ink, consisting of several overlapping loops and strokes, is written over the 'HANDTEKENING:' label.



ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:

T.G. Vaseput

PRIVÉ ADRES:

Leistraat 20 bis
3572 PE Utrecht

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

MSc Astronomy and Astrophysics

AANGEVRAAGD DOOR DE INSTELLING:

University of Amsterdam

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:

24-02-2014

HANDTEKENING:

A handwritten signature in black ink, consisting of several overlapping horizontal strokes and a vertical stroke at the end, positioned below the 'HANDTEKENING:' label.