Research in Flanders

In Flanders public research is mainly situated within the universities. There is no additional separate network of research institutes in the region, as is the case in some of our neighbouring countries (e.g. CNRS-institutes in France and Max Planck institutes in Germany). That is why you can find every kind of research within the universities: basic research, applied research and innovation. To achieve their triple mission (education, research and innovation, and scientific and societal services) the universities receive government funding (85 M€ for the University of Antwerp in 2007). In 2008 the importance of the research parameters for the assignment of the funding will increase because parameters that refer to the triple mission of the university are incorporated in the new Flemish funding model for higher education. Although the government funding can to a large extent be spent freely, all universities use approximately 75% of it for the remunerations of their academic and managerial staff. As a result the funding of research at the universities is to a large extent a matter of externally and competitively acquired resources.

The parallel government funding of fundamental research includes especially the Research Foundation – Flanders (FWO, research initiated by the researchers, > 100 M€ a year for Flanders to fund doctoral students, postdocs and research projects) and the resources granted annually by the government on the basis of competitive parameters (master degrees, doctorates, publications and citations) for the Research Fund (BOF) at each university (100 M€ a year for Flanders, of which 11.9% for the University of Antwerp in 2007). Moreover resources for fundamental research are divided by the federal Belgian government to research groups that are recognised as Inter-University Attraction Poles (IUAP).

The funding of basic and applied research is regulated mainly by the Institute for the promotion of Innovation by Science and Technology in Flanders (IWT, 250 M€ a year), for example by means of specialisation grants for doctoral students, projects for Strategic Basic Research (SBO) and bilateral projects with companies. Moreover the Flemish Community provides resources for basic and applied research by funding
twelve Policy Research Centres housed within universities and by means of the Industrial Research Fund (IOF, 12 M€ a year, of which 11.5% for the UA in 2007). The Industrial Research Fund too is driven by competitive parameters (doctorates, publications, citations, spin-offs, patents).

The University of Antwerp has also actively attracted international funding, in particular through the successive EU-programs, for the pursuit of basic and applied research.

Contracts with private companies are of course also an important source of income for the funding of basic and applied research. In order to encourage contracts with industry, the Flemish government funds Interdisciplinary institute for BroadBand Technology (IBBT). The institute has the structure of ‘laboratories without walls’, i.e. the research groups involved house in existing universities. Two University of Antwerp research groups, the Visionlab in the department of Physics and the PATS research group in the department of Mathematics and Computer Science participate in the institute.

From the above brief overview one can conclude that researchers in Flanders have a broad array of funding opportunities at their disposal. These can be grouped into funding for fundamental research (BOF and FWO), other government funding (e.g. IUAP, IWT, IOF), international funding (e.g. EU) and private funding.

**Faculty and research positions at the Flemish universities**

All members of the academic staff belong to one of the following three categories:

- Professors (‘independent academic staff’, ZAP): lecturers, senior lecturers, professors and full professors. Each professor has an education task, a research task and contributes to scientific and social assistance. Research takes officially 25% of the time, yet the university uses 40% as a target. After a first appointment as professor one is evaluated after three years and, with a good evaluation, permanently appointed. A limited number of research professors (ZAPBOF, funded by the BOF)
spends 100% of their time doing research, although most take on a limited teaching load too.

- Research and teaching assistants (‘assisting academic staff’, AAP), either working towards a PhD (mandate assistant, three times an appointment of two years), or postdoctoral (doctoral assistant, one time three years, extendible once for two or three years). Each assistant has to spend at least 50% of the time doing research. Having successfully finished a MSc is a minimum prerequisite to start as an assistant.

- Researchers (‘special academic staff’, BAP), either doctoral students or postdocs, are paid with internal (BOF, IOF) or external funds. This can be with a personal mandate (FWO-doctoral student, FWO-postdoc, IWT-doctoral student, IWT-postdoc, BOF-doctoral student) or an appointment funded with project resources, but in both cases the researchers spend 100% of their time doing research. To acquire a personal mandate or to be appointed as a researcher, one needs to have a MSc.

To qualify for an appointment as a professor or for a promotion to a higher rank, professors have to meet the criteria of the rank in which they are appointed or to which they are promoted. A first professorial appointment is mostly as lecturer and is for three years, followed by a permanent appointment upon positive evaluation. There is, in other words, no tenure track system in Flanders (although one will start for a limited number of positions from 2009 onwards). Only in exceptional cases a first professorial appointment is made in a higher rank. Consequently, the rank of senior lecturer, professor or full professor is normally acquired through internal promotion.

