Science that matters
Faculty of Science - Strategic Plan 2016-2020

change perspective

Radboud University
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Radboud University
Foreword

Excellence in research and education is key to our mission. The excellence of our research is reflected in the track record of our scientists receiving the prestigious Spinoza Prize from the Netherlands Organisation for Scientific Research (five are NWO Spinoza Prize laureates) and our success in the prestigious grants programme of the European Research Council (we have received thirteen Advanced ERC grants). And the excellence of our educational programmes is reflected in the high ranking of these programmes nationwide. However, excellence in itself is not enough. It’s necessary, but not sufficient for success. Society applauds excellence, but it also expects to see an impact on society. The ambition to be a leader in science and education can only be achieved by close collaboration with our stakeholders and by making a broad, positive impact on society. This impact includes training programmes that prepare our students for a leading role in society, mutually beneficial public-private partnerships which explore new knowledge and novel applications and setting up spin-off companies to create an ecosystem in which academia and industry flourish, just to mention a few important aspects. This is why we have chosen the theme “Science that matters” as a guiding principle for our activities in the years ahead.

In this strategic plan we set out several initiatives that are designed to extend our impact in science and education. We have been very successful in the Excellence track of the Horizon2020 programme, but less so in the Industrial Leadership and Grand Challenges tracks. The latter offer many opportunities to strengthen our position in research and our impact on society, together with our partners from industry and other external stakeholders. This is important not only for research, but also for training and education. We have developed dedicated Master specializations in which our unique expertise and advanced research facilities are presented in a training programme that is attractive for the best students around the world. We expect that enrolment in these specializations will increase significantly over the next few years. To further facilitate the exchange of students and staff, all of our Bachelors and Masters programmes will be taught in English within a few years.

Striving for excellence in teaching and research requires excellent leadership. In this context we will explicitly focus on diversity, since heterogeneous teams and organizations have a greater potential for innovation and success than teams whose members are homogeneous. As a first step towards more diversity, we aim to reverse the gender bias which drives women out of science careers. This focus on gender issues is just one aspect of our efforts to take leadership to a higher level within our faculty.
This plan is a supplement to the University’s strategic plan. We are confident that the steps laid out in the strategic plans of the Faculty and the University as a whole will fuel our ambitions and thus lead to even greater success.

On behalf of the Faculty Board

Professor Lutgarde Buydens
*Dean of the Faculty of Science*
Mission statement

The Faculty of Science is a comprehensive student-oriented community, where research and teaching are closely intertwined. We aim to strengthen our international character by attracting research and teaching staff with a wide range of backgrounds – people who combine their talents in order to help us forge a leading European institute.

Thanks to expertise in training and research, the Faculty contributes to both science and society. We promote collaboration with public and private partners both in the Netherlands and in the wider academic world. This is the basis for our success in Europe, both in terms of ‘curiosity-driven’ research and for more application-oriented work that focuses on the Grand Challenges. Our research is embedded in six interdisciplinary institutes.

The Faculty attracts top-notch science students from the Netherlands and abroad, and challenges them to get actively involved. Students are thus active participants in training programmes that help them achieve their ambitions. We offer in-depth training, allowing students to become experts in their field and to become critical, committed academics with their own views on science and society who are willing and able to take up responsible positions in an increasingly globalised world.
Introduction

In 2012 the Faculty presented its Strategic Plan for the period 2012-2016, entitled “Thought Leadership”. This plan has guided several new developments in education and research and many of the targets of the Strategic Plan were in fact achieved in 2015. One example is the large number of prestigious grants we have won, illustrating the excellence of our research. Moreover, the amount of external funding, which has almost doubled in the past five years, now equals the direct funding from the University. This steep increase in external funding paved the way for new challenging research activities, which will pay off in the near future. In terms of training and education, the enrolment of students has grown rapidly, while our training programmes continue to score highly in terms of the appreciation; several programmes are ranked as ‘Best in the Netherlands’, receiving the predicate ‘excellent’. These illustrate the remarkable progress made over the past four years and now a new Strategic Plan is needed to make a next step in developing the Faculty and to strengthen our international position.

In order to accommodate a sharp increase in the number of students, we have invested in new student facilities and additional support for students. In addition, our teaching staff have spent a great deal of time and effort to ensure that all students receive the attention and training they deserve. We are pleased to learn from internal and national evaluations that our Bachelors and Masters programmes are highly appreciated by our students. These evaluations explicitly remark on the significance and impact of the personal involvement of students and staff in training and our excellent facilities. National evaluations (for example those carried out by Keuzegids and Elsevier) rank several of our training programmes as the Best in the Netherlands and some have received the highest accolade: excellent. They also confirm our own experience that Faculty of Science students find rewarding work after graduation.

