APPLIED SCIENCES

Societal relevance rooted in strong foundations

Strategic Plan 2022-2026

TU Delft

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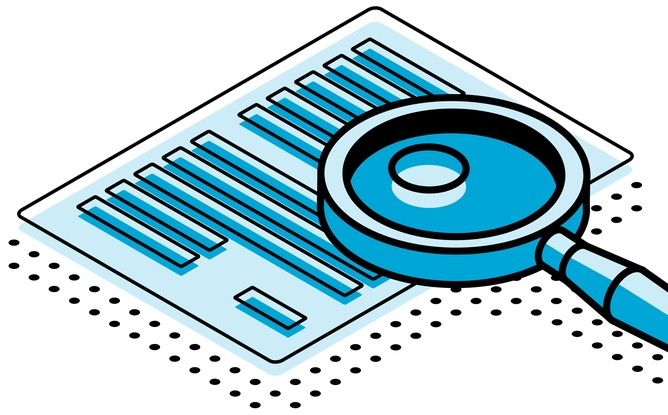


Paulien Herder, Dean

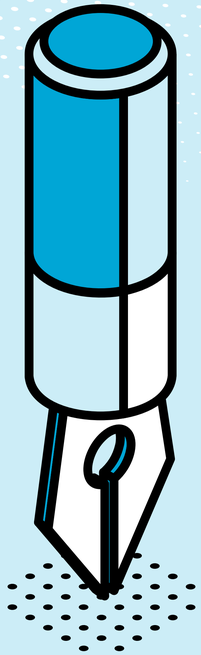
Introduction

In the run-up to this Strategic Plan, I had many conversations with our academics, lecturers and support staff. The common thread in these conversations was the enormous ambition within our faculty: to innovate and pursue new avenues of research, to improve our teaching and to make support processes even better. We do all of this to help science advance and to educate people to enable them to find answers to the great challenges facing our society.

Climate, food, health, human capital and safety are all themes that call for intensified cooperation both within and outside TU Delft. A prominent form of collaboration we will therefore intensify in the coming years, is the one with Erasmus MC and Erasmus University Rotterdam in the field of health and technology, artificial intelligence and data science. In addition, the National Growth Fund will enable us to contribute to pressing societal challenges in large consortia in the coming years.

In this challenging landscape, the Faculty of Applied Sciences is in an excellent starting position to fulfil its ambition to continue to play a role on the world stage in the innovation of key technologies such as quantum and nanotechnology, photonics, imaging, biotechnology, chemical technology, synthetic biology and materials science.

This Strategic Plan explains how we intend to achieve this ambition. It is impossible to summarise the plan in a document, much less a one-page foreword. The plan won't really come to life until people start implementing it. Therefore, our people and cooperation with others within and outside the faculty are the key to success. And through the efforts of more than 1,100 staff members and over 3,500 passionate students, the Faculty of Applied Sciences is an inspiring scientific ecosystem in which our ambitions can be achieved.

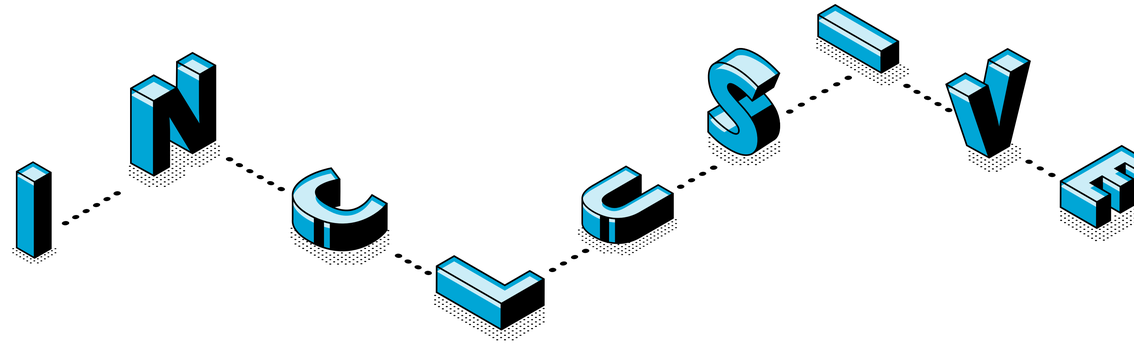


An open and inclusive culture is an important pillar of a healthy academic climate. We realise that this is easier said than done, which is why we will continue to work actively on this, as we do already. This includes the recruitment of new employees, our information provision to new students and the communication and the way we work within Applied Sciences. In this way we want to ensure that everyone feels welcome in our faculty.

Finally, an up-to-date infrastructure which enables interaction is essential in helping us achieve our ambitions. With the creation of the new Physics building, the entire Applied Sciences faculty will be located in the southern part of the Campus. The Physics building will bring together high-quality and innovative research and education on quantum technology, nanotechnology, photonics and imaging technology. We hope to be able to welcome everyone to our new Physics building in a few years.

A bright future awaits us. We are already working hard to achieve our ambitions for Applied Sciences together, based on this Strategic Plan! ■

Paulien Herder
Dean

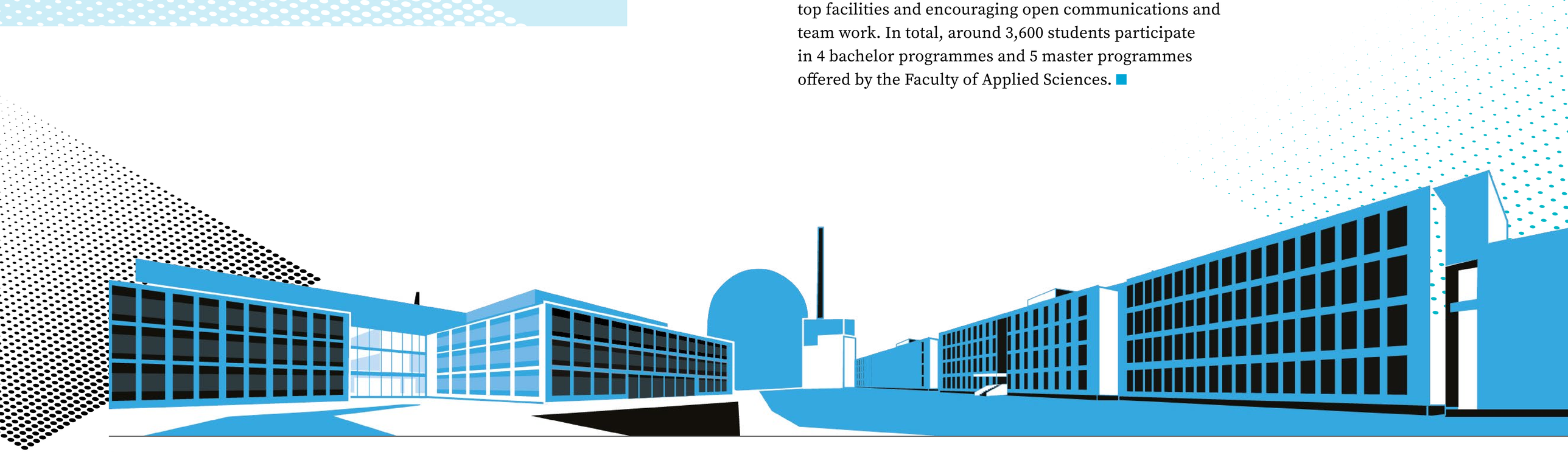


> 'An open and inclusive culture is an important pillar of a healthy academic climate. We realise that this is easier said than done, which is why we will continue to work actively on this, as we do already'

The Faculty of Applied Sciences

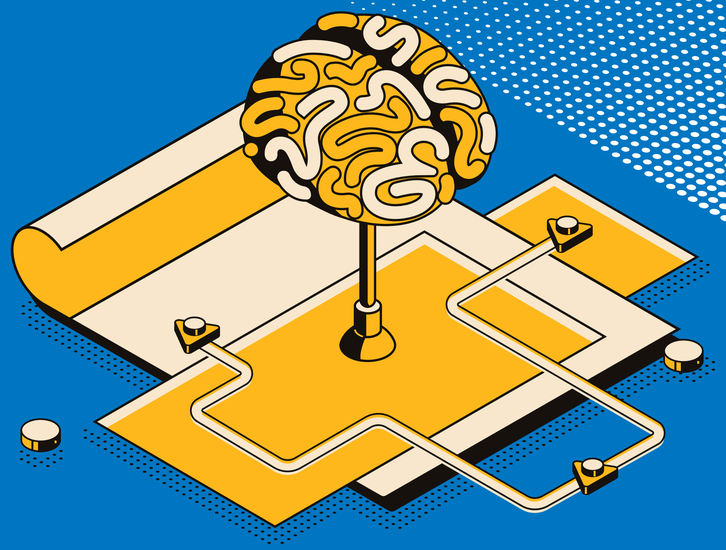
The Faculty of Applied Sciences is an inspiring scientific ecosystem, with more than 1.100 employees, including 150 pioneering principal investigators and over 500 PhD candidates and 120 postdocs, together with a population of more than 3,600 passionate BSc and MSc students. Our Faculty aims to contribute to solving our key 21st century challenges, by researching and innovating key enabling technologies, such as quantum- and nanotechnology, photonics, imaging, biotechnology, synthetic biology, materials for energy storage and conversion, and chemical technology. Our scientists conduct ground breaking fundamental and applied research in the fields of Life and Health Science & Technology, Nanoscience, Chemical Engineering, Radiation Science & Technology, and Engineering Physics.

The Faculty of Applied Sciences is committed to excellence in both teaching, research and (societal) impact. In terms of research it aims to be among the best in the world. Based on our research, we have launched a number of start-up companies, which are supported by TU Delft's Innovation & Impact Center and by our incubator YES!Delft. The Faculty also aspires to be a good employer. At the heart of this lie our core values: Diversity, Integrity, Respect, Engagement, Courage, and Trust (DIRECT). This means providing a safe, inspirational and inclusive working environment with top facilities and encouraging open communications and team work. In total, around 3,600 students participate in 4 bachelor programmes and 5 master programmes offered by the Faculty of Applied Sciences. ■



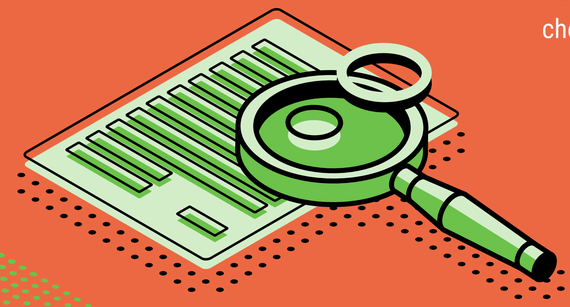
EDUCATION

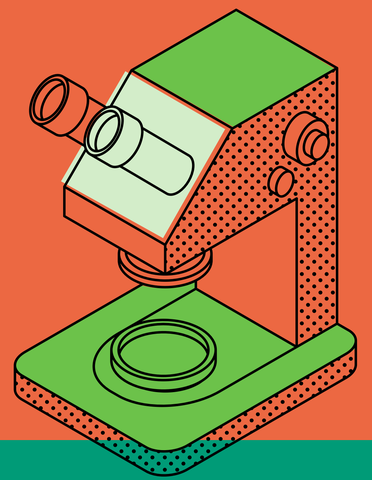
Vision on education.



RESEARCH

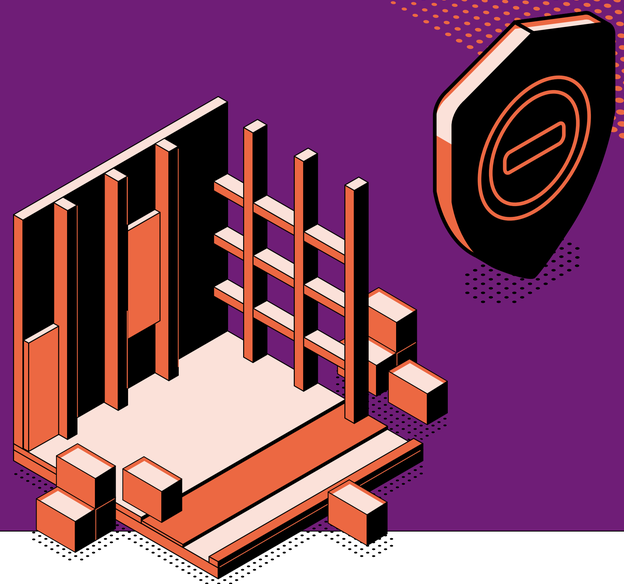
Research in the Faculty integrates science and engineering of living and non-living systems at scales ranging from quantum phenomena to industrial chemical processes.





