



**Identifying the Best:
The CHE Ranking of Excellent European Graduate
Programmes in the Natural Sciences and Mathematics**

Sonja Berghoff
Uwe Brandenburg
Diane J. Carr
Cort-Denis Hachmeister
Detlef Müller-Böling

CHE Centre for Higher Education Development gGmbH
Verler Str. 6
33332 Gütersloh
Germany

Phone: ++49 (0) 5241 97 61 0
Fax: ++49 (0) 5241 97 61 40
E-Mail: info@che.de
Internet: www.che.de

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CENTRE FOR HIGHER
EDUCATION DEVELOPMENT



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Abstract

The Centre for Higher Education Development (CHE) has designed a “Ranking of Excellent European Graduate Programmes.” In this first round, the ranking has concentrated on the natural sciences and mathematics. The centre applied a two-step approach for analysis. First, four general indicators were identified for all European universities. Second, for those universities that excelled in at least three out of these four indicators with a gold or silver medal, an in-depth analysis was run based on institutional questionnaires and online surveys. The results show that Europe in general provides a very high level of research and of graduate teaching in the academic fields that were analysed. This project is intended to be transferred to other academic fields in the near future.

Acknowledgements

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- Johanna Witte who cooperated in developing the project as a core project team member from the starting phase onwards,
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Genesis and philosophy

The Centre for Higher Education Development (CHE) has created a “Ranking of Excellent European Graduate Programmes” (in short: CHE-ExcellenceRanking) in the fields of biology, chemistry, mathematics, and physics.

On the basis of our longstanding experience with ranking of European higher education institutions in Austria, Belgium, Germany, the Netherlands, and Switzerland, the CHE intends to contribute to the European Higher Education Area while demonstrating the competitive strength of European universities.

The CHE-ExcellenceRanking is one of the strategies to extend the national perspective of the CHE-UniversityRanking. Instead of looking at all HEIs for a country, the approach of the ExcellenceRanking consists of selecting a small number of excellent institutions for further investigation.

Target Groups

The CHE-ExcellenceRanking targets the following groups:

1. *Undergraduates from European and non-European universities intending to earn a master's or PhD degree (or equivalent) in the sciences and mathematics:*

The objective of the CHE-ExcellenceRanking is to fill the existing gap of information sought after by students who are in their final stage of (or just finished) their undergraduate studies and who intend to pursue a master's or PhD degree. Besides general information on the institutions with one or two top group places¹ in the ranking, these students will benefit by receiving more in-depth information on a highly selective group of top class Higher Education Institutions (HEIs) in the fields of biology, chemistry, mathematics, and physics. The information will be divided into the different disciplines and according to the multidimensional approach of the CHE. This approach will not show a league table but rather, depending on different indicators, groups of particularly excellent HEIs. The information will be divided into the different disciplines and according to the CHE-Ranking Principles:

- No aggregation of individual indicators or an overall score for an entire HEI but a subject-related presentation of results.
- No weighed overall score for the research performance of a faculty but a consideration of each indicator separately.
- No league table and ranks but profiles of research-intensive HEIs.

2. *Higher Education Institutions (HEIs):*

The excellent HEIs with three or four gold or silver medals to be presented will benefit from the CHE-ExcellenceRanking in various ways. Firstly, being selected out of approximately 4.000 HEIs in the whole of Europe may be regarded as a highly useful marketing tool. Secondly, the CHE-ExcellenceRanking will inform prospective master's and PhD students and thus can be perceived by the included HEIs as an outstanding opportunity for student recruitment. Finally, the HEIs will be able to compare their performance in a broad variety of aspects to that of other European HEIs of similar excellence. This will allow them to identify areas in which they may be able to increase their as of yet high-level standards.

¹ The methodology of the CHE-ExcellenceRanking described later is based on a differentiation between European HEIs according to their top performance in up to four indicators.

3. *Organisations and the society at large*

Organisations such as foundations and other funding institutions are continuously in need of information regarding excellent programmes which might best serve their grantees. The CHE-ExcellenceRanking will provide such information with the awareness of the limitations of certain indicators. Moreover, it will allow the public to get an inside view into the research abilities and teaching capacities in the natural science and mathematics fields of the finest higher education institutions in Europe. Thus, the ranking will help to promote the knowledge society and will also prepare the natural science and mathematics fields for the increasing demand for life-long learning.

Basic Methodology²

The CHE-ExcellenceRanking follows the sound and internationally recognised methodological principles³ which have been developed by the CHE. These principles include a discipline-oriented and multidimensional approach, abstaining from a comparison of institutions as a whole and taking the heterogeneous preferences of students into account. In doing so, we emphasize the importance of considering different perspectives from inside the university. Additionally, we highlight our preference to classify institutions in three broad quality clusters, rather than assigning individual ranks that focus on a limited number of universities per subject. Of course, the methodology will be adapted to differences deriving from the heterogeneity of countries as well as to the specialities of the fields of analysis. The CHE-ExcellenceRanking also adheres to the *“Berlin Principles on Ranking of Higher Education Institutions”*⁴ as launched during the meeting of the International Ranking Experts Group (IREG) in Berlin in May 2006.

The CHE-ExcellenceRanking differs from the established CHE-UniversityRanking in that it looks for examples of excellence throughout the whole of Europe rather than presenting each institution in the context of the entire European higher education setting. In this first phase, the search is focusing on the fields of biology, chemistry, mathematics, and physics. In follow-up phases, it will be extended to other academic fields.

The analysis of the European higher education institutions concentrated on measures for research achievements. Thus, in the first “pre-selection” step, European HEIs were identified as excelling in one of four indicators. The top group for each indicator was identified depending on the distribution of its values. A steep distribution produced a small top group, a smooth distribution, a larger top group. In a second step, this top group was divided into two subgroups by applying the same method as for the first grouping. Each indicator shows three groups that are named gold, silver and bronze medal.

Achieving a gold (or silver) medal means that the respective institution belongs in the group of institutions which cover at least 25% (or 50%, if silver) of the total amount of publications, for example, counted for all institutions. The share of medals therefore depends on the shape of the distribution: If there are few institutions with a large number of publications, there will be fewer medals than for a smoother distribution. A bronze medal

² For a detailed explanation of the methods see annex A.

³ See for example: Tavenas (2004), Van Dyke (2005), Usher/Savino (2006) and Marginson (2006).

⁴ See: http://www.che.de/downloads/Berlin_Principles_IREG_534.pdf

is given to those institutions that do not belong to this 50% top group, but still perform better than average in the respective indicator.

The CHE is aware that every selection of indicators, however carefully set up, carries the risk of overlooking individual research teams or of not taking into account a specific department with a particular expertise.

The classification is based on the following four indicators:

- **Number of publications⁵ in the web of science (1997 – 2004)**

The “size” indicator

This is the number of publications found in the web of science with a query by institution and subject: biology, chemistry, mathematics, and physics, with the publishing year from 1997 to 2004.

- **Citations (normalized to the international standard)**

The “reception” indicator

This indicator compares the average number of citations received by the papers of a research unit (CPP) with its international reference value, namely corresponding the field-based mean citation score (FCSm) by calculating the ratio. It was developed by Anthony van Raan and the CWTS as a measure for the visibility of a department compared to an international standard. Self-citations are excluded in the calculation of the ratio to prevent the ratio from being affected by divergent self-citation behaviour.

- **Outstanding researchers**

The “lighthouse” indicator

This indicator identifies institutions with outstanding researchers. Only researchers that are still teaching at the specific institution are counted. Thomson Scientific provides a list of “Highly Cited Researchers,” each of whom are among the 250 most cited researchers for their published articles within a specific time period.⁶ In addition, Nobel prize winners and field medallists in mathematics were taken into account.

- **Number of projects in the Marie Curie programme⁷**

The “European dimension” indicator

This indicator measures European activity. The Sixth Framework Programme's Human Resources and Mobility (HRM) activity is largely based on the financing of training and

⁵ The publication and citation indicators were computed by Prof. Dr. van Raan from the CWTS Leiden.

⁶ See: <http://hcr3.isiknowledge.com/home.cgi>

⁷ See: <http://cordis.europa.eu/fp6/projects.htm>

mobility activities for researchers. These activities, known as the Marie Curie Actions, are aimed at the development and transfer of research competencies, the consolidation and widening of researchers' career prospects, and the promotion of excellence in European research. Six activity lines were taken into account relative to their financial impact and availability.

The results of the allocation of gold, silver or bronze medals in any of the four indicators resulted in a table containing all those universities which managed to receive at least one silver medal in one of the four indicators (top group).

In a second step, those institutions with at least three silver medals in the four indicators in each academic field were chosen for the next phase of the project (excellence group). These institutions were considered for an in-depth analysis and presentation. Study conditions, programmes and other criteria were taken into consideration. In order to ensure the best possible quality of the endeavour as well as the utmost intercultural awareness, a group of HEIs covering different countries and academic fields was chosen to test the questionnaires and methods. Since education and research systems differ considerably within Europe, the CHE-ExcellenceRanking was interested in giving these aspects of the research proper consideration. The testing partners were selected according to a variety of indicators, including performance level in as many of the analysed fields as possible and regional spread, to help identify “cultural” differences in the various university systems.

In the next project phase, the data collected from the institutions and the information gathered from online questionnaires were analysed and, depending on the statistical validity, ranked according to the CHE principles. If such validity could not be stated, the data were presented without groupings.

Indicators fulfilling the following criteria were presented with ranked results:

1. A sufficiently high percentage of institutions (at least 50%) were able to provide reliable and dependable data.
2. The data provided could be considered comparable between countries within reasonable boundaries. For example, funding proved to be impossible as an indicator because budgeting systems varied too much; the calculation of staff costs and the level of detail that could be shared by the HEIs were also too diverse.
3. Student evaluations were only taken into account if the sample group size for each indicator was at least ten students.

As a result, the following indicators were chosen to be ranked:

- **students' judgements** on the doctoral and master's level, such as the overall situation, aspects of training and courses, counselling and advise, the computer equipment, the laboratories and the library. For doctoral students, more research oriented aspects were judged, e.g., the possibility to take part in the scientific community by attending conferences or workshops and by publishing papers.
- the percentage of **international and female staff** within the group of staff with a doctorate.
- the percentage of **female and international doctoral and master's students**.

Due to the fact that a lot of data are missing or were given in a way that made the numbers incomparable, many facts cannot be compared in the ranking. Examples were the number of exchange students in each subject or even the exact number of doctoral students within a department. Data which did not meet the criteria mentioned above but were of informational value were not ranked but presented as quantitative and qualitative information in the online version of the CHE-ExcellenceRanking. Facts on the size of the departments, admission conditions, and details on academic programmes (such as study abroad or course offerings) are also outlined.

One central feature of the online version is the possibility to access the departments/faculties via research categories. Each department was asked to name their research groups and to assign them to one or more research categories. This allows for the option to search for a subfield of a subject and to identify those departments working on a student's own field of interest. More than **1,000 research groups** were named by the departments, and this is considered to be one of the most valuable informative assets of the endeavour. Prospective doctoral students are possibly less interested in the general performance of a faculty or department than in a specific research group. They usually have very clear ideas about the specialised topic on which they are focusing. Thus, it might be of some value for a student searching for a biology doctoral programme specialising in insects to know that the faculty at University A is excellent in its research output in this domain. However, it might be much more interesting for this individual to learn that he could delve into honeybee studies in Würzburg's bee group. Or, a student in astrophysics might be attracted less by the overall performance of the Physics Department at the University of Copenhagen than by its research group focusing on dark matter and cosmology. These are just two examples illustrating the particular added value of the in-depth analysis of the CHE ExcellenceRanking.

Findings on the Country Level

The findings can be divided into two sections: findings for the top group, comprising of HEIs with one silver (or gold) medal in at least one out of four indicators, and findings from the in-depth analysis results for the excellence group consisting of those HEIs which obtained silver (or gold) medals in at least three out of four indicators.

Results for the excellence group

For the group that obtained silver or gold medals in three or four indicators, a relatively small number of higher education institutions (HEIs) remained. Less than 60 HEIs made it into this group. In the individual fields, the numbers dropped to 25 in biology, 25 in chemistry, 24 in physics, and a mere 19 in mathematics. Assuming that the number of universities eligible for ERASMUS comprises of more than 4.500 institutions⁸, the excellence group represents the top 1,3% of this total. Within this top segment, some countries are much more strongly represented vis-à-vis their share in population or even just in the number of HEIs selected from the country. The Netherlands (4), Sweden (5) and Switzerland (3) are striking examples. Considering the size of their populations, it is less surprising that the countries with the highest absolute number of selected institutions are Germany (13) and the United Kingdom (12). However, despite its smaller population, Italy is more strongly represented with six institutions than France with just five.

Table 1: Number of universities in the excellence group

Country	Number of universities	Country	Number of universities
Germany	13	Belgium	3
United Kingdom	12	Switzerland	3
Italy	6	Spain	2
France	5	Denmark	1
Sweden	5	Finland	1
The Netherlands	4	Norway	1

Looking at table 2, the United Kingdom not only attains the largest number of gold medals but also the largest number of medals in total within the excellence group. Switzerland, with only three universities in this group, is in third place concerning gold medals and holds the largest relative percentage of gold medals: 16 out of 22 medals in the whole.