We train our students using a broad repertoire of methods, including traditional lectures, practical exercises, student presentations, and internships, as well as through novel ICT-based approaches including computer simulations, web lectures and virtual experiments. As with research, improving training and education of students to the highest international standards is part of the global competition for talented teachers and students. An important target is to improve the international character of our training programmes and to attract the very best students and scholars. A major aspect related to the global competition for talent is to create an atmosphere where international students and staff members feel welcome and comfortable. Our campus offers many ways to achieve this goal, but greater effort will be needed to compete more effectively for talent at an international level.
Our research activities are now at a high, international standard. Examples include the large number of ERC Advanced Grants (ten in the past seven years), the number of Spinoza awards and, last but not least, the Nobel Prize for Physics, which was awarded in 2010 to Andre Geim and Konstantin Novoselov, two former employees who started their prize winning research at our Faculty. The strength of this is rooted in a multi-disciplinary research environment where staff members, technicians and support staff work together as a coherent team as well as in the unique research facilities that attract many scientists from other universities to our campus to run their experiments.

We consider it important that staff, students, guests and interns interact well. We identify five core values that are the cornerstones of behaviour in the Faculty: integrity, respect, commitment, openness and cooperation. In research these values create an atmosphere that is reliable, verifiable, impartial, independent and responsible. We endorse transparent research methods and open access to data and publications. In education our core values are reflected in the personalised learning, small groups and interactive teaching methods in which our students are personally involved.

Our unique expertise in training and research has had a considerable impact on the region around the University through the creation of new spin-off companies, knowledge transfer and shared facilities (e.g. Radboud Research Facilities). We also collaborate with companies to combine knowledge with engineering to create new products. We will continue to work on our visibility at the national and international level to improve the reputation of Radboud University as an exemplary institute for training and research worldwide.
Education

We strongly believe that students are ultimately responsible for their own success – during their academic career and beyond. They need to be ambitious and critical in relation to their own skills and attitudes, so that they are able to reflect on their performance, select the best courses, minors and specialisations to achieve their ambitions and develop in such a way that they achieve their goals. This is what we mean by ‘personalised learning’. With the introduction of digital online learning tools such as Small Personal Online Courses (SPOCs), virtual experiments and web lectures students have ample tools to acquire knowledge. This large diversity of online tools facilitates training and fits well with our student-oriented approach (training in small groups). This approach has also been a key aspect of teaching at Radboud University for many years. We will further facilitate personalised learning by ensuring an appropriate conceptual framework for education and by fostering personal contact between teachers and students. However, students must take the lead in this process. Our strong emphasis on personalised participatory learning requires changes in the current attitudes of students and staff members alike. We will provide training to make this transition and to challenge our students to participate in interactive learning.

What should we teach our students?

We don’t believe in producing a specific type of graduate. To best prepare our students for a future career, it’s important that they reflect on their “future self”, formulate their own ambitions and choose the academic path that will most likely help them achieve their goals. It’s important that our students learn to adapt to the challenges they will face by:

1. In-depth training: acquiring state-of-the-art disciplinary knowledge and skills and the intellectual confidence to respond to complex unexpected situations.
2. An entrepreneurial attitude (including for scientists focusing on basic research): the skills not only to come up with innovative ideas, but also to realize them.
3. Leadership skills: the skills needed to take up responsible positions in the heart of society, often in an international setting.
4. Life-long learning: constantly seeking personal development by gaining new knowledge and learning new skills.

These are the cornerstones on which students build their academic paths.
Evaluations by students and alumni consistently reveal several highly appreciated aspects of our training programmes. One of these relates to the personal approach we adopt: working in small groups, in line with current concepts and ideas related to personalised learning. Despite their growing numbers, students work in small groups of 10-15 students for practical exercises and in teams of 2-4 students for research projects and oral presentations. Moreover, we foster personal contact between students and teachers. A second aspect relates to the excellent student facilities, such as the study halls, ICT infrastructure, virtual lab facilities, web lectures and rooms for student societies. A third asset relates to the Huygens building with its open structure, which facilitates contacts between staff members, between students, and between students and staff. Other features that are highly appreciated are the high quality of the programmes, the expertise and knowledge of our lecturers, the openness and accessibility of staff members, and the coaching and supervision of students.

