Faculty of Science
Overall impression
2012
New energy!

Preface

The year 2012 revolved around implementing the changes initiated in 2011 in our faculty. Despite reduced staff, we worked hard to provide top quality education and to ensure that our scientific knowledge offers social value. We strive to respond to the world around us which, after all, is constantly changing. The faculty owes it to its status to join the discussion with institutions that determine the national and international research agendas. We are increasingly represented in the most important bodies. We are also increasingly bringing the relevance of our research to society into the limelight. Our research is appreciated and financed in part because of an inspiring Social Advisory Council that supports us.

In our educational activities, we tackle and learn from the changes together. In 2012, we made preparations for the matching activities. The intention is to ensure that our range of degree programmes increasingly links up to our students’ needs. In other words, does the degree programme suit the student, and does the student suit the degree programme? The matching activities started in 2013. In 2012, we also increased our focus on tutorship and on the structural professionalisation of our lecturers.

But some things we did not change. The UU Faculty of Science was, is and remains the institute which is pre-emminently fit for working and thinking at the highest level. It is the place where top research is conducted which is recognised by international peers. Excellent research is part and parcel of our university and reflects on our education... an excellent education with satisfied students and a satisfied labour market.

Another thing that remained the same was the importance of integrity. Integrity is not just the absence of plagiarism and fraud. It also stands for transparency and independence and avoiding a conflict of interest. We are dedicated to integrity. And we confront each other about integrity matters. Raising awareness about quality and integrity is an important objective of our education.

We have achieved a great many things. With renewed energy! New professors are working at virtually every department, creating new ideas. While upholding our principles of top research and top education, we excelled ourselves in commercialising our ideas. We are acquiring more funding while preserving our identity.

Our hard work in 2012 has been rewarded: the faculty received positive assessments from the review committee and we managed to achieve valorisation in highly diverse areas. This includes the launch of the Top Sector Chemistry Scholarship, an initiative of the Association of the Dutch Chemical Industry and the research conducted by Krijn de Jong, Professor of Inorganic Chemistry and Catalysis, into new development methods for bioplastics, a clean alternative to plastic, based on petroleum.

In 2012, the faculty received many prizes and scholarships. For instance, Niels Boon, the theoretical physicist who obtained his doctorate degree in January, received the prestigious Molecular Physics Longuet-Higgins Young Authors Prize 2011. Enrico Mastrobattista received a European subsidy to the value of 2.2 million euros for research into so-called bio-pharmaceuticals.

In this Overall impression of 2012, we want to show you that the faculty changes along with the changing world, with renewed energy. Change is here to stay. And, we are not done yet. In fact, we are never done, because change is a fact of life. Change is here to stay!

Gerrit van Meer,
Dean of the Faculty of Science

Profile of the Faculty of Science

The faculty’s research is structured as follows:

- Top sectors
  - Life Sciences & Health
  - Agro & Food
- Centre for Education and Learning
  - UMC
  - Utrecht Life Sciences
  - Veterinary Medicine
- UU Life Sciences
  - UMC
- Molecular Life Sciences
  - UNIL
  - UMC Life Sciences
  - Veterinary Medicine
- Science for Sustainability
  - Geosciences
- UU Sustainability
  - Geosciences
- UU Institutions
  - Top sector
    - Creative Industry
- UU Youth & Identity
- Foundations of Natural Sciences
- Game Technology
- Top sectors
  - Water
  - Chemistry
  - High-Tech Systems and Material
  - Energy
- Faculty focal areas in relation to the university’s strategic themes
Education