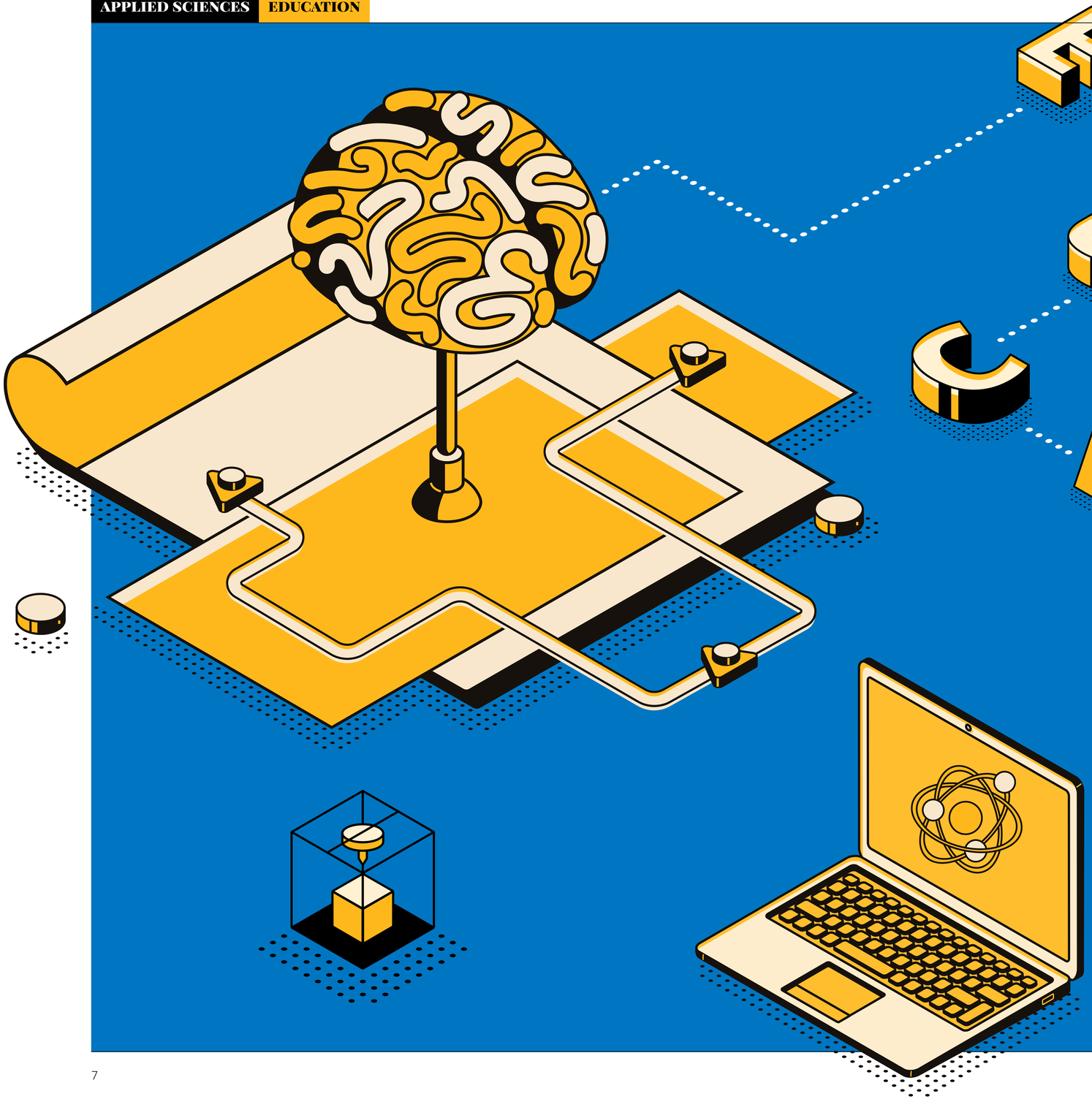
INFRASTRUCTURE & SAFETY

Infrastructure for teaching and research is key to the Faculty.



ACADEMIC CULTURE AND SUPPORT

The Faculty pursues a culture in which the different perspectives, backgrounds and insights of staff and students strengthen both individuals and the academic community as a whole.

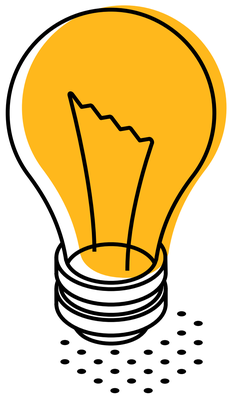


Education

Vision on education.

Education

Students and staff work together to create high-quality and societally relevant education at the interface between natural sciences and engineering. We aim to offer an inspiring, engaging, safe and attractive study environment, which enables students to develop themselves into critical, problem-solving, result-oriented and socially responsible engineering scientists. This starts with a solid foundation in mathematics, natural sciences and engineering at the Bachelor's level, with ample focus on research and design, and deepens further at the Master's level. It is our goal to educate graduates who are able to creatively develop science-based, sustainable and socially responsible solutions for societal and technological challenges. For the degree programmes offered by the Faculty, the ambition is to be among the most prominent and innovative in The Netherlands and Europe, and to be known for the typical Delft qualities of the programmes' graduates: a hands-on and can-do mentality; an ability to adapt to changes; a talent for effective teamwork in diverse environments; and a focus on the impact of technological solutions in their socio-economic context, including ethical dilemmas.



'Students and staff work together to create high-quality and societally relevant education at the interface between natural sciences and engineering'

What do we deliver?

- We aim to educate engineers, scientists and STEM teachers who make valuable contributions and take up responsible positions in the heart of society.
- We cultivate an attitude to pursue and realise innovative ideas at the interface between science, engineering and society.
- Our collaborative and inclusive environment, characterised by an open communication style, fosters entrepreneurial, leadership and communication skills.
- Our graduates are competitive for careers in academia, education, industry and government, in the Netherlands and abroad.

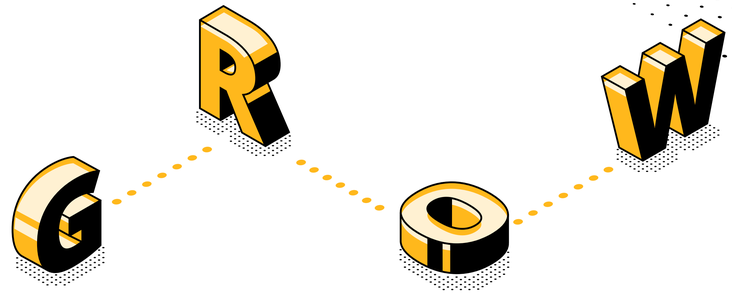
What do we teach?

- We provide a sound basis in science and engineering, quantitative analysis, digital skills and design to shape the future of technology.
- We teach our students to develop an academic professional attitude and to act as ethically responsible individuals.
- We train our students in applying scientific methods to acquire and critically evaluate new knowledge.
- We train our students to communicate and collaborate for sharing knowledge.
- We enable our students to follow their curiosity and ambitions and acquire new competences now and in the future.

‘Our education allows and stimulates students to personalise their learning programmes’

How do we teach?

- We offer a learning environment which encourages young people to develop themselves and to keep learning, while being mindful of a healthy work-life balance.
- Our learning environment includes modern teaching formats and digital tools and offers, where possible, learning by doing.
- Our education allows and stimulates students to personalise their learning programmes.
- Our students are taught by staff who are up to date in teaching, research and design.



- We create a community of students, staff and alumni to improve our educational programmes, research and professional development.
- We learn together, with our students and staff each having their own roles and taking shared responsibility.

Rooted in its 2020 Vision on Education and the lessons learned during the Covid-19 pandemic, the Faculty formulated its ambitions for the 2021-2027 period and attached concrete actions to these ambitions. In the Faculty, excellent research and excellent teaching are valued equally. In the coming years, members of the Faculty will be actively supported and facilitated in their ambition to grow, invest and excel in teaching. While keeping up the value of research-driven education, this will lead to a more favourable balance for the teaching staff and will enhance innovation in education.
Within this context, the following concrete actions will be taken in the 2021-2027 period.

> ‘Sufficient and systematic training in teamwork is the most frequently mentioned area of improvement in the Faculty’s programmes, both in alumni surveys and in employer surveys’

Education management

In practice, and often historically, the interaction between the management of the Faculty’s degree programmes on the one hand, and its research departments on the other hand varies from programme to programme and from department to department. In the coming years, the Faculty aims for more uniformity, while maintaining the strongly felt joint responsibility for both the contents and organisation of teaching. Of particular interest, as evidenced during the Covid-19 pandemic, is a continued close collaboration and communication between the faculties and universities participating in the joint degree programmes.

New degree and minor programmes

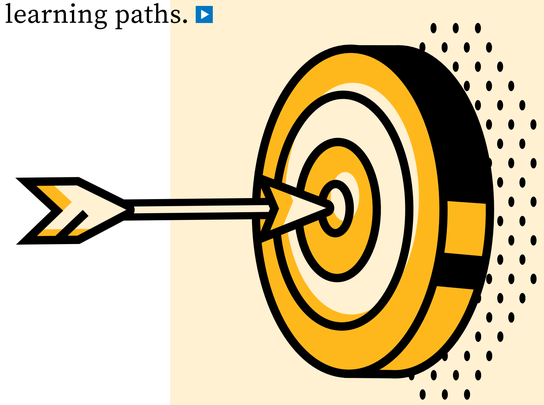
Together with the Faculty of Science at Leiden University, a new LDE Minor on sustainable chemistry and biotechnology was started recently. With the creation of this novel minor, minors are now offered in each of the Faculty’s main topics: modern physics, quantum science & quantum information, sustainable chemistry & biotechnology, nanobiology, and education. Also, together with TU Delft’s EEMCS Faculty, TU Delft’s QuTech institute and the Faculty of Science at Leiden University, a new joint degree Master’s programme on Quantum Information Science and Technology (QIST) will start in 2023-2024. This MSc programme will boost the further development of the quantum hub that is emerging in the Delft region, with well-known large companies and various start-ups.

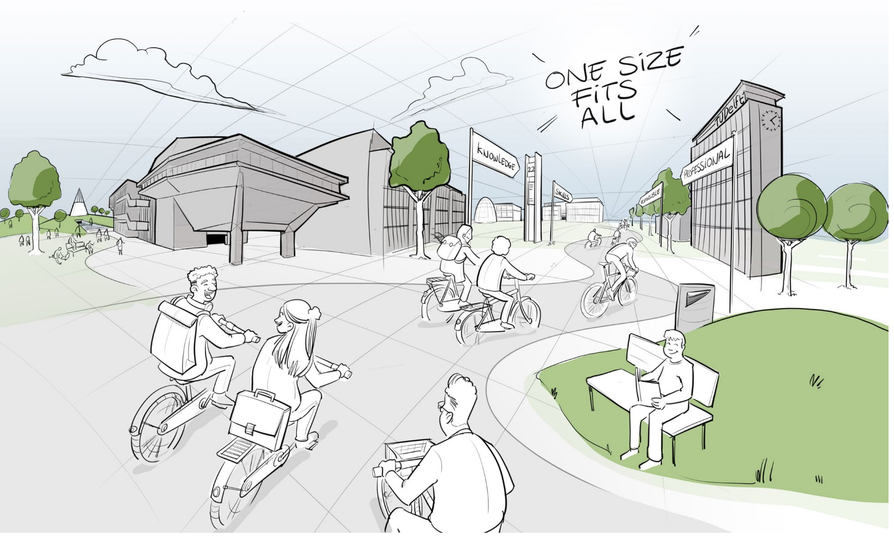
Academic and people skills and interdisciplinarity

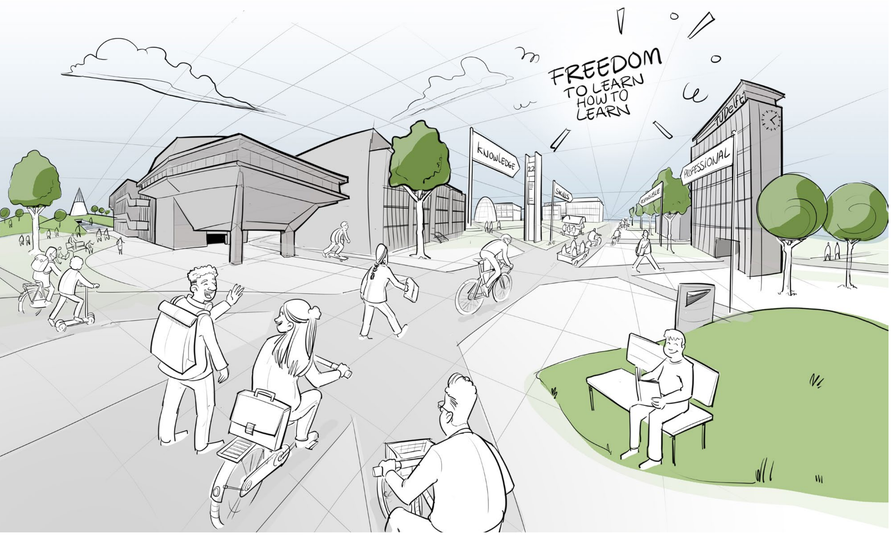
More and more attention is drawn to general academic skills and transferable skills. Sufficient and systematic training in teamwork is the most frequently mentioned area of improvement in the Faculty’s programmes, both in alumni surveys and in employer surveys. The Faculty is therefore very happy (and has in fact strongly supported) that, financed from van Rijn funding, TU Delft’s ITAV (Instituut voor Talenonderwijs en Academische Vorming) has been able to hire staff and has started to develop course modules on both these important academic skills. ITAV seeks close collaboration with the various degree programmes and faculties. Other academic skills that the Faculty particularly wants its students to improve on are self-reflection and creativity. These are skills that are ideally suited to be developed within design and graduation thesis projects.

Innovate and individualise the Faculty’s teaching

The ambition is to offer more individual learning experiences for students, increasing their freedom to choose not only what they want to learn in their field of study but, more importantly, also how they learn. This will not alter the targeted attainment levels of the graduates. Cherishing and embracing student diversity should also have implications for the diversity in how the Faculty teaches and how it facilitates students to learn. The Faculty is now, partially due to lessons learned during the pandemic, revising and expanding its vision, recognising the value of supporting individual student’s choices, and taking responsibility, together with the students, for different learning paths.







In the course of the following years, the Faculty will carry out pilot projects in which a particular course is offered in different – parallel – teaching formats. Students can choose between various alternatives and benefit from a choice of different didactics. Depending on their own path, pace, choices and development they can choose in what way they want to acquire knowledge and skills. The Faculty not only does this to optimise and individualise learning paths for its diverse student population, it also aims to better understand how students learn most effectively and what alternative didactics and choices could be offered to optimise individual paths. The profound experience in teaching at the Faculty, obtained over so many years, combined with recently developed blended and online education, will provide a solid basis for this.

Recognition of teacher excellence and innovators

Educating outstanding students requires excellent teaching and world-class lecturers. Teaching excellence plays a distinct role in the hiring, yearly appraisal, tenure and promotion of all faculty members. They are required to obtain a university teaching qualification (UTQ) and stimulated to further develop their professional teaching skills. From Van Rijn funding for education, four tenure trackers and one associate professor with a focus on education have been hired, as well as 7 (postdoc) junior teachers. This has effectively increased the Faculty's teaching capacity by some 20%. Opportunities will be sought to offer tenure track positions to the Faculty's best junior teachers. By 2027, the Faculty will have at least 12 (i.e. two per department) members of faculty on an education-oriented career track.