We believe that innovation in teaching methods offers opportunities to improve our training programmes and to adapt the content to the needs of individual students. New developments and ICT tools (web lectures, SPOCs, online teaching) and new concepts (blended learning, “flipping the classroom”) have yet to be fully explored and will be taken into consideration when we revise our training programmes.

We provide in-depth training programmes in Biology, Medical Biology, Physics & Astronomy, Mathematics, Chemistry, Molecular Life Sciences, Science, Computing Science and Information Science. These programmes focus on the most recent insights and concepts and their impact on science and society. The programmes challenge our students to explore new boundaries in science with a keen eye for potential applications and societal impact. All programmes bring the student to a level where he/she has an in-depth knowledge of at least one discipline and experience with research in that discipline. Minors are offered to provide a broader perspective in related disciplines and to encourage training and collaboration in a multi-disciplinary context.

Each Masters programme concentrates on a small number of specialisations. The topics of these specialisations correspond to the world-class scientific expertise within the Faculty in areas such as Astrophysics, Organic Chemistry, Solid-State Physics, Microbiology, Cyber security, Genetics & Epigenetics and Cognitive Neuroscience. We train our students to become experts in their field through in-depth training and we encourage collaboration with researchers from other disciplines by offering research projects in a multi-disciplinary setting. This involves an appropriate blend of lectures, practical exercises, virtual experiments and computer simulations along with internships as the cornerstone that guarantees optimal interweaving of research and
education. Students who aspire to follow a career in research will be able to further specialise, thus deepening their knowledge and sharpening their research skills.

Entrepreneurship requires both a mind-set and a set of skills which enable students to identify opportunities, be flexible, generate new ideas and have the confidence and capabilities needed to turn these ideas into working realities. These are essential skills for our students, future researchers, as well as teachers and managers. Many courses encourage creative thinking – coming up with smart solutions, while carefully planning and carrying out projects. Students can specialise in entrepreneurship. They will then seek opportunities to create new businesses and bring them to the market while engaging in rational risk taking or to innovate in order to enhance existing businesses.

Our graduates find responsible positions at the heart of society – often in an international setting – and our training programmes prepare them for such positions. This is why it’s essential that they develop leadership skills and learn to work in intercultural, interdisciplinary teams. About 45% of our staff come from abroad and English is the common language in our research departments and in the Master’s courses. With so many guest researchers from abroad and an increasing number of international students, we create an international ambiance for our students. Yet we encourage them to follow courses and engage in internships abroad. Leadership also implies that our students learn to communicate about their research activities and solutions to problems with colleagues from other disciplines and other stakeholders. Training in these aspects requires formats such as teamwork assignments, written reports and oral presentations. In addition to training for a research career, we also offer specialisations to students who prefer a career in organisations at the interface between science and society (policy, advisory boards, interest groups and governments) or in communicating science.

Each student should be involved in – and be in control of – his/her education and training. This applies to selecting an appropriate course of study, specialisation and elective courses as well as to the competencies which students will use. This choice is determined by their talents, but also by thinking about their future self and the role they want to play in society. We see the training programmes as an inherent part of their career. When students learn to think about and work on their own education, life-long learning becomes second nature.

Didactical skills are an asset for every lecturer, in and outside education. In collaboration with the Radboud Teacher Academy, we offer students various opportunities in the Bachelor’s and Master’s programmes to enhance their didactical skills, including a route to a first-grade qualification for high-school teaching.
Training for a first-grade qualification includes pedagogical training, which is provided by the Radboud Teacher Academy, and training to explain novel concepts in science, using a wide range of didactical tools. The latter is done by staff from the Faculty. This way we also contribute to the education of the next generation.

We invite students to be part of our academic community, which involves working in an open, active, stimulating and involved environment. In this setting we offer them:

- A highly valued, high-level training programme by world-renowned researchers.
- Staff members who provide excellent teaching on a well-chosen range of topics.
- Internships as the cornerstone of the training programmes, whereby students interact with top scientists and learn research by practising it as junior researchers.
- Support in defining the aspirations and goals, mapping strengths and weaknesses and choosing the corresponding skills set and study programme. We also offer courses on the required attitudes, skills and preparation for a future career.
- Excellent student facilities.
- New IT-based tools for education and testing, in addition to facilities such as web lectures, virtual experiments, and examinations in a digital environment.
- For ambitious students who seek extra challenges besides their regular study programme the Faculty offers several opportunities. One of these is to participate in a double Bachelor’s degree programme, for instance Physics & Mathematics, Physics & Chemistry, Mathematics & Computer Science. Another opportunity – for a selected group of 25 students each year – is to participate in the Radboud Honours Academy programme. This is a 30 EC programme during the 2nd & 3rd years of the Bachelor’s programme. It consists of a multi-disciplinary group project (typically working on topics with considerable societal impact), a training programme in academic skills, and an individual research project under the supervision of a senior lecturer with an international component.
- An invitation to participate actively in the academic community in Nijmegen, for instance in the University’s formal representative bodies. In addition, they are encouraged to participate in workgroups and committees. Thanks to systematic monitoring and active student participation, students share their opinions on education and provide feedback to the Faculty on how to improve.

We expect our students to be active participants in our academic community. We expect them to be ambitious and set goals for themselves by reflecting on their future self. In particular we expect them:

- To be responsible for making good progress and performing well: the nominal duration of the Bachelor’s programme is three years and the Master’s programmes usually takes two years.
• To engage in building and shaping their career.
• To draw up an annual study plan for activities based on their future ambitions.
• To be responsible for selecting a specialisation and corresponding courses.

For the future of the Netherlands it’s important that we ensure a high level of science teaching for a large number of students. We have been extremely successful in recruiting new students. Enrolment has increased by more than 50% over the past five years. There are good reasons to assume that this success is at least partly the result of the activities of the Radboud Pre-University College of Science. This college coordinates many activities to prepare high-school students for an academic study. The activities focus on high-school students (e.g. special courses at the Bachelor’s level for excellent high-school students, an orientation programme within the Faculty where students actively participate in various training activities) and on high-school teachers (refresher courses). Successful student recruitment, which brings young school pupils into contact with the sciences at an early stage, is followed by active monitoring of progress and performance of our Bachelor’s students to ensure that students complete their Bachelor’s and Master’s programmes within the nominal timeframe.

We will provide full Bachelor’s programmes in English, starting with Chemistry and Molecular Life Sciences in September 2016, followed by the other programmes not later than September 2019. To facilitate the enrolment of international students we provide a transparent and prompt admission procedure for those who wish to study at Radboud University and good facilities such as support with housing. We invite them to become active members of our community and to participate in Dutch society.

The introduction of the Bachelors/Masters system has led to increased mobility after completion of the Bachelor’s programme. For the Faculty of Science the number of Bachelor’s students that opt for a Master’s programme elsewhere is more than balanced by enrolment of Master’s students from other universities. We believe that the increased mobility after the Bachelor’s programme is just the start of an international battle for the best students. This is why we have developed unique specialisations within each Master’s programme, focusing on topics that correspond to research domains where we are leading worldwide. We believe that this will attract motivated students who seek the best training in these research fields.

A promising inflow of students in our Master’s programmes comes from Universities of Applied Sciences (Polytechnic Universities), which train students up to the Bachelor’s level. Many students from these Universities who are admitted to a Master’s programme are very successful students. This has led to close collaboration
to prepare the best students for Master’s programmes at our Faculty. Another mutual advantage of this collaboration is the quick referral of students whose interests and talents are better matched by training programmes at the Universities of Applied Science.

The small number of female students, especially for Chemistry, Computer Science and Physics & Astronomy, reflects a nationwide problem, which appears to be hard to tackle. We will continue our efforts to increase the number of female students by offering training programmes that prepare such students for concrete applications of their scientific expertise, by recruiting female staff members as role models, and by actively informing high-school students about the skills needed to join our science programmes and pursue a career in science.

**Actions and ambitions**

- Enrolment of between 550 - 600 Bachelor’s students, which we have achieved in 2014 and 2015, matches the available in terms of lecture halls, practical exercises and staff. We do not seek to substantially increase enrolment in our Bachelor’s programmes. Rather we aim to maintain enrolment at approximately the same level as in previous years, and to increase the quality of students so that the number who complete the Bachelor’s and Master’s requirement within the nominal timeframe increases.

- The Master’s programmes offer specialisations that clearly reflect the unique expertise of researchers and research facilities and these are promoted in an appealing way. We will implement an active campaign to recruit students from abroad for our Master’s programmes. This campaign will focus on highly motivated students. After a selection procedure to ensure a quality level that meets at least the level of our own Bachelor’s students, we aim for a target number of at least 25% of the total enrolment being students from abroad.

- The number of female students in some training programmes has been limited for many years. We aim to increase the number of female students in Physics & Astronomy and Computer Science to at least 25%. This will require specific outreach activities and dedicated activities for high-school students.