INTAKE

Bachelor’s programmes

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>213</td>
<td>200</td>
<td>210</td>
<td>205</td>
</tr>
<tr>
<td>Pharmaceutical Sciences &amp; College of Pharmaceutical Sciences</td>
<td>368</td>
<td>349</td>
<td>176</td>
<td>219</td>
</tr>
<tr>
<td>Physics and Astronomy</td>
<td>112</td>
<td>95</td>
<td>109</td>
<td>99</td>
</tr>
<tr>
<td>Chemistry</td>
<td>79</td>
<td>55</td>
<td>49</td>
<td>83</td>
</tr>
<tr>
<td>Computing Sciences</td>
<td>160</td>
<td>163</td>
<td>156</td>
<td>61</td>
</tr>
<tr>
<td>Information Sciences</td>
<td>52</td>
<td>44</td>
<td>37</td>
<td>49</td>
</tr>
<tr>
<td>Mathematics/ Applied Mathematics</td>
<td>145</td>
<td>85</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1129</td>
<td>991</td>
<td>793</td>
<td>784</td>
</tr>
</tbody>
</table>

All degree programmes have more or less the same intake. This is a national trend: more and more students choose to study at a university.

Master’s programmes

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s programmes of the Graduate School of Natural Sciences</td>
<td>328</td>
<td>377</td>
<td>378</td>
<td>420</td>
</tr>
<tr>
<td>Master’s programmes of the Graduate School of Life Sciences²</td>
<td>83</td>
<td>120</td>
<td>144</td>
<td>144</td>
</tr>
<tr>
<td>School of Pharmacy</td>
<td>83</td>
<td>115</td>
<td>190</td>
<td>137</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>494</td>
<td>612</td>
<td>712</td>
<td>701</td>
</tr>
</tbody>
</table>

² The Graduate School of Life Sciences is an alliance between the Faculty of Medicine, the Faculty of Veterinary Medicine and the Faculty of Science. We have only provided the intake numbers for the three Master’s programmes of the Faculty of Science.

The overall intake of the Master’s programmes has decreased. This is partially the result of choices made at an earlier stage in the profile: Astrophysics and Energy Science, for instance, are no longer Master’s programmes of the Faculty of Science.

THE FACULTY OF SCIENCE OFFERS:


Master’s programmes GSNS | Artificial Intelligence, Chemical Sciences, Computer Science, Information Science, History and Philosophy of Science, Mathematical Sciences, Science Education and Communication, Physics and Climate Science.

Teacher training Master’s programmes | Teacher Training in Biology for Preparatory Higher Education Teacher Training in Physics for Preparatory Higher Education Teacher Training in Chemistry for Preparatory Higher Education Teacher Training in Mathematics for Preparatory Higher Education

Master’s programmes GSLS | Environmental Biology, Drug Innovation, Molecular and Cellular Life Sciences.

22 minors

STUDENTS OF THE FACULTY OF SCIENCE CAN COUNT ON:

• Involved lecturers who are also researchers
• A sound basis with plenty of freedom and choices in the Bachelor’s programmes
• Focus on a scientific discipline of the student’s choosing in the Master’s phase
• A wide range of Master’s programmes
• Programmes for highly talented and ambitious students
• Education that is closely related to many award-winning research at an international top level
Student satisfaction

Who are best suited to judge the faculty but students themselves?

The University Choice Guide 2013 has awarded the ‘top degree programme’ quality seal to the Bachelor’s programmes of Computing Sciences and to Chemistry of Utrecht University. The guide has based its judgement on student assessments and expert assessments.

In the 2012 National Student Survey, the Bachelor’s programmes of the Faculty of Science received an average mark of 4.02 out of 5. The national average for all universities’ degree programmes is 3.97. Please find below the scores of Utrecht University in the various areas:

<table>
<thead>
<tr>
<th>General judgement about</th>
<th>UU’s science Bachelor’s programmes</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your degree programme in general</td>
<td>4.02</td>
<td>3.97</td>
</tr>
<tr>
<td>The content of the degree programme</td>
<td>4.12</td>
<td>3.98</td>
</tr>
<tr>
<td>General skills</td>
<td>3.83</td>
<td>3.80</td>
</tr>
<tr>
<td>Scientific skills</td>
<td>3.90</td>
<td>3.85</td>
</tr>
<tr>
<td>Preparation for professional career</td>
<td>3.34</td>
<td>3.23</td>
</tr>
<tr>
<td>Lecturers</td>
<td>3.85</td>
<td>3.82</td>
</tr>
<tr>
<td>Information from your degree programme</td>
<td>3.52</td>
<td>3.52</td>
</tr>
<tr>
<td>Study facilities</td>
<td>3.56</td>
<td>3.74</td>
</tr>
<tr>
<td>Testing and assessments</td>
<td>3.70</td>
<td>3.60</td>
</tr>
<tr>
<td>Time-tables</td>
<td>3.75</td>
<td>3.76</td>
</tr>
<tr>
<td>Study load</td>
<td>3.62</td>
<td>3.58</td>
</tr>
<tr>
<td>Study guidance</td>
<td>4.45</td>
<td>3.40</td>
</tr>
<tr>
<td>Study environment</td>
<td>3.64</td>
<td>3.74</td>
</tr>
<tr>
<td>General atmosphere</td>
<td>4.22</td>
<td>4.10</td>
</tr>
<tr>
<td>Involvement in improving your degree programme</td>
<td>3.65</td>
<td>3.51</td>
</tr>
</tbody>
</table>

Science and Technology Student Award for Bart Saes

In March 2012, Utrecht Chemistry student Bart Saes received the Science and Technology Student Award. He wrote the best proposal for a Bachelor’s thesis in which the expertise of the strategic alliance between The technical University of Eindhoven, Utrecht University and the University Medical Centre Utrecht were combined. Bart Saes received the 2,500-euro award for a proposal that makes it possible to make even better use of biomass as a raw material in the chemical industry. In his project, he established a link to a current research project in Utrecht, while executing and using theoretical calculations in the area of conversion in Eindhoven.

Unilever Research Prize 2012 awarded to Mark Vis

Mark Vis, Master student of ‘Nanomaterials: Chemistry and Physics’ received the Unilever Research Prize 2012 for his special performance in his graduation research project. The jury praised his independent approach to research and his substantial expertise. Mark Vis graduated cum laude. He discovered a new type of liquid crystal with a so-called lamellar structure in mixtures of plate-shaped colloids. A sum of 2,500 euros was part of the prize.

Young Talent Incentive Prize for Riande Dekker

Bachelor student of Chemistry Riande Dekker won the Young Talent Incentive Prize of the Royal Holland Society of Sciences and Humanities on 30 November 2012. She received the prize for the excellent results she obtained in her first year.

Science Shop Prize 2012 for Stephan Leemhuis

The Science Shop Prize for most socially relevant research was awarded to Stephan Leemhuis for his research into an algorithm for an optimal use of storage systems for energy, and for his Master’s thesis about the placement of local systems for temporary energy storage.

Gold for the Netherlands at the International Mathematics Olympiad

Secondary school student Jetze Zoethout, (17), from Goutum won a gold medal at the International Mathematics Olympiad, which was held in Argentina. Jetze is studying Mathematics and Philosophy at Utrecht University this year. He aced his Mathematics A levels.

Students create smallest Van Gogh ever

Students Friso de Jongh and Almar Neiteler reduced Van Gogh’s masterpiece with a focused ion beam and projected the image onto a small piece of silicon.
Research

KEY FIGURES

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific publications</td>
<td>1715</td>
<td>1862</td>
<td>1849</td>
<td>1965</td>
<td>1859</td>
</tr>
<tr>
<td>PhD theses</td>
<td>139</td>
<td>132</td>
<td>139</td>
<td>159</td>
<td>115</td>
</tr>
</tbody>
</table>

Research volume per department; in FTEs and itemised per category of funding

<table>
<thead>
<tr>
<th></th>
<th>Biology</th>
<th>Pharmaceutical Sciences</th>
<th>In Information and Computing Sciences</th>
<th>Physics and Astronomy</th>
<th>Chemistry</th>
<th>Mathematics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government funding</td>
<td>34</td>
<td>34</td>
<td>13</td>
<td>32</td>
<td>33</td>
<td>14</td>
<td>160</td>
</tr>
<tr>
<td>Indirect funding</td>
<td>63</td>
<td>22</td>
<td>24</td>
<td>55</td>
<td>55</td>
<td>18</td>
<td>223</td>
</tr>
<tr>
<td>Contract funding</td>
<td>37</td>
<td>63</td>
<td>16</td>
<td>20</td>
<td>20</td>
<td>7</td>
<td>176</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>119</td>
<td>53</td>
<td>107</td>
<td>107</td>
<td>39</td>
<td>559</td>
</tr>
</tbody>
</table>