Student journey, learning community, and student-teacher interactions

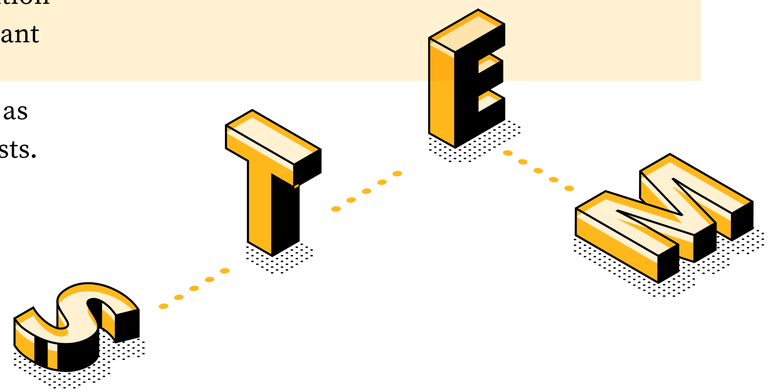
Emphasis in the Faculty's teaching is on enabling students to individually grow to their maximum potential, while being mindful of a healthy work-life balance. In educating students, the Faculty pays ample attention to personal growth and development (Bildung) and students are equipped with the required tools. The Faculty encourages its students to undertake well-chosen activities outside the curriculum, and to meaningfully engage in society and study communities. The Faculty particularly values that students are exposed to international and multicultural experiences. It will facilitate that by 2027 all Bachelor's students who choose to do so, can spend their minor abroad in an exchange programme. All Master's students will have had an international study experience, either by having spent a significant part of their study abroad, or by having actively and significantly participated in an international classroom experience or project environment. ■

TU Delft Lerarenopleiding

Teachers play an important role in the development of young people. Teachers of Science, Technology, Engineering and Mathematics (STEM) subjects inform, teach and enthuse their students. Students with a solid foundation in the STEM subjects are well prepared for their future. They can contribute to the Netherlands as a knowledge economy. Due to the current and expected future shortage of teachers, the role of the TU Delft Teacher Training Programme is greater than ever.

The teacher training programme leads to a teaching qualification in the subjects computer science, physics, chemistry, mathematics, technology or research & design. The programme is flexible and modular, which means that there are opportunities to combine the programme with another master's programme. What makes the TU Delft Teacher Training Programme special is the attention given to activating education. In other words, what a teacher can do to stimulate the (thinking) activity of students. A lot of attention is also given to designing the teaching programme. It is important that a future teacher becomes a 'maker of education' and to be able to attune education to differences between students, such as differences in educational levels, work pace, talents and interests. Educational innovation is also an important theme within the programme. The focus is on innovation to teach students new learning techniques and to simplify educational processes. ■

> 'The programme is flexible and modular, which means that there are opportunities to combine the program with a technical master's programme'



Lessons drawn from Covid-19

The Faculty also plans to further capitalise on the lessons learned from post-pandemic teaching:

- Despite success in developing off-campus teaching, the Faculty realised that it wants to be an on-campus community and that it really needs students and teachers to collaborate and interact in person.
- In the planned new Physics building on TU Delft Campus South, and in existing buildings 22, 50 and 58, investments are needed in infrastructure that supports flexibility in teaching, offering opportunities for small-scale student-student and student-teacher interaction, student projects, group work and on-campus individual study.

The balanced use of online, blended and on-campus teaching activities creates opportunities for better constructive alignment at the level of programmes and courses, for more individual learning experiences and individual attention, even within large cohorts of students, thus acknowledging their diversity. ■

Dr. Tom Burdyny

Teacher of the year 2021 TU Delft

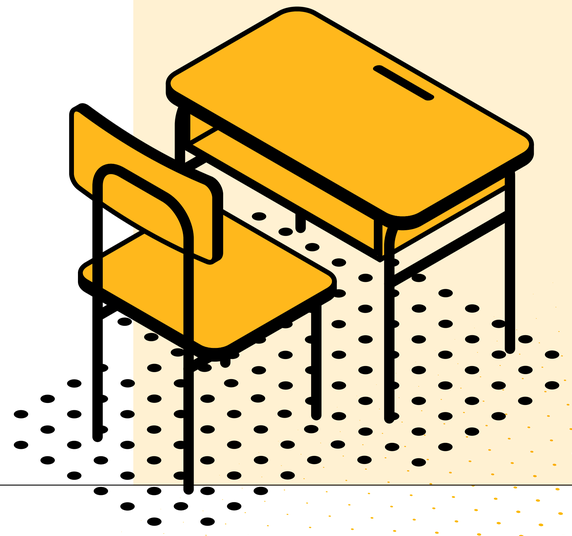
'From my own experience I've seen how a lecturer can amplify or spark someone's love for a particular subject.'

Diversity and inclusion
in the student community

Diversity and inclusion are fundamental notions for all students and teachers: everyone is welcome and can participate, regardless of their background or personal situation. The Faculty has also appointed a Diversity and Inclusion officer, and embraces the TU Delft policy of ensuring that study programmes are accessible to students with disabilities and special needs as much as possible. The Faculty actively aims to contribute to the well-being of students who experience obstacles due to, for example, learning disabilities, physical or sensory impairments, mental vulnerability or chronic illness.

Achieving a better gender balance among students has been particularly important for the Faculty in previous years – and still is. Some of the study programmes are close to a 50/50 male/female student balance, other programmes still need improvement. Especially through hires in the Sectorplan Natuur- en Scheikunde, the Faculty has significantly improved its gender balance among teachers, but unfortunately it still is not sufficient. As other science faculties in The Netherlands have performed better in this respect the Faculty will actively try to learn from their best practices.

‘The Faculty continues to strive for diversity in its new faculty hirings, since diversity in teacher role models contributes to a diverse student influx’

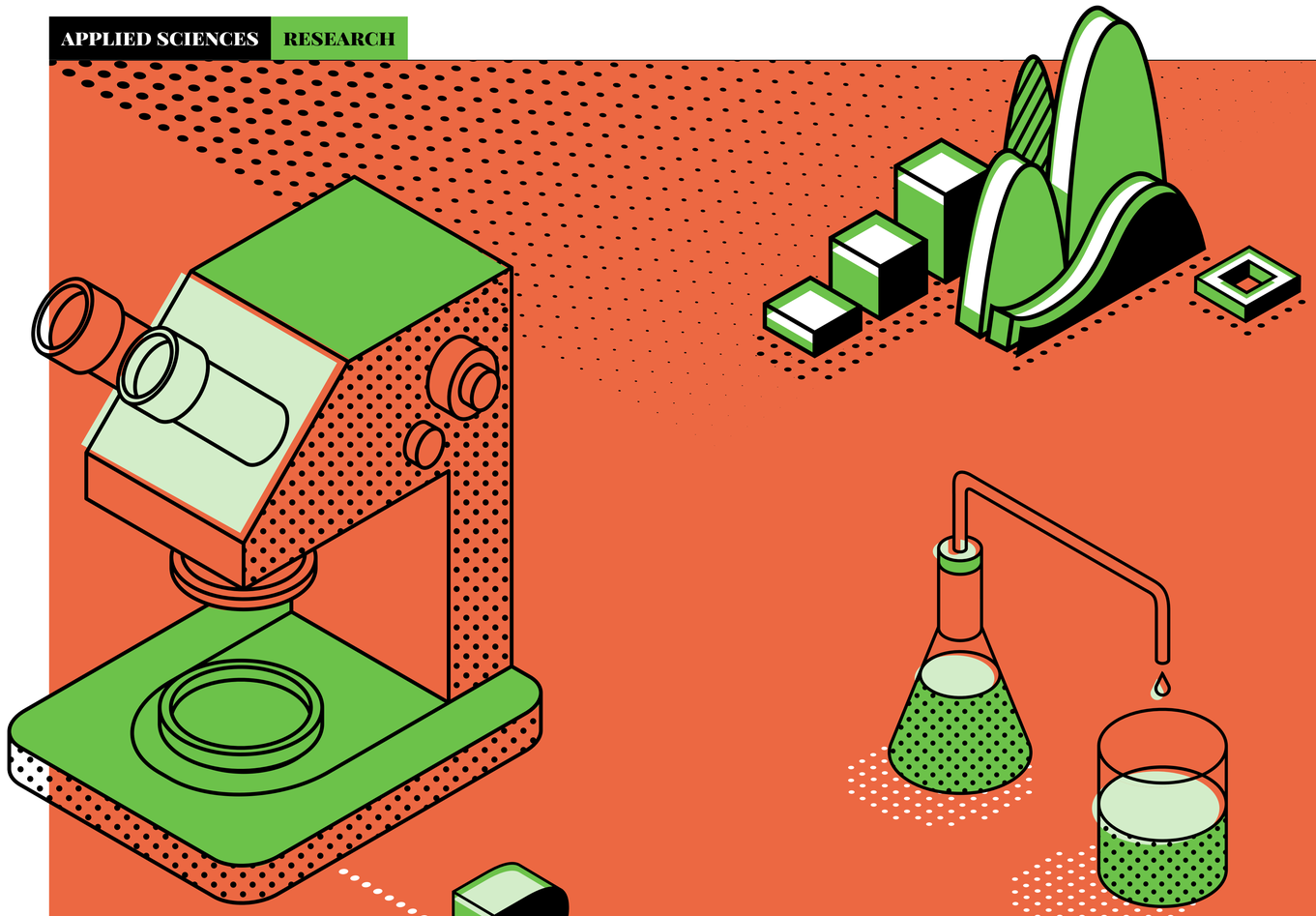


Diversity, however, is and should be broader than gender diversity. In the Faculty’s Dutch-language Bachelor’s programmes, a student influx is targeted that resembles the composition of high-school VWO-NT profile classes in the Zuid-Holland province, which is typically not very diverse, in terms of nationality, culture, religion, socioeconomic background, gender, sexual orientation and so forth. To improve this, the Faculty actively manages its PR, reaches out to regional high schools and makes sure in all meetings it is welcoming to everyone. More importantly, the Faculty continues to strive for diversity in its new faculty hirings, since diversity in teacher role models contributes to a diverse student influx. Matching and welcoming activities will be critically evaluated and adapted on the basis of their impact on achieving a diverse student influx.
In the international Bachelor’s programme Nanobiology and in all Master’s programmes, the Faculty strives for a balance between Dutch, European and non-European students, so that a balanced international classroom is achieved.

A more elaborate Vision & Action Plan on Education 2021-2027 is available.

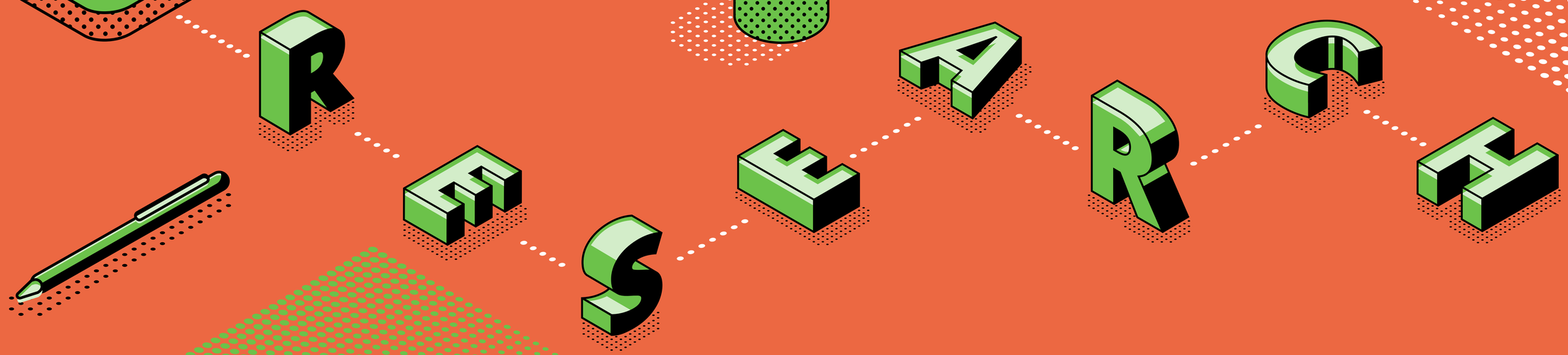
Education and Student Affairs Department (ESA)

The implementation and execution of the Vision & Action Plan is to a great extent supported and coordinated by the Faculty’s Education and Student Affairs (ESA) department. In this team, the BSc and MSc program coordinators act as the organizational professionals who support teachers and programme directors in a variety of issues, from solving practical issues to quality assurance and curriculum development. Each programme has its own coordinator, who functions as a linking pin between the programme director, teachers, schedulers, and other stakeholders involved in organizing the day-to-day education in a smooth and meaningful way. Each programme also has its own study advisor, who is the primary point of contact for students to turn to when they have questions about the programme and their planning, or when they struggle with personal or health issues that might influence their results. Apart from this, the ESA team houses high level professionals with educational expertise on online and education learning as well as in educational science and quality assurance. General support is also provided by this team, e.g. in internships and studying abroad. The highly involved ESA-team is a key factor in making the Vision & Action Plan on Education in the coming years a success. ■



Research

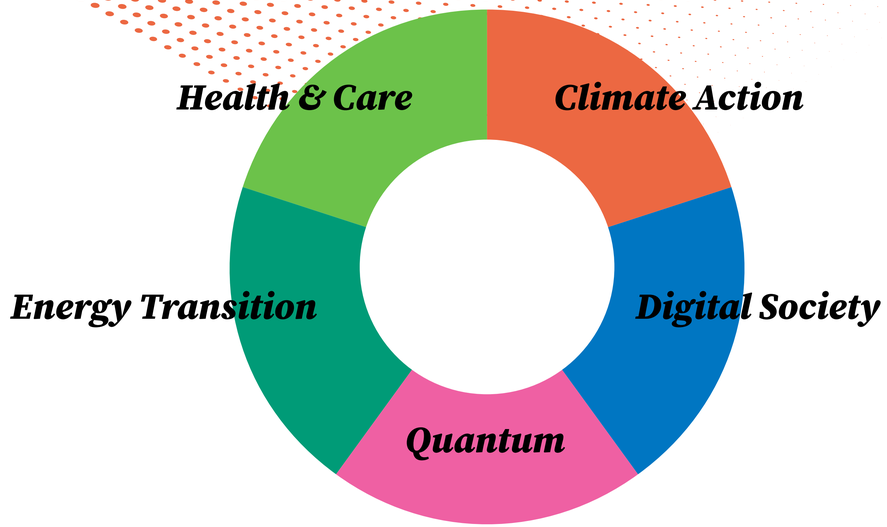
Research in the Faculty integrates science and engineering of living and non-living systems at scales ranging from quantum phenomena to industrial chemical processes.



Research
Introduction

Research in the Faculty integrates science and engineering of living and non-living systems at scales ranging from quantum phenomena to industrial chemical processes. By addressing profound and potentially transformative challenges, our research programmes aim to generate fundamental understanding as well as societal impact.

The Faculty consists of six departments that are rooted in distinct disciplines and each play prominent roles in the international scientific arena. The Faculty stimulates individual freedom and excellence, while at the same time fostering a collaborative and open atmosphere in and among departments. We aim to further increase our collaboration on cross-cutting themes in health, energy, materials and artificial intelligence, in particular through shared projects, investments in research infrastructure, and through shared appointments. Attracting and retaining a diverse, high-calibre team of academic staff members (PI's) is essential for the Faculty's ambition to be internationally leading.



