

# CHAPTER 3

# RESEARCH ORGANISATIONS



1

# HIGHER EDUCATION INSTITUTIONS<sup>1</sup>

1.1

## UNIVERSITY ASSOCIATIONS

The backbone of the output generated by Flanders' academic and other knowledge actors is shaped by the **5 university associations**. These associations each bring together one of the universities with one or more university colleges. University colleges provide higher education and advanced vocational training, and their mission includes research and the provision of other services to society. The bachelor qualification is the highest obtainable at the university colleges; master diplomas (and higher) remain the preserve of the universities.

The 5 university associations of the Flemish Community are:

- **Antwerp:** UA and 3 university colleges in the city of Antwerp
- **Brussels:** VUB and Erasmushogeschool Brussel, and a cooperation agreement with the Royal Military School
- **Ghent:** UGent and 3 university colleges, 2 in East-Flanders and 1 in West-Flanders
- **KU Leuven:** KU Leuven and 5 university colleges diffused over various locations in Flanders
- **Limburg:** UHasselt and university college PXL, along with TuL (= the Transnational University Limburg a cooperation between UHasselt and Universiteit Maastricht)

Universities and university colleges each have their organisation that promotes dialogue and cooperation amongst them and defends their interests in a concerted way. Universities are united in **VLIR** (Flemish Inter-University Council), while the university colleges come together in **VLHORA** (Flemish Council of University Colleges).

1.2

## UNIVERSITIES

The universities play a major role in (the output of) Flemish R&D. The universities generate almost 90% of all non-private scientific output in Flanders. The **five universities** of the Flemish Community are:

- Katholieke Universiteit Leuven (**KU Leuven**);
- Universiteit Gent (**UGent**);
- Universiteit Antwerpen (**UA**);
- Vrije Universiteit Brussel (**VUB**);
- Universiteit Hasselt (**UHasselt**).

1.3

## FUNDING

Public funding for the universities can be categorised into three budgetary flows:

- a **basic allowance** (from the Flemish Government's department Education and Training), amounting to 1,136.8 million euro in 2019, of which 394.5 million euro allocated for R&D-related initiatives;
- support granted on a **competitive** basis;
- a variety of (project-based) external (**private**) sources, donations, income from IPR, etc.

1.3.1

### COMPETITIVE FUNDING

The **Research Foundation Flanders** (Fonds Wetenschappelijk Onderzoek Vlaanderen, FWO) and the **Special Research Fund** (Bijzonder Onderzoeksfonds, BOF) mainly support academic fundamental and basic research. Both have an array of different types of funding to do so. Two complementary programmes

<sup>1</sup> For more information, visit [www.studyinlanders.be](http://www.studyinlanders.be)

are aimed at attracting (Odysseus, FWO) and retaining (Methusalem, BOF) top researchers. FWO support is granted based on competition between the different universities, while BOF support is a performance-based research funding system of which the funds are allocated to the Flemish universities based on fixed competitive parameters.

**VLAIO** and the **Industrial Research Fund** (Industrieel Onderzoeksfonds, IOF) mainly support industrial and applied research. VLAIO support is granted on a competitive basis, whereby applicants are evaluated on several criteria. VLAIO also provides support at academic level for research conducted at the request of companies; for example, through innovation mandates and Baekeland mandates. IOF support is a targeted subsidy for applied and strategic basic research, allocated to the universities based on fixed criteria and then granted based on intra-university competition.

Extra support is provided and aimed at further strengthening academic working conditions and research excellence, e.g. through the research infrastructure programme at FWO.

The **major budget sources** for 2021 were:

- FWO (356.03 million euro), of which 76.18 million euro for strategic basic research including doctoral grants, clinical research 17.23 million euro and 31.38 million euro for research infrastructure;
- BOF (222.243 million euro);
- IOF and interface activities (56.888 million euro).

### 1.3.2 PRIVATE FUNDING

Higher education institutions also receive **support from private partners** (to conduct contract research), donations and bequests from private persons or institutes, the federal authorities, other Flemish public bodies (mainly the Department for Education and Training) and the EU (mainly through the Horizon 2020 programme, and to a limited extent from other EU programmes such as ERDF-Interreg). Funding sources from commercialising

research results has also increased in recent years.

### 1.3.3 FLANDERS RESEARCH INFORMATION SPACE

All information relating to publicly funded research at the Flemish research institutes can be consulted via the Flanders Research Information Space research portal (FRIS). You will find information on researchers, research institutes, publications and projects. From 2022 on, also metadata of patents, research infrastructure and datasets will be published on the FRIS research portal [www.researchportal.be](http://www.researchportal.be).

The FRIS Research Portal offers a unique view of publicly funded research in Flanders. The portal is a source of inspiration for reporting, analyses and statistics. In this way, the government can improve its policies and respond better to trends in society.

In addition, FRIS strives to bring researchers closer together, to stimulate interdisciplinary research, to enable networking between researchers and to help find experts in certain disciplines.

Thanks to direct integration with the systems of the scientific institutions, FRIS offers the most recent data. A change in the database of a research center is immediately implemented on the portal. All information about researchers, research groups, publicly funded projects and all publications from 2008 onwards is accessible to everyone.

In 2018, FRIS was awarded the Agoria e-Gov Award "Open Data" and "Best Project".

## 2

# STRATEGIC RESEARCH CENTRES

Flanders aims to be a front-runner in the European knowledge society and economy by continuing to build on and utilize its existing knowledge base and by increasing its innovation potential. Apart from the universities, the leading Flemish research and innovation actors are the **four strategic research centres** (SRC, or 'Strategische Onderzoekscentra' (SOC) in Dutch), sometimes referred to as public research organisations (PRO). Each of the centres is active in a specific research area and they have co-founded several spin-off or start-up companies, often based on breakthrough research.

The Flemish Government concludes with each of these SRC a multi-annual management agreement including key performance indicators, in return for an annual grant. In addition, some SRC receive a grant for the execution of reference tasks on behalf of the Flemish government. The total budget from the Flemish Government for the 4 SRC reached 264.6 euro in 2021. The amount of public support for Imec alone is 111.6 million in 2021, which makes it the biggest funding from the Flemish Government awarded to any knowledge institute.



embracing a better life

- World-leading research and innovation hub in nanoelectronics and digital technologies
- Over 4,000 researchers with almost 100 nationalities
- Various R&D groups in Flanders, the Netherlands, Taiwan and the US
- €640 million revenue in 2019

[www.imec-int.com/en](http://www.imec-int.com/en)



- Independent research centre focused on cleantech and sustainable development
- Almost 1,000 employees from 45 countries, including over 100 people with a PhD
- Interdisciplinary research and large-scale pilot installations
- Focuses on the fields of energy, chemistry, materials, health technology and land use
- €205 million revenue in 2019

[www.vito.be](http://www.vito.be)



science meets life

- Independent research institute doing cutting edge research on molecular mechanisms of life, from microorganisms to plants and human beings
- 1,700 scientists from 75 countries
- Close collaboration with Flemish universities and businesses to bridge the gap between scientific research and entrepreneurship
- Achieved major biotech breakthroughs
- €115 million turnover in 2019

[www.vib.be](http://www.vib.be)



DRIVING INNOVATION IN MANUFACTURING

- Strategic research centre that stimulates product and production innovation for the Flemish industry
- 600 full-time researchers and over 140 company members, of which 50% are Small and Medium sized Enterprises (SMEs)
- Close collaboration with universities, other research institutions and businesses
- High-tech research infrastructure for testing and validating new products
- €65 million turnover in 2019

[www.flandersmake.be](http://www.flandersmake.be)

## 2.1 IMEC



Imec (Interuniversity Microelectronics Centre) is a world-leading research and innovation hub in nanoelectronics and digital technologies. Leveraging its unique combination of leadership in microchip technology with profound software and ICT expertise, imec creates disruptive innovation in application domains such as healthcare, smart cities and mobility, logistics and manufacturing, energy and education.

Imec employs around 4,000 researchers from almost 100 nationalities. It is headquartered in Leuven (Belgium) and has distributed R&D groups at a number of Flemish universities, in the Netherlands, Taiwan and the USA. Moreover, imec has offices in China, India and Japan. In 2019, imec's revenue (P&L) totaled 640 million euro, of which over 100 million euro from the Flemish Government.

The imec campus in Leuven (Belgium) consists of 24,400m<sup>2</sup> of office space, laboratories, training facilities, technical support rooms, and 2 cleanrooms which run a semi-industrial operation (24/7). There is a 300mm cleanroom that focuses on advanced R&D towards (sub-)3 nm process technology and a 200mm cleanroom for R&D, development-on-demand, prototyping and low volume manufacturing of innovative technology solutions for smart applications including sensors, actuators, and MEMS, NEMS, PV technologies, wireless technologies, life sciences technologies, wearables, ...

Imec has, among others, a pilot line for silicon and organic solar cells, unique laboratories for bioelectronics research, life sciences labs, state-of-the art tools for materials characterization and reliability testing, dedicated labs for sensor and imaging technologies, wireless connectivity, ...

### 2.1.1 IMEC'S RESEARCH

Imec's research covers various aspects of nanoelectronics such as advanced semiconductor scaling, low power sensing and actuating, radar and radio technology, and digital technologies including data science and security expertise and AI. By setting up local and global ecosystems of partners across a multitude of industries, imec creates technology solutions enabling innovation in various domains, such as healthcare, smart cities and mobility, logistics and manufacturing, sustainable energy and smart education.

Among its fields of expertise:

- CMOS and beyond CMOS technologies
- Advanced patterning solutions
- Image sensors and vision systems
- Silicon photonics
- Connected health solutions
- Photovoltaics
- GaN
- Sensor solutions for IoT
- Solutions for IoT communication
- Radar sensing systems
- Solid state batteries
- Data science and data security
- Flexible electronics
- Technologies for life sciences
- Artificial intelligence

Imec was founded in 1984 as a non-profit organization led by Prof. Roger Baron Van Overstraeten. It is supervised by a Board of Directors, which includes delegates from industry, Flemish universities and the Flemish Government. Since 1984, imec has been led by Roger Van Overstraeten, Gilbert Declerck (as of June 1999), and Luc Van den Hove (as of July 2009).

### 2.1.2 IMEC'S VENTURING INITIATIVES

Imec offers an ecosystem of tailored venturing support to give new start-ups and entrepreneurs a head-start on their road to market. Imec has a long history of launching start-ups and supporting innovative ideas. Imec already launched 118 spin-offs since its foundation in 1984.

Imec's business accelerator program, imec.istart, offers selected start-ups an initial financial injection (50,000 EUR pre-seed funding), professional coaching and mentoring, access to technology and working facilities, access to its network of partners and investors. Since its launch in 2011, imec.istart helped more than 198 tech start-ups in diverse fields, ranging from multimedia and logistics to the healthcare sector, to develop into sustainable ventures. In 2019, imec.istart was granted first place in the European 'Top University Business Accelerators' ranking by UBI Global and was ranked fourth best in the world.

Imec.xpand is a venture capital fund initiated by imec, investing in innovative semiconductor and hardware research spinouts and startups. Imec.xpand is an independently managed, game-changing way to enable early-stage nano electronics-based innovation powered by imec, the world-leading R&D hub for nanoelectronics and digital technology.

### 2.1.3 LEVERAGING EXPERTISE TO EXCEL

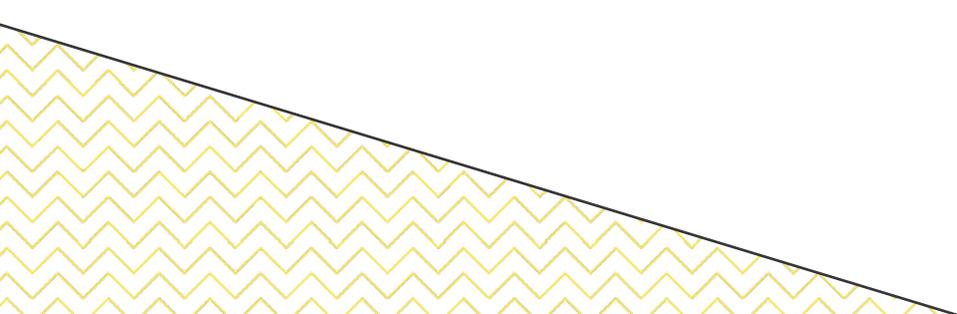
Imec partners with other research leaders in the region to combine and leverage expertises and drive innovation and position our region as a leader in a specific research domain.

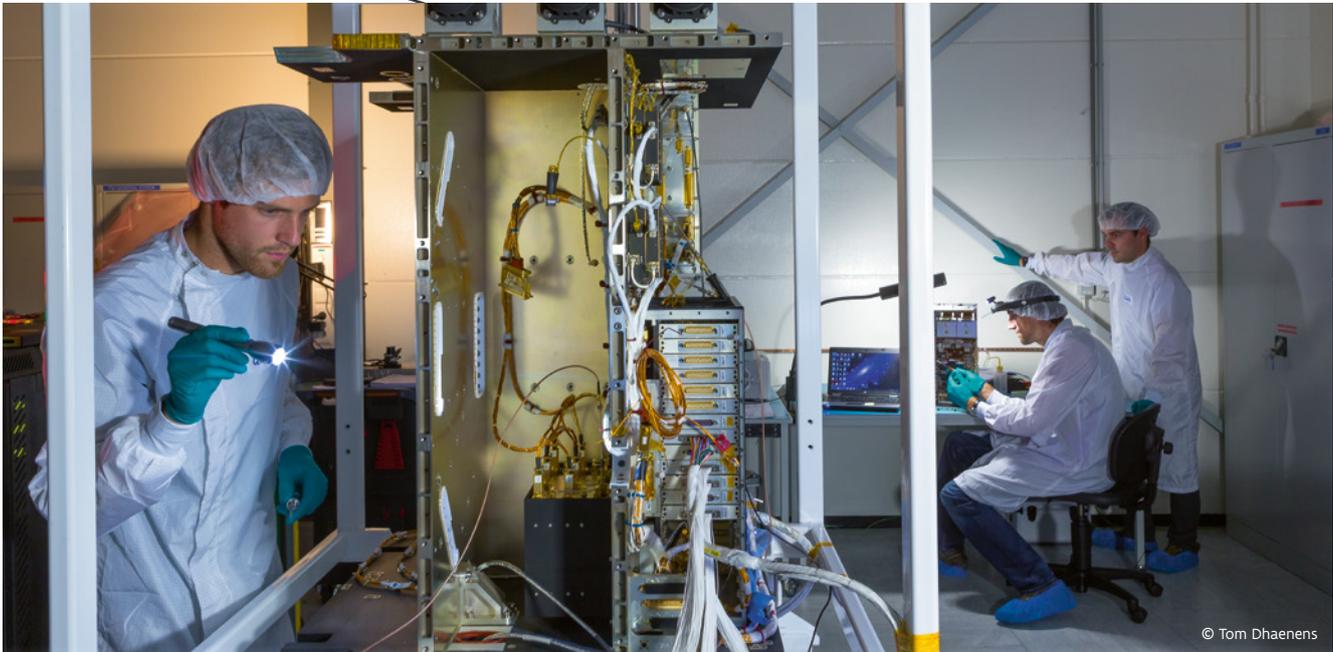
Holst Centre, set up in 2005 by imec and TNO (The Netherlands), is an independent research and innovation center, developing wireless technologies and flexibel electronics, aiming at responding to the global societal challenges of tomorrow and contributing to a healthier and more sustainable world. Supported by local, regional and national governments, Holst Centre is located on High Tech Campus Eindhoven, benefiting from, and contributing to, the state-of-the-art on-site facilities. Holst Centre has over 180 employees from 28 nations.

EnergyVille was set up by imec, KU Leuven, VITO, and UHasselt to perform research into sustainable energy and intelligent energy systems. EnergyVille employs 400 researchers whose work centers around six interdisciplinary domains: photovoltaics, electrical and thermal storage, power control and conversion, electrical and thermal networks, buildings and districts, strategies and markets.

Solliance Solar Research was founded in 2010 as a joint venture between the Dutch TNO, the Belgian imec and ECN (the Energy research Centre of the Netherlands, that became a part of TNO since 2018). Together with the industrial and academic partners Solliance Solar Research plays a leading role in the worldwide research and development of thin-film solar technology.

OnePlanet research center is a Dutch innovation center for Food, Health and Agricultural Technology. It was launched in 2019 as a collaboration between imec Radboud University, Wageningen University & Research (WUR) and the academic hospital Radboudumc focusing on the development of sustainable technologies for food, health and agriculture.





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## 2.2 VIB



VIB (Vlaams Instituut voor Biotechnologie – Flemish Institute for Biotechnology) is an independent research institute where some 1,700 top scientists from Belgium and abroad conduct pioneering basic research. As such, they are pushing the boundaries of what we know about molecular mechanisms and how they rule living organisms such as human beings, animals, plants and microorganisms. Based on a close partnership with five Flemish universities – Ghent University, KU Leuven, University of Antwerp, Vrije Universiteit Brussel and Hasselt University – and supported by a solid funding program, VIB unites the expertise of all its collaborators and research groups in a single institute.

VIB's technology transfer activities translate research results into concrete benefits for society, such as new diagnostics and therapies and agricultural innovations. These applications are often developed by young start-ups from VIB or through collaborations with other companies. This also leads to additional employment and bridges the gap between scientific research and entrepreneurship.

VIB also engages actively in the public debate on biotechnology by developing and disseminating a wide range of science-based information.

The institute has already achieved major breakthroughs in the fields of cancer research, immunology and inflammation, neurobiology and neurogenetics, angiogenesis and cardiovascular disease, plant biology and plant systems biology. VIB manages 2 bio-incubators and 1 bio-accelerator in Ghent and Leuven. It's 2019 revenue was 115 million euro, of which 77 million euro public funding.

### 2.2.1 VIB'S RESEARCH

VIB consists of eight thematic research centres with a total of 81 research groups performing pioneering research at the campuses of the partner universities.

- VIB-KU Leuven Center for Brain & Disease Research
- VIB-KU Leuven Center for Cancer Biology
- VIB-KU Leuven Center for Microbiology
- VIB-UAntwerp Center for Molecular Neurology
- VIB Center for Inflammation Research
- VIB-UGent Center for Medical Biotechnology
- VIB-UGent Center for Plant Systems Biology
- VIB-VUB Center for Structural Biology

One of the institute's strengths is the combined expertise of its scientists, who are world leaders in their field, and the core facilities that allow the use of the latest technologies on a scale that cannot be achieved by a single research group.

Finding answers to the most crucial questions in tomorrow's life sciences requires both a multidisciplinary and multilevel approach, as well as different levels of magnification and aggregation. These levels range from organism to organ and cellular and subcellular levels to molecular and even atomic levels.

To enable such an approach, VIB scientists need critical mass, diversity and interdisciplinarity. Therefore, talented researchers and technicians are recruited from different academic and geographic backgrounds. Driven by curiosity, they are encouraged to think unconventionally and explore across boundaries.

Cooperation between Flemish research institutions is increasingly common. For example, Neuro-Electronics Research Flanders (NERF) is an interdisciplinary research center, empowered by imec, KU Leuven and VIB. NERF studies neuronal circuits and develops new technologies to link circuit activity to brain function.

### 2.2.2 VIB'S TECH TRANSFER ACTIVITIES

While research forms the basis of scientific knowledge, transferring the research results to the marketplace is of equal importance to VIB. The Innovation & Business team ensures that research results are translated into tangible products and services that find their way to patients and consumers. Financial return from tech transfer activities is reinvested in VIB's basic research programs.

Translating scientific findings into drugs for patients or products for consumers is a long and costly process, requiring skills, expertise and financial means that exceed VIB's resources. To bridge this gap, VIB has established partnerships with several companies. Additionally, VIB's Discovery Sciences team specifically bridges the gap between promising targets to the commercial development of products, de-risking the initial investments of interested industry partners.

To fuel economic growth and accelerate the translation of VIB's research into actual products, investment in the establishment of new start-up companies is of the utmost importance. So far, VIB has been involved in creating 22 new companies in the field of therapeutics, diagnostics, ag-bio and bioethanol, employing around 850 people.

Biotech companies need appropriate infrastructure to carry out their work. VIB has invested in three biotech incubators in Leuven and two Bio-Accelerators in Ghent. The bio-incubator in Ghent now houses 10 companies with 216 employees. The Leuven bio-incubator houses 16 companies with 382 employees. Ghent is also the home for the bio-accelerator which allows small companies to accelerate their development into key players. Currently, 4 companies and 575 employees are located here.

### 2.2.3 INVESTING IN CUTTING-EDGE TECHNOLOGY

Science and technology are inextricably intertwined. The development of new technologies often leads to breakthroughs in scientific research. VIB's core facilities and 'Technology Watch' program ensure that its scientists have early access to a wide range of state-of-the-art technologies. Staying at the forefront in research also means staying on top of developments on the technology front. VIB's Technology Watch team continuously scouts for novel technologies of potential interest to VIB and, when appropriate, mediates early access to these disruptive technologies through partnerships with cutting-edge technology providers.

VIB believes in an integrated approach to the various 'omics' domains. This approach opens perspectives to gain more focused insights into the molecular blueprint of many development and disease processes. However, it requires a techno-scientific expertise that is impossible to create within one research group.

VIB has recognized this trend and made substantial investments in embedding high-tech platforms in the institutional core and service facilities. In consultation with the Technology Watch team several leading-edge technology platforms have been implemented. VIB's core and service facilities do not only provide their high-tech equipment and expertise to researchers within the institute; they also reach out to scientists from academia and industry. A recent evaluation by an international expert panel has confirmed the status of VIB's core facilities as 'gold standard' in Europe.

To solidify VIB's position at the leading edge of technological development, VIB has recently launched the Technology Innovation Lab. This Technology Watch division focuses on providing VIB researchers to priority access to the very latest research technologies, often still in the prototype or pre-commercial stage.

In order to significantly consolidate VIB's expertise in single cell studies – a research field of increasing importance – the Single Cell Accelerator program was initiated. Through this initiative, VIB scientists will have access to funding to evaluate, develop and integrate emerging breakthrough single-cell technologies at VIB.

## 2.3 VITO



VITO (Vlaamse Instelling voor Technologisch Onderzoek - Flemish Institute for Technological Research) is an independent research centre in the area of **cleantech and sustainable development** in Flanders. As an innovative customer-oriented research organisation, it accelerates the transition to a sustainable world, providing knowledge and technological innovations that facilitate this transition to a more sustainable society. VITO de-risks innovation for businesses and strengthens the economic and societal fabric of Flanders, with interdisciplinary research and large-scale pilot installations.

VITO does this in the field of energy, chemistry, materials, health technology and land use. VITO unites different parties in a sustainable value chain. By cooperation, expansion and development of expertise, we can make smarter use of existing sustainable solutions and develop new technologies. Technology should be feasible and cost-effective. This calls for partnerships between research centres, commercial parties and the authorities, who together create impact in the sustainability transition. VITO is the driving force by providing practical knowledge, innovative processes and business models.

Anyone who wants to do sustainable business must opt for circular economy in all its forms. In 2019, VITO focused more than ever on circularity. The search for better and more sustainable forms of energy and energy management have led to new insights. In view of the challenges posed by climate change, VITO puts a lot of effort into everything to do with land use. More efficient use of agricultural land will lead to better harvests, less spraying and more profitable cultivation. By better monitoring the water in our watercourses, we can draw conclusions and make forecasts. In this way we can anticipate the negative consequences of a changing climate. VITO focuses on developing solutions that can capture and reuse CO<sub>2</sub>, reduce the energy demand for chemical processes and answer questions about the processing of plastic waste and residual flows. VITO also focuses on all environmental factors that determine our health. Through large-scale biomonitoring, VITO helps governments to draw conclusions and take measures.

In 2019, VITO employed 959 employees and 103 PhD's and postdocs of 45 nationalities. VITO had a revenue of 203 million euro of which 63 million euro public funding. Apart from Flanders, it has offices in China, India and the Middle East.<sup>2</sup>

## 2.4

## FLANDERS MAKE



Flanders Make is the Flemish strategic research centre that aims at stimulating **product and production innovation** in the Flemish manufacturing industry, thus supporting the further digital transition towards Industry 4.0 and (consequently) further strengthening the international competitiveness of the Flemish manufacturing industry. Flanders Make's research focuses on the development of personalised, smart and connected products (vehicles and machines) and production systems (flexible assembly). Its 2019 revenue was 65 million euro of which 24.9 million euro of the Flemish Government.

Flanders Make identifies three market trends to which it responds with its research:

1. smart interconnected products and production systems
2. customised production at the cost price of serial production
3. sustainable production centred on human needs

## 2.4.1

## KEY COMPETENCES

Flanders Make combines its expertise in four key competences, all related to modelling and virtualisation. For each key competence, a 10-year research roadmap has been developed and a cluster has been set up in which Flanders Make works together with universities and other research institutes as well as companies on (pre-competitive) research, tailor-made innovation (for individual companies) and testing and validation.

Under 'Decision & Control', the focus is on innovations in localisation, adaptive control and decision support for operators. Flanders Make helps the industry to measure data, interpret data and apply it in robust, self-learning measuring and knowledge instruments to improve mechatronic systems. Artificial intelligence plays a major role in these areas.

Under 'Design & Optimisation', Flanders Make helps developers to improve the increasingly-complex design process, by aligning the production process from the outset. Specific tools give designers near-instant insight into the different possible concepts and optimal design choices. Flanders Make also offer support for production environments, in which it takes the impact of production on the design into account.

'Motion Products' emphasizes products with a motion component such as vehicles and machines, helping enterprises to develop new 'future-proof' products which are smart, automatically adapt to the environment to provide optimal performance, and use digital, Industry 4.0 technology. The focus is on the architecture and the validation of systems, as well as the combination of autonomy and automation (autonomation) for professional applications.

'Flexible Assembly' is about supporting businesses in their digital transformation to become 'factories for the future' getting smart machines and people to work together. Research is done into flexible assembly units that can cope with multiple product variations.

## 2.4.2

## RESEARCH INFRASTRUCTURE

Flanders Make provides high-tech research infrastructure where companies can test and validate their products, i.e. (components of) vehicles or machines, and optimise their production processes. All these activities take place in the three physical 'co-creation sites' (combining office space and research labs) of Flanders Make in Kortrijk (customised production), Lommel (vehicle development) and Leuven (machine development) and at the Flemish drone federation EUKA in Sint-Truiden on the one hand, and in the labs and test facilities of the universities (inter alia the Core Labs dedicated to the clusters) and other research institutes associated with Flanders Make on the other hand. Today, Flanders Make has more than around 600 researchers and over 140 company members (of which 50% are SMEs).

## 3 FLEMISH SCIENTIFIC INSTITUTES

Within the Flemish Community, there are five scientific institutes, each managed by a department of the Flemish Government. These perform scientific research in a specific policy field. Apart from building up and diffusing the knowledge gained from scientific research, the institutes also provide advice and assistance to policy-makers, as well as services to society as a whole. Furthermore, they strive to develop and exchange their knowledge through international contacts or programmes and via cooperation with other (foreign) institutes, e.g. through membership of EU research networks.

- The **Agency Botanic Garden Meise** (Agentschap Plantentuin Meise) is a scientific research institute, that operates as a centre of excellence for research into tropical and European botany, with a collection of over 18,000 species of plants and one of the largest herbaria in the world. It has been a part of the Flemish Community, following its de-federalisation in 2014, as an agency of the EWI domain.
- The **Institute for Agricultural and Fisheries Research** (Instituut voor Landbouw en Visserijonderzoek, ILVO) conducts research in four main areas: plant sciences (applied genetics, breeding, crop protection), animal sciences (functional nutrition), technology and food science (food safety) and social sciences; in many cases this research is conducted in collaboration with various international partners;
- The **Research Institute for Nature and Forest** (Instituut voor Natuur- en Bosonderzoek, INBO) conducts research on themes such as fauna, flora, biotopes, areas and regions, sustainable land and water use, with a focus on factors such as ecohydrology, acidification, pollution and climate change;
- The **Royal Museum of Fine Arts Antwerp** (Koninklijk Museum voor Schone Kunsten Antwerpen, KMSKA) is charged with the care of a unique art collection, composed of mainly Flemish works, complemented with several pieces from other schools;
- The **Agency for Archaeological Heritage** (Agentschap voor Onroerend Erfgoed, AOE) conducts research into the immovable heritage of Flanders (archaeology, monuments, landscapes), focusing on themes such as the restoration of historic gardens, sea wrecks, historic organs, parks, industrial and maritime heritage, etc.

## 4 OTHER FLEMISH KNOWLEDGE INSTITUTES

Apart from the aforementioned organisations, there exist a variety of other institutions and organisations in the public domain with activities that primarily focus on (scientific) data collection, research and/or knowledge generation. In most cases, they are mainly or to some extent supported by the Flemish Government. Some of these organisations play a prominent worldwide role in their field of activity.

The largest knowledge institutes include:

- The **Flanders Marine Institute, VLIZ** (Vlaams Instituut voor de Zee): is renowned for supporting coastal and marine scientific research. It does so by offering an array of services for which scientists do not have the time or resources, but that are nevertheless essential for the success of scientific research. It operates the Simon Stevin vessel (the Flemish multidisciplinary coast research ship), manages the InnovOcean campus site and the Flanders Marine Data and Information Centre, which is active in international networks such as the IOC of UNESCO. It also houses the European Marine Board and supports the European-level initiatives EMODnet and JPI Oceans. VLIZ has been instrumental in supporting knowledge brokerage for the benefit of the Blue Economy in Flanders, where the new spearhead cluster 'Blue Cluster' is catalysing innovation projects among its industrial membership;
- The **Institute for Tropical Medicine, ITM** (Instituut voor Tropische Geneeskunde, ITG): is one of the world's leading institutes for training, research and support of tropical medicine and health care in developing countries, providing (reference) clinical services for the management of tropical diseases. ITM hosts many international reference laboratories and is an expert centre on HIV;
- The **Centre for Research and Conservation (CRC)**: is the research department of the Royal Zoological Society of Antwerp (RZSA), conducting applied and fundamental hypothesis-driven conservation research in various zoological disciplines (e.g. veterinary sciences). Research takes place in Flanders, in zoos and associated institutions, as well as in Brazil, Cameroon and Congo (bonobo research).

# 5 INSTITUTES GOVERNED BY OTHER AUTHORITIES

## 5.1 FEDERAL AUTHORITY

Belgium has **ten federal scientific establishments**, most of which are located in Brussels. They cover a wide variety of research activities and collections and include museums, libraries, weather and space observatories, as well as research institutes dealing with African culture, geology and public health. Some of these bodies not only perform research in specific fields of expertise, but also have a publicly orientated scientific mission. At the administrative level, they are managed by various policy fields and under the overall responsibility of the federal State Secretary for Science, as part of the Programmatic Public Service for Science Policy (BELSPO).

The federal scientific establishments have a **two-fold mission**: a scientific public service mission on the one hand (the development, maintenance and dissemination of scientific, technical and cultural information and documentation, collection conservation, etc.) and a research mission on the other hand (through research often conducted in partnership with the universities of the Flemish and/or French Community). As such, these establishments interact with and enhance the scientific potential and outcome generated by the actors in the Flemish STI landscape, particularly the researchers in higher education institutions who are active in the same field of activity. The federal scientific institutes are:

- the Belgian Institute for Space Aeronomy (BIRA);
- the National Library of Belgium (KBR);
- the Royal Belgian Institute of Natural Sciences (KBIN);
- the Royal Institute for Cultural Heritage (KIK);
- the Royal Meteorological Institute (KMI);
- the Royal Museum for Central Africa;
- the Royal Museums of Art and History (KMGK);
- the Royal Museums of Fine Arts of Belgium (KMSK);
- the Royal Observatory of Belgium (including the Planetarium) (KSB);
- the State Archives of Belgium.

In addition to these institutes, there also exist **federal partner institutions and other organisations subsidised by BELSPO** (for example, the University Foundation), whilst some of the federal scientific institutes report to other federal public services. E.g. in the field of health, Sciensano provides research and monitoring services on health-related risks in the broad sense (healthcare, animal health, environment, food safety, medications and vaccines...).

The Federal Government also has responsibility for two other research organisations, being **the National Institute for Radioelements (IRE)**, and the renowned **Belgian Nuclear Research Centre (SCK CEN)**.



## 5.2 INTERNATIONAL INSTITUTIONS, ORGANISATIONS OR PLATFORMS IN THE STI FIELD

Apart from institutes related to or managed by the Government of Flanders and the Federal Government, there are also a few other EU or international institutions located in Flanders that collect scientific data or conduct research. Some of these receive funding or support from the Flemish Government.

Examples include:

- the **EU Joint Research Centre (JRC)** known as the **Institute for Reference Materials and Measurements (IRMM)**, location: Mol (nearby the Flemish VITO and the federal SCK/CEN);
- The executive offices of the **EU's Joint Technology Initiatives** for Innovative Medicines (IMI), Clean Sky, Electronic Components and Systems for European Leadership (ECSEL) Fuel Cells and Hydrogen (FCH), location: Brussels;
- **European Cooperation in Science and Technology (COST)**, funding organisation for science and technology research networks, location: Brussels;
- the **ESA Business and Innovation Centre (ESA BIC)**, location: Mol and Geel;
- **United Nations University Institute on Comparative Regional Integration Studies (UNU-CRIS)**, location: Bruges;
- the **European Marine Board (EMB)**, location: Ostend;
- **European Marine Observation and Data Network (EMODnet)**, location: Ostend;
- the **Project Office of the Intergovernmental Oceanographic Commission (IOC)** of UNESCO for the International Oceanographic Data and Information Exchange (IODE) programme, location: Ostend;
- the Von Karman Institute for fluid dynamics, which is funded by consortium of 15 countries, location: Sint-Genesius-Rode.

## 6 POLICY RESEARCH CENTRES

In 2001, the Flemish Government launched a centralised 'Steunpunten' programma (policy research centres programme) to provide a scientific basis for policy research. From 2016 on, a decentralised approach towards policy research centres was elaborated whereby every policy area was made responsible for setting up, funding and following up its own centres. The policy research centres that are active today with the EWI policy area are:

- **Expertisecentrum Onderzoek en Ontwikkelingsmonitoring van de Vlaamse Gemeenschap (ECOOM, Expert Centre Research and Development monitoring of the Flemish Community)**: an inter-university consortium in which all Flemish universities participate;
- **Steunpunt Economie en Ondernemen (Store, Policy Research Centre Economy and Entrepreneurship)**: a cooperation between KU Leuven and UGent.

ECOOM is, inter alia, responsible for the calculation of the official R&D-intensity indicator of Flanders, whilst the Policy Research Centre Economy and Entrepreneurship analyses spearhead clusters and maps entrepreneurship in Flanders. In 2022 ECOOM and Store merged.

## 7

## OTHER BODIES OF PUBLIC INTEREST IN THE FIELD OF SCIENCE AND INNOVATION

Several other long-standing public institutions of the Flemish Community, which are related to science policy in a more academic context, play a promotional or advisory role. Although they are not directly involved in policy-making, they are part of the broader Flemish STI domain:

- **Koninklijke Vlaamse Academie van België voor Wetenschappen en Kunsten** (KVAB, Royal Flemish Academy of Belgium for Arts and Sciences), established in 1772;
- **Koninklijke Academie voor Geneeskunde van België** (KAGB, Royal Academy of Belgium for Medicine);
- **Koninklijke Academie voor Nederlands Taal- en Letterkunde** (KANTL, Royal Academy for Dutch Language and Literature), established in 1886;
- **Stichting Technologie Vlaanderen voor Innovatie en Arbeid** (STV voor Innovatie en Arbeid, the Flanders Foundation for Technology Assessment in Innovation and Work), which is a part of the SERV;
- **Vlaamse Academische Stem** (VLAAS, Flemish Academic Centre for Science and the Arts) is a non-profit organisation supported by both the KVAB and the KANTL.

## 8

## RESEARCH INFRA-STRUCTURES

The Flemish policy relating to research infrastructure is the responsibility of two entities, namely FWO and the EWI Department. EWI is the liaison with the relevant minister. It drafts policy and is responsible for regulations. It represents Flanders in the Belgian consultative bodies and expresses the Flemish/Belgian position in international forums. FWO supports fundamental and strategic, basic research in Flanders. The three complementary financing instruments of the FWO for research infrastructure are: the programme for **medium-scale research infrastructure** (150,000 to 1,000,000 euro); the programme for **large-scale research infrastructure** (starting from 1,000,000 euro); and the programme for **international research infrastructure** (IRI).

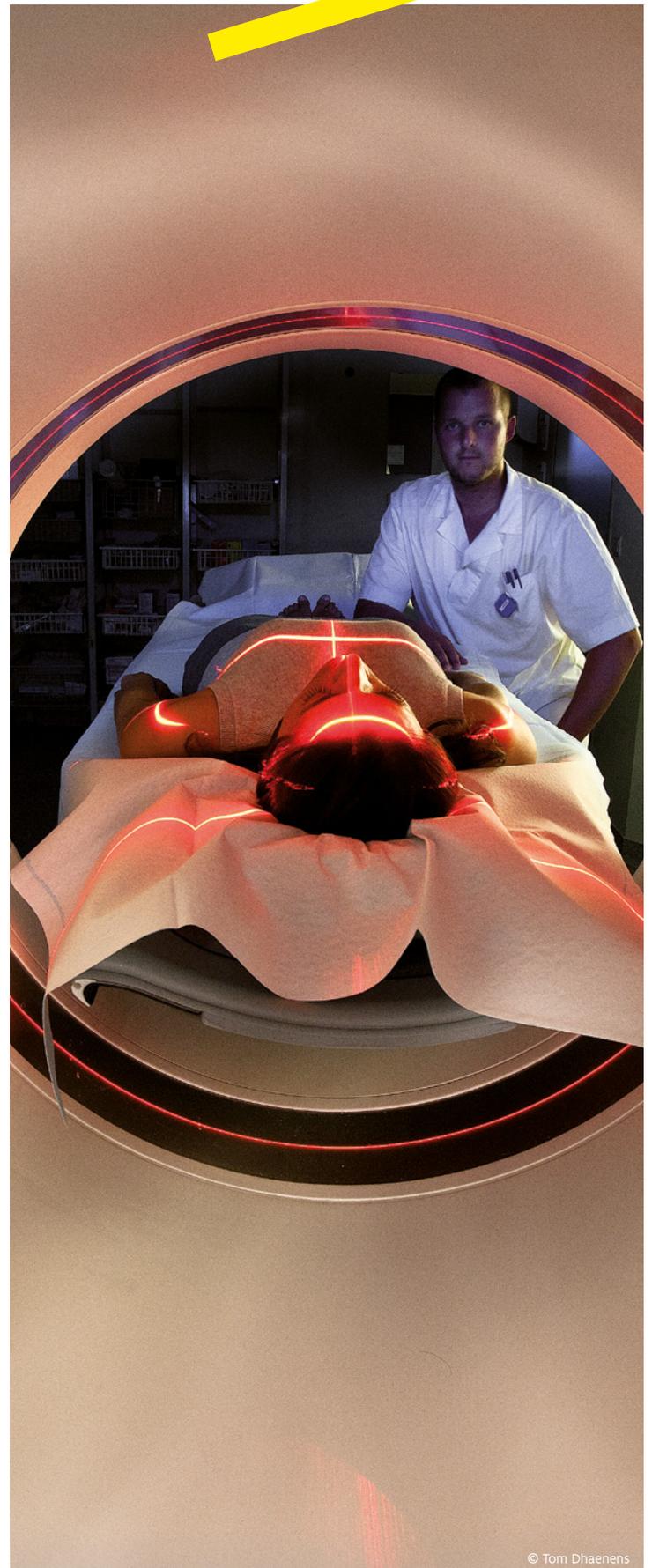
EWI has published an extensive brochure<sup>3</sup> covering both the regional as well as the international large-scale research infrastructures. The **regional large scale infrastructures** covered by the brochure are:

- **PolyLine** (smart energy)
- **3teslaMRI** (brain mapping)
- **Caps-It** (infectious microorganisms with a high or unknown biosafety risk)
- **Cryo-TEM** (Cryogenic Transmission Electron microscope)
- **KU Leuven FACS Core Facility** (flow cytometric analysis)
- **NextGenQBio** (Next Generation Screening in Quantitative Biology & Drug Discovery)
- **PacBio Sequel I** (Long Read Sequencer)
- **PHENOVISION** (plant phenotyping platform)
- **Q-MIP** (Quantitative Molecular Imaging Platform)
- **SPHYNX** (Studying PHYsiology with NeXt generation Molecular imaging system)

3 "Large scale research infrastructures in Flanders. Flemish participation in international research infrastructures 2020"

[www.vlaanderen.be/publicaties/large-scale-research-infrastructure-in-flanders-flemish-participation-in-international-research-infrastructure-2020](http://www.vlaanderen.be/publicaties/large-scale-research-infrastructure-in-flanders-flemish-participation-in-international-research-infrastructure-2020)

- **Combined TOFSIMS-in situ SPM instrument** (3D-nanochemical analysis)
- **Flemish Atom Probe User Facility** (Atom Probe Tomography)
- **Freeform Optics** (pilot line for advanced freeform optics)
- **HAXPES-lab** (High Energy Photoelectron Spectroscopy system)
- **HyLaForm** (Hybrid laser-based additive – subtractive research platform)
- **Lena Clean Room** (MEMS & Packaging Clean Room)
- **MC-ICP-MS** (Platform for interdisciplinary isotopic research by means of multi-collector inductively coupled plasma – mass spectrometry)
- **Multi-Nano** (Multimodal Fluorescence Microscopy and Nanoscopy Platform)
- **NMRCORE** (Nuclear Magnetic Resonance spectroscopy platform for Convergent REsearch)
- **PaRtiCLE** (A Proton Research beam Line)
- **XCT-Centre** (X-ray Computed Tomography Centre)
- **Library of Voices** (musical heritage resources)



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## 9

# COOPERATION AND OUTREACH TO BUSINESSES

## 9.1

## COOPERATION AMONG KNOWLEDGE ACTORS WITHIN FLANDERS

The various Flemish R&D&I performers cooperate increasingly among each other. In some cases, this takes place through formal institutes or cooperation agreements. There is numerous cooperation through and with strategic research centres like VIB or imec, from the level of individual research groups up to the level of the university as a whole. Two examples of the latter are:

- **Energyville vzw:** association of KU Leuven, VITO, imec and UHasselt in the field of sustainable energy and intelligent energy systems. It provides expertise to industry and public authorities on energy-efficient buildings and intelligent networks for a sustainable urban environment. This includes, for example, smart grids and advanced district heating and cooling.
- **Neuro-electronics Research Flanders, NERF:** this basic research initiative is a collaborative venture between imec, VIB and KU Leuven. It aims to unravel the neuronal circuitry of the human brain through research that combines nano-electronics and neurobiology.

Cooperation may also take place on a project basis and include federal or international institutes that are located in Belgium. For example, ILVO cooperates with UGent and Scienscano. The InnovOcean site in Ostend is home to an array of actors in the field of marine issues: the province of West-Flanders, VLIZ (Flanders), IODE (UNESCO/IOC Project Office), the secretariats from the European Marine Board (EMB) and from the European Marine Observation and Data network (EMODnet). The EC's JRC IRMM in Mol cooperates in Belgium with, among other, VITO, imec, KU Leuven, VLIZ and UGent.

## 9.2

## TECHNOLOGY TRANSFER

Networking with the knowledge institutions in the field of innovation takes place through the business developers of the **Technology Transfer Offices** of the five university associations, the similar services of the strategic research centres and the knowledge diffusion actors of the university colleges.

The Tech Transfer Offices of the five Flemish universities are well developed and operate independently with a focus on the valorisation of the expertise within their own university association.

In order to lower the barrier for external potential partners they have developed a **common website** TTO Flanders, which offers a unique portal to the knowledge and technology of the five Flemish universities and thirteen university colleges and aims to:

- be a unique point of contact for industry looking for research expertise and licensing opportunities
- maximise the valorisation of the available university knowledge and technology for the benefit of the economy and society
- further improve the collaboration between the TTOs of the Flemish universities
- strengthen the performance of the TTOs by developing common means and sharing best practices
- become a player on the European and international innovation scene.



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To develop strategic alliances with companies, each Flemish university has created dedicated **expertise centres**. The expertise centres are clustered around five domain (and one residual category).

- Health;
- Materials & Chemistry;
- ICT & Electronics;
- Cleantech & Energy;
- Engineering;
- Others.

Each expertise centre is coordinated by a business developer who has a liaison role in the process of the valorisation of knowledge, between on the one hand the researchers and their findings and the other hand the business and the market. The business developers have an overview of the expertise within their domain and can refer efficiently within the university and the market.

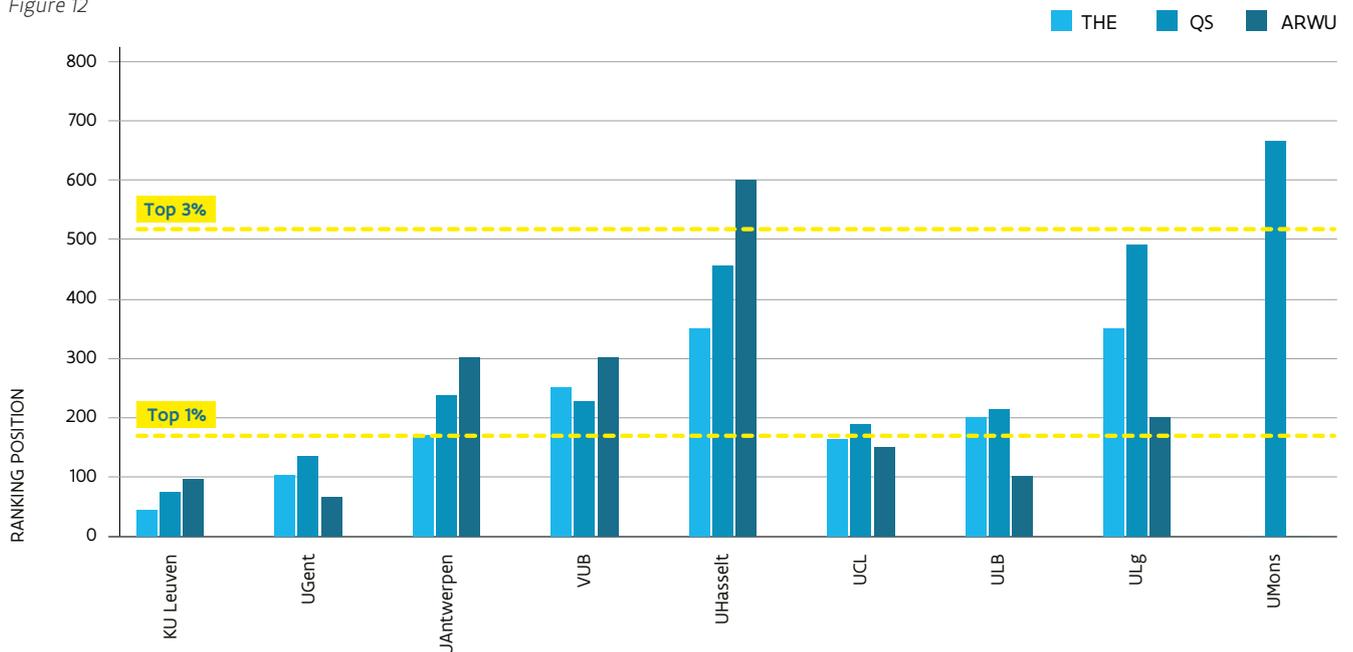
10

# PERFORMANCE FROM INSTITUTIONS BENCHMARKED INTERNATIONALLY

Several international rankings exist in which academic or knowledge institutes are listed, that can provide an indication of their relative strength in an international perspective. The presence of universities from the Flemish Community in the major worldwide rankings are as follows:

## RANKING POSITION OF THE BELGIAN UNIVERSITIES 2020

Figure 12



All the Flemish universities score very high on these three different rankings and belong almost for each ranking to the top 3% worldwide. The Catholic University of Leuven and the Ghent University even rank in the top 1% for all these three rankings.

Each ranking uses different criteria with different weights in their calculation of the ranking position. We give the main elements for these three well known rankings.

**The Times Higher Education (THE) World University Rankings 2021** is an international “league table” ranking that uses 13 metrics clustered in following 5 indicators teaching, research, citations, industry incomes and international outlook.

**The Academic Ranking of World Universities (ARWU) 2020**, the so-called “Shanghai Ranking”, scores the 1,000 universities worldwide that have the best results on indicators that are mainly focusing on research (Highly cited researchers in Web of Science, articles in Nature and Science, articles in two citation indexes of Web of Science and results on the indicators per researchers) and prestige (Alumni and staf with awards). Since 2019 all Flemish universities are part of this ranking.

**The Quacquarelli Symonds (QS) World University Ranking 2022** scores universities worldwide on the indicators Academic reputation, Employer reputation, Faculty/student ratio, Citations per faculty, International faculty ratio and International student ratio.

Next to this three well known rankings, the European Commission asked to develop another type of ranking. Since 2014 the **online ranking tool U-Multirank** is active. The U-Multirank is different than the other rankings because it scores the universities in groups from A “very good” to E “weak”. This meets a frequently recurring criticism of rankings, namely that the allocation of ranking positions makes performance differences between universities appear larger than they really are. Through an online tool [www.umultirank.org](http://www.umultirank.org) it is possible to compare universities based on the criteria of your own choice. The 35 different criteria are grouped into 5 dimensions: Teaching & learning, Research, Knowledge Transfer, International Orientation and Regional Engagement.



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