- Our training programmes will be organised to encourage students to become active participants who are responsible for their own success; both during their academic career and afterwards. In the first year of the Bachelor’s programme we will closely monitor the progress of our students and provide help whenever necessary. Gradually, our personalised training approach will lead to a more proactive attitude and active involvement of students. We will facilitate this process by offering active training concepts, such as “flipping the classroom”, virtual experiments and web lectures.
• All programmes include labour market orientation to prepare students for a career after graduation. Our partners in industry and our alumni will help with internships and feedback related to the programmes’ connection to the labour market.

• We will offer training to develop leadership skills and to encourage internships and study abroad. The aim is that at least 50% of our students spend an internship or part of their study outside of the campus, and preferably abroad.

• We will contribute to a campus with an international orientation, which offers a stimulating environment for international students and staff.

• As of September 2016 the Bachelor’s programmes Chemistry and Molecular Life Sciences will be lectured in English. The other Bachelor’s programmes will follow in subsequent years. In 2019 all Bachelor’s programmes will be lectured in English. We will organise training courses for staff members so as to improve proficiency when teaching in English. We anticipate that the University will organise dedicated courses for students, who need special training to meet the language requirements.

• We will take action to promote the training of students to become first-degree qualified high-school teachers. One of the ways in which we intend to achieve this goal is to create a challenging environment for these students by establishing a new Department of Science Education Research. As of September 2017, at least 25 students should start the training programme to become a 1st grade qualified teacher every year.

• The nominal duration of Bachelor’s and Master’s programmes is the norm. At least 50% of students who enter the second year obtain their Bachelor’s diploma within three years and at least 80% within four years.

• The intake quality of students has increased thanks to the selection procedure and study choice check. The dropout rate in the first year will be less than 15% for each Bachelor’s programme.

• For a Master’s degree we offer a two-year programme. At least 50% of Master’s students obtain their diploma within two years, and 90% do so within three years.

• We will set up an Entrepreneurs Club, where students and established successful entrepreneurs and participants from industry will get together to exchange ideas, to train students in entrepreneurship, to recruit the best students for new projects and to improve the ecosystem for entrepreneurship at our Faculty.
Research

In the Strategic Plan 2012-2016 we have defined several research topics where the Faculty wants to be leading worldwide. These topics are:

- Organic Chemistry, focusing on molecular life-like systems, self-assembly and the design of new molecules and drugs.
- Solid-State Physics, focusing on development of new materials and concepts based on collective, emergent quantum effects. Unique research facilities are available for research under extreme conditions such as high magnetic fields, ultrashort laser pulses, and low temperatures.
- Astrophysics, focusing on stellar evolution and compact binaries, on supermassive black holes, gravitational waves and ultra-high energy cosmic rays.
- Microbiology, focusing on microorganisms in their natural environment and their mutual interactions using approaches from biochemistry (proteome), molecular biology (genome, transcriptome), cell biology, and physiology & ecophysiology of bacteria involved in the nitrogen, sulphur and methane cycles.
- Cyber security, focusing on a broad range of topics in computer security, including cryptography, security protocols, smartcards, and the security and correctness of software.
- Genetics & Epigenetics, unravelling the molecular basis of development and differentiation emanating from the genome and epigenome in the context of health and disease with emphasis on cancer.
- Cognitive Neuroscience, focusing on information processing in (networks of) neurons and on applications of novel concepts about learning and plasticity in machine learning.

These choices have worked out quite well; we have made great progress and have achieved a worldwide leading position in these research fields. The excellence in these research domains is the result of joint efforts by our scientific staff and support staff and provides the backbone of our Master’s specialisations (see paragraph on Training and Education). At the same time we see scientific developments accelerating. This means that new developments (e.g. scientific breakthroughs by Faculty staff or novel unique research facilities) can be expected and additional research topics will be selected in the near future.

Our scientific excellence is to a large extent related to our unique research facilities. The Faculty houses many world-class research facilities, including a High-Field Magnet Laboratory (HFML), a suite of Free-Electron Lasers (FELIX), a Scanning Probe Microscopy lab, and an Experimental Garden. An initiative taken by the researchers working at the HFML to play a leading role in a European Magnetic Field Laboratory (EMFL) will strengthen this world-class facility. We expect that the combination of
FELIX and HFML will add a unique feature to our facilities. In addition to these facilities on campus, the Faculty participates in world-class facilities abroad, including the Large Hadron Collider at CERN (Geneva) and the ALMA telescopes in Chile. Each of the facilities mentioned above attracts top scientists from abroad to carry out experiments in collaboration with our own staff and contributes to enhancing the profile of Radboud University.