Climate Action

- Circular 'waste-to-product' processes
- Circular materials
- Further reduction of emissions, energy requirement and area footprints of waste-water treatment facilities and for developing
- Sustainable solutions to material and energy needs
- AI for process technology and catalysis
- Innovative forms of Nuclear Energy

Health & Care

- Organ on chip
- Pharma
- Diagnostic devices
- Molecularly targeted and personalized medicine
- Biotechnological production processes for global health challenges
- Instrumentation and computational imaging
- Ultrasonic imaging devices and quantitative biomarker extraction
- Health Technology for imaging, theranostics, radionuclide production and therapy, and external beam (proton) therapy

Energy Transition

- Zero-emission biotechnology
- e-Refinery
- Batteries
- Sustainable, low-emission production of transport fuels, chemicals and materials, as well as food and feed products
- Materials Science with emphasis on energy conversion and storage

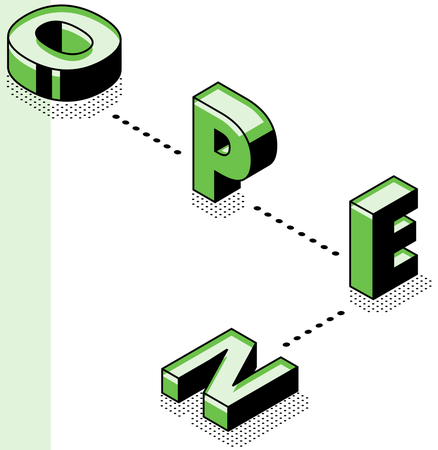
Digital Society

- DAI labs
- Computational Science
- Electron-based instrumentation, EUV-lithography, industrial optics and precision metrology

Quantum

- Novel quantum materials, as well as quantum sensors and transducers
- Advanced understanding of physical processes at the nanoscale, fostering breakthroughs of both technological and fundamental scientific nature

Open Science



TU Delft wishes to take Open Science to the next level: a situation in which Open Science has become the default way of practicing research and education, and the 'information era' has become the 'open era'. It is TU Delft's ambition to be frontrunner in this process. This is reflected in the TU Delft Strategic Framework 2018-2024, with 'openness' as one of its major principles. Open Science proposes new approaches to research and education processes, with a focus on transparency, integrity and efficiency.

The Faculty of Applied Sciences supports Open Science principles as openness is increasingly crucial to resolve major challenges of our time in which our faculty aims to be among the best in the world. Our Faculty strives to remain a front runner in making scientific papers and the underlying information (data / software / methods) openly available. Practicing research in a more transparent and open manner will increase the quality of research, facilitate collaboration and inclusive participation, and speed up the scientific process.

The Faculty trusts that good data management leads to research that is more time- and cost-efficient as it prevents data loss and duplication of efforts and can contribute to the quality, reproducibility and impact of research. We have a Data Steward (since 2017) to increase awareness for Research Data Management practises and provide support. The Data Steward was involved with creating the Faculty's Research Data Management Policy through consultations with all departments. The Research Data Management Policy has been in place since the January 2020, outlining the roles and responsibility of researchers.

Researchers who need support in Open Science practices can contact the Faculty Data Steward or can use the resources and support that the TU Delft Library provides. We participate in the Open Science Community and each department has at least one Data Champion that can be asked for advice on data management practices specifically. In 2020 82% of the Faculty's publications were available Open Access (compared to 81% of TU Delft publications) and in 2021 this number increased to 86% (compared to 85% for TU Delft). It is our aim to remain at the forefront of Open Science developments.

PhD Policy and Training at TU Delft

The TU Delft Graduate School (GS) prepares and trains doctoral candidates (or: PhD candidates) to become highly qualified, autonomous and leading researchers and skilled professionals. The GS coordinates, on behalf of the Board for Doctorates, the appointment of promotors and the evaluation and defense of doctoral dissertations.

It also provides an overview of the framework and regulations that are related to obtaining the degree of Doctor (PhD) at TU Delft. The Faculty Graduate Schools (FGS) develop and execute the Faculty PhD policy, which consists of guidelines for the selection and interim evaluation of PhD candidates, support for promotors and objectives and guidelines for research and discipline-specific courses.

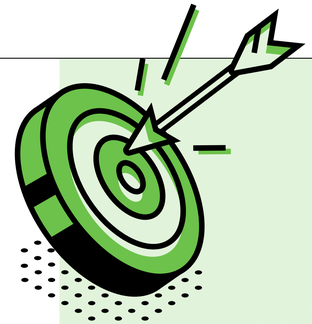
'We participate in the Open Science Community and each department has at least one Data Champion that can be asked for advice on data management practices specifically'

The TU Delft Graduate School ensures that doctoral candidates receive excellent skills training, supervision and mentoring and deliver a high quality dissertation. The GS offers transferable skills training courses; the Faculty Graduate School is responsible for training related to research (in general and domain specific) and for the advancement of discipline related knowledge, competences and skills. Such courses are organised by research organisations such as the Casimir Research School, the Kavli Institute of Nanoscience Delft and the BiotechDelft Foundation. These organisations provide highly valuable contributions to the Faculty's graduate education, and we will continue to support them.

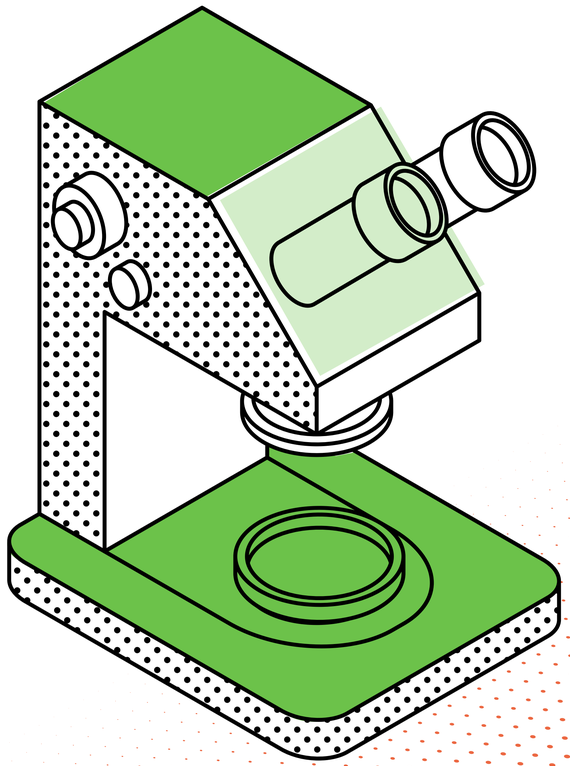
A major point of concern is that the average time to acquire a PhD degree at the Faculty of Applied Sciences is beyond the formal period of four years. All departments have discussed the topic extensively with PhD candidates, the PhD Council and the promotors to identify and remove the factors for delay. These discussions served as a starting point for a change in culture, with an increased awareness of the individual responsibility of promotors for a 'PhD-in-4'. Another pillar for change is the increased amount of feedback: collegial feedback, feedback between PhD candidates and supervisors and feedback from the head of department. The PhD Council plays a role in strengthening PhD candidates in this respect. Monitoring tools, offered by the FGS, allow promotors and heads of department to observe and steer in the PhD processes. ■

'Another pillar for change is the increased amount of feedback: collegial feedback, feedback between PhD candidates and supervisors and feedback from the head of department'

Bionanoscience



The Department of Bionanoscience combines world-leading scientific research and teaching at the interface between nanophysics and biology. In collaboration with Erasmus MC, the department runs the interdisciplinary and international BSc and MSc programmes in Nanobiology.



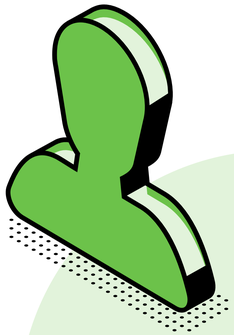
The fully independent experimental and theoretical groups are broadly focused on single-molecule biophysics, synthetic biology and cell biology. The research programme is driven both by curiosity and the need for specific applications, such as sustainable building materials, gene therapy, phage therapy, DNA/protein sequencing, antiviral drug screening and antibiotics production, to name but a few.

Though they work on diverse topics, the department's groups are unified in their aim to foster a mechanistic and quantitative understanding of how biology works, from single molecules to whole cells and the interactions between them. Understanding from a biological perspective how the human body functions in disease and in health is crucial for health convergence. Deepening this understanding will enable the researchers to improve healthcare by paving the way for molecularly targeted therapy and personalised medicine, as well as supporting the development of sustainable solutions to material and energy needs compatible with the long-term health of humans and our planet alike.

GOALS FOR THE COMING YEARS

- *Develop intra-departmental strategic collaborations to capitalise on synergies and attract external funding for joint projects.*
- *Deepen intra-faculty collaborations to safeguard and develop the department's major state-of-the-art infrastructure investments (e.g. cryo-electron microscopy facility, imaging facility, cell culture and cleanroom).*
- *Increase the fraction of application-driven research funded directly by industry.*
- *Continue to innovate in the educational space, with open learning materials and the integration of biology into the early physics curricula of the Nanobiology programme.*
- *Improve the mobility and competitiveness of all the department's staff.*

Department people



35 Postdocs

25 Technicians

19 Principal Investigators (PIs)

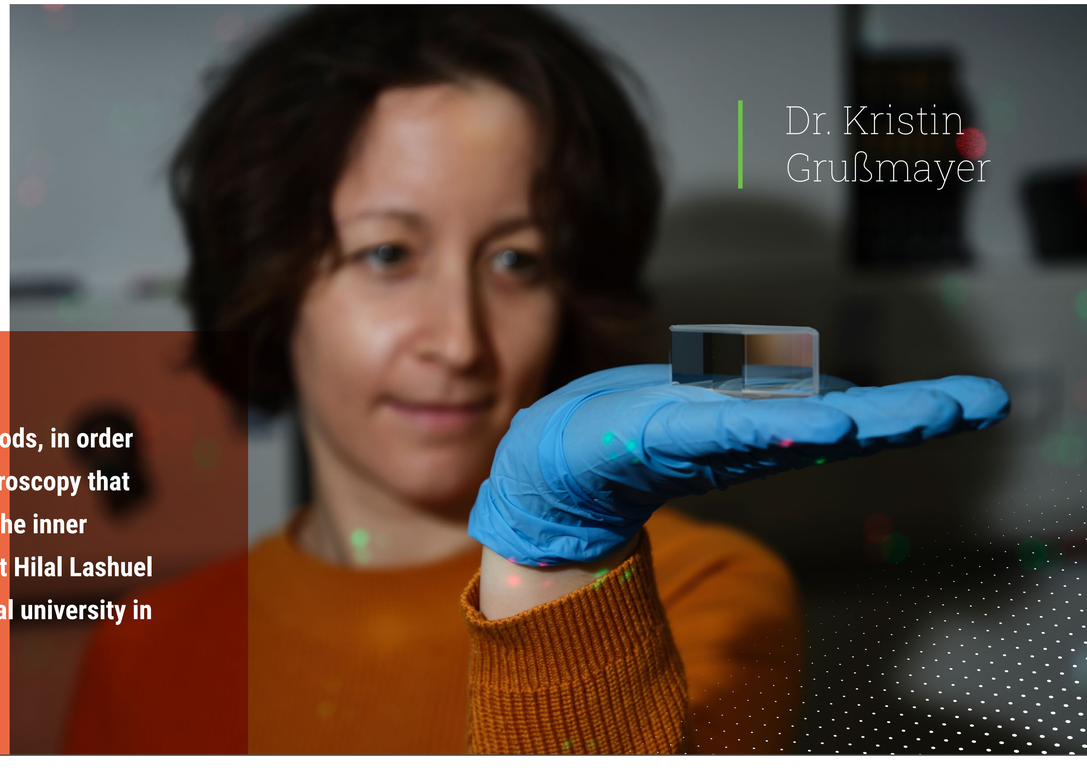
14 Support staff

51 PhD candidates

> 'Understanding from a biological perspective how the human body functions in disease and in health is crucial for health convergence'

The department benefits from great diversity, both in terms of nationality and gender, and has been successful in attracting independent excellence funding on both junior and senior levels, especially from the European Research Council (ERC) and the Dutch Research Council (NWO). The department's quality of research and the impact of its publications are both high, ensuring its continued competitiveness in securing external funding.

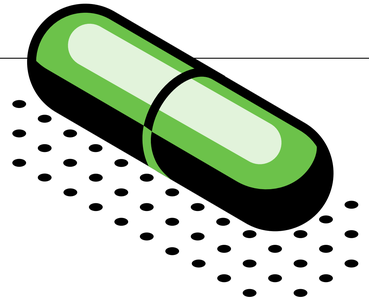
The department's flat structure of independent groups provides excellent career prospects for both junior and senior faculty, and has helped bring in promising international talents during a decade of growth. With the single-molecule, synthetic biology and cell biology research lines firmly established, and the in-house cryo-electron microscopy facility up and running, the department will now focus on capitalising on synergies and staff diversity to further promote excellence in scientific research, education and valorisation. ■



Dr. Kristin Grußmayer

The heart of Grußmayer's work is about pushing the boundary of microscopy methods, in order to ultimately apply them in the life sciences. What is special about the kind of microscopy that Grußmayer does? 'Our microscopy is compatible with living cells and it can show the inner workings of cells in three dimensions.' Grußmayer collaborates with neurobiologist Hilal Lashuel and his group from EPFL (École Polytechnique Fédérale de Lausanne), the technical university in Switzerland where she did her postdoc, to study Huntington's disease.

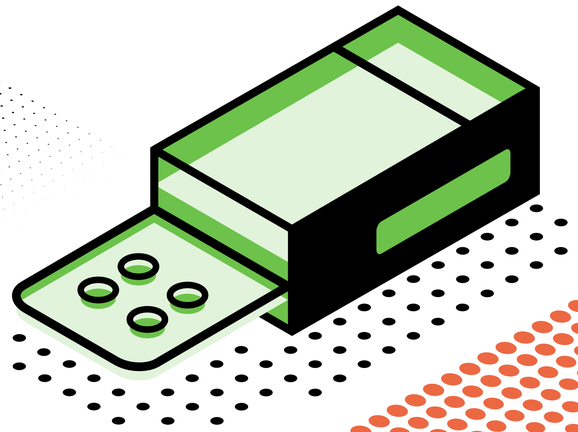
Biotechnology



Biotechnology plays a key role in the transition towards a low-carbon emission economy. In industrial biotechnology, vigorous innovation is required to enable the sustainable, low-emission production of chemicals, materials and transport fuels, as well as food and feed products. In environmental biotechnology, scientific and technological advances are needed to further reduce emissions, energy requirements and footprints of wastewater treatment facilities, and to develop circular 'waste-to-product' processes. Innovations in biotechnological production processes are also needed to arrive at high-quality, cost-effective responses to global health challenges.