Source: Metis

1. Government funding is funding from the Ministry of Education, Culture and Science intended for Utrecht University. Indirect funding comprises grants from research financiers NWO — including STW and FOM — and KNAW for research programmes as well as personal grants, such as Veni, Vidi and Vici grants. Contract funding comprises all grants of other financiers, such as the EU, ministries, companies and non-profit organisations.

In 2012, 158 new subsidy projects were initiated: 77 indirect funding projects and 81 contract funding projects. The projects have a combined total value of more than 60 million euros.

PUBLICATIONS

In 2012, researchers of the Faculty of Science published in renowned scientific journals such as Science, Nature and Proceedings of the National Academy of Sciences. These and other publications have found their way to the general public.

Making plastics without petroleum

Biomass can be more efficiently converted into important materials for plastics, medicine and paint. The catalyst of minute iron particles has been developed by chemists of Utrecht University, who have published their research in Science. Professor Krijn de Jong is cooperating with Dow Benelux to further develop the catalyst, which means that products may be manufactured with this technique within a few years. Watch the interview with Professor Krijn de Jong about this research.

Stem cells attack brain tumour

By making smart use of stem cells, cell biologist Paul van Bergen en Henegouwen and his colleagues at Utrecht University, in cooperation with American colleagues, succeeded in combating tumours in mice brains. After injection into a tumour, the stem cells continuously attack it with proteins which destroy the cancer cells. The results of this research were published in the magazine Proceedings of the National Academy of Sciences. The researchers now continue their work related to the treatment of human cancer cells. Click here for the publication.

Consent about the reduction of Arctic ice after 20 years

After twenty years of at times contradictory results, an international team consisting of forty researchers, including Professor Michiel van den Broeke (research leader) and Dr Willem Jan van de Berg and their PhD students Jan van Angelen, Jan Lenaerts and Stefan Ligtenberg, has reached agreement about the question at which rate the ice sheets in Greenland and Antarctica are melting. In a publication in Science, researchers showed that these ice sheets are now melting three times as fast compared to the nineties. As a result, the sea water level has risen by 11.1 millimetres in the last twenty years.

* The decreased amount of FTEs affected the amount of scientific publications
Subsidies and grants

NWO large-scale research facilities (€ 32 million)
Two programmes coordinated at Utrecht University received funding from the Ministry of Education, Culture and Science to set up large-scale research facilities. The projects ‘uNMR-NL’ and ‘Proteins@Work’, in which several Dutch research institutes work together, received 18.5 and 13.5 million euros respectively.

AN ULTRA-HIGH FIELD NMR FACILITY FOR THE NETHERLANDS (uNMR-NL)
In the new uNMR-NL facility, researchers are going to use nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI) to get to the bottom of diseases such as Alzheimer’s and Parkinson’s, to discover new medicine, to develop new materials for batteries and solar cells and to improve the production of crops and food quality. “The facility that is being set up contains a new magnet that is stronger than the ones previously used in NMR and MRI”, says Marc Baldus, Professor at the Bijvoet Centre of Utrecht University and coordinator of the project.

PROTEINS@WORK
The Proteins@Work facility coordinated by Albert Heck plans to make high-quality techniques, equipment and expertise for research into proteins in cells and tissue available to biological and biomedical researchers in the Netherlands.

NWO Zwaartekracht (€ 18.3 million)
Theoretical physicists of Utrecht University and physicists of the University of Amsterdam and the Leiden University participate in the consortium ‘Delta Institute for Theoretical Physics: Matter at all Scales’. In 2012, this consortium received a prestigious Zwaartekracht subsidy to set up excellent scientific research programmes in the next ten years. Main applicants from Utrecht are Gerard ‘t Hooft and Henk Stoof.