⁸ A complete list of institutions eligible for ERASMUS can be found under <http://eacea.ec.europa.eu/eei/index.jsp>

Table 2: Medals Table (Excellence group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	56	24	2	82
Germany	24	43	6	76
Switzerland	16	5	1	22
Sweden	13	12	3	28
The Netherlands	11	23	6	40
France	10	9	0	19
Italy	4	14	2	20
Denmark	4	6	0	10
Belgium	4	5	0	9
Spain	2	7	0	9
Finland	2	1	0	3
Norway	1	2	0	3

Figure 1: Medals across countries (Excellence group)

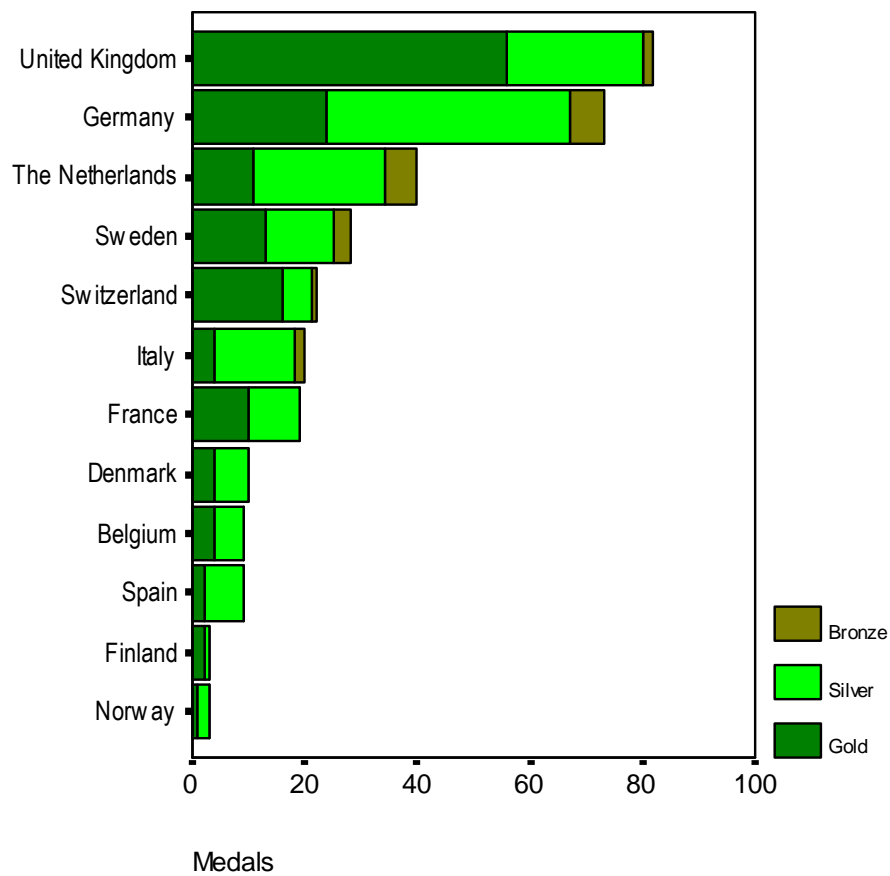
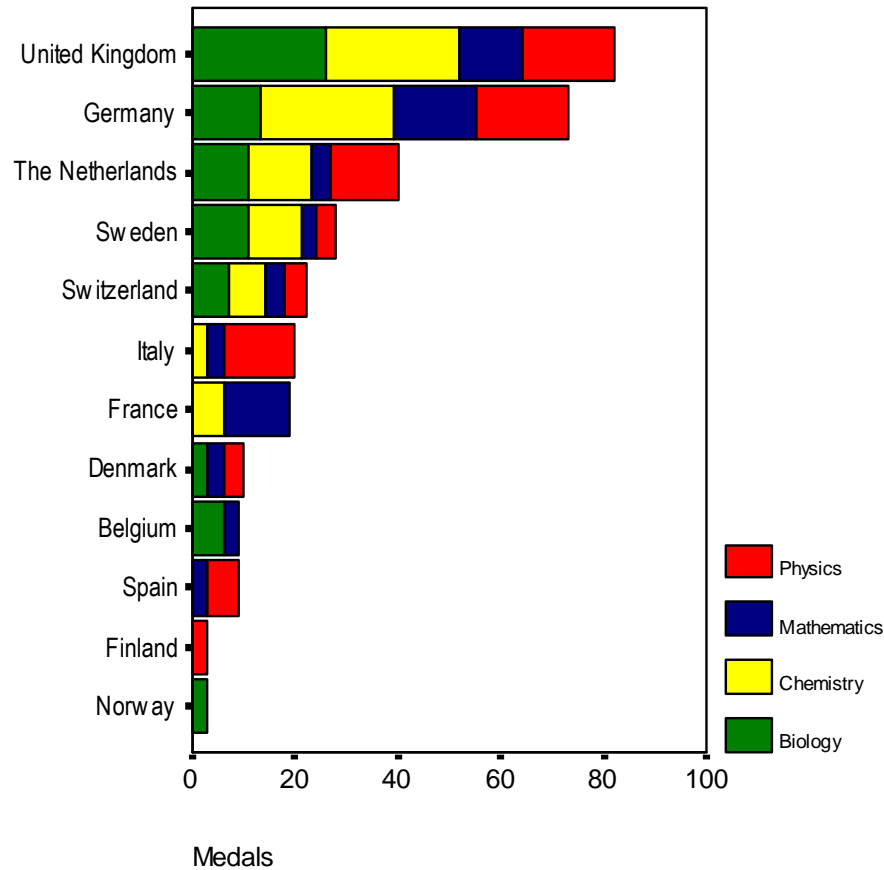


Figure 2: Distribution of medals according to subjects across countries (Excellence group)



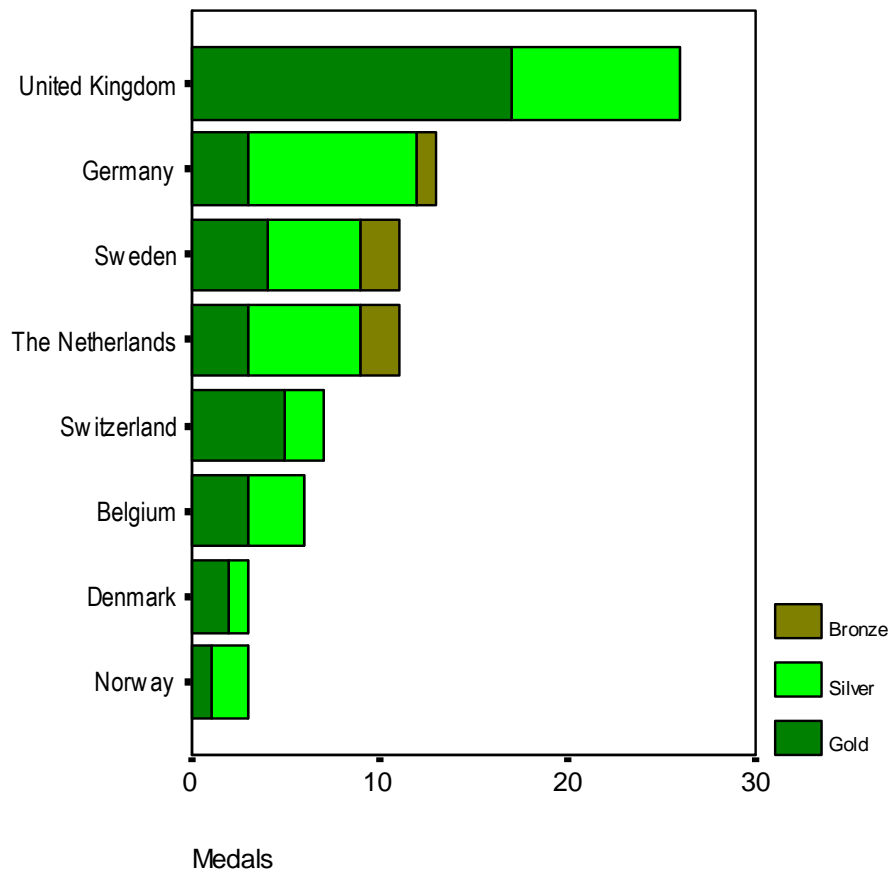
Another interesting finding is the fact that most institutions (33) are selected in only one subject area, 15 in two subject areas, 4 in three and also only 4 in all subject areas. If, even in the relatively closely connected academic fields of the natural sciences and mathematics, only 14% of the very top institutions in one geographic region are featuring three or all four subject areas, this can indeed be taken as an argument against institution-wide rankings. Obviously, even in closely defined areas in highly selective groupings, differences are quite substantial and general comparisons become difficult to make. Ranking within subjects therefore becomes a more logical method in order to compare specific programmes within disciplines.

Biology

Table 3: Medals Table Biology (Excellence group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	17	9	0	26
Switzerland	5	2	0	7
Sweden	4	5	2	11
Germany	3	9	1	13
The Netherlands	3	6	2	11
Belgium	3	3	0	6
Denmark	2	1	0	3
Norway	1	2	0	3

Figure 3: Medals distribution across countries in Biology (Excellence group)

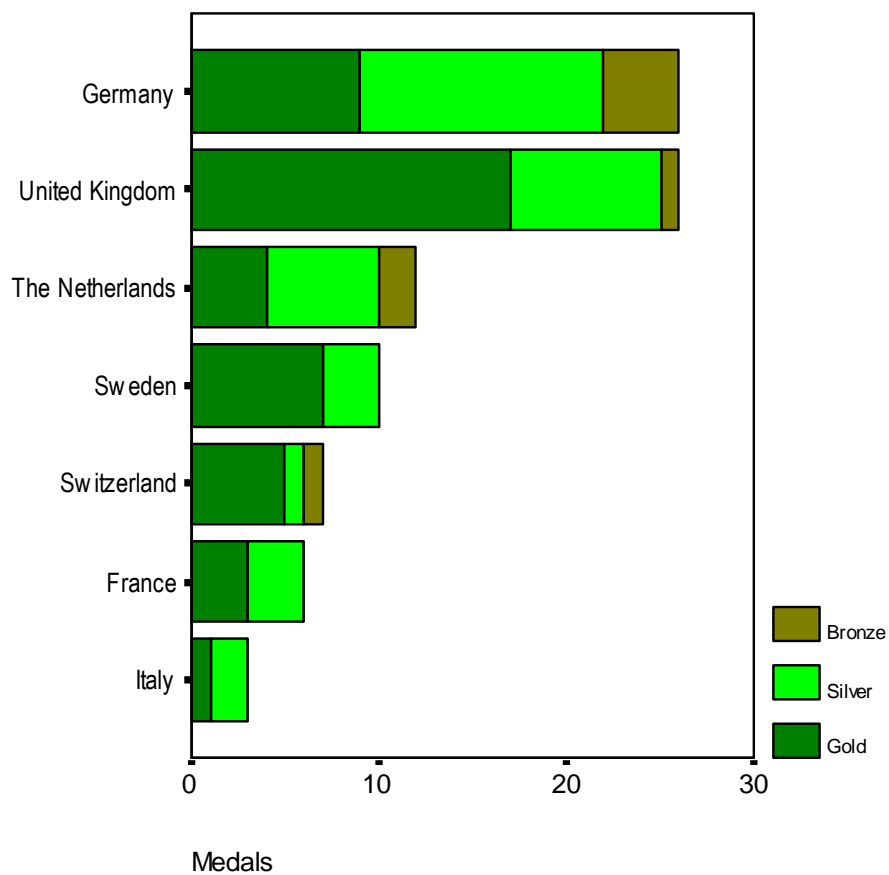


Chemistry

Table 4: Medals Table Chemistry (Excellence group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	17	8	1	26
Sweden	7	3	0	10
Germany	9	13	4	26
Switzerland	5	1	1	7
The Netherlands	4	6	2	12
France	3	3	0	6
Italy	1	2	0	3

Figure 4: Medals distribution across countries in Chemistry (Excellence group)

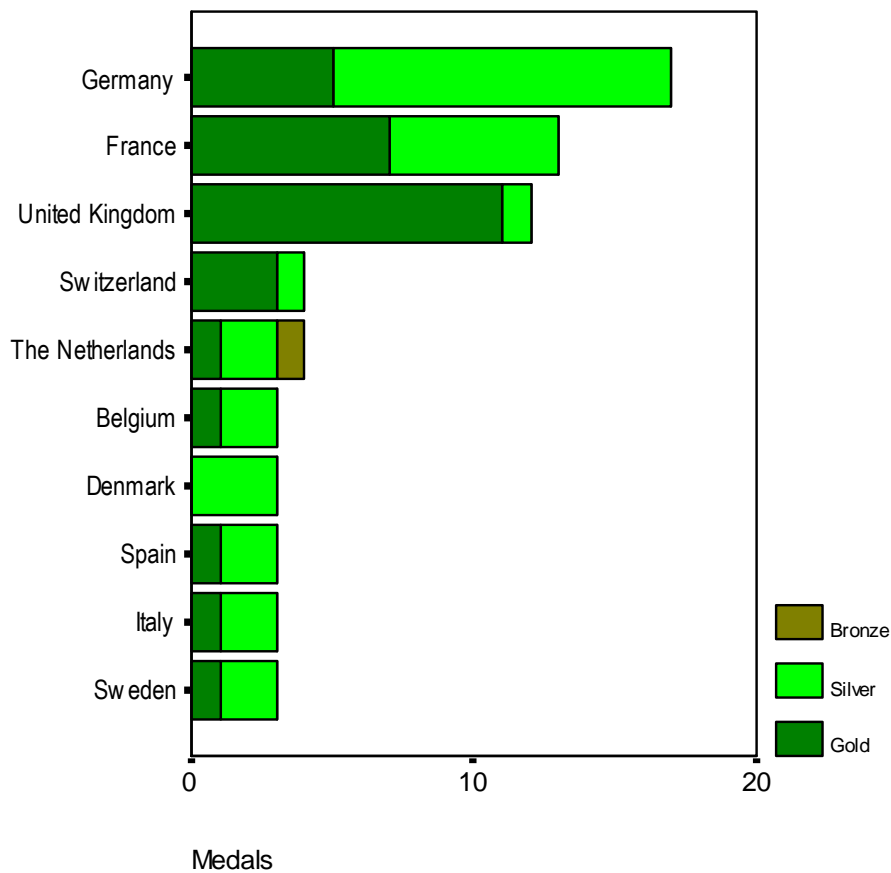


Mathematics

Table 5: Medals Table Mathematics (Excellence group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	11	1	0	12
France	7	6	0	13
Germany	5	12	0	17
Switzerland	3	1	0	4
The Netherlands	1	2	1	4
Belgium	1	2	0	3
Spain	1	2	0	3
Italy	1	2	0	3
Sweden	1	2	0	3
Denmark	0	3	0	3

Figure 5: Medals distribution across countries in Mathematics (Excellence group)

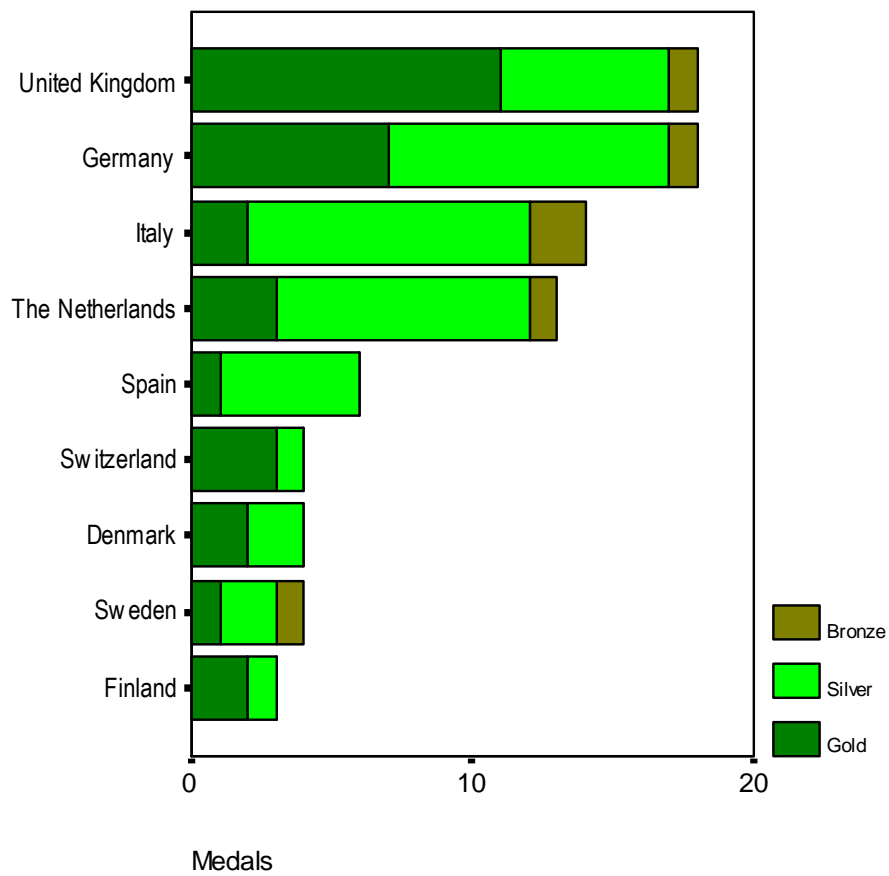


Physics

Table 6: Medals Table Physics (Excellence group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	11	6	1	18
Germany	7	10	1	18
The Netherlands	3	9	1	13
Switzerland	3	1	0	4
Italy	2	10	2	14
Denmark	2	2	0	4
Finland	2	1	0	3
Spain	1	5	0	6
Sweden	1	2	1	4

Figure 6: Medals distribution across countries in Physics (Excellence group)



Results of the CHE surveys

As not all universities returned the questionnaire or could only fill out a portion, only two kinds of indicators were chosen for the ranking: 1) the students' judgements and 2) the percentages of international students/researchers and of women in different degree levels.