In order to pave the way toward these innovations, research in the Biotechnology department generates relevant knowledge, concepts, catalysts and processes, while also providing a training ground for highly skilled researchers, in line with its mission statement:

> 'Inspired by societal challenges and scientific curiosity, we enable ground-breaking innovations and train top-class researchers in life sciences and engineering'

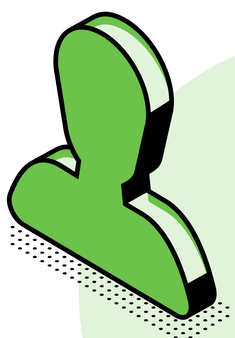


GOALS FOR THE COMING YEARS

- *Support our 10 tenure-track PIs in becoming internationally leading scientists with good chances to acquire personal and collaborative research grants.*
- *Intensify intra- and interdepartmental interdisciplinary collaboration on key challenges in industrial and environmental biotechnology, for example via a 12-PhD internal research programme on Zero-Emission Biotechnology.*
- *Extend the department's research programme by applying its core strengths in science, design and engineering to health-related research topics and the protein transition.*
- *Successfully implement and run the national UNLOCK infrastructure for the exploration of microbial biodiversity.*
- *Start and develop an ambitious research programme in the recently awarded Nationaal Groeifonds programme Cellular Agriculture.*

The department's research focuses on industrial biotechnology (enzyme-based biocatalysis, microbial biotechnology) and environmental biotechnology. We integrate fundamental, application-inspired research with design and engineering. Uniquely, the department conducts and integrates research in these key areas at all relevant organisational levels of biotechnological processes, including the discovery, characterisation and engineering of enzymes as molecular catalysts; physiology, systems biology and microbial cell and cellular network engineering; ecophysiology of microbial consortia; design and integration of unit operations in industrial and environmental bioprocesses and analysis of the socio-economic impact of innovations in biotechnology. Key themes for the coming years include zero-emission biotechnology (including e-biorefinery concepts), circular waste-to-product processes and computational biotechnology. ■

Department people



20 Postdocs

31 Principal Investigators (PIs)

81 PhD candidates

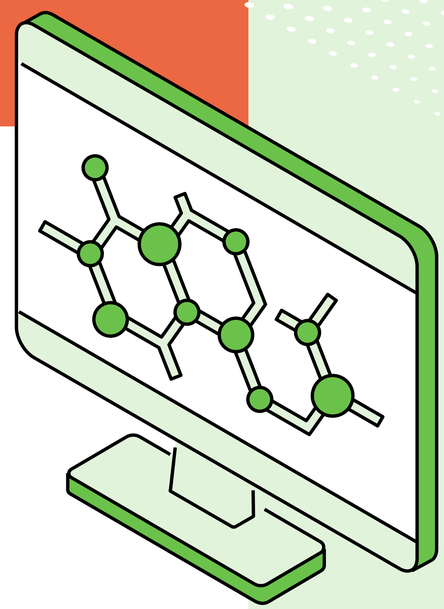
23 Technicians

19 Support staff

Dr. Marieke Klijn

To enable efficient and affordable production of biopharmaceuticals, such as vaccines or cancer medicines, the biopharmaceutical industry is actively searching for continuous processing setups. Marieke Klijn: 'Continuous process flows are already applied elsewhere, for example in the petrochemical industry. In the biopharmaceutical industry, however, continuous processing and testing is complicated by the interplay of technological, biological and regulatory factors. My group addresses this challenge by using in-situ analytical techniques for monitoring and control purposes and investigating the effects on accuracy and robustness across the process development pipeline.'

Chemical Engineering



The Department of Chemical Engineering embraces a wide array of disciplines, combining its core expertise of designing chemical processes and reactors with related fields in materials science, chemistry and physics. This integrated approach puts the department in an excellent position to address some of society's biggest challenges, such as climate change, health challenges and energy materials.

Therefore, we've made these challenges a cornerstone of our departmental mission:

> 'We develop solutions for societal problems, leveraging our broad expertise in chemical engineering, chemistry, physics and materials science. We harness our scientific curiosity to define emerging fundamental questions and educate future leaders in the field of chemical engineering'

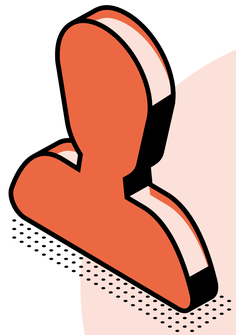
GOALS FOR THE COMING YEARS

- *Set up large flagship programmes towards solving the societal challenges of circular chemistry, the energy transition and health engineering. e-Refinery is a good example of how complex energy challenges can be addressed by working together. Similar programmes will be developed in the two other fields by building upon existing strengths.*
- *Create focus on finding successful solutions to societal challenges that benefit the greater good. Foster a collaborative culture in order to strike a balance between individual success and contributing to larger consortiums.*
- *Rejuvenate staff by hiring one tenure-track candidate per year (on average), without growing the department. The required disciplinary expertise and personal qualities of will be defined on the basis of the thematic orientation described above and the demands from our teaching programmes.*
- *Improve the gender balance of the staff until it mirrors the gender balance of graduates in the Chemical Engineering department (~30%). In the past years, the department has experienced the benefits of having a more diverse scientific staff. This made us to realise that a greater emphasis on social safety is needed. The department will set up an awareness programme with the aim of improving social safety.*
- *Improve the work-life balance and the quality of research and teaching in the department. To achieve this, the department aims to simplify the internal processes and evaluate the balance between added value and time invested more carefully.*

Prof.dr. Atsushi Urakawa

‘More than ninety percent of chemicals go through a catalytic process during their production,’ says Atsushi Urakawa, Professor of Catalysis Engineering at the Department of Chemical Engineering at TU Delft. ‘Yet, catalysts are like magic stones: we don’t know how they work, but they work beautifully – making chemical reactions run much faster, reducing the energy needed for these reactions and allowing us to steer reactions towards the desired end-products.’

Department people

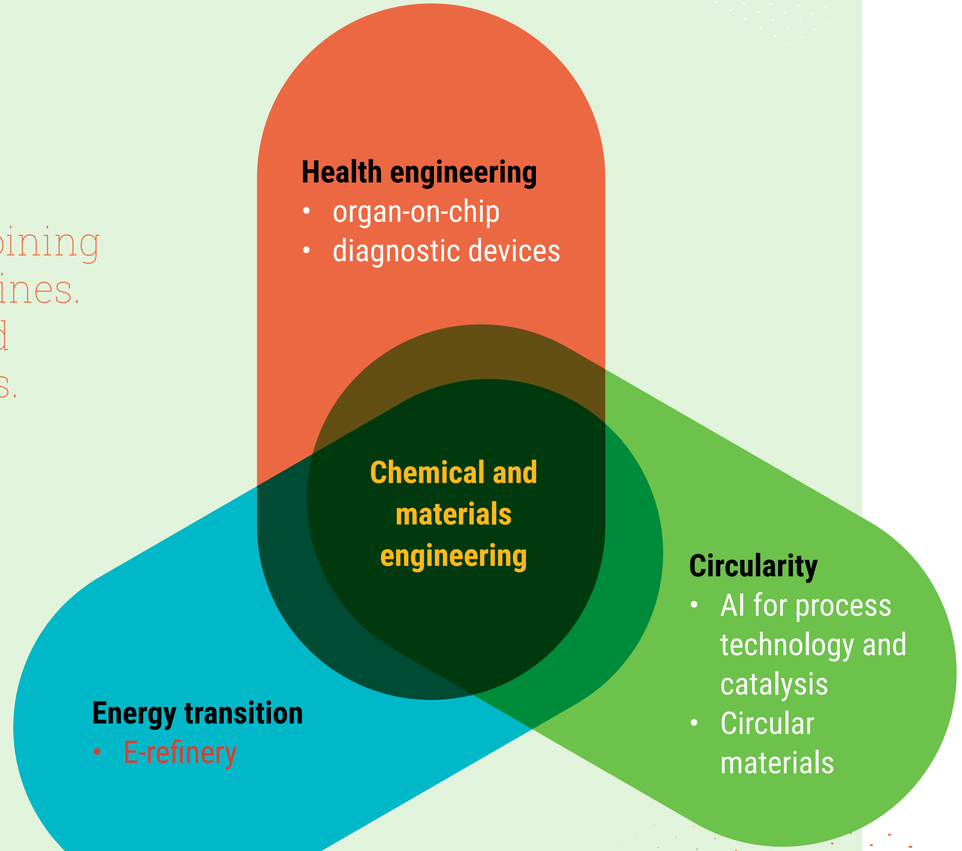


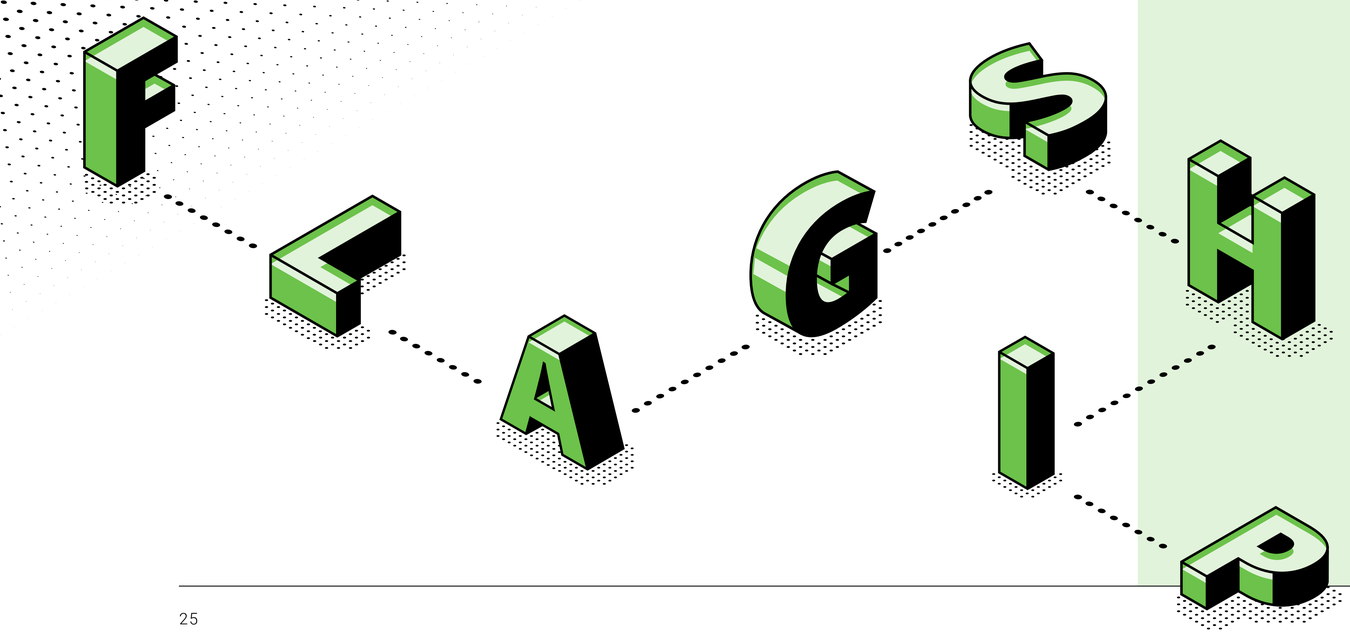
- **34** Postdocs
- **35** Principal Investigators (PIs)
- **65** PhD candidates
- **19** Technicians
- **12** Support staff

We contribute to the chemical engineering education of students through the BSc and MSc programs, Molecular Science and Technology (with Leiden University) and Chemical Engineering. In addition, our PI’s contribute to the other programs such as Nanobiology, Applied Physics, Sustainable Energy Technology, Applied Earth Sciences.

To most effectively combine our diverse expertise, the department aims to create ‘flagship’ programmes to address three emerging societal challenges: circular technology, energy transition and health engineering. The interests of the PIs are evenly distributed across these themes. With these flagships, they can effectively take on complex engineering challenges to advance industrial implementation. ■

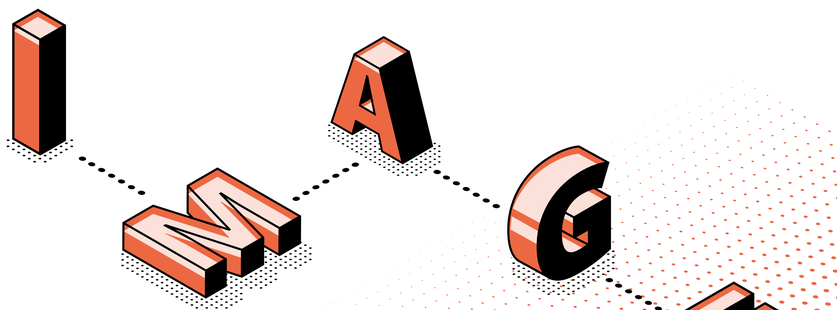
Societal challenges that can be tackled by joining chemical and materials engineering disciplines. This diagram shows both young (white) and more established (red) flagship programmes.





Imaging Physics

The department of Imaging Physics, or ImPhys, is a hub for physics driven innovation of imaging technologies and instrumentation. Our ambition is to be leading in the creation of breakthroughs in imaging instrumentation and methods. As such the department's profile encompasses a mix of science, engineering and design. Research topics span the entire range from curiosity-driven to application-inspired, are always academically challenging, relevant to society, and approached from a fundamental perspective. In our department we strive for an optimal mix of diversity in background, talents, and skills at all levels to aid in flexibility, creativity, and overall efficiency of operation of the department.