Every second year all professors are invited to apply for promotion. Each faculty presents its opinion regarding the candidates to the Central Evaluation Commission, on the basis of whose proposal the Board of Directors decides which professors get promoted. Each professor gets evaluated every five years. That period is shortened up to three years after a first appointment, a permanent appointment or a promotion. These evaluations are done by the evaluation commission within each faculty. They judge whether the achievements are ‘favourable, ‘undersized or ‘insufficient’.
The University of Antwerp

The University of Antwerp (UA) was founded in 2003 after the merger of the three universities that were previously known as RUCA, UFSIA and UIA. The university's roots go back to 1852. The University of Antwerp has approximately 10,000 students, which makes it the third largest university in Flanders. Over 1,000 of these students - exchange students not included - are from foreign countries, with a majority of EU countries. In order to face the challenges posed by the internationalization of European education and research, the University is part of the Antwerp University Association (AUHA) offering academic and professional education to over 25,000 students.

The University of Antwerp has faculties in Applied Economics, Arts and Philosophy, Law, Medicine, Pharmaceutical and Biomedical Sciences, Political and Social Sciences, and Sciences. The four campuses are situated in the historic city centre and in the green belt to the south of the city.

The University of Antwerp has a strong research orientation. According to the 3rd EU Report on Science and Technology Indicators (2003) the university belongs to the EU’s leading universities in terms of relative scientific impact scores in the natural and biomedical sciences. The research orientation of the university is apparent from the fact that external research funding amounted to 64 M€ in 2007, i.e. 75% of the block grant (85 M€) the university receives from the Flemish government. Along with 400 faculty, the university employs 250 research and teaching assistants and 880 researchers. Annually, the faculty publishes over 3,000 original scientific works, about 1,200 of which are included in the Web of Science. On average 100 doctoral students out of a pool of about 800 obtain their doctorate (PhD). Furthermore, every year, around 1,000 students successfully complete a postgraduate degree programme (MA or MSc). Research activities include fundamental and basic scientific research, as well as applied and policy-oriented research.

The University of Antwerp houses Centres of Excellence in nanotechnology, in molecular neurogenetics, in environmental studies, in social policy and in vaccine & infectious diseases. Each of these centres clusters a number of research teams working
in neighbouring fields of science, thus combining high-quality basic research into the required critical mass in terms of staff and ongoing research programmes.

The university also houses seven Core Facilities providing expert technological support accessible to researchers from both academia and industry. One of these is CalcUA, one of the most powerful computer clusters of Belgium and headed by professor Annie Cuyt of the department of Computer Science. CalcUA provides capacity to perform highly demanding calculations in a broad range of research applications (computer science, mathematics, biomedical sciences, physics, chemistry, linguistics, ...), at a speed of 3 billion operations/second.

The allocation model of the University of Antwerp

The University of Antwerp has taken the new Flemish funding model for the higher education into account to introduce a new internal allocation model. Through this model 65 M€ (out of the total block grant of 85 M€) is distributed between the seven faculties. The model gives each faculty a basic allowance, which in total contains 30% of the university’s funding. The share of each faculty in this basic allowance is stipulated on the number of students (50%) and doctoral students (50%). The remaining 70% is divided between the faculties on the basis of educational parameters (47%, i.e. 33% of the total) and research parameters (53%, i.e. 37% of the total). The research parameters are:

- bachelor and master degrees (25%),
- PhD thesis (30%),
- publications (25%), for the natural and biomedical sciences only SCIE-publications are counted, whereas for human and social sciences all articles and books incorporated in the Academic Bibliography are taken into account,
- doctoral students and postdocs (10%), and
- externally acquired funding (10%).
In 2007, the Faculty of Sciences got assigned 23.3% of the university funding on the basis of the allocation model. On the research parameters the faculty scored 29.7%, i.e. 14.2% bachelors and masters degrees, 41.0% of PhDs, 39.0% of SCIE-publications, 40.3% of doctoral students and postdocs, and 33.3% of the acquired research funding. In the near future, the implementation of the allocation model will allow all seven faculties to develop autonomously and to implement their own policies.