The questions on international staff or students were answered by about 50% of the universities. Looking at the numbers across subjects, in chemistry, more than a third of both staff with a doctorate and students pursuing a doctoral degree comes from abroad. In mathematics, only every fifth staff member with a doctorate comes from abroad, and only a quarter of the doctoral students are from abroad (see Figure 7 and Figure 8).

The red "boxes" cover the range from the lower to the upper quartile. The black line crossing through the boxes shows the position of the median. The marks outside the boxes mark the smallest and the largest observation, unless they are not outliers like ETH Zürich as in Figure 7. Outliers are defined to be observations outside the interquartile range (= the height of the red box).

Figure 7: Box plots of the percentage of international staff

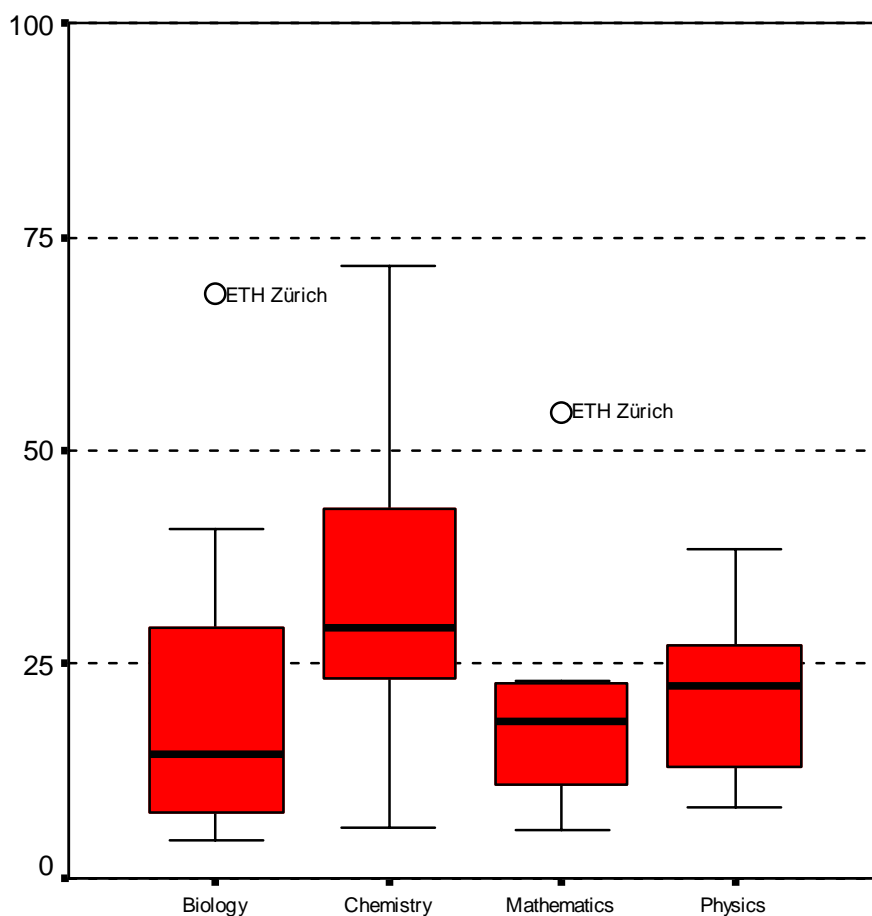
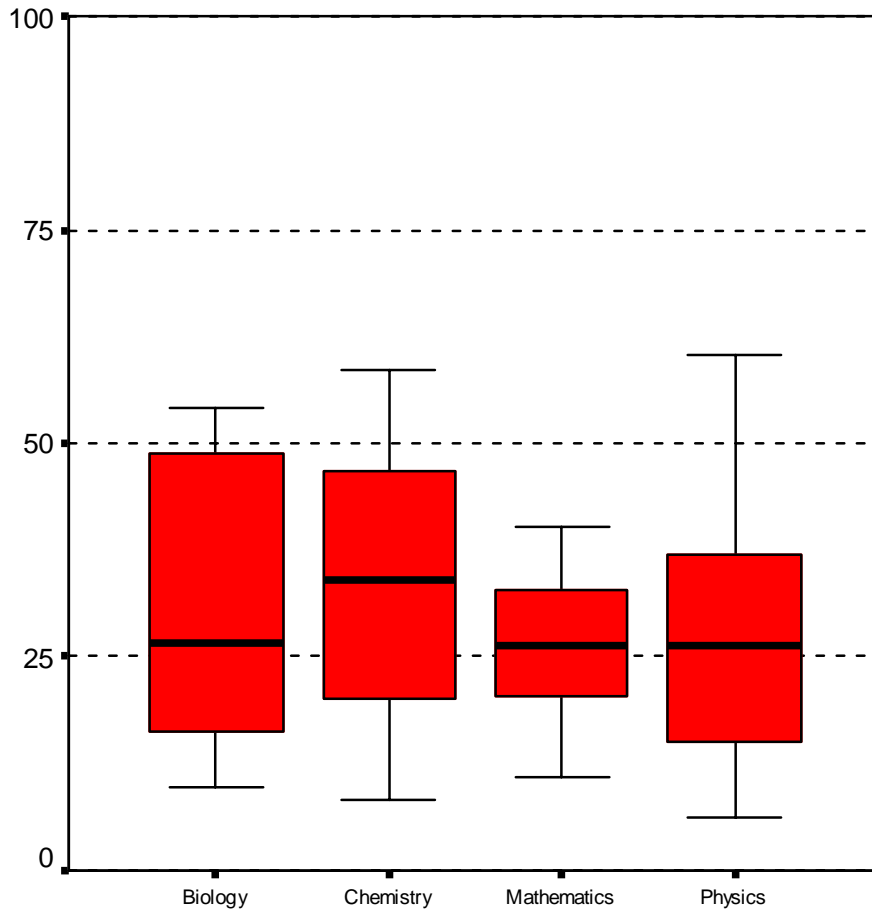
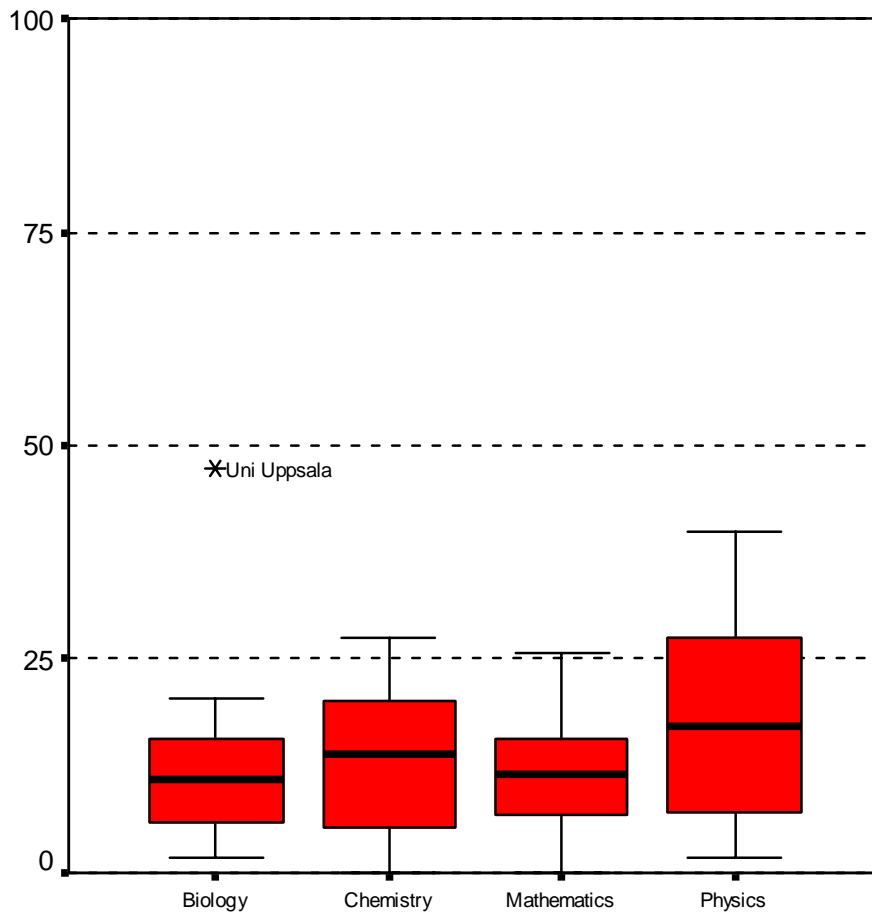


Figure 8: Box plots of the percentage of international doctoral students



Not surprisingly, the percentage of international master's students is lower than for doctoral students and staff; for all subjects the percentage is about 13% (Figure 9). This may in part be due to the fact that a lot of master's programmes started very recently or have not yet started. It may also indicate that mobility under the Bologna process will not start to become as important at the master's level as at the doctoral level. Remarkably high is the percentage of international staff and doctoral students at ETH Zürich as well as the percentage of international master's students in biology at the University of Uppsala.

Figure 9: Box plots of the percentage of international master's students



In biology, chemistry and physics, for about half of the departments there are enough judgements to make comparisons between results. For mathematics, the percentage is about a third. In many cases there were too few students to obtain higher numbers.

Students were asked for their opinions on different aspects of their study situation. They were provided with several statements like "the study conditions are excellent" and were asked to choose how much they agree with this statement, from "I agree very much" to "I don't agree at all." For computations and graphics, these judgements were translated to a scale from 1 = "very much agreement" to 6 = "total disagreement."

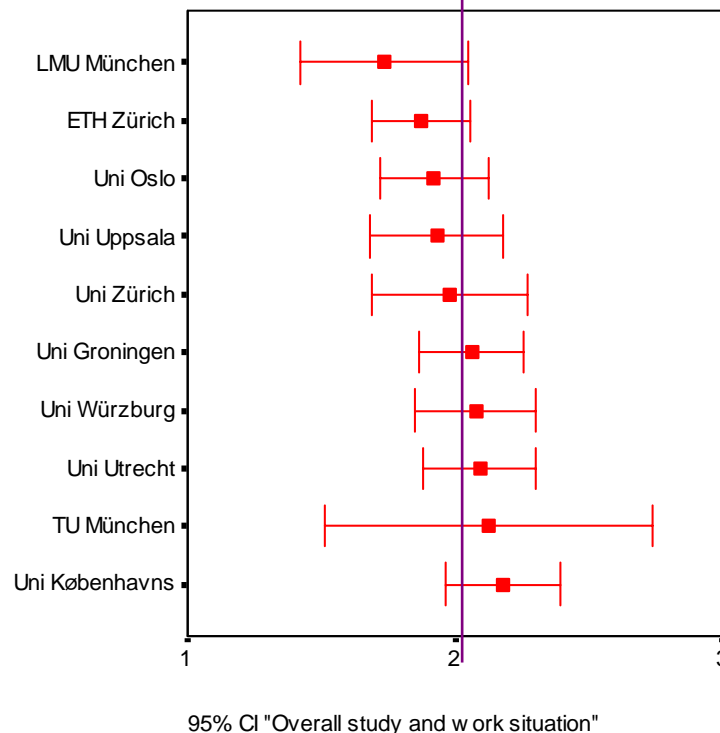
Table 2: Details on the composition of the indicators

Indicator (mas. = master's students, doc. = doctoral students)	Short description
Overall study situation (mas.&doc.)	Comprehensive judgement looking at the overall situation.
Advisory (mas.&doc.)	Comprises judgements on the availability of advisors, their assistance in career planning, their caring for the student's personal development and the quality of counselling.
Career centres (mas.&doc.)	Judgements on the assistance in finding an adequate employment position by the university's career centre, on informational events, student initiatives, partnerships with companies or research institutes, and the possibilities of internships.
Examinations (mas.&doc.)	Contains judgements on the transparency of study and examination requirements, whether the coursework is in line with the content of the examinations, the fairness of examinations and the awarding of marks and organisational aspects.
Laboratories (mas.&doc.)	Considers judgements on the state of the laboratories as well as the space and the equipment of laboratories.
Library (mas.&doc.)	Judgements on the stock of literature (whether it is up-to-date, available and accessible) and on services such as search facilities or opening hours
Training (mas.&doc.)	Includes judgements on the quality of theory and methodology training, the level of interdisciplinarity, the variety of course content and quality of instruction.
Study organisation (mas.&doc.)	Comprises judgements on the transparency of admission conditions, assistance regarding formal procedures, and the organisational framework.
IT-infrastructure (mas.)	Includes judgement on hardware equipment, subject-specific software, condition of computers and service.
Counselling (mas.)	Judgements on admission, counselling on studying abroad, social and psychological counselling, counselling in relation to studies.
Websites (mas.)	Judgements on the web sites of the department: information on organisational aspects, courses and research team. Availability of an English website.
Rooms (mas.)	Students' opinions on the rooms: their condition, space and technical facilities
Social relations (mas.)	What students think about student organisations, contact to other students, teamwork and the relation to academic teaching staff.
Conference attendance (doc.)	Doctoral students' opinions about the information on conferences, the time to prepare contributions for these and the financial support for visiting conferences.
Contact with other doctoral students (doc.)	Doctoral students' opinions about the teamwork with other PhD-students, PhD student organisations and discussions outside own team.
Publication possibilities (doc.)	What doctoral students think about their opportunity to publish and the counselling services on writing and placing papers.
Research community (doc.)	Doctoral students' judgements on the informal contact to the scientific community and guest researchers.
Teamwork (doc.)	What doctoral students think about team communication, organisation and social relationships.
Time for PhD project	Doctoral students judge whether they have enough time for writing their thesis.