GOALS FOR THE COMING YEARS

- *Rejuvenate the department and recruit replacements in the fields of applied optics and electron microscopy in view of upcoming retirements in these areas. Invest into strategic alliances with key industrial and academic partners in these fields.*
- *Lead the health-tech convergence effort with regional partners in the areas of integrated advanced microscopy workflows, integrative neuromedicine, and 'deep' MRI and ultrasound imaging.*
- *Change our internal departmental organization to increase ownership and accountability of all the individual PI's for their own research and education, for their position in the international scientific landscape, and for their role in managing the department.*
- *Support the growth of our cohort of tenure track scientists to take up leadership in their respective fields and for the department and TU Delft as a whole.*
- *Focus on the career tracks of assistant professors, associate professors and full professors, balancing efforts in teaching/research/valorisation/organisation. Grow the 'Recognition and Rewards' programme at the department level.*

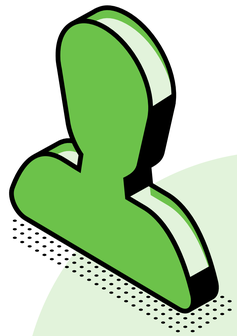
Dr. Daan Brinks

'We can now make actual movies, rather than graphical simulations, of brain cells firing.' Closely collaborating with Erasmus MC, Daan Brinks aims to unravel the workings of brain cells at every level – from molecules to entire organisms.

In the domain of healthcare we develop new instrumentation, and new imaging modalities for applications from pre-clinical life sciences to clinical diagnostics, using light, electron, acoustic, and magnetic imaging modalities. ImPhys researchers work at all levels of the pipeline of discovery, invention, development and analysis to enable insights in the fundamentals of imaging sciences and deliver technological breakthroughs to the clinic. In the domain of digital society, ImPhys generates innovation in sensing and precision metrology, with light and electron optics, and in instrumentation design. In both areas computational imaging techniques and AI increasingly set the pace for progress.

The department's mission statement is 'Inspired by challenges in the domains of life and health and of digital society and by scientific curiosity, we create ground-breaking innovations and train top researchers in imaging science and technology.' ■

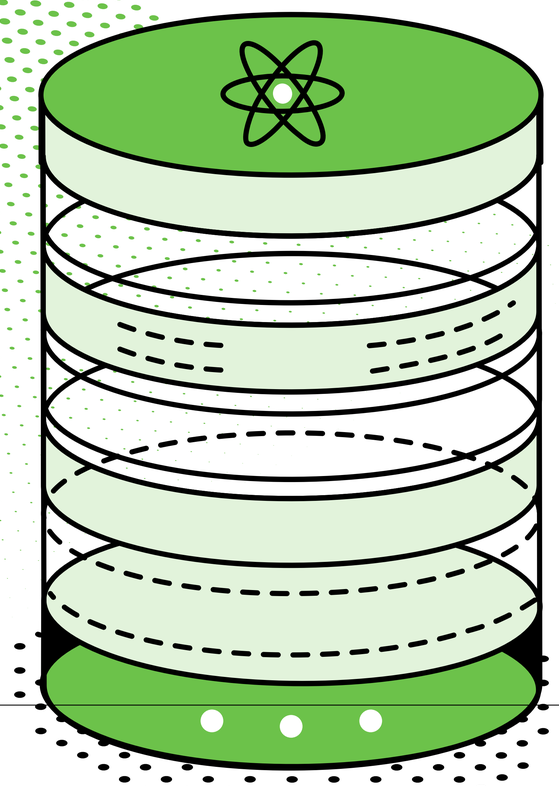
Department people



- 20 Postdocs
- 16 Technicians
- 30 Principal Investigators (PIs)
- 6 Support staff
- 62 PhD candidates

Quantum Nanoscience

The Department of Quantum Nanoscience seeks to advance the understanding of physical processes at the nanoscale to achieve fundamental scientific and technological breakthroughs.



The possibilities of quantum technology are vast, with quantum computation and quantum communication arguably being the best-known examples. By focusing on basic research into a wide variety of manifestations of quantum physics, the department aims to create avenues for quantum innovation in the broadest sense.

With its leading position in nanoscience and nanofabrication, Quantum Nanoscience excels in experimentally realising and controlling systems governed by quantum correlations: from nano-patterned optical lattices and ultra-thin oscillating drums all the way down to chains of individual atoms assembled by scanning tunnelling microscopy. To unlock the full potential of quantum technology, research conducted by the department revolves around advancing its abilities to design and create novel quantum materials, as well as quantum sensors and transducers – vital components for any form of quantum technology.

GOALS FOR THE COMING YEARS

- *Consolidate research themes via internal and external collaborations; exploit consolidated themes to land large national and international grants.*
- *Strengthen the Delft Electron Microscopy Initiative (DEMI) for an electron microscopy facility together with the departments of ImPhys and Bionanoscience.*
- *Support the development of the new Master's Programme in Quantum Information Science & Technology (QIST).*
- *Enhance internal cohesion and improve diversity and inclusion.*
- *Nurture talent within both scientific staff and supporting personnel ('OBP').*

Combining innovative fabrication and measurement techniques, as well as advanced theoretical modelling, the department's researchers strive to advance the understanding of physical processes at the nanoscale, fostering breakthroughs of both a technological and fundamental scientific nature. The department offers a stimulating, interdisciplinary research environment, in which students and scientific staff explore, learn and teach together.

The department's research programme consists of **four themes**:

Quantum Matter

The department employs its unprecedented level of control to build and explore new forms of quantum matter, specifically designed to exploit the unique benefits of symmetry and topology. Examples include the use of pulsed laser deposition to grow complex oxide interfaces that, depending on their exact composition, host exotic electron correlation effects, as well as transmission electron microscopy studies on semiconductor nanowires and edge states in topological insulators. Collaborations with chemical engineers allows to extend these studies to the smallest scale and design devices exploiting the functionality of a single molecule. Each of these research topics can count on theory support from within the department.

'The department offers a stimulating, interdisciplinary research environment, in which students and scientific staff explore, learn and teach together'

Dr. Eliška Greplová

Imagine if we could find an alternative to plastic by using a quantum computer and artificial intelligence to help us decide on all the best ideas that chemists have? Eliška Greplová uses artificial intelligence in quantum computing to help develop the next generation of quantum devices that will be able to tackle sustainability challenges.

Quantum Transduction

Converting quantum information from one type of physical system to another without losing quantum coherence is a recurring challenge in quantum nanoscience. Quantum transduction, as it is known, can be used for the controlled exchange of information between quantum states encoded in diverse forms, such as photons, phonons, Cooper pairs and spins.

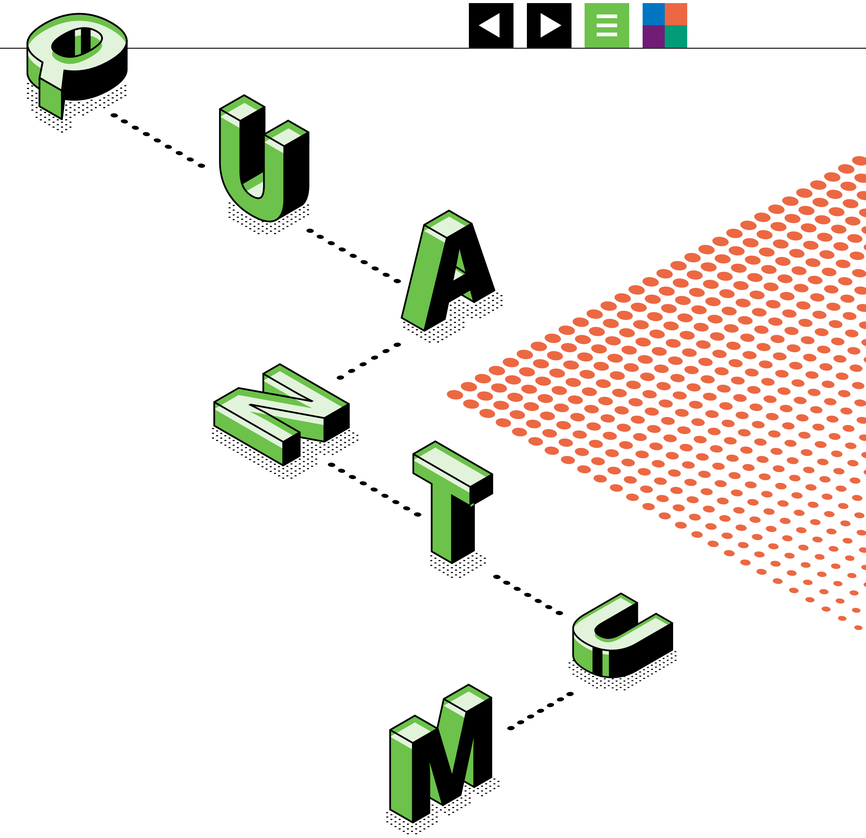
Two particular examples of quantum transduction are opto-mechanics and circuit QED. In the first, a (microwave) optical cavity interacts with a mechanical resonator. In the second, the mechanical resonator is replaced by an on-chip artificial atom. Both fields are studied extensively within the department.

Quantum Sensing

A well-known property of quantum systems is their strong responsiveness to fluctuations in their environment. The department aims to exploit this feature to develop ultrasensitive devices for quantum sensing of e.g. magnetism or charge. One such device, which is currently under development in the department, is a magnetometer based on a single diamond NV spin, capable of detecting spin waves with micrometre precision. Another example involves the use of nanophotonic structures for detecting photons on length scales smaller than the optical wavelength.

Quantum Information (implemented via QuTech)

The department also strives to form a bridge between academic exploratory research on quantum nanoscience and mission-driven research on quantum technology. To this end, the department employs a number of scientists who are seconded to QuTech. Research activities include superconducting transmon qubits, semiconductor spin qubits and the development of an NV-centre-based quantum internet. ■

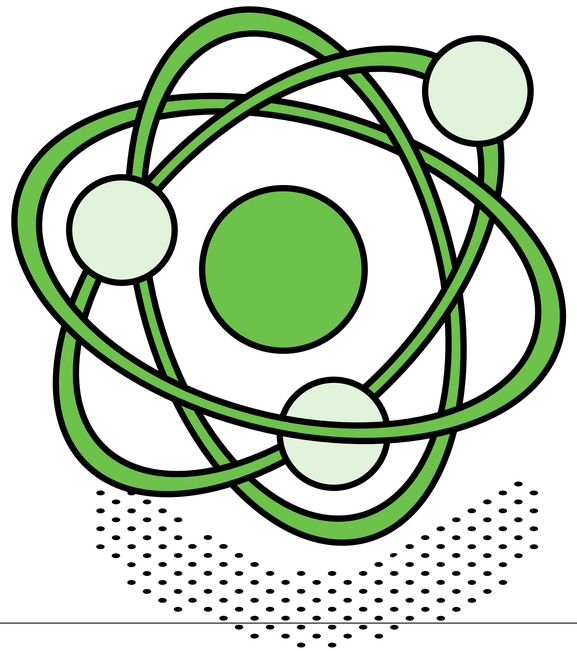


Department people

- 17 Postdocs
- 17 Principal Investigators (PIs)
- 56 PhD candidates
- 4 Technicians
- 8 Support staff

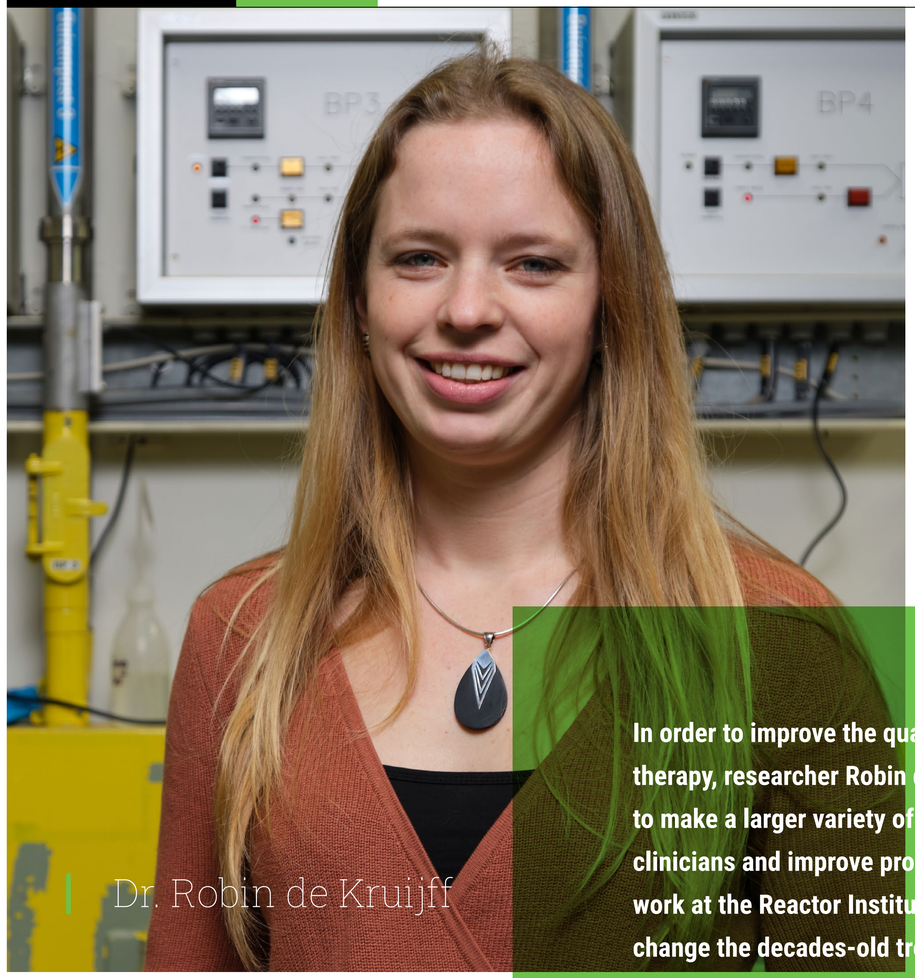
Radiation Science & Technology

The department's research programme consists of three themes: first, materials science with emphasis on energy conversion and storage (e.g. batteries, (super/pseudo)-capacitors, hydrogen conversion (fuel cells) and sensors, luminescence and magneto-caloric materials, metals, nuclear materials, self-healing materials, skyrmions, solar photovoltaic materials, cultural heritage, etc). Second, health technology for imaging (e.g. diagnostics) and radionuclide therapy (combined into theranostics), radionuclide production, and external beam (proton) therapy of cancer. Third, innovative forms of nuclear energy, with focus on molten salt reactors and small modular reactors.