PhD candidates are employees of the University and most of the research output of the Faculty is the result of their work. We offer a dedicated training programme to our PhD candidates so that they become experts in their field and attractive employees for other universities and companies after completion of their PhD. We expect that they select the courses that are most appropriate for them. They are in control, and it is the joint responsibility of PhD candidates and supervisors to make sure that the thesis is completed after a regular appointment of four years.

The success of our scientific efforts is partly explained by the organisation of the Faculty in dedicated multi-disciplinary research institutes that participate in national and Europe-wide research consortia. We take a pro-active approach in an attempt to influence research agendas at the national and European level. Moreover, all of our research groups participate in international networks for research and training of young scientists. Within the research institutes dedicated groups involving scientists, technicians and administrators work together. The success of the Faculty, therefore, not only reflects the merits of our top scientists only but also the joint efforts of all employees. All make an important contribution to the success of the Faculty as a whole.

Our research activities are mainly curiosity-driven and with this type of research we have been very successful in the Horizon 2020 priority domain “Excellent Science”. We will continue to invest in curiosity-driven research domains where the Faculty has a leading position worldwide. We also support research activities that are necessary to provide the support and scientific breadth necessary to anticipate new scientific breakthroughs and to respond in a flexible way to new developments. A sufficiently broad range of research activities is also necessary to provide the knowledge base and critical mass needed for the training of our students.

We have been very successful in the Horizon 2020 priority domain ‘Excellent Science’, but less successful in the sections ‘Societal Challenges’ and ‘Industrial Leadership’. We aim to improve our success rate in the latter two sections for two reasons. Firstly, we want to demonstrate the impact of our expertise and knowledge for society, make a contribution to meeting societal challenges and pave the way for novel industrial
applications. Secondly, success in these areas will attract additional funding to achieve Excellent Science and explore novel potential applications with our external stakeholders. Identifying potential research domains where the Faculty can be successful is a bottom-up process driven by the research institutes. We invite them to propose research domains where the Faculty can make a difference, together with external stakeholders. In particular, we will encourage proposals where several disciplines meet. ‘Healthy Brain’ is one such domain. We will make further investments to attract the expertise needed for successful applications in the sections ‘Societal Challenges’ and ‘Industrial leadership’ of the EU’s Horizon 2020 programme.

We will increase the societal impact of our expertise and knowledge by engaging in several new initiatives which should contribute to an ecosystem where academia and commercial companies flourish. One of these initiatives is to make our research infrastructure available for external partners. Moreover, we encourage employees and alumni to start new spin-off companies, helping both students and alumni to identify new business opportunities as well as potential patents. The Faculty has a good track record in establishing spin-off companies and we aim to create an ecosystem of excellent research activities and new companies to the benefit of both. A dynamic ecosystem, within which academic researchers and industrial partners can work together will provide a further stimulus to economic and scientific activities in the region. Pivot Park, Noviotech Campus and the HAN University of Applied Sciences will be part of this ecosystem.

The concentration of high-quality research institutes and unique research facilities on a single campus encourages researchers to investigate topics with a high scientific and societal impact that often require multi-disciplinary approaches. Many research projects in the Faculty include researchers from other faculties, such as the Radboudumc, the Faculty of Social Sciences, the Faculty of Arts, and the Faculty of Management Sciences. We will support further collaboration with our colleagues in the other faculties. The results of these collaborations with researchers from other disciplines have been very productive. Often new insights obtained at the overlap between disciplines had major societal impact and changed our view of the world.

**Actions and ambitions**

- We have a leading position in organic chemistry, solid-state physics, astrophysics, microbiology, cyber security, genetics and epigenetics and cognitive neuroscience. Each of these research themes has a good mix of excellent senior scientists (level ERC Advanced Grant or Spinoza award) and highly-talented junior scientists and also a balance of researchers focusing on curiosity-driven research and application-oriented research.
- We will identify research domains for successful grant applications in the sections 'Societal Challenges' and 'Industrial leadership' of the Horizon 2020. These applications will include participation of other public or private partners. We will provide additional funding to attract specific expertise if that would be a requirement for success.
- We will encourage the recruitment of new staff members with expertise and interest in application-oriented research, to make a good balance between curiosity-driven research and application-oriented research with external stakeholders.
- We will increase the number of spin-off companies, the long-term collaboration with industrial partners and with regional and federal governmental agencies on strategic research topics and the success rate in future national and EU programmes such as Horizon 2020.
- At least 75% of the doctoral candidates complete their manuscript for a PhD thesis within 4 years.
Our human capital