Indicator (mas. = master's students, doc. = doctoral students) (doc.)	Short description
Workroom (doc.)	Doctoral students' opinions about the state of the workroom, the space and the computer equipment.
Workshops (doc.)	What doctoral students think about the possibilities to participate in workshops, whether they get enough information about these and financial aid for them.
Research stay (doc.)	Doctoral students' opinions about their possibilities to arrange a research stay abroad.

The judgements were grouped according to the mean of the departments' students, the overall mean, the number of students answering, and the variation of their judgements. The following figures, for example, show for biology and chemistry the confidence intervals, the departments' mean judgements and the overall mean for one indicator - the overall work and study situation.

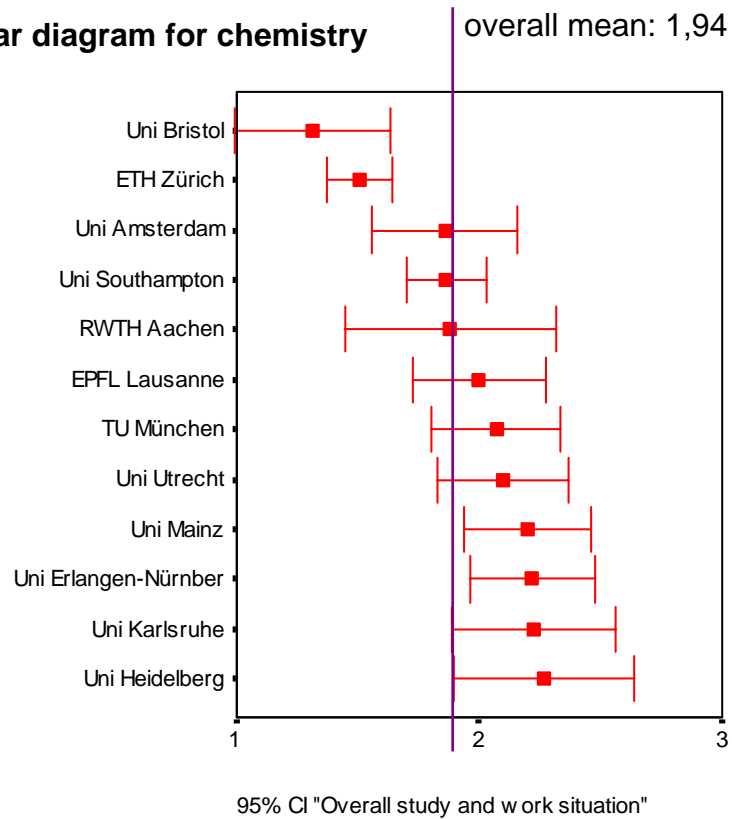
Figure 10: Error bar diagram for biology overall mean: 2,02



Universities with a confidence interval (CI) completely on the left side of the overall mean can be said to receive judgements above average and therefore belong to the top group in students' judgements. Universities with a confidence interval completely on the right side

of the overall mean are rated below average and therefore belong to the bottom group in students' judgements. The rest of the universities remain in the intermediate group.

Figure 11: Error bar diagram for chemistry



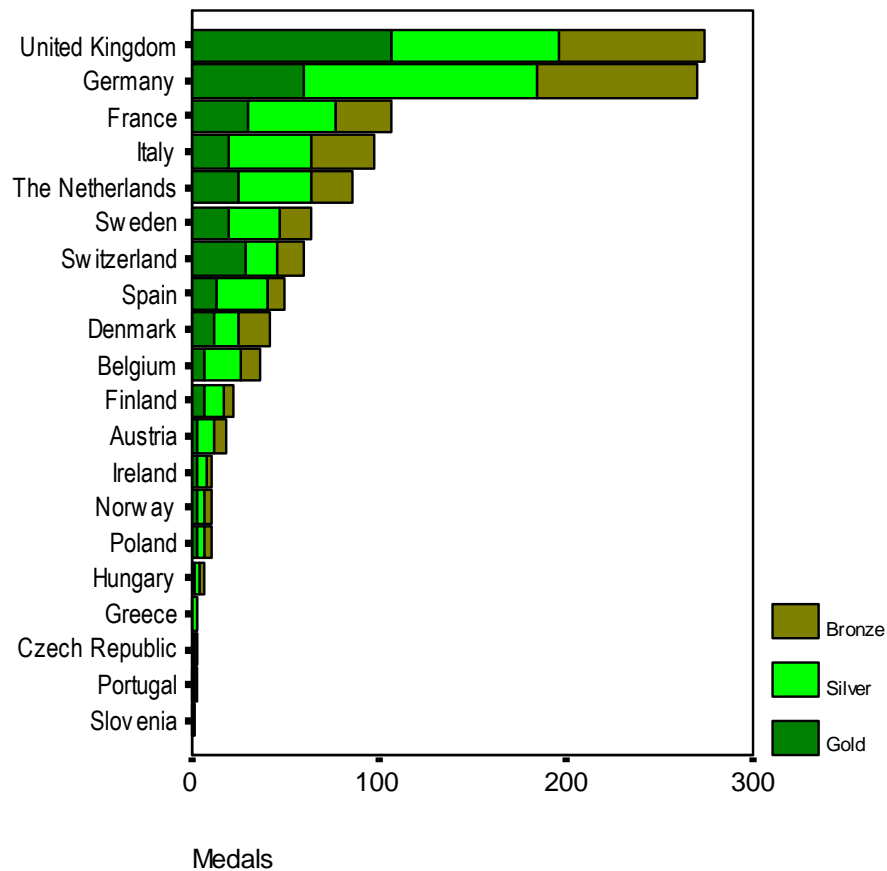
Results for the top group

Regarding the table of medals across all subjects, in terms of the total number of medals, universities in the UK and in Germany are more or less on par. The difference lies in the distribution of gold and silver medals. Whereas the universities in the United Kingdom earn by a large margin the most gold medals, German universities only achieve 55% of the UK's results. However, the German universities receive considerably more silver medals than the UK institutions. Also, small countries had a strong impact. For example, although Switzerland obtained fewer medals in total than other countries, it earned a high degree of gold medals in proportion to the total number of medals achieved. Nearly half of the total number of its medals is golden, whereas gold medals comprise of only a fifth of the total in German universities.

Table 7: Medals Table (Top group)

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	107	89	78	274
Germany	60	124	86	270
France	30	46	30	106
Switzerland	28	17	15	60
The Netherlands	25	39	22	86
Italy	20	44	33	97
Sweden	19	28	16	63
Spain	13	27	9	49
Denmark	12	13	16	41
Belgium	7	19	11	37
Finland	7	10	5	22
Ireland	3	5	3	11
Norway	3	4	3	10
Poland	3	4	3	10
Austria	2	10	6	18
Hungary	1	3	3	7
Czechoslovakia	1	1	0	2
Greece	0	2	1	3
Portugal	0	1	1	2
Slovenia	0	1	0	1

Figure 12: Distribution of medals across countries



Another observation is that only four countries from Central and Eastern Europe could place institutions within the top group and none of them managed to obtain at least three silver medals for the excellence group.. Indeed, only a single institution from Poland made it into the group excelling in two indicators; all other Central and Eastern European institutions obtained a medal in just one of the indicators.. One explanation for this might be that two out of the four indicators directly rely on publications in English run journals. The reception of these publications, along with the fact that one must publish in exactly these journals to become a highly cited author and to be widely received in the scientific community, may partly explain the lack of presence of Central and Eastern European institutions in the CHE-ExcellenceRanking. However, the participation in Marie Curie Projects is generally open to all countries; therefore, there would have been a chance for Central and Eastern European HEIs to enter the scene via this indicator.

Figure 13: Distribution of medals according to subjects across countries

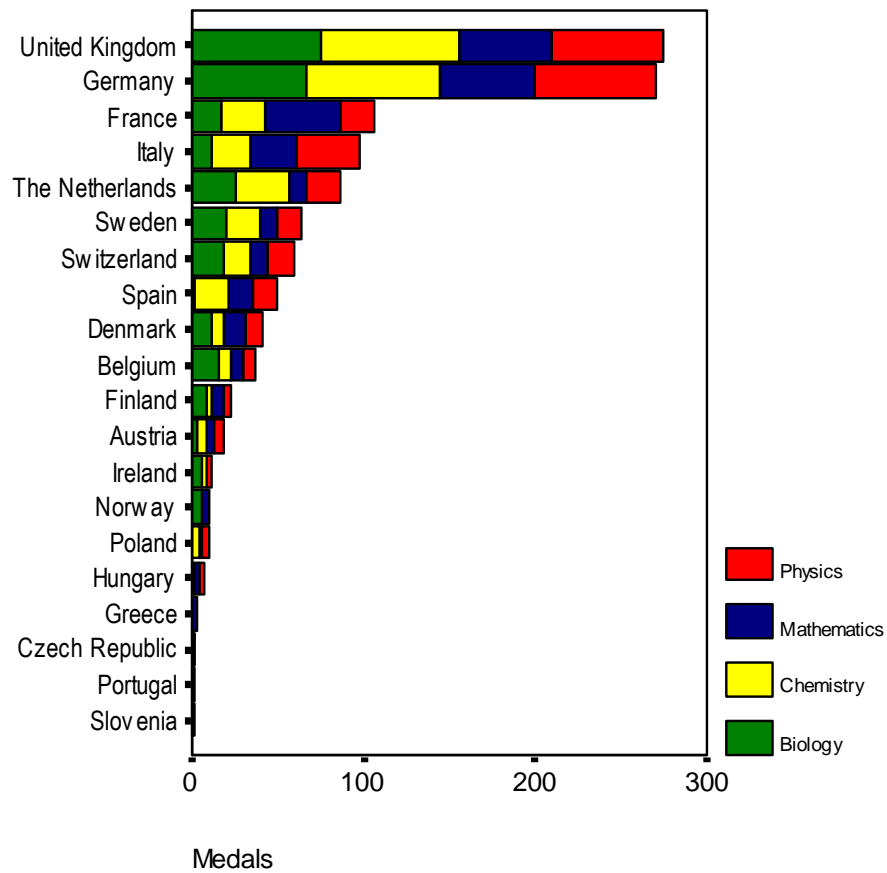


Table 8: Number of universities in the top group

Country	Number of universities
Germany	42
United Kingdom	42
France	25
Italy	21
Spain	14
The Netherlands	13
Sweden	10
Switzerland	7
Finland	7
Belgium	6

Country	Number of universities
Denmark	5
Ireland	5
Poland	4
Norway	3
Austria	3
Hungary	3
Greece	2
Czech Republic	1
Portugal	1
Slovenia	1

Most institutions in the top group come from the United Kingdom and Germany. Together they provide nearly 40% of the whole number of institutions on the list. France and Italy

add another 20%; In other words, four countries have a share of more than 60% of the overall number of institutions.

The picture becomes more diverse if we take into account the number of top group placements across subjects in each country. Whereas it is not very surprising to see the countries with the most number of institutions overall (UK and Germany, and to some extent France) dominating the scene in absolute numbers, some smaller countries seem to produce excellence in abundance. The most striking examples are the Netherlands, Sweden and Switzerland which are levelling out with Italy, not far behind France, and indeed with more institutions successfully entering the larger picture than Spain or Poland.

Table 9: Top group placements

	Number of Departments with Silver or Gold medals			
	1 silver/gold medal	2 silver/gold medals	3 silver/gold medals	4 silver/gold medals
Austria	4	4	0	0
Belgium	9	4	3	0
Czech republic	2	0	0	0
Denmark	11	2	2	1
Finland	8	3	1	0
France	31	13	5	1
Germany	59	29	17	4
Greece	2	0	0	0
Hungary	4	0	0	0
Ireland	8	0	0	0
Italy	28	9	6	0
Norway	2	1	1	0
Poland	5	1	0	0
Portugal	1	0	0	0
Slovenia	1	0	0	0
Spain	17	7	3	0
Sweden	14	4	7	1
Switzerland	10	7	3	3
The Netherlands	14	8	10	1
United Kingdom	60	28	8	14

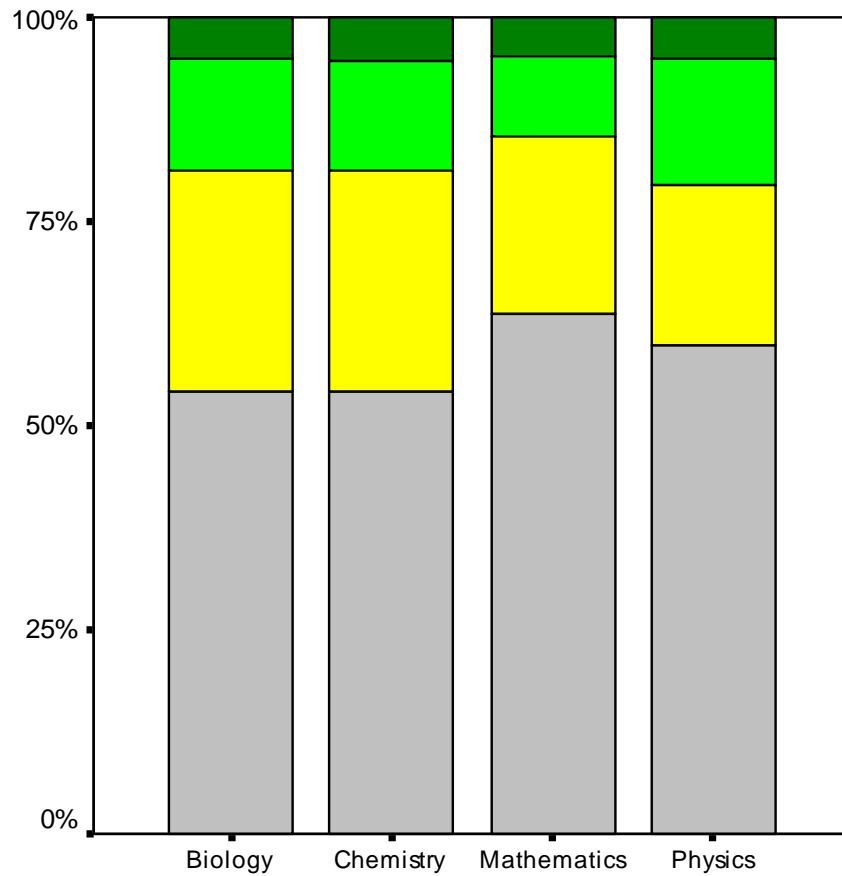
The geographical spread seems to suggest that there is still a recognisable gap between Western and Northern European countries on the one hand and Southern and Central Eastern European countries on the other hand, particularly concerning the impact of scientific work in the world-wide community. However, it is also worth noting that a number of Southern European HEIs made it into the excellence group.