The Faculty of Sciences

The Faculty of Sciences offers bachelor degrees, master degrees and a PhD program in Biology, Chemistry, Computer Science, Physics and Mathematics. The faculty also offers a bachelor degree in Bio-engineering and advanced masters in Environmental Sciences and Nanophysics. A total of 996 students are enrolled, either pursuing a bachelor degree (546), a master degree (109) or a PhD (339). The master programmes are one year by law, but will from 2009 onwards become two years, allowing, among other things, to prepare for doctoral studies. Every year, about 100 students finish their master and about 40 finish their PhD.

The organisation of the Faculty of Sciences is such that Computer Science and Mathematics are in one department. The 11 professorships in Computer Science (selections to fill one vacancy are currently being held) are thus a de facto sub-department.

A total of 200 students pursue studies in Computer Science. 130 Of them are enrolled in the bachelor Computer Science, 15 in the master Computer Science and 55 in the PhD programme Computer Science. Over the last 6 academic years (including the current) 13 researchers have defended their PhD in Computer Science at the University of Antwerp.
Research in Computer Science

An academic department has the task of carrying out research of high quality, leading to internationally recognized results. To achieve this one has to choose between two strategic options: either focus on a single research theme (and aim to become a leading voice), or cover a broad area (and forge numerous international cooperations). The Computer Science Department of the University of Antwerp has opted for the latter approach for two reasons. (a) Robustness: Computer Science is a young and rapidly changing field, hence it is very difficult to identify a focus point that can last for more than a few years. (b) Vulnerability: the University of Antwerp is rather small and focus on a single research theme has the inherent risk of inbreed, something a small university cannot afford. Other factors played a choice in this role as well, such as the lack of an industrial context (Antwerp —being a harbor city— has no obvious candidates for synergies with industry around Computer Science) and the lack of an engineering faculty (which could help in leveraging research results).

Consequently, we adhere to the following mission statement:

*The research in Computer Science (``Informatica'') at the University of Antwerp should cover a representative sample of the field to provide excellent academic education and achieve excellent service to the society. In order to develop a culture of ``bio-diversity'', we actively seek for synergies both inside and outside the department.*

The current teaching curriculum of Computer Science consists of four modules: (1) Software Engineering, (2) Telecommunication and Distributed Systems, (3) Databases and Data mining, (4) Computational Science. These modules are a superstructure for the different active research groups within the department, which are (in alphabetical order):

- *AdREM*: Advanced Database Research and Modelling
- *CANT*: Computer Arithmetic and Numerical Techniques
- *COMP*: Computational Modelling and programming
INTRODUCTION

- **ECT**: Emerging Computational Techniques
- **FOTS**: Formal Techniques in Software Engineering
- **LORE**: Lab On Reengineering
- **PATS**: Performance Analysis of Telecommunication Systems

Each research group presents itself in detail later in this document. In each of the group reports, the second chapter (Scientific Activity) lists the publications, research projects, national and international collaborations for that research group. This demonstrates that the model of diversity works and that we are indeed able to forge numerous international cooperations.

Moreover, the department actively seeks internal synergies and embraces a culture of cross-fertilization. Ph.D. students are encouraged to be aware of what goes on within all the research groups through the WIS- and FRIS-seminars (WIS seminars invite external speakers, while FRIS-seminars offer presentations by Ph.D. students — see http://www.seminars.win.ua.ac.be). Office space is arranged such that Ph.D students should interact with one another. Consequently, Ph.D.-students typically have lunch together in the nearby university restaurant; they buy presents jointly for the graduation ceremony; ...

As a result, there is a good level of cooperation between the research groups. Figure 1 shows a link between a research group when there has been a joint publication or a joint project in the last 9 years (since 2000).
To understand the structure of the department, it is important to know its historical roots. The turning point there is the creation of the University of Antwerp (officially October 2003), as a fusion of the three former Antwerp Universities: RUCA ("Rijksuniversitair Centrum Antwerpen"), UIA ("Universitaire Instelling Antwerpen") and UFSIA ("Universitaire Faculteiten Sint-Ignatius Antwerpen"). Since UFSIA lacked a faculty of sciences, hence also a computer science department, the department unites both mathematics and computer science departments of both the RUCA and UIA.