GOALS FOR THE COMING YEARS (SOME STRONGLY LINKED TO RID):

- *Expand the impact of the nuclear instruments/facilities by:*
  a. *Focusing of our current research to the new instruments and the cold neutron source, and exploring new research fields that can benefit from these (e.g. soft matter);*
  b. *Widening the sample environments to better include operando phenomena;*
  c. *Developing simultaneous measurement methods (e.g. X-ray and neutron small angle scattering, neutron-depth profiling and X-ray absorption spectrometry, X-ray and neutron imaging, etc.);*
  d. *Extending infrastructure for research with higher activity levels (e.g. hot cells).*
- *Exploit research synergies with Convergence partners (e.g. combining therapies for personalised treatment) and fill gaps in expertise to connect therapies (e.g. radiation/biodosimetry).*
- *Secure and strengthen nuclear expertise and knowledge in the Netherlands at various levels (academia, government, industry, society, …)*



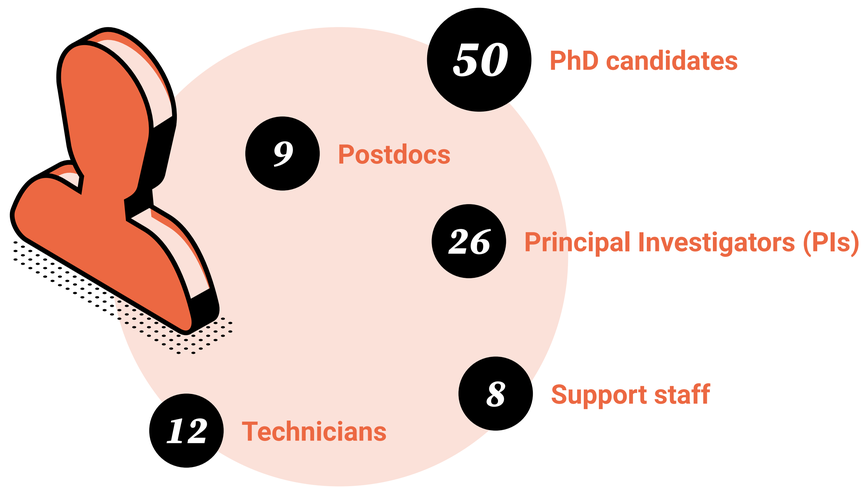
Dr. Robin de Kruijff

'The department works on solutions to big societal challenges'

In order to improve the quality of targeted tumour therapy, researcher Robin de Kruijff is on a mission to make a larger variety of radionuclides available for clinicians and improve production methods. With her work at the Reactor Institute Delft (RID), she aims to change the decades-old trend that only a few types of radionuclides are used for radiation therapy. The shortage of these radionuclides is causing problems worldwide, which is why many governments and companies are looking for alternative ways to produce them.

The department works on solutions to big societal challenges, capitalising on its reactor-based infrastructure. This infrastructure gives it an edge, because neutrons and positrons induce interactions in materials/elements/isotopes complimentary to X-rays and other probes. Examples include neutron depth profiling of lithium-ion batteries, radionuclide production for medical research and applications (e.g. new therapies), neutron diffraction of materials during synthesis, neutron imaging of historical objects, etc. In order to keep pushing the envelope and maximise the valorisation of the research reactor, sample environments and instruments connected to the reactor are continuously being upgraded, while new research themes are being explored in which these methods have clear added value and create high impact.
The department also makes a significant contribution to teaching students of the Faculty of Applied Sciences, focusing particularly on physics, chemistry and biomedical sciences. ■

Department people



Innovation and impact

The Faculty of Applied Sciences will continue to enhance its impact for a better society by developing strong partnerships in various areas and support the development of innovations outside of academia, either through spin-offs or technology transfer. Co-creation with businesses is one of the keys to success that will be pursued.

Frameworks for cooperation can be found through Horizon Europe, Topsectors, NWO and the national Groeifonds initiatives. The Faculty has a prominent position in terms of excellent research and high-tech facilities. These will play an important role in forming national and international consortia. Expanding the Faculty's existing network and strong relations will open new opportunities to establish research projects and obtain funding. Academics and tenure trackers in particular will be supported by the Innovation and Impact Centre in getting this done.

The Convergence for Health & Technology initiative, the thematic Delft Research Initiatives on Health and Energy, and QuTech are examples of existing and successful partnerships to further benefit from. Researchers from the Faculty are well embedded in those groups, allowing for cross-faculty and cross-university projects and shared external connections. The research activities from those partnerships attract significant attention from outside, as a result of which new initiatives and opportunities arise. Novel areas to develop similar strong partnerships will be defined and new research projects with collaboration from industry will be shaped for those areas. Examples of such areas are Synthetic Cells, PharmaTech, and Batteries. At the moment these are very successful fundamental themes, which have potential to further develop their technology readiness for a later transfer to society. The Faculty will support innovation activities that create impact for a better society by various means, all leading to excellent science and engineering.
In addition, the Faculty is participating in the development of national roadmaps for large-scale research infrastructure. We aim to consolidate and expand our position in imaging facilities in the broadest sense of the word, using photons, electrons, neutrons, and positrons. By pooling our infrastructures and researchers, we aim to become known for our world-class imaging research.

The ground-breaking research of the Faculty very regularly results in publications in top journals. The Faculty's communications team aims to bring out updates on important new developments every week, but at least once a month, and to ensure that this news is picked up by the relevant channels. ■

The National Growth Fund of the Dutch government grants conditional funding of 60 million euros to the Cellular Agriculture consortium, whose goal is to produce and promote protein-rich food from cultivated cells. The TU Delft is one of the founders of the consortium, with Marcel Ottens as initiator of the line of research. The TU Delft, together with the companies PlanetBio, DSM, Meatable, CE Delft and others, forms a hub in Delft for this new field of work.

Infrastructure & Safety

Infrastructure for teaching and research is key to the Faculty.

Infrastructure & Safety

Infrastructure for teaching and research is key to the Faculty. This includes all facilities in buildings (labs, offices), large-scale research facilities (e.g. RID and the cleanroom), equipment and ICT facilities for staff and students.

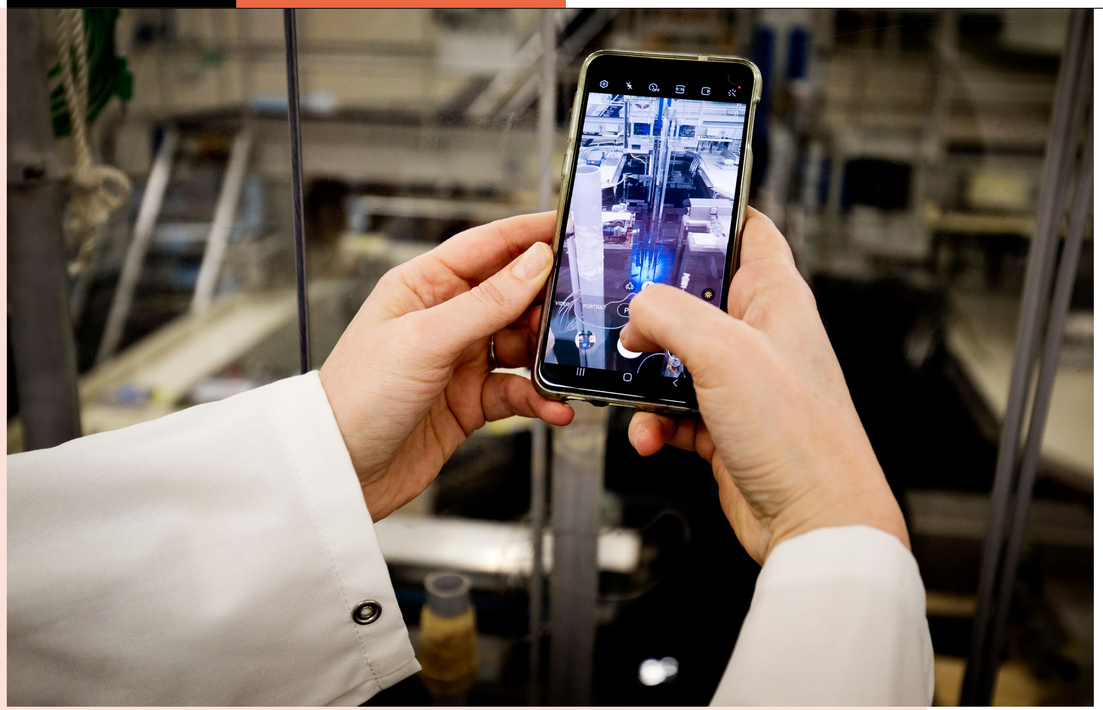
OUTLINE NEW PHYSICS BUILDING

The Faculty uses multiple buildings across the campus as listed below:

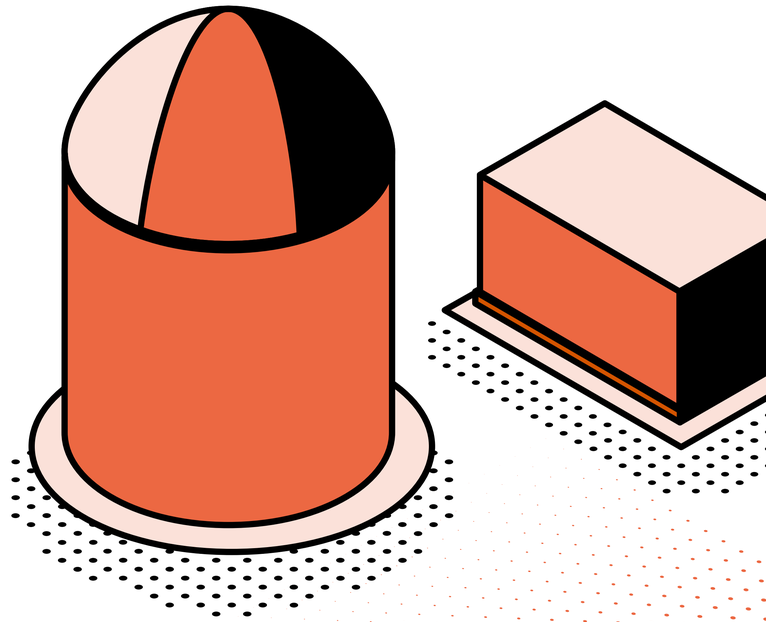
MAIN FUNCTION	DEPARTMENTS	BUILDING
Molecular en life sciences research and teaching	Biotechnology, Chemical Engineering, Bionanoscience	Building 58
Physics research and teaching; support staff	Quantum NanoScience, Imaging Physics, Science Education and Communication, general administrative support staff (FOD)	Building 22
Radiation research and teaching	Radiation Science Technology, TU Delft Reactor Institute	Building 50
TU Delft Hortus Botanicus	Biotechnology	Building 6
Cleanroom nanofabrication	Kavli Institute of Nanoscience Delft	Building 104
Industrial Catalysis Lab (high pressure)	Chemical Engineering	Building 67

The Faculty aims to create and maintain state-of-the-art infrastructure that is safe, enjoyable to work in, and cost-effective. For the next years, focus will be on developing the new buildings for Physics (planned for delivery in 2026) and the cleanroom in the Kluyver Area (Campus-South). At the same time, a maintenance programme will be executed for Buildings 6, 22 and 50, that sometimes impact our activities to a large extent.

The new Physics building will accommodate high-quality and innovative research in the fields of quantum technology, photonics, imaging, nanoscience and science communication. Also, the building will have state-of-the-art teaching laboratories, a ‘makerspace’ and self-study places. Around the same time, an educational building will be realised in the Campus-South area. With these new buildings, all Applied Sciences Buildings will be in proximity of each other. ■



The TU Delft Reactor Institute operates a unique research facility: the HOR nuclear reactor. This is a small pool-type research reactor (2 MW). The reactor is a source of neutrons and positrons for a wide variety of research purposes.



TU Delft Reactor Institute

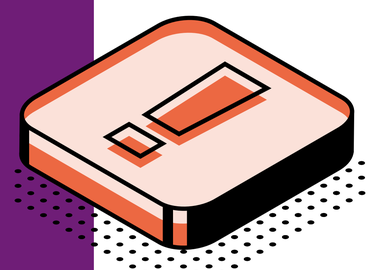
The Faculty's largest and most unique facility is operated by the TU Delft Reactor Institute (RID): the 'HOR' nuclear reactor. This small pool-type research reactor (2 MW) is not built to produce electrical power but as a source of neutrons and positrons for research purposes. The nuclear reactor has been temporarily shut down in preparation for a major upgrade: as part of the OYSTER programme, the RID's neutron source is being connected to a system which will cool the neutrons it produces to -250°C. At this extremely low temperature, better imaging results can be obtained. Once the cold source is operational, the facility will offer many opportunities for international research and commercial use, as the RID has a number of advantages: flexibility, easy (and above all: fast) access, and the availability of a multitude of instruments. The added cold source and instrumentation are expected to be operational early 2023. ■

Safety

Where state-of-the-art research takes place, boundaries are crossed, new fields are discovered, and new (combinations of) materials and equipment are being used. This means that the Faculty pursues and enforces high levels of safe and healthy working conditions.