Across all four subject areas, Germany and the United Kingdom dominate the groups in sheer numbers. Of all faculties that achieved silver or gold medals across all subject areas, about 46% are located in one of these two countries. France, as the third largest provider of universities excelling in one or more of the indicators, is far behind compared to the UK, with less than 40% in chemistry and less than 20% in biology. However, in mathematics, France is on par with Germany and not far behind the UK.

On the general level, the analysis shows that there are some commonalities as well as some considerable differences between the academic fields. Overall, in biology, 122 HEIs were spread over the four categories, with 6 that achieved a silver or gold medal in all four indicators, 17 in three, 33 in two and 66 in one indicator. In chemistry, 133 HEIs qualified with 7 that achieved a silver or gold medal in four indicators, 18 in three, 36 in two, and 72 in one indicator. Physics showed an overall number of 117 HEIs with 6 that achieved a silver or gold medal in four indicators, 18 in three, 23 in two, and 70 in one indicator. Finally, 129 HEIs in mathematics with 6 that achieved a silver or gold medal in all four indicators, 13 in three, 28 in two, and 82 one indicator.

One can observe that the distribution seems to be rather comparable between the subject areas. It is, for example, striking that in three of the four academic areas, exactly 6 HEIs (in chemistry, 7) that achieved a silver or gold medal in all four indicators. Also in terms of percentages, this group comprises about 5% of the entire sample in each of the four academic areas. Moreover, moving from one segment to the next higher segment leaves us with a decrease in the range of 40-50%. There are some exceptions, such as in physics, where one can observe a rather equal distribution of about 19% (two gold or silver medals) and about 15% (three gold or silver medals).

Figure 14: Distribution of silver or gold medal achievements of faculties across academic disciplines



- four gold-/silver medals
- three gold-/silver medals
- two gold-/silver medals
- one gold-/silver medals

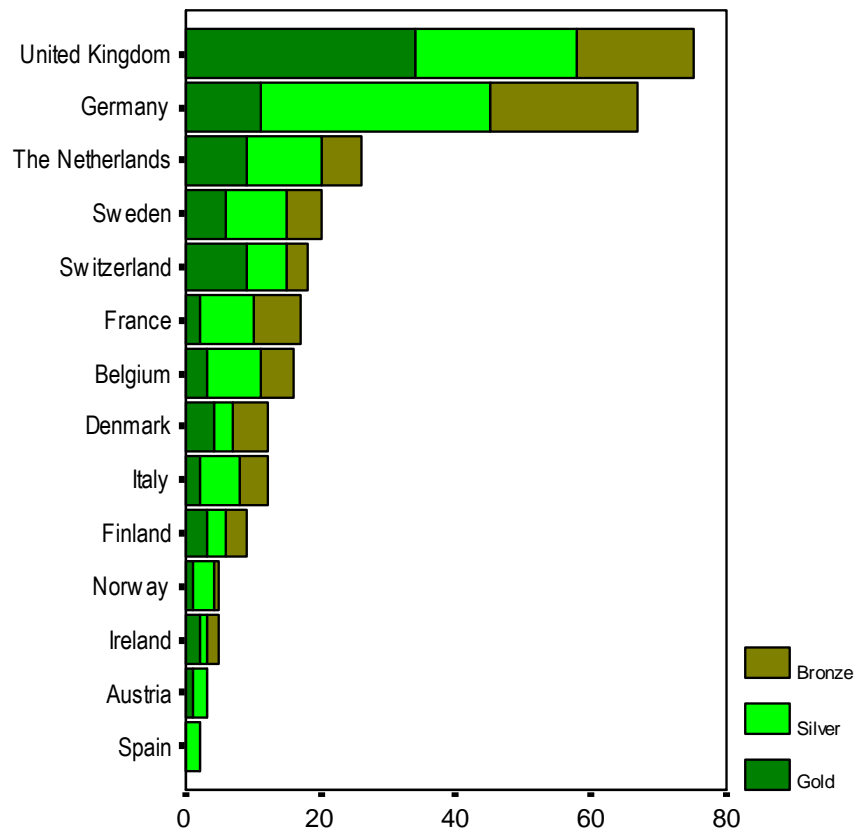
In mathematics, the distribution here is considerably steeper than in the other areas, leaving the group with only one gold or silver medal stronger (more 60%) than the average of the other three subjects areas of 56% (and the overall average of nearly 58%). Meanwhile, the group achieving a silver or gold medal in three indicators is considerably smaller (with 10%) compared to the average over the other three subject areas.

Biology

Table 10: Medals Table Biology

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	34	24	17	75
Germany	11	34	22	67
The Netherlands	9	11	6	26
Switzerland	9	6	3	18
Sweden	6	9	5	20
Denmark	4	3	5	12
Belgium	3	8	5	16
Finland	3	3	3	9
France	2	8	7	17
Italy	2	6	4	12
Ireland	2	1	2	5
Norway	1	3	1	5
Austria	1	2	0	3
Spain	0	2	0	2

Figure 15: Medals distribution across countries in biology

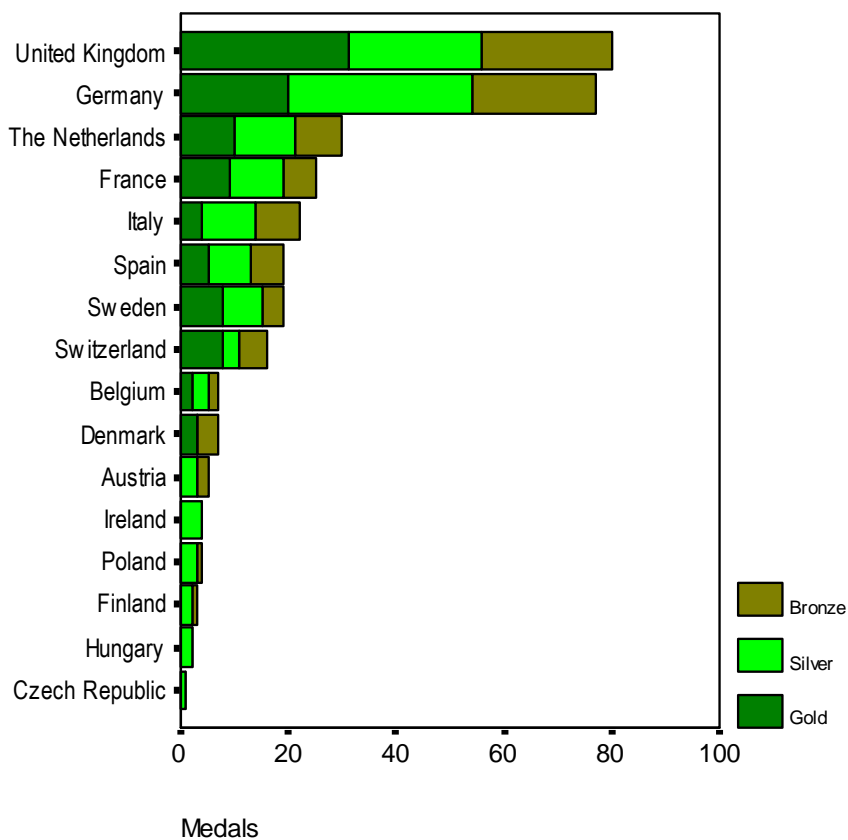


Chemistry

Table 11: Medals Table Chemistry

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	31	25	24	81
Germany	20	34	23	74
The Netherlands	10	11	9	30
France	9	10	6	25
Sweden	8	7	4	19
Switzerland	8	3	5	16
Spain	5	8	6	19
Italy	4	10	8	22
Denmark	3	0	4	7
Belgium	2	3	2	7
Ireland	0	4	0	4
Austria	0	3	2	5
Poland	0	3	1	4
Finland	0	2	1	3
Hungary	0	2	0	2
Czechoslovakia	0	1	0	1

Figure 16: Medals distribution across countries in chemistry

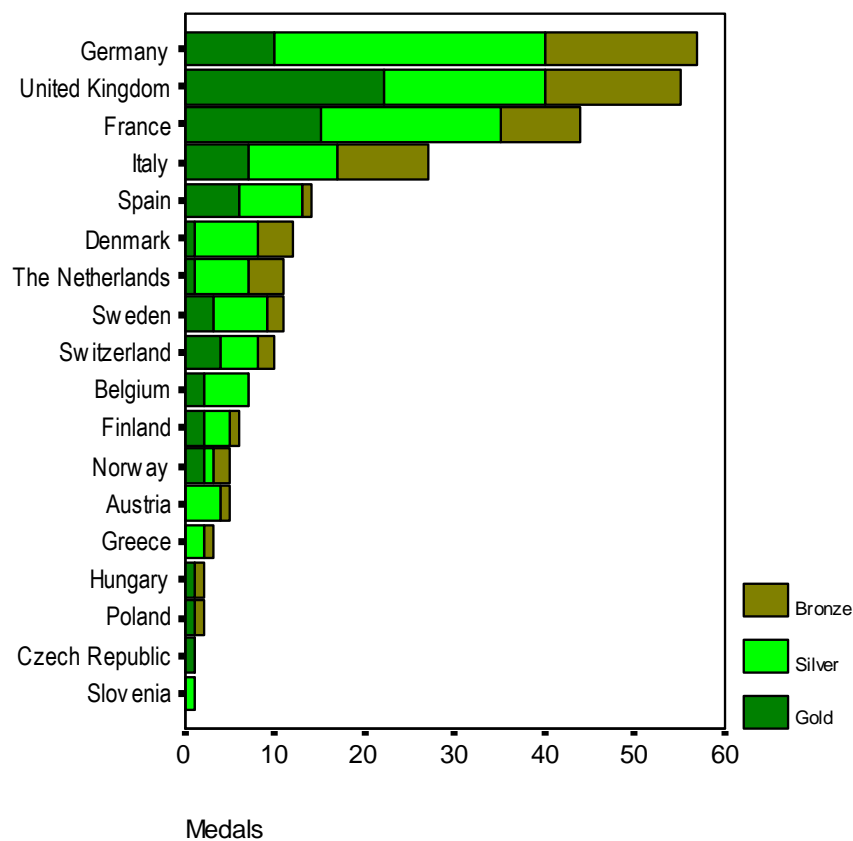


Mathematics

Table 12: Medals Table Mathematics

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	22	18	15	55
France	15	20	9	44
Germany	10	30	17	54
Italy	7	10	10	27
Spain	6	7	1	14
Switzerland	4	4	2	10
Sweden	3	6	2	11
Belgium	2	5	0	7
Finland	2	3	1	6
Norway	2	1	2	5
Denmark	1	7	4	12
The Netherlands	1	6	4	11
Hungary	1	0	1	2
Poland	1	0	1	2
Czechoslovakia	1	0	0	1
Austria	0	4	1	5
Greece	0	2	1	3
Slovenia	0	1	0	1

Figure 17: Medals distribution across countries in mathematics

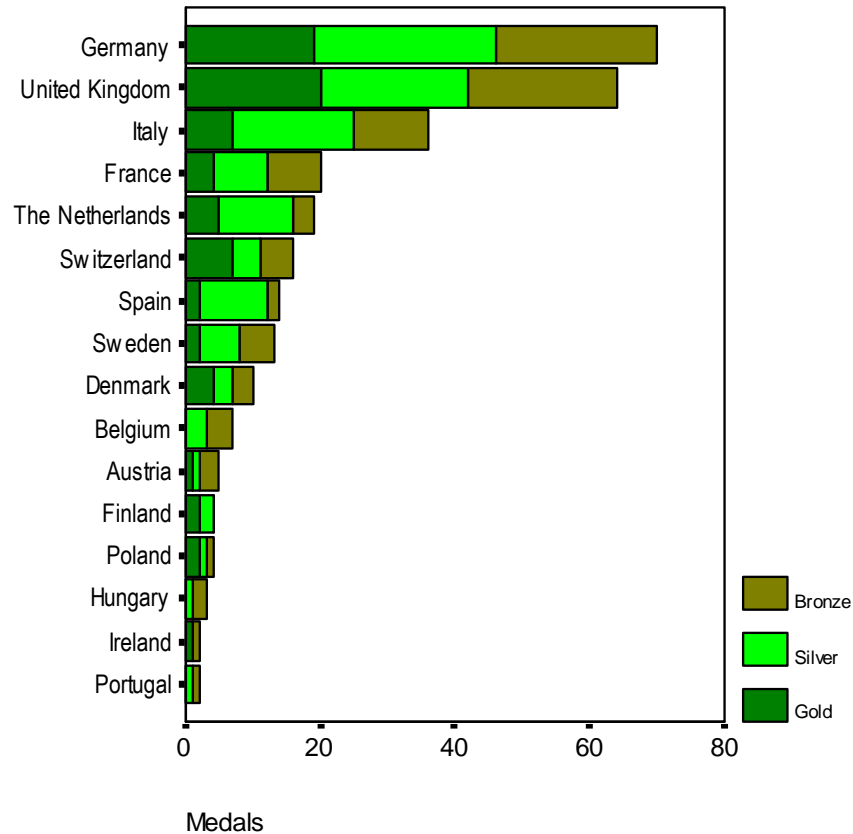


Physics

Table 13: Medals Table Physics

Country	Gold Medals	Silver Medals	Bronze Medals	Medals total
United Kingdom	20	22	22	64
Germany	19	27	24	67
Italy	7	18	11	36
Switzerland	7	4	5	16
The Netherlands	5	11	3	19
France	4	8	8	20
Denmark	4	3	3	10
Spain	2	10	2	14
Sweden	2	6	5	13
Finland	2	2	0	4
Poland	2	1	1	4
Austria	1	1	3	5
Ireland	1	0	1	2
Belgium	0	3	4	7
Hungary	0	1	2	3
Portugal	0	1	1	2

Figure 18: Medals distribution across countries in physics



Findings on the University Level

Distribution of excellence group placements across universities

Figure 19: Percentages of number of placements in the excellence group per university