ERC Advanced Grant (€ 2.5 million)
Bert Weckhuysen, Professor of Inorganic Chemistry and Catalysis received a prestigious ERC Advanced Grant of 2.5 million euros in 2012. Weckhuysen is going to focus on the development of techniques in the next few years in order to gain a better understanding of the preparation and functioning of catalysts used to convert biomass.

ERC Starting Grant (€ 1.5 million)
UU biologist Pankaj Dhonukshe received the prestigious European ERC Starting Grant of 1.5 million euros. He had already received a Dutch Vidi grant of 800,000 euros at the beginning of July 2012. Dhonukshe has received grants for his fundamental research into cell division in plants. The results of his research may contribute to the growing of better crops and an increased insight in the development of cancer.

ERC Starting Grant (€ 1.5 million)

NWO-Vici (€ 1.5 million)
- Petra de Jongh (Chemistry), title: Stable Nanoparticles for Sustainable Catalysis
- Ronald de Vries (Biology), title: Fungi in the Service of the Bio-Based Economy
- Fred Muller (Physics), title: The Structure of Reality and the Reality of Structure

NWO-Vidi (€ 800,000):
- Pankaj Dhonukshe (Biology), title: Oriented Cell Divisions: A Map to Building an Organism
- Corette Wierenga (Biology), title: A Balanced Brain
- Marijn van Huis (P&C), title: Jumping Atoms Transform Nanocrystals
- Andy Beale (Chemistry), title: Catalysts Ticking over Nicely
- Bert Jansen (Chemistry), title: How the Recovery of Nerve Damage is Impaired
- Gil Cavalcanti (Mathematics), title: From Generalized Complex Geometry to Four-Dimensional Spaces

NWO-Veni (€ 250,000):
- Martin Harterink (Biology), title: The Skeleton of Neurons
- Rashmi Sasidharan (Biology), title: Post-Flooding Trauma in Plants
- Alessandro Grelli (Physics), title: Research of a New State of Matter

Subsidy programmes for PhD students
- EU programme Innovative Doctoral Programme ‘ManiFold’ for the Bijvoet Centre (€ 2.6 million)
- NWO Graduate Programme for NIOK, Debye Institute and Bijvoet Centre (each € 0.8 million)

Contract cases in 2012

<table>
<thead>
<tr>
<th>Type of Contract</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral consultancy contracts</td>
<td>3</td>
</tr>
<tr>
<td>Bilateral contracts with a company</td>
<td>24</td>
</tr>
<tr>
<td>Bilateral contracts with a university</td>
<td>6</td>
</tr>
<tr>
<td>Consortium agreements</td>
<td>5</td>
</tr>
<tr>
<td>Non-Disclosure agreements</td>
<td>9</td>
</tr>
<tr>
<td>Material transfer agreements</td>
<td>13</td>
</tr>
<tr>
<td>Cooperation agreements (among other things PPC)</td>
<td>12</td>
</tr>
<tr>
<td>Other contract cases</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
</tr>
</tbody>
</table>

This list includes contracts which researchers concluded with external (private) parties. PPC stands for Public-Private Cooperation. In 2011, we had 67 cases; in 2012, we had 85.
Promising Utrecht Chemistry students eligible for extra scholarship

Promising Chemistry students of Utrecht University are eligible for a monthly allowance of 500 euros starting from the academic year 2012-2013. The following academic year, this scholarship system will be also offered at other Dutch higher Education Institutions. This scholarship is an initiative of the Association of the Dutch Chemical Industry and in cooperation with Utrecht University. The initiative is focused on counteracting the expected shortage of scientists and engineers.