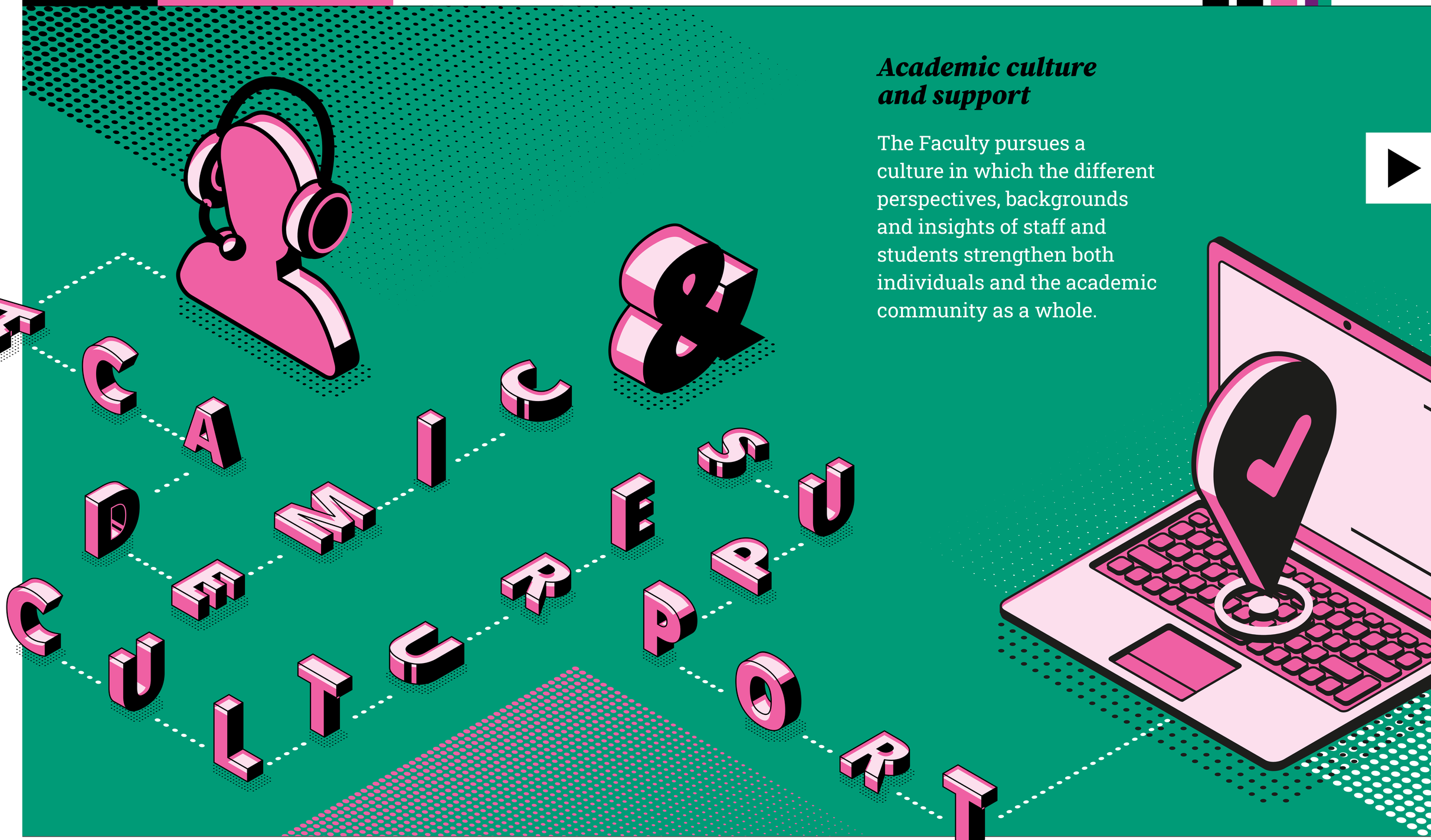
In order to conduct innovative research, employees are the most important capital within our faculty, and the faculty needs to ensure the health, safety and well-being of its employees to the best of its ability. In the coming years, the focus will be on creating leadership for safe working conditions among management and employees, making health and safety risks transparent and keeping them up to date, and addressing complex issues from the field of health, safety and welfare, taking into account and anticipating developments in the field. Each department has a dedicated safety officer and the Health, Safety & Environment advisor informs the management at the department and faculty level periodically about the state of affairs. ■

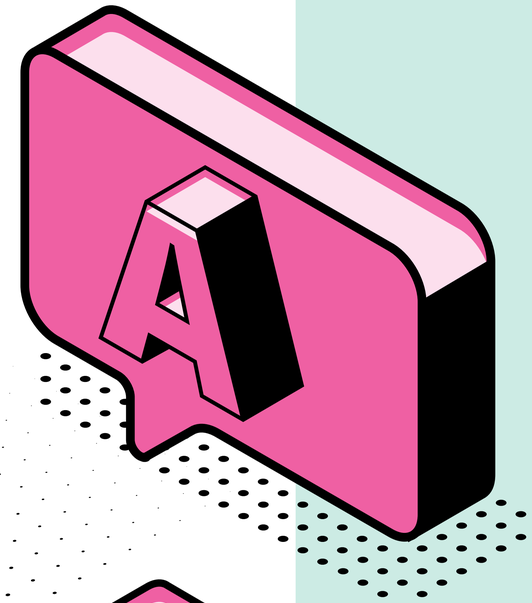
'The faculty needs to ensure the health, safety and well-being of its employees to the best of its ability'

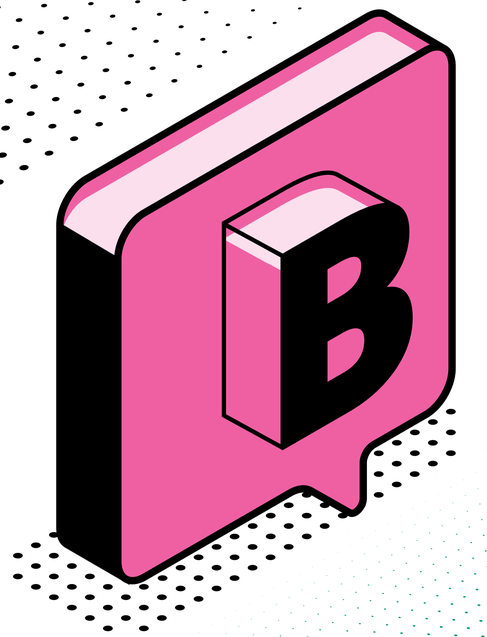


Academic culture and support

The Faculty pursues a culture in which the different perspectives, backgrounds and insights of staff and students strengthen both individuals and the academic community as a whole.







Academic culture

The Faculty pursues a culture in which the different perspectives, backgrounds and insights of staff and students strengthen both individuals and the academic community as a whole. This requires the establishment of a culture of openness, trust, respect and mutual appreciation. Staff and students should feel encouraged and rewarded for sharing their ideas, concerns and even disagreements. The Faculty strives to create a safe space, where everyone knows it is worthwhile to speak up and have– sometimes difficult – conversations on inclusion that will ultimately move us forward.

Many aspects of diversity are present in the Faculty, either visibly or invisibly. Inclusion follows from diversity, as it indicates the extent to which the ideas, contributions and perspectives of different groups of people are acknowledged, appreciated and integrated within the community. Increasing inclusion in a diverse environment is work in progress. It requires a longer-term approach in which students and staff get actively involved at all levels. It also requires short-term actions which focus on specific aspects like awareness of possible biases in vacancy texts, recruitment processes and career committees. One of the Faculty's goals is to increase the intake of women in degree programmes and academic positions. The target is to ensure that 25% of permanent staff members (assistant professors, associate professors and full professors) are female. To achieve this, one in three hires has to be female.

Maintaining a healthy work-life balance has been and continues to be key. The pandemic and the additional extra workload it caused have not made this any easier. The Faculty aims to consciously create conditions that help keep the workload manageable. It will invest strategically in resources, in supporting as well as educational staff. The way the workload is spread over various programmes and teachers will also be considered. The Faculty intends to further improve hybrid working initiatives that will enhance the work-life balance, and be alert of those having the opposite effect.

The Faculty's highly competitive academic setting calls for both a stimulating and a collaborative working environment. The Faculty believes that a modern academic culture which stimulates opportunities and responsibilities for PIs leads to more creativity and innovation in research and education. For that reason, the departments all rely on strong Principal Investigators (PIs) as a key organisational unit, sometimes combined with a light section structure. For PIs, this enhances academic freedom to excel, while they can still share knowledge and creativity with nearby colleagues. The Faculty also provides flexible and versatile academic career opportunities in the field of research, education, instrumentation, valorisation and leadership, and to stimulate staff to grow and excel in areas they aspire or master.

The Faculty's highly competitive academic setting calls for both a stimulating and a collaborative working environment

At the same time, more personal freedom and scientific independence go hand-in-hand with shared responsibilities, such as administrative responsibilities to support the organisational management of the department as a whole. A high level of managerial support is in place to support the academic head of department (a revolving, part-time role), consisting of at least a department manager, project officer, safety officer, HR advisor, and business controller.

ANNUAL NEW YEAR'S BREAKFAST

Support

The contribution of support staff in an academic environment is indispensable and needs to be of high quality. In order to achieve and maintain this level of performance, the Faculty invests in developing its technical and administrative staff by training and continuous attention for professional growth and new challenges. Communication fits seamlessly into this with its activities by strengthening the interconnectedness and commitment within the faculty, among employees, by sharing information about teaching, research and the organisation and by organising faculty-wide events and meetings for employees.

In the coming years, focus will be on the availability of reliable and appropriate management information in order to properly administer and manage the faculty. Management information of all support areas (i.e. HR, finance, housing and safety) must be available as much as possible in real time, tailored to the target group, and user-friendly.

Finance

The Faculty's financial distribution model provides lump-sum financing of the research departments. Financial governance takes place at departmental level and, for cross-departmental aspects, at Faculty level under responsibility of the Dean. A future-proof balance between governmental structural funding (1e geldstroom) and project funding (2e/3e geldstroom) is a main focus in the Faculty's financial policy. In order to support PIs in the (financial) management of their research projects, each department deploys project officers. The Faculty aims to keep its reserve position within the prescribed bandwidth, and aims to have little Faculty-level reserves. Most reserves, if any, are at the department level. The reserve policy of the Faculty and departments is targeted at investments in (large) infrastructure, saving up for moving to the new Physics building, and enhancing key research or educational strategic areas, that are difficult to finance through department or PI budgets alone yet share a common interest among multiple stakeholders. ■

'New faculty is recruited internationally, in a combination of 'scouting' and open applications'

Human Resources

Recruitment

New faculty is recruited internationally, in a combination of 'scouting' and open applications. We do not have an outlined or predetermined set of positions/chairs on specific topics, so for each vacancy we search as broad as possible. Potential candidates go through a rigorous recruitment process, involving all department faculty members, and are selected primarily on the basis of their excellence in research. Teaching, valorisation, organisation and leadership competences are evaluated as part of the selection procedure.

Tenure track

In general, new junior research staff members start on a five-year tenure track assistant professor position. Tenure track assistant professors are given the opportunity – along with the support of a personal development programme – to conduct independent ground-breaking research and become a successful innovative academic with impact on science and society through teaching and research. In considering the award of tenure, each candidate is evaluated on their own merits and tenure can be conveyed as either assistant or associate professor. The tenure decision is made by the head of department and the dean, in close consultation with the department's faculty and the Management Team of the Faculty. Successful academics may further progress to the position of full professor. Tenure track academics that do not meet the expected ▸

level of performance at the end of their five-year tenure track programme, receive support in exploring their options for a career outside TU Delft. Newly appointed staff members follow courses to obtain their university teaching qualification (UTQ). PhD candidates and temporary staff are selected by the staff member, under the final responsibility of the head of department. Researchers that are eligible for personal grants such as ERC grants and the NWO's Veni, Vidi and Vici programme receive support in the preparation of proposals.

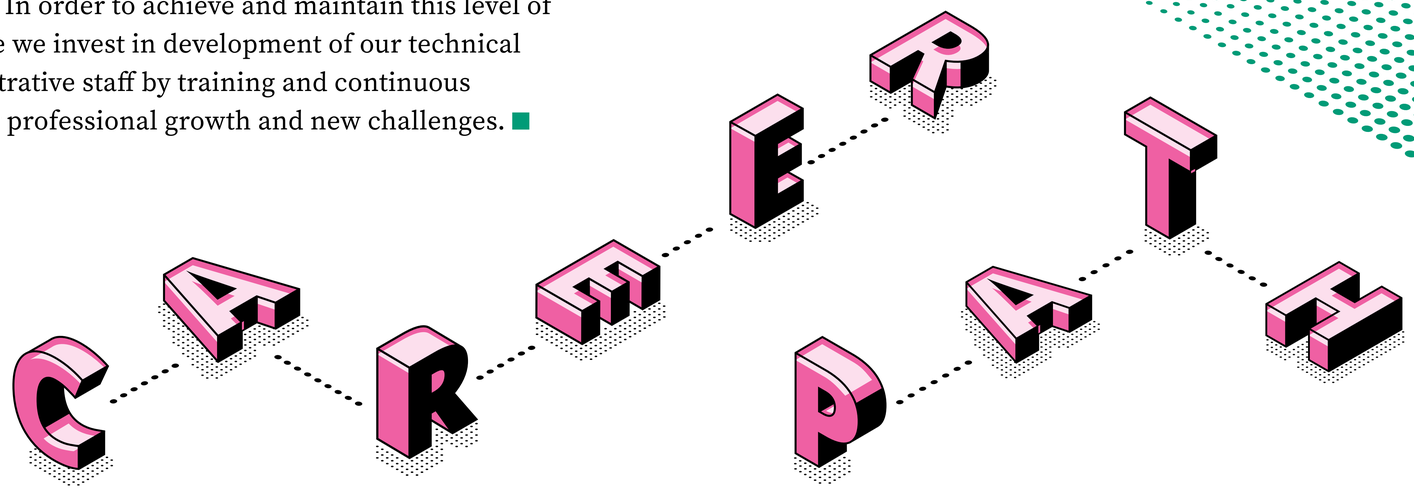
Appraisal

Yearly evaluation cycles are defined and supervised at the Faculty level (a cycle consists of a preliminary consultation by all supervisors, an appraisal per individual in the form of a progress interview, and an evaluation consultation). The assessment of full professors takes place at the Faculty level, and the assessment of assistant and associate professors takes place at department level.

Career paths

In the international academic labour market fierce competition is common. In order to attract and retain talent it is crucial to focus continuously on professional and personal development of our staff. The appreciation and rewarding of talent provides opportunities for achievements in the fields of research, education, valorisation and leadership. We enable flexible and versatile academic career paths and allow staff to grow and excel in areas they aspire and master. The availability of a specific chair is not a prerequisite to the promotion to associate or full professor. Assistant professors will be promoted to associate professor, based on the staff member's quality in research, teaching and impact, as well as his or her national and international visibility. A Faculty Career Committee, consisting of senior Faculty members and an independent chair from another Delft Faculty, provides advice to the department head and Dean about the proposed promotion to associate professor. The Rector of the TU Delft decides, after a rigorous assessment process, about promotions to full professorship, based on a proposal by the Dean. The opportunity for promotion to associate and full professorship allows young researchers to develop their scientific careers to the fullest extent possible. The contribution of support staff in an academic environment is indispensable and also needs to be of high quality. In order to achieve and maintain this level of performance we invest in development of our technical and administrative staff by training and continuous attention for professional growth and new challenges. ■

'The opportunity for promotion to associate and full professorship allows young researchers to develop their scientific careers to the fullest extent possible'



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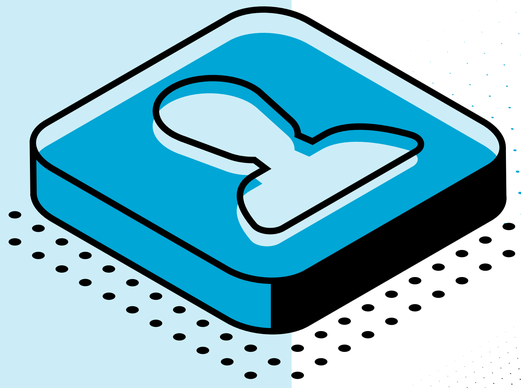

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