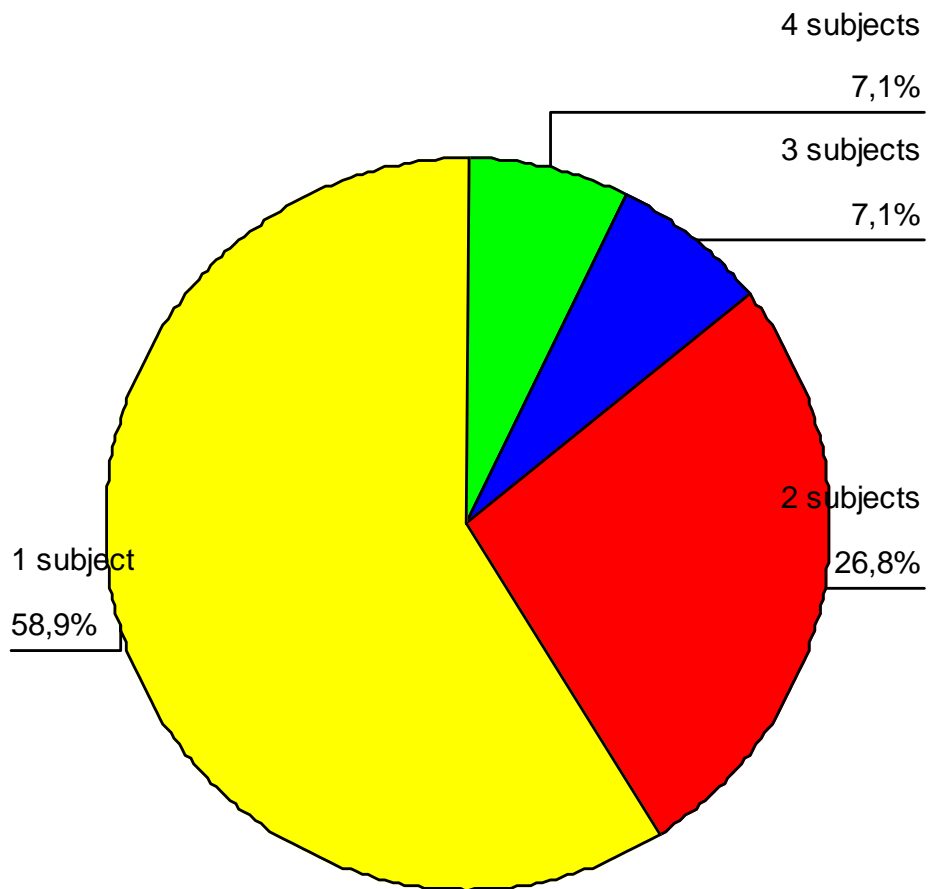


Table 14: Distribution of excellence group placements across universities

University	Number of subjects in the excellence group	Subjects in the excellence group			
		Biology	Chemistry	Mathematics	Physics
Eidgenössisch Technische Hochschule Zürich	4	X	X	X	X
Imperial College London	4	X	X	X	X
Universiteit Utrecht	4	X	X	X	X
University of Cambridge	4	X	X	X	X
Københavns Universitet	3	X		X	X
Technische Universität München	3	X	X		X
Universiteit Leiden	3	X	X		X
University of Oxford	3	X	X	X	
Eberhard Karls Universität Tübingen	2	X		X	
Johannes Gutenberg-Universität Mainz	2		X		X
KTH Sveriges Största Tekniska Universitet	2		X	X	
Ludwig-Maximilians-Universität München	2	X			X
Lunds Universitet	2		X		X
Rheinische Friedrich-Wilhelms-Universität Bonn	2			X	X
Rheinisch-Westfälische Hochschule Aachen	2		X	X	
Rijksuniversiteit Groningen	2	X			X
Ruprecht-Karls-Universität Heidelberg	2		X		X
The University of Birmingham	2	X			X
Universitat de Barcelona	2			X	X
Université Paris-Sud 11	2		X	X	
Universiteit van Amsterdam	2		X		X
University of Edinburgh	2	X			X
Uppsala Universitet	2	X	X		
Bayerische Julius-Maximilians-Universität Würzburg	1	X			
Durham University Science Laboratories	1		X		
École Polytechnique Fédérale de Lausanne	1		X		
Friedrich-Alexander-Universität Erlangen-Nürnberg	1		X		
Helsingin Yliopisto	1				X
Karolinska Institutet	1	X			
Katholieke Universiteit Leuven	1	X			
Technische Universität Berlin	1			X	
Universidad Autónoma de Madrid	1				X
Università degli Studi di Firenze	1				X
Università degli Studi di Padova	1				X
Università degli Studi di Roma "La Sapienza"	1				X
Università di Bologna	1		X		
Università di Pisa	1				X
Università di Roma "Tor Vergata"	1			X	
Universität Bielefeld	1			X	
Universität Karlsruhe	1		X		
Universität Stuttgart	1		X		
Universität Zürich	1	X			
Université Catholique de Louvain	1			X	
Université de Rennes 1	1		X		
Université Louis Pasteur Strasbourg	1			X	
Université Paris 7 - Denis Diderot	1			X	
Université Pierre et Marie Curie	1			X	
Universiteit Gent	1	X			
Universitet Stockholms	1	X			
Universitetet i Oslo	1	X			
University College London, University of London	1	X			
University of Bristol	1		X		

University of Glasgow	1	X			
University of Manchester	1				X
University of Southampton	1		X		
University of Sussex	1		X		

Excellence Group Tables

Table 15: Excellence Group Biology

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
The University of Birmingham	United Kingdom	Silver	Silver	Silver	
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
University of Edinburgh	United Kingdom	Gold	Gold	Silver	Silver
Universiteit Gent	Belgium	Silver	Silver	Gold	
University of Glasgow	United Kingdom	Silver	Gold	Silver	
Rijksuniversiteit Groningen	The Netherlands	Silver	Silver	Silver	
Københavns Universitet	Denmark	Gold	Silver		Gold
Universiteit Leiden	The Netherlands	Gold	Silver	Silver	Bronze
Katholieke Universiteit Leuven	Belgium	Gold	Silver	Gold	
Imperial College London	United Kingdom	Gold	Gold	Gold	Silver
University College London, University of London	United Kingdom	Gold	Gold	Gold	Silver
Ludwig-Maximilians-Universität München	Germany	Gold	Silver		Gold
Technische Universität München	Germany	Silver	Gold	Silver	
Universitetet i Oslo	Norway	Silver	Silver		Gold
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
Karolinska Institutet	Sweden	Gold	Gold	Gold	Bronze
Universitet Stockholms	Sweden	Silver	Silver	Silver	Bronze
Eberhard Karls Universität Tübingen	Germany	Silver	Silver	Silver	Bronze
Uppsala Universitet	Sweden	Gold	Silver		Silver
Universiteit Utrecht	The Netherlands	Gold	Gold	Silver	Bronze
Bayerische Julius-Maximilians-Universität Würzburg	Germany	Silver	Silver	Silver	
Eidgenössisch Technische Hochschule Zürich	Switzerland	Silver	Gold	Gold	Gold
Universität Zürich	Switzerland	Gold	Gold	Silver	

Table 16: Excellence Group Chemistry

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Rheinisch-Westfälische Technische Hochschule Aachen	Germany	Gold	Silver		Gold
Universiteit van Amsterdam	The Netherlands	Bronze	Gold	Silver	Silver
Università di Bologna	Italy	Gold	Silver	Silver	
University of Bristol	United Kingdom	Gold	Gold	Silver	Gold
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
Durham University Science Laboratories	United Kingdom	Silver	Gold		Silver
Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	Silver	Silver	Silver	Bronze
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Silver	Silver	Bronze
Universität Karlsruhe	Germany	Silver	Gold	Silver	Bronze
École Polytechnique Fédérale de Lausanne	Switzerland	Silver	Gold	Gold	
Universiteit Leiden	The Netherlands	Silver	Silver	Silver	Bronze
Imperial College London	United Kingdom	Gold	Gold	Silver	Gold
Lunds Universitet	Sweden	Gold	Gold	Silver	Gold
Johannes Gutenberg-Universität Mainz	Germany	Gold	Gold	Silver	Gold
Technische Universität München	Germany	Gold	Gold	Gold	
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
Université Paris-Sud 11	France	Gold	Silver		Gold
Université de Rennes 1	France	Silver	Silver		Gold
University of Southampton	United Kingdom	Silver	Gold	Silver	
KTH Sveriges Största Tekniska Universitet	Sweden	Silver	Gold		Gold
Universität Stuttgart	Germany	Silver	Silver	Silver	Bronze
University of Sussex	United Kingdom	Silver	Silver	Gold	Bronze
Uppsala Universitet	Sweden	Silver	Gold		Gold
Universiteit Utrecht	The Netherlands	Gold	Gold	Gold	Silver
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Bronze

Table 17: Excellence Group Mathematics

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Rheinisch-Westfälische Technische Hochschule Aachen	Germany	Silver	Silver	Silver	
Universitat de Barcelona	Spain	Silver	Gold	Silver	
Technische Universität Berlin	Germany	Silver	Gold	Silver	Silver
Universität Bielefeld	Germany	Gold	Silver	Gold	
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Gold	Silver	Silver
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
Københavns Universitet	Denmark	Silver	Silver	Silver	
Imperial College London	United Kingdom	Gold	Gold	Gold	Silver
Université Catholique de Louvain	Belgium	Silver	Gold		Silver
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
Université Pierre et Marie Curie	France	Gold	Gold		Silver
Université Paris 7 - Denis Diderot	France	Gold	Silver		Silver
Université Paris-Sud 11	France	Gold	Gold	Gold	Silver
Università di Roma "Tor Vergata"	Italy	Silver	Gold		Silver
KTH Sveriges Största Tekniska Universitet	Sweden	Silver	Gold		Silver
Université Louis Pasteur Strasbourg	France		Gold	Silver	Silver
Eberhard Karls Universität Tübingen	Germany	Silver	Gold	Silver	
Universiteit Utrecht	The Netherlands	Silver	Silver	Gold	Bronze
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Silver

Table 18: Excellence Group Physics

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Universiteit van Amsterdam	The Netherlands	Gold	Silver	Silver	Bronze
Universitat de Barcelona	Spain	Silver	Silver		Silver
The University of Birmingham	United Kingdom	Silver	Silver	Gold	
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Silver	Silver	Silver
University of Cambridge	United Kingdom	Gold	Gold	Silver	Gold
University of Edinburgh	United Kingdom	Silver	Gold		Silver
Università degli Studi di Firenze	Italy	Silver	Silver		Silver
Rijksuniversiteit Groningen	The Netherlands	Silver	Gold		Silver
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Gold	Silver	Gold
Helsingin Yliopisto	Finland	Silver	Gold	Gold	
Københavns Universitet	Denmark	Gold	Silver	Silver	Gold
Universiteit Leiden	The Netherlands	Silver	Silver		Gold
Imperial College London	United Kingdom	Gold	Gold	Gold	Gold
Lunds Universitet	Sweden	Silver	Gold	Silver	Bronze
Universidad Autónoma de Madrid	Spain	Silver	Silver		Gold
Johannes Gutenberg-Universität Mainz	Germany	Silver	Gold	Silver	Bronze
University of Manchester	United Kingdom	Gold	Bronze	Gold	Silver
Ludwig-Maximilians-Universität München	Germany	Gold	Gold		Silver
Technische Universität München	Germany	Gold	Gold		Silver
Università degli Studi di Padova	Italy	Gold	Silver	Silver	Bronze
Università di Pisa	Italy	Silver	Silver	Silver	
Università degli Studi di Roma "La Sapienza"	Italy	Gold	Silver	Silver	Bronze
Universiteit Utrecht	The Netherlands	Silver	Silver		Silver
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Silver

Top Group Tables

Table 19: Top Group Biology

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Technische Universität Wien	Austria		Silver		
Universität Wien	Austria	Gold	Silver		
Katholieke Universiteit Leuven	Belgium	Gold	Silver	Gold	
Université Catholique de Louvain	Belgium	Silver	Silver		
Université Libre de Bruxelles	Belgium	Silver	Bronze	Silver	Bronze
Universiteit Antwerpen	Belgium	Bronze	Bronze	Silver	Bronze
Universiteit Gent	Belgium	Silver	Silver	Gold	
Aarhus Universitet	Denmark	Silver	Bronze		Bronze
Danmarks Tekniske Universitet	Denmark	Bronze	Gold		
Den Kongelige Veterinær- og Landbohøjskole	Denmark	Bronze	Silver		
Københavns Universitet	Denmark	Gold	Silver		Gold
Syddansk Universitet	Denmark	Bronze	Gold		
Helsingin Yliopisto	Finland	Gold	Gold		
Kuopion Yliopisto	Finland	Bronze	Gold		
Tampereen Yliopisto	Finland		Silver		
Turun Yliopisto	Finland	Bronze	Silver		
Uolun Yliopisto	Finland	Bronze	Silver		
L'Université Paris Descartes	France	Silver			
Université de Nice Sophia Antipolis	France		Silver	Silver	
Université Joseph Fourier Grenoble	France	Bronze	Silver		
Université Louis Pasteur Strasbourg	France	Bronze	Gold	Silver	Bronze
Université Paul Sabatier	France	Bronze	Silver		
Université Pierre et Marie Curie	France	Gold	Bronze		
Université Robert Schuman	France	Bronze	Silver		
Université Victor Segalen Bordeaux 2	France	Bronze	Silver		
Albert-Ludwigs-Universität Freiburg	Germany	Silver	Gold		
Bayerische Julius-Maximilians-Universität Würzburg	Germany	Silver	Silver	Silver	
Eberhard Karls Universität Tübingen	Germany	Silver	Silver	Silver	Bronze
Freie Universität Berlin	Germany	Silver	Bronze		
Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	Bronze	Silver	Silver	
Georg-August-Universität Göttingen	Germany	Silver	Bronze		Silver
Heinrich-Heyne-Universität Düsseldorf	Germany	Silver	Silver		Bronze
Humboldt-Universität zu Berlin	Germany	Bronze	Silver		Gold
Johann Wolfgang Goethe-Universität Frankfurt	Germany	Bronze	Silver		
Johannes Gutenberg-Universität Mainz	Germany	Bronze	Silver		
Ludwig-Maximilians-Universität München	Germany	Gold	Silver		Gold
Otto-von-Guericke-Universität Magdeburg	Germany	Bronze	Gold		
Philipps-Universität Marburg	Germany	Bronze	Silver	Gold	
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Bronze		
Ruhr-Universität Bochum	Germany	Bronze	Silver		
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Gold		
Technische Universität Berlin	Germany		Silver		
Technische Universität München	Germany	Silver	Gold	Silver	
Universität Bayreuth	Germany	Bronze	Silver		