The Faculty of Science is an open community, where everyone makes a contribution to the ambition of the Faculty and where the Faculty creates an environment in which all employees feel comfortable with equal opportunities for everyone. We support diversity and create an environment for optimal intellectual and social development irrespective of gender and ethnic or cultural background. Many of the staff (> 40%) are from abroad. For a Faculty which operates in an international context and which aims to provide an international setting for students from abroad, this is a great asset.

Diversity is an asset that should be cherished. This is why it’s an important aspect of all recruitment activities. Special programmes will be initiated to encourage diversity. One aspect of diversity refers to female students and scientists. Similarly to most other science faculties in the Netherlands, the proportion of female students and scientists is too small. There is ample evidence that teams and organisations whose members are heterogeneous have a higher potential for innovation than teams whose members are homogeneous. For instance, the number of women in a group has been linked to effectiveness in solving difficult problems. The proportion of female staff members in the Faculty is too small, especially at the higher levels. This is why the Faculty will take new initiatives to hire and maintain more female staff members at all levels (PhD, post doc, assistant professor, associate professor and full professor).

A policy designed to encourage employees to contribute to the Faculty’s core activities of teaching and research requires a policy on human resource management. All employees need to be encouraged to use their talents and to develop their skills and expertise to make an optimal contribution. All employees of the Faculty are important, not only the top scientists.

In line with our University’s Human Resources Agenda we will take several actions to develop our human capital. We support continuous learning as an important tool to create a stimulating and sustainable environment for all employees. This is why we will provide an optimal environment for development to the benefit of employees and the Faculty. This implies facilitating both horizontal and vertical career moves. Like students, we expect that employees are primarily responsible for their own career and take the initiative, for example in the annual appraisal, to address this issue and to take courses, whenever useful, to bring added value to the Faculty and for themselves. Where possible, the Faculty will support and facilitate training. We will promote leadership by offering dedicated courses for scientists at different levels of development (PhD, post doc, assistant professor, associate professor and full professor) and for employees active in the service departments. We will actively
promote the values of Radboud University. We expect that all employees behave accordingly as an example for others.

**Actions and ambitions**

- We will take action to ensure that we will be able to attract the highest quality people from the relevant employment market in the face of increasing international competition, thus ensuring equality of opportunity.
- Leadership is an important quality for academic success. We will encourage our (potential) leaders to develop their leadership skills. Together with the University and Radboudumc we will offer dedicated leadership courses for scientists at various stages of their career (from PhD to full professor) helping them to improve their skills, knowledge and competencies.
- Diversity is very important for a university that operates in a global context. In terms of diversity, the Faculty focuses on gender by aiming to increase the number of female staff members. We will implement the recommendations made by the gender committee as laid down in their report. The most important of these are to:
  - finance and support an extension of the University’s Mohrmann Fellowship programme to attract talented women at the assistant and associate professor level, and to accommodate female guest professors
  - safeguard productivity and visibility during pregnancy leave by offering €50,000 for flexible use to each female tenure tracker and assistant/associate/full professor during pregnancy leave
  - appoint a diversity coordinator
  - encourage the participation of female staff members in the mentoring programme of the University and organise intervision lunches for female PhD candidates and postdocs in the Faculty
  - ensure that diversity training is part of ‘academic leadership’ and courses for newly appointed professors.
Alumni and fundraising

Alumni are the University’s ambassadors in society. In the past decade the role of alumni as stakeholders has not received the attention it deserves. Alumni need to be more involved in core activities of the Faculty, such as training, public relations, lobbying, public-private partnerships, fundraising and informing our students about future career perspectives.

In order to strengthen their participation in the Faculty’s activities, the Faculty will improve monitoring of our alumni and will initiate more contact and activities to cement the bonds among alumni as well as between the Faculty and alumni. We will align these activities with their interests at different stages of their lives. In particular, we will strengthen the interaction with alumni who have strategic positions in society, which are important to the Faculty.

We invite our alumni to advise us on our programmes. They are familiar with the training programmes of the Faculty and are, par excellence, qualified to bring key-information to better prepare our students for a career in society after graduation, an aspect that needs to be improved in our training programmes according to student evaluations. Alumni already participate in special sessions to inform our students about future career perspectives and in meetings, where they report on their career and on the needs of future employers.