See: http://www.uu.nl/NL/Actueel/Pages/Veelbelovendescheikundestudentenmakenkansopextrabeurs.aspx

“Essential for breakthrough of new-generation medicine”

New mass spectrometer for large biomolecules

Albert Heck, Professor of Biomolecular Mass Spectrometry at Utrecht University, in cooperation with Alexander Makarov of Thermo Fisher Scientific, has developed a mass spectrometer with which large and complex biomolecules can be accurately analysed for the first time. A breakthrough in the development of biologicals, a new generation of medicine that is winning ground, is thus within reach. The researchers described their findings in Nature Methods in October 2012. See: http://pers.uu.nl/nieuwe-massaspectrometer-voor-grote-biomoleculen/

“Exhibition & discussion about genetic modification”

Scientists ‘infect’ apples with knowledge

In November 2012, scientists of Utrecht University and the Netherlands Proteomics Centre, in cooperation with artist Charlotte Jarvis, ‘prayed’ apples with DNA containing the code of the Universal Declaration of Human Rights. The apples were on display from 15 November to 6 December 2012 as part of the exhibition ‘Blighted by Kenning’ in Droog, Amsterdam. The purpose of the exhibition was to inform the public about genomics research and its relevance. On 20 November, a discussion night about the image of genetic modification was held in Droog, Amsterdam.

See: http://pers.uu.nl/appels-genetische-modificatie-rechten-mens/

STW Perspectief for Microscopy Valley

In July 2012, the research programme Microscopy Valley was given the go-ahead by technology association STW. The programme concerns the development of combinations of fluorescence and electron microscopy techniques to make molecules such as proteins visible in cells. The combination of these two techniques, also known as correlative microscopy, bridges the various length scales relevant in a cell. The number of users of this new technique and the number of applications are increasing. Microscopy manufacturers are interested in the integration of fluorescence and electron microscopy in one single microscope.

In Microscopy Valley, three universities, three university medical centres, one research institute, thirteen companies and five other organisations work together under the leadership of Professor Hans Gerritsen of Utrecht University.

See: http://www.uu.nl/NL/Actueel/Pages/Ruim-zees-miljoen-euro-voor-ontwikkeling-nieuwe-microscopietechniek.aspx

Valorisation and outreach activities

Active science students

Study society A-Eskwadraat

In August 2012, students’ association A-Eskwadraat organised the seven-day International Conference for Physics Students, a conference with a highly diverse programme. Four hundred international Physics students attended the lectures of Gerard ’t Hooft and Hitoshi Murayama during this week.


Mebiose

Study society for Biomedical Sciences. http://www.mebiose.nl

Utrecht Biologists Association

The Utrecht Biologists Association makes great efforts to have Utrecht Biology students make the most of their days as a student. In 2012, this resulted in four area of action courses, which are now included in a module in Biology’s curriculum. http://www.projects.science.uu.nl/ubv/

U.S.S. Proton

Utrecht Chemistry Student Society Proton. Like every year, Proton organised an introduction for first-year students in 2012, in cooperation with the Department of Chemistry. Students went camping to get to know each other and played a game in the city centre to get to know Utrecht. The week was concluded with a departmental barbecue. http://www.ussproton.nl/

Unitas Pharmaceuticorum


Sticky

Study Society for Information and Computing Sciences and Information Sciences. https://www.stickyutrecht.nl/
Follow your ambition: Be Bèta

Pick any path you want with a science degree programme, there are more options than you think. In relation to this, the faculty launched a new website in September: www.betainutrecht.nl. At the Faculty of Science in Utrecht you can navigate your way around the world of science. Via a Bachelor’s programme, a Master’s programme or a profession, you can see through which study path they are connected. The website the faculty wants to meet the requirement of students in secondary education regarding an easy to navigate website where they can compare career perspectives, in support of their study choice.

Spin-offs for prospective students
The new website for prospective students of science programmes at Utrecht University has scored well in terms of user-friendliness among secondary school students. With this website is clear and easy to navigate. The website also meets the requirements of student societies and the government in terms of increased transparency of information about the degree programmes. Utrecht University intends to extend the site to cover the entire range of degree programmes.

If you choose a science programme in Utrecht, you get:

• A sound basis with many options
• Honours education: special programmes for talented and ambitious students
• Double major: two diplomas with 20% extra subjects
• Matching: choose a degree programme that meets your needs
• Low drop-out rate: 84% of students continue to the second academic year. (National 82%)
• High yield: 64% of students obtains a Bachelor’s diploma in four years. (National 57%)
• Education and research at an international top level (score high in rankings)
• A wide range of Master’s programmes