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Universität Bielefeld	Germany			Silver	
Universität Hamburg	Germany	Bronze	Silver	Silver	
Universität Karlsruhe	Germany		Gold		
Universität Konstanz	Germany	Bronze	Gold		
Universität Regensburg	Germany	Bronze	Silver	Silver	
Universität Stuttgart	Germany		Gold		Bronze
Universität zu Köln	Germany	Bronze	Silver		Bronze
Universität zu Lübeck	Germany	Bronze	Silver		
Westfälische Wilhelms-Universität Münster	Germany	Bronze	Bronze	Silver	
Dublin City University	Ireland			Silver	
University College Cork	Ireland	Bronze	Gold		
University of Dublin, Trinity College	Ireland	Bronze	Gold		
Università degli Studi di Milano	Italy	Gold	Bronze	Silver	Bronze
Università degli Studi di Napoli Federico II	Italy	Silver			
Università degli Studi di Padova	Italy	Silver		Silver	Bronze
Università degli Studi di Roma "La Sapienza"	Italy	Gold			
Università degli Studi di Verona	Italy	Bronze	Silver		
Università di Bologna	Italy	Silver			
Norges Teknisk-Naturvitenskapelige Universitet	Norway	Bronze	Silver		
Universitetet i Oslo	Norway	Silver	Silver		Gold
Universidad Complutense de Madrid	Spain	Silver			
Universitat de Barcelona	Spain	Silver			
Göteborgs Universitet	Sweden	Silver	Silver		Bronze
Karolinska Institutet	Sweden	Gold	Gold	Gold	Bronze
Lunds Universitet	Sweden	Gold	Silver		
Sveriges Lantbruksuniversitet	Sweden	Silver	Bronze		
Umeå Universitet	Sweden	Bronze	Gold		
Universitet Stockholm	Sweden	Silver	Silver	Silver	Bronze
Uppsala Universitet	Sweden	Gold	Silver		Silver
École Polytechnique Fédérale de Lausanne	Switzerland		Silver		Bronze
Eidgenössisch Technische Hochschule Zürich	Switzerland	Silver	Gold	Gold	Gold
Universität Basel	Switzerland	Bronze	Gold	Silver	
Universität Bern	Switzerland	Silver	Gold		
Universität Zürich	Switzerland	Gold	Gold	Silver	
Université de Genève	Switzerland	Silver	Gold		
Université de Lausanne	Switzerland	Bronze	Gold		
Delft University of Technology	The Netherlands		Bronze	Silver	
Erasmus University Rotterdam	The Netherlands	Silver	Gold		
Radboud Universiteit Nijmegen	The Netherlands	Bronze	Silver		
Rijksuniversiteit Groningen	The Netherlands	Silver	Silver	Silver	
Universiteit Leiden	The Netherlands	Gold	Silver	Silver	Bronze
Universiteit Maastricht	The Netherlands	Bronze	Gold		
Universiteit Utrecht	The Netherlands	Gold	Gold	Silver	Bronze
Universiteit van Amsterdam	The Netherlands	Silver	Gold		Bronze
Vrije Universiteit Amsterdam	The Netherlands	Silver	Gold		
Wageningen Universiteit	The Netherlands	Gold	Gold		
Brunel University West London	United Kingdom		Gold		
Durham University Science Laboratories	United Kingdom		Gold		
Imperial College London	United Kingdom	Gold	Gold	Gold	Silver
King's College London	United Kingdom	Gold	Gold		

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
London School of Hygiene & Tropical Medicine	United Kingdom		Gold		
Newcastle University	United Kingdom	Bronze	Gold		
Queen Mary University of London	United Kingdom	Bronze	Gold		
Queen's University Belfast	United Kingdom	Bronze	Silver		
St. George's, University of London	United Kingdom		Silver		
The University of Birmingham	United Kingdom	Silver	Silver	Silver	
The University of Nottingham	United Kingdom	Bronze	Silver	Silver	Bronze
The University of Warwick	United Kingdom		Gold		Bronze
The University of York	United Kingdom	Bronze	Gold		Silver
University College London, University of London	United Kingdom	Gold	Gold	Gold	Silver
University of Aberdeen · King's College	United Kingdom	Bronze	Silver		
University of Bath	United Kingdom		Silver		
University of Bristol	United Kingdom	Silver	Gold		
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
University of Dundee	United Kingdom	Bronze	Gold		
University of East Anglia	United Kingdom		Gold		
University of Edinburgh	United Kingdom	Gold	Gold	Silver	Silver
University of Glasgow	United Kingdom	Silver	Gold	Silver	
University of Lancaster	United Kingdom		Silver		
University of Leeds	United Kingdom	Bronze	Gold		Bronze
University of Leicester	United Kingdom	Bronze	Gold	Silver	
University of Manchester	United Kingdom	Silver	Silver		Bronze
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
University of Sheffield	United Kingdom	Bronze	Gold		Silver
University of Southampton	United Kingdom	Bronze	Silver		
University of St Andrews	United Kingdom	Bronze	Gold		
University of Sussex	United Kingdom		Gold		Bronze
University of Wales/Prifysgol Cymru, Bangor	United Kingdom		Silver		

Table 20: Top Group Chemistry

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Universität Innsbruck	Austria	Bronze	Silver		Silver
Universität Wien	Austria	Silver	Bronze		
Katholieke Universiteit Leuven	Belgium	Gold	Silver		
Université catholique de Louvain	Belgium	Silver	Bronze		
Université de Liege	Belgium	Bronze	Gold	Silver	
Univerzita Karlova v Praze	Czech Republic	Silver			
Aarhus Universitet	Denmark	Bronze	Gold		Bronze
Danmarks Tekniske Universitet	Denmark	Bronze	Gold		
Syddansk Universitet	Denmark		Gold		Bronze
Helsingin Yliopisto	Finland	Silver	Silver		Bronze
Université Bordeaux I	France	Silver	Silver		
Université Claude Bernard Lyon 1	France	Gold			
Université de Rennes 1	France	Silver	Silver		Gold
Université Joseph Fourier Grenoble	France	Silver	Bronze		
Université Louis Pasteur Strasbourg	France	Bronze	Gold	Gold	Bronze
Université Montpellier 2	France	Silver			Bronze
Université Paris 7 - Denis Diderot	France	Bronze		Silver	
Université Paris-Sud 11	France	Gold	Silver		Gold
Université Paul Sabatier	France	Silver			
Université Pierre et Marie Curie	France	Gold	Silver		Bronze
Université Robert Schuman	France	Gold	Gold		
Albert-Ludwigs-Universität Freiburg	Germany	Silver	Gold		
Bayerische Julius-Maximilians-Universität Würzburg	Germany	Gold		Gold	
Eberhard Karls Universität Tübingen	Germany	Silver	Bronze		
Freie Universität Berlin	Germany	Silver	Bronze		
Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	Silver	Silver	Silver	Bronze
Georg-August-Universität Göttingen	Germany	Silver	Bronze	Gold	Bronze
Heinrich-Heyne-Universität Düsseldorf	Germany	Bronze	Gold		
Johann Wolfgang Goethe-Universität Frankfurt	Germany	Bronze	Silver		
Johannes Gutenberg-Universität Mainz	Germany	Gold	Gold	Silver	Gold
Ludwig-Maximilians-Universität München	Germany	Gold	Bronze		Bronze
Martin-Luther-Universität Halle-Wittenberg	Germany	Silver			
Philipps-Universität Marburg	Germany	Gold	Silver		Bronze
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Silver		
Rheinisch-Westfälische Technische Hochschule Aachen	Germany	Gold	Silver		Gold
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Silver	Silver	Bronze
Technische Universität Berlin	Germany	Bronze	Gold	Silver	Bronze
Technische Universität Carolo-Wilhelmina zu Braunschweig	Germany	Bronze		Silver	
Technische Universität München	Germany	Gold	Gold	Gold	
Universität Bielefeld	Germany		Silver	Silver	
Universität Duisburg-Essen	Germany	Bronze	Bronze	Silver	
Universität Hamburg	Germany	Silver	Silver		
Universität Karlsruhe	Germany	Silver	Gold	Silver	Bronze
Universität Konstanz	Germany		Silver	Gold	
Universität Leipzig	Germany	Silver			Bronze
Universität Rostock	Germany	Bronze	Silver		
Universität Stuttgart	Germany	Silver	Silver	Silver	Bronze
Universität Ulm	Germany	Bronze	Gold		

Universität zu Lübeck	Germany		Silver		Bronze
Westfälische Wilhelms-Universität Münster	Germany	Gold	Bronze	Silver	
Budapesti Műszaki és Gazdaságtudományi Egyetem	Hungary	Silver			
Szegedi Tudományegyetem	Hungary	Silver			
National University of Ireland, Galway	Ireland				Silver
University College Cork	Ireland		Silver		
University College Dublin, National University of Ireland	Ireland		Silver		
University of Dublin, Trinity College	Ireland		Silver		
Università degli Studi di Firenze	Italy	Silver	Bronze	Silver	Bronze
Università degli Studi di Milano	Italy	Gold	Bronze		Bronze
Università degli Studi di Napoli Federico II	Italy	Silver	Bronze		
Università degli Studi di Padova	Italy	Silver			
Università degli Studi di Parma	Italy	Bronze	Silver		
Università degli Studi di Roma "La Sapienza"	Italy	Gold			
Università degli Studi di Salerno	Italy	Bronze	Silver		
Università degli Studi di Trieste	Italy	Bronze	Gold		
Università degli studi di Udine	Italy		Silver		
Università di Bologna	Italy	Gold	Silver	Silver	
Università di Pisa	Italy	Silver			
Adam Mickiewicz University Poznan	Poland	Silver			
Uniwersytet Warszawski	Poland	Silver			Bronze
Uniwersytet Wrocławski	Poland	Silver			
Universidad Complutense de Madrid	Spain	Gold			
Universidad de Oviedo / La Universidad de Asturias	Spain	Silver	Bronze		
Universidad de Zaragoza	Spain	Silver	Bronze	Silver	
Universidad del País Vasco/Euskal Herriko Unibertsitatea	Spain	Silver			
Universidad Politécnica de Madrid	Spain		Silver		
Universidad Politécnica de Valencia	Spain	Bronze	Gold	Silver	Bronze
Universidade de Santiago de Compostela	Spain	Gold			
Universitat de Barcelona	Spain	Gold	Silver		Bronze
Universitat de València	Spain	Gold	Silver		Bronze
Chalmers Tekniska Högskola	Sweden	Bronze	Silver		Bronze
KTH Sveriges Största Tekniska Universitet	Sweden	Silver	Gold		Gold
Linköpings Universitet	Sweden		Silver		
Lunds Universitet	Sweden	Gold	Gold	Silver	Gold
Umeå Universitet	Sweden		Silver		
Universitet Stockholms	Sweden	Bronze	Gold	Silver	Bronze
Uppsala Universitet	Sweden	Silver	Gold		Gold
École Polytechnique Fédérale de Lausanne	Switzerland	Silver	Gold	Gold	
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Bronze
Universität Basel	Switzerland	Bronze	Gold		Gold
Universität Bern	Switzerland	Bronze	Silver		
Université de Genève	Switzerland	Bronze	Gold		
Université de Lausanne	Switzerland	Bronze	Silver		
Delft University of Technology	The Netherlands	Silver	Gold		Bronze
Radboud Universiteit Nijmegen	The Netherlands	Bronze	Silver		
Rijksuniversiteit Groningen	The Netherlands	Bronze	Gold		Bronze
Stichting Katholieke Universiteit	The Netherlands				Gold
Technische Universiteit Eindhoven	The Netherlands	Silver	Gold		Bronze
Universiteit Leiden	The Netherlands	Silver	Silver	Silver	Bronze
Universiteit Maastricht	The Netherlands		Silver		
Universiteit Twente	The Netherlands	Bronze	Gold	Silver	

Universiteit Utrecht	The Netherlands	Gold	Gold	Gold	Silver
Universiteit van Amsterdam	The Netherlands	Bronze	Gold	Silver	Silver
Vrije Universiteit Amsterdam	The Netherlands	Bronze	Gold		
Brunel University West London	United Kingdom		Silver		
Durham University Science Laboratories	United Kingdom	Silver	Gold		Silver
Imperial College London	United Kingdom	Gold	Gold	Silver	Gold
Keele University	United Kingdom		Silver		
King's College London	United Kingdom	Bronze	Silver		
Loughborough University	United Kingdom	Bronze	Silver		
Newcastle University	United Kingdom	Bronze	Silver	Silver	
Queen's University Belfast	United Kingdom	Bronze	Gold		Bronze
St. George's, University of London	United Kingdom		Gold		
The University of Birmingham	United Kingdom	Bronze	Gold		Bronze
The University of Nottingham	United Kingdom	Silver	Gold		Bronze
The University of Warwick	United Kingdom	Bronze	Gold		Gold
The University of York	United Kingdom	Bronze	Gold		Bronze
University College London, University of London	United Kingdom	Bronze	Silver	Silver	
University of Aberdeen · King's College	United Kingdom		Silver		
University of Bath	United Kingdom	Bronze	Gold		Bronze
University of Bristol	United Kingdom	Gold	Gold	Silver	Gold
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
University of Glasgow	United Kingdom	Bronze	Silver		
University of Hull	United Kingdom		Silver		
University of Leeds	United Kingdom	Gold	Gold		
University of Liverpool	United Kingdom	Bronze	Gold		Gold
University of Manchester	United Kingdom	Gold	Silver		Bronze
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
University of Reading	United Kingdom	Bronze	Silver		
University of Sheffield	United Kingdom	Bronze	Gold		Bronze
University of Southampton	United Kingdom	Silver	Gold	Silver	
University of St Andrews	United Kingdom	Bronze	Silver		Silver
University of Strathclyde	United Kingdom	Bronze	Silver		Bronze
University of Sussex	United Kingdom	Silver	Silver	Gold	Bronze

Table 21: Top Group Mathematics

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Technische Universität Wien	Austria	Silver			Silver
Universität Wien	Austria	Silver	Silver		Bronze
Katholieke Universiteit Leuven	Belgium	Gold			
Université Catholique de Louvain	Belgium	Silver	Gold		Silver
Université de Liege	Belgium		Silver		
Université Libre de Bruxelles	Belgium	Silver			
Universiteit Gent	Belgium	Silver			
Univerzita Karlova v Praze	Czech Republic	Gold			
Aarhus Universitet	Denmark	Bronze	Silver	Silver	Bronze
Danmarks Tekniske Universitet	Denmark	Bronze	Silver		
Den Kongelige Veterinær- og Landbohøjskole	Denmark		Gold		
Københavns Universitet	Denmark	Silver	Silver	Silver	
Syddansk Universitet	Denmark	Bronze	Silver		
Helsingin Teknillinen Korkeakoulu	Finland		Silver		
Helsingin Yliopisto	Finland	Silver	Silver		
Jyväskylän Yliopisto	Finland	Bronze	Gold		
Kuopion Yliopisto	Finland		Gold		
Université Bordeaux I	France	Gold	Silver		
Université Claude Bernard Lyon 1	France	Silver			Silver
Université de Bourgogne	France	Bronze	Silver		
Université de la Méditerranée	France	Bronze	Silver		
Université de Nantes	France	Bronze	Silver		
Université de Nice Sophia Antipolis	France	Bronze	Silver		Bronze
Université de Rennes 1	France	Silver	Gold		Bronze
Université des Sciences et Technologies de Lille U.S.T.L.	France	Silver			
Université François-Rabelais	France		Gold		
Université Joseph Fourier Grenoble	France	Silver			Bronze
Université Lille 2 Droit et Santé	France		Gold		
Université Louis Pasteur Strasbourg	France		Gold	Silver	Silver
Université Montpellier 1	France		Silver		
Université Paris 12 Val de Marne	France		Gold		
Université Paris 7 - Denis Diderot	France	Gold	Silver		Silver
Université Paris-Dauphine	France			Silver	
Université Paris-Sud 11	France	Gold	Gold	Gold	Silver
Université Paul Sabatier	France	Gold	Gold		Bronze
Université Pierre et Marie Curie	France	Gold	Gold		Silver
Université Robert Schuman	France	Silver	Gold		
University de Caen Basse-Normandie	France	Bronze	Silver		
Albert-Ludwigs-Universität Freiburg	Germany	Bronze	Silver		Gold
Bayerische Julius-Maximilians-Universität Würzburg	Germany	Bronze	Silver		
Christian-Albrechts-Universität zu Kiel	Germany	Bronze	Gold		
Eberhard Karls Universität Tübingen	Germany	Silver	Gold	Silver	
Freie Universität Berlin	Germany	Bronze	Silver		
Georg-August-Universität Göttingen	Germany	Bronze	Silver		
Humboldt-Universität zu Berlin	Germany	Gold	Bronze	Silver	Bronze
Ludwig-Maximilians-Universität München	Germany	Bronze	Silver		
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Gold	Silver	Silver
Rheinisch-Westfälische Technische Hochschule Aachen	Germany	Silver	Silver	Silver	

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Ruhr-Universität Bochum	Germany	Silver			
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Gold		
Technische Universität Berlin	Germany	Silver	Gold	Silver	Silver
Technische Universität Darmstadt	Germany	Silver			
Technische Universität Kaiserslautern	Germany	Bronze	Silver		
Universität Bielefeld	Germany	Gold	Silver	Gold	
Universität Duisburg-Essen	Germany	Silver	Bronze		Bronze
Universität des Saarlandes	Germany	Bronze	Silver		
Universität Hamburg	Germany	Bronze	Gold		
Universität Karlsruhe	Germany	Silver			
Universität Rostock	Germany	Bronze	Silver		
Universität Stuttgart	Germany	Silver			
Universität zu Köln	Germany	Bronze	Silver		
Universität zu Lübeck	Germany		Silver		
Westfälische Wilhelms-Universität Münster	Germany	Bronze	Silver		Bronze
National Technical University of Athens	Greece	Silver			
University of Crete	Greece	Bronze	Silver		
Eötvös Loránd University (ELTE) International Studies	Hungary	Gold			Bronze
Politecnico di Milano	Italy	Silver			
Politecnico di Torino	Italy	Bronze	Silver		Bronze
Università degli Studi di Firenze	Italy	Gold			Bronze
Università degli Studi di Milano	Italy	Silver			Bronze
Università degli Studi di Napoli Federico II	Italy	Silver			
Università degli Studi di Padova	Italy	Gold			Gold
Università degli Studi di Pavia	Italy	Bronze	Gold	Silver	
Università degli Studi di Roma "La Sapienza"	Italy	Gold	Bronze		Bronze
Università degli Studi di Trieste	Italy	Bronze	Silver		Bronze
Università di Bologna	Italy	Silver			
Università di Pisa	Italy	Gold		Silver	Bronze
Università di Roma "Tor Vergata"	Italy	Silver	Gold		Silver
Norges Teknisk-Naturvitenskapelige Universitet	Norway	Bronze	Gold		Silver
University of Bergen	Norway	Bronze	Gold		
Uniwersytet Warszawski	Poland	Gold	Bronze		
Univerza v Ljubljani	Slovenia	Silver			
Universidad Autónoma de Madrid	Spain	Silver	Gold		
Universidad Complutense de Madrid	Spain	Gold			
Universidad de Granada	Spain	Gold			
Universidad de Oviedo / La Universidad de Asturias	Spain		Silver		
Universidad de Sevilla	Spain	Gold			
Universidad de Zaragoza	Spain	Silver			Bronze
Universitat Autònoma de Barcelona	Spain	Silver			
Universitat de Barcelona	Spain	Silver	Gold	Silver	
Universitat de València	Spain	Silver			
Universitat Politècnica de Catalunya	Spain	Gold			
Chalmers Tekniska Högskola	Sweden	Silver		Silver	
Karolinska Institutet	Sweden		Silver		
KTH Sveriges Största Tekniska Universitet	Sweden	Silver	Gold		Silver
Lunds Universitet	Sweden	Bronze	Silver		
Universitet Stockholms	Sweden		Gold		
Uppsala Universitet	Sweden	Bronze	Gold		
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Silver

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Universität Basel	Switzerland		Silver		
Universität Zürich	Switzerland	Bronze	Gold	Silver	
Université de Geneve	Switzerland	Bronze	Silver		
Delft University of Technology	The Netherlands	Silver	Bronze		
Rijksuniversiteit Groningen	The Netherlands	Bronze	Silver		
Universiteit Leiden	The Netherlands	Bronze	Silver	Silver	
Universiteit Utrecht	The Netherlands	Silver	Silver	Gold	Bronze
Durham University Science Laboratories	United Kingdom	Bronze			Silver
Heriot-Watt University Edinburgh	United Kingdom	Bronze			Silver
Imperial College London	United Kingdom	Gold	Gold	Gold	Silver
King's College London	United Kingdom		Gold	Silver	
London School of Hygiene & Tropical Medicine	United Kingdom		Gold		
Swansea University	United Kingdom	Bronze	Silver		
The University of Surrey	United Kingdom		Silver		
The University of Warwick	United Kingdom	Silver	Gold		Bronze
The University of York	United Kingdom		Gold		
University College London, University of London	United Kingdom	Bronze	Gold		Bronze
University of Bath	United Kingdom	Bronze	Gold		
University of Bristol	United Kingdom	Bronze	Gold	Gold	
University of Cambridge	United Kingdom	Gold	Gold	Gold	Gold
University of Edinburgh	United Kingdom	Silver	Silver		
University of Glasgow	United Kingdom	Bronze	Silver	Silver	
University of Lancaster	United Kingdom	Bronze	Silver	Silver	
University of Leeds	United Kingdom	Silver			Gold
University of Leicester	United Kingdom	Bronze	Gold		
University of Manchester	United Kingdom	Gold	Silver		Bronze
University of Oxford	United Kingdom	Gold	Gold	Gold	Gold
University of St Andrews	United Kingdom	Bronze	Silver		
University of Sussex	United Kingdom	Bronze	Silver		
University of Wales Institute/Athrofa Prifysgol Cymru, Cardiff	United Kingdom	Bronze	Silver		

Table 22: Top Group Physics

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
Universität Innsbruck	Austria	Bronze	Gold		
Universität Wien	Austria	Silver	Bronze		Bronze
Katholieke Universiteit Leuven	Belgium	Silver			Bronze
Université catholique de Louvain	Belgium	Bronze	Silver		
Université Libre de Bruxelles	Belgium	Silver	Bronze		Bronze
Aarhus Universitet	Denmark	Silver	Gold		Bronze
Danmarks Tekniske Universitet	Denmark	Bronze	Gold		Bronze
Københavns Universitet	Denmark	Gold	Silver	Silver	Gold
Helsingin Yliopisto	Finland	Silver	Gold	Gold	
Kuopion Yliopisto	Finland		Silver		
Ecole normale supérieure	France				Gold
Université de la Méditerranée	France	Bronze	Gold		
Université de Rennes 1	France				Silver
Université Joseph Fourier Grenoble	France	Silver	Bronze		Silver
Université Montpellier 1	France		Silver		
Université Paris 7 - Denis Diderot	France	Silver	Bronze		Bronze
Université Paris-Sud 11	France	Gold	Silver		Bronze
Université Pierre et Marie Curie	France	Gold	Bronze		Bronze
Université Robert Schuman	France	Bronze	Silver		
University de Caen Basse-Normandie	France		Silver		
Albert-Ludwigs-Universität Freiburg	Germany	Bronze	Gold	Silver	
Bayerische Julius-Maximilians-Universität Würzburg	Germany	Bronze	Silver		
Bergische Universität Wuppertal	Germany			Gold	Bronze
Eberhard Karls Universität Tübingen	Germany	Bronze		Silver	Bronze
Freie Universität Berlin	Germany	Silver			Bronze
Friedrich-Alexander-Universität Erlangen-Nürnberg	Germany	Bronze	Silver		Bronze
Heinrich-Heyne-Universität Düsseldorf	Germany		Gold		Bronze
Humboldt-Universität zu Berlin	Germany	Silver	Bronze		
Johann Wolfgang Goethe-Universität Frankfurt	Germany	Bronze	Silver	Gold	
Johannes Gutenberg-Universität Mainz	Germany	Silver	Gold	Silver	Bronze
Leibnitz Universität Hannover	Germany	Bronze	Silver		
Ludwig-Maximilians-Universität München	Germany	Gold	Gold		Silver
Philipps-Universität Marburg	Germany	Bronze	Gold		
Rheinische Friedrich-Wilhelms-Universität Bonn	Germany	Silver	Silver	Silver	Silver
Rheinisch-Westfälische Technische Hochschule Aachen	Germany	Silver	Gold		
Ruhr-Universität Bochum	Germany	Gold			
Ruprecht-Karls-Universität Heidelberg	Germany	Silver	Gold	Silver	Gold
Technische Universität Berlin	Germany	Bronze	Silver	Silver	
Technische Universität Dortmund	Germany	Bronze	Gold		
Technische Universität München	Germany	Gold	Gold		Silver
Universität Bielefeld	Germany	Bronze	Gold		
Universität Duisburg-Essen	Germany	Bronze	Silber		Gold
Universität Hamburg	Germany	Silver	Silver		Bronze
Universität Karlsruhe	Germany	Gold	Gold		Bronze
Universität Konstanz	Germany	Bronze	Silver		
Universität Stuttgart	Germany	Bronze	Silver		
Universität zu Köln	Germany	Silver	Bronze		Bronze
Eötvös Loránd University (ELTE) International Studies	Hungary	Bronze	Silver		Bronze

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
University of Dublin, Trinity College	Ireland		Gold		Bronze
Università degli studi di Cagliari	Italy		Gold		
Università degli Studi di Firenze	Italy	Silver	Silver		Silver
Università degli Studi di Genova	Italy	Bronze	Gold		
Università degli Studi di Milano	Italy	Gold	Bronze		Bronze
Università degli Studi di Napoli Federico II	Italy	Silver			
Università degli Studi di Padova	Italy	Gold	Silver	Silver	Bronze
Università degli Studi di Perugia	Italy	Bronze	Silver		
Università degli Studi di Roma "La Sapienza"	Italy	Gold	Silver	Silver	Bronze
Università degli Studi di Torino	Italy	Silver	Silver		
Università degli Studi di Trieste	Italy	Bronze	Silver		Bronze
Università di Bologna	Italy	Gold	Bronze	Gold	
Università di Ferrara	Italy	Bronze	Silver		
Università di Pisa	Italy	Silver	Silver	Silver	
Università di Roma "Tor Vergata"	Italy	Silver	Silver		Bronze
Uniwersytet Jagiellonski	Poland	Silver			
Uniwersytet Warszawski	Poland	Gold	Gold		Bronze
Universidade Técnica de Lisboa	Portugal	Bronze	Silver		
Universidad Autónoma de Madrid	Spain	Silver	Silver		Gold
Universidad de Oviedo / La Universidad de Asturias	Spain		Silver		
Universidad Politécnica de Valencia	Spain		Gold		Silver
Universitat Autònoma de Barcelona	Spain	Bronze	Silver		
Universitat de Barcelona	Spain	Silver	Silver		Silver
Universitat de València	Spain	Silver	Silver		Bronze
Chalmers Tekniska Högskola	Sweden	Silver	Bronze		Bronze
Göteborgs Universitet	Sweden	Bronze	Silver		
Karolinska Institutet	Sweden		Silver		
KTH Sveriges Största Tekniska Universitet	Sweden	Silver			
Lunds Universitet	Sweden	Silver	Gold	Silver	Bronze
Uppsala Universitet	Sweden	Gold	Bronze		
École Polytechnique Fédérale de Lausanne	Switzerland	Silver	Silver		
Eidgenössisch Technische Hochschule Zürich	Switzerland	Gold	Gold	Gold	Silver
Universität Basel	Switzerland	Bronze	Gold		Bronze
Universität Zürich	Switzerland	Bronze	Gold		
Université de Genève	Switzerland	Bronze	Gold	Silver	
Université de Lausanne	Switzerland	Bronze	Gold		
Delft University of Technology	The Netherlands	Bronze	Silver		
Radboud Universiteit Nijmegen	The Netherlands	Bronze	Silver		
Rijksuniversiteit Groningen	The Netherlands	Silver	Gold		Silver
Universiteit Leiden	The Netherlands	Silver	Silver		Gold
Universiteit Twente	The Netherlands		Gold		
Universiteit Utrecht	The Netherlands	Silver	Silver		Silver
Universiteit van Amsterdam	The Netherlands	Gold	Silver	Silver	Bronze
Vrije Universiteit Amsterdam	The Netherlands		Gold		
Brunel University West London	United Kingdom		Silver		
Durham University Science Laboratories	United Kingdom	Silver	Gold		Bronze
Imperial College London	United Kingdom	Gold	Gold	Gold	Gold
King's College London	United Kingdom		Silver		Bronze
Queen Mary University of London	United Kingdom	Bronze	Silver		
St. George's, University of London	United Kingdom		Silver		
The University of Birmingham	United Kingdom	Silver	Silver	Gold	

UNIVERSITY	COUNTRY	Publications	Citations	Highly Cited	Marie Curie
The University of Nottingham	United Kingdom	Bronze	Bronze	Silver	Gold
University College London, University of London	United Kingdom	Gold	Bronze		Bronze
University of Bath	United Kingdom		Silver		
University of Bristol	United Kingdom	Bronze	Gold		
University of Cambridge	United Kingdom	Gold	Gold	Silver	Gold
University of Edinburgh	United Kingdom	Silver	Gold		Silver
University of