A special group is our alumni abroad. Their involvement can strengthen the University’s international profile and can help significantly in the recruitment of international students. The University has a special programme designed to strengthen these ties. We will help our international alumni to organise local meetings, sometimes in collaboration with partners such as NUFFIC.

Together with the University coordinator for fundraising, the Faculty will start a fundraising programme to finance novel initiatives within the context of this Strategic Plan that cannot be funded from the regular direct funding. Alumni can play an important role in this process.

**Actions and ambitions**

- We will initiate activities that are geared to alumni between 5 and 30 years after their graduation, with special attention for international and VIP alumni.
Excellent support

Excellent research and teaching require excellent support. During the past decade the Faculty Services unit has made great progress and currently the level of support provided by the service departments is very high, although improvement is still needed in some areas. Faculty Services continuously optimises its support and develops its expertise in order to advance research and teaching. Just like the scientific units, the service unit is a learning organisation with a strong focus on excellence.

Internationalisation of teaching and research is a key issue for both the Faculty and the University. The service unit will contribute to this by supporting international recruitment and by facilitating the international activities of students (incoming and outgoing). Moreover, the international reputation of the University in both research and teaching needs to be further strengthened. Due to internationalisation the population within the Faculty will become more diverse and this raises the importance of defining a code of conduct for personal interactions and organisational matters. Last but not least, Faculty Services must adapt to an increasingly international environment, e.g. by increasing the staff’s proficiency in English.

The Faculty has been very successful in attracting large grants and prestigious awards for excellent basic research. The amount of funding available for basic research is decreasing because the funding agencies are increasingly focusing on societal relevance and industrial leadership. Acquisition of external funding is getting more difficult and acquired research funds often have many (bureaucratic) strings attached. It’s intended to develop thematic research domains that can contribute to societal challenges and pave the way for novel industrial applications. Departments within the service unit will team up to optimally support the research institutes in attracting and handling complex external funds and in developing thematic research domains.

Like most large organisations, the University and the Faculty have numerous information systems for their primary and support processes. Management information for research, education, and administration is crucial but often hard to get in the required form. The ownership of each type of information and the access rights of others must be clear. Data integrity must be ensured and obsolete information systems will be phased out. Information management both at University and Faculty level is a broad topic that will be given full attention during the years ahead.
For advanced research a state-of-the-art infrastructure is a prerequisite. The research infrastructure concerns a variety of technical facilities, e.g. computing facilities for data recording, data storage and analyses, and intensive computing, a machine workshop for building scientific equipment, and General Instrumentation with shared equipment operated by experts. On the Faculty’s premises a variety of research laboratories are housed that require specialised support. Several of these are part of Radboud Research Facilities, which provides facilities and expertise to small and medium-sized enterprises in the region. The Faculty also houses two unique laboratories, our High-Field Magnet Laboratory (HFML) and Free-Electron Laser for Infrared Experiments (FELIX), that operate as international user facilities and receive visiting scientists from all over the world. This wide range of research infrastructures will be supported and co-developed by Faculty Services.

The Huygens building has been instrumental to the blossoming of the Faculty because it encourages interdisciplinary contacts between scientists and students. Because of the rapid growth of the student population and the number of staff members, the building has become too small, making it necessary to use additional office space outside of the Huygens building. An extension of the Huygens building will be explored.

Sustainability will become increasingly important. Our scientific activities involve high levels of consumption of energy and water, stringent air treatment and ventilation, the production of (chemical) waste, and the use of (increasingly) scarce natural resources. In addition, the standard office activities in the Faculty use vast amounts of paper, electronic devices, and we engage in travel around the globe. This is why our service unit will actively pursue more sustainability in collaboration with scientists, students, and the central office of the University.

**Actions and ambitions**

- We will establish an ‘Innovation Panel’ to develop thematic research domains that attract external funds and increase our visibility.
- Information management will be properly organised in close collaboration with Radboud Services. Information systems within the Faculty that are obsolete will be phased out.
- Research data will be made available to other scientific communities and organisations via Research Information Services.
- We will keep our research infrastructure for all relevant functionality at a state-of-the-art level. A substantial part of this infrastructure is used by small and medium-sized enterprises in the region via Radboud Research Facilities.
• The Faculty of Science will play its role in supporting the University’s ambitions with respect to sustainability. In addition, the sustainability issues that are specific to the primary activities in the science domain will be addressed in an ambitious way.