Studies in computer science at the former RUCA arose in an interdisciplinary context. In the initial stages it was supported largely by various academic personnel with a background in computational programming, and was later taken up as a unit in the overall structure of the University of Antwerp. This group further specialised in distributed computing in general and in particular in innovative forms of high-
performance computing. Following this early phase, further personnel doing research on applications in the field of computer modelling were taken on board.

At the former UIA, the first professor in Computer Science was appointed in 1974-75. First a research group on formal computer science was founded, then another on databases. In 1990-91 the RUCA-UlA began a comprehensive university study programme within the Sciences Faculty leading to the Licentiate degree in Computer Sciences. This programme was restructured at the time of the inauguration of the University of Antwerp in 2000. Since 1983-84 a graduate study programme designated ‘Complementary Studies in Computer Science’ was also offered.
Research evaluations at the University of Antwerp

The University of Antwerp regards research evaluations as a self-evident feature of its research policy. This is apparent from successive initiatives to monitor the quality of its research. In 1991, the University of Antwerp requested the Centre for Scientific and Technology Studies (CWTS, Leiden University, the Netherlands) to carry out a bibliometric analysis of the publication pattern of the research groups in the exact and biomedical sciences. This was followed in 1999 by a second bibliometric study, which was conducted in conjunction with a peer review by foreign experts.

Against the backdrop of these bibliometric studies, the other Flemish universities were invited, both in 1999 and 2006, to organize research evaluations together or on a region wide scale. These attempts remaining unsuccessful, the University of Antwerp decided to start its own cycle of discipline-specific research evaluations in 2007. Each year, the quality of the research groups of two disciplines is to be evaluated by a panel of international peers that visits the university one or two days. In steady state the research groups in each discipline will be evaluated every eight years, with an intermediate evaluation if relevant.

During the academic year 2007-2008 the research groups in economics and computer science are evaluated. As in the Dutch system of Research Evaluations, and contrary to the UK Research Assessment Exercise, the results will not have any direct consequences for the departments and research groups involved. The results will be presented to the Research Council of the university, whose members will advice upon the follow-up of each research evaluation.

The assessment criteria used throughout the research evaluations at the University of Antwerp are the same as those defined in the Dutch Standard Evaluation Protocol 2003-2009 for Public Research Organisations. The main criteria in the evaluation are:

- Quality (international recognition and innovative potential)
- Productivity (scientific output)
• Relevance (scientific and socio-economic impact)
• Vitality and feasibility (flexibility, management, and leadership)

Each international peer panel presents its judgements on these criteria according to a five-point scale: excellent, very good, good, satisfactory, and unsatisfactory. A detailed description of the evaluation criteria and the five-point scale is given below.

Assessment criteria

**Quality** is to be seen as a measure of excellence and excitement. It refers to the eminence of a group’s research activities, its abilities to perform at the highest level and its achievements in the international scientific community. It rests on the proficiency and rigour of research concepts and conduct; it shows in the success of the group at the forefront of scientific development.

**Productivity** refers to the total output of the group; that is, the variegated ways in which results of research and knowledge development are publicised. Usually, quantitative indicators measure this. The output needs to be reviewed in relation to the input in terms of human resources.

**Relevance** is a criterion that covers both the scientific and the technical and socio-economic impact of the work. Here in particular research choices are assessed in relation to developments in the international scientific community or, in the case of technical and socio-economic impact, in relation to important developments or questions in society at large.

**Vitality and feasibility** refers to the internal and external dynamics of the group in relation to the choices made and the success rate of projects. On the one hand, this criterion measures the flexibility of a group, which appears in its ability to close research lines that have no future and to initiate new venture projects. On the other hand, it measures the capacity of the spokesperson to run projects in a professional way.
Assessment of policy decisions is at stake, as well as assessment of project management, including cost-benefit analysis.

**Extended description of the five point scale**

**Excellent:** Work that is at the forefront internationally, and which most likely will have an important and substantial impact in the field. The research group is considered an international leader.

**Very good:** Work that is internationally competitive and is expected to make a significant contribution; nationally speaking at the forefront in the field. The research group is considered an international player and a national leader.

**Good:** Work that is competitive at the national level and will probably make a valuable contribution in the international field. The research group is considered internationally visible and a national player.

**Satisfactory:** Work that is solid but not exciting, will add to our understanding and is in principle worthy of support. The research group is nationally visible.

**Unsatisfactory:** Work that is neither solid nor exciting, flawed in the scientific and or technical approach, repetitions of other work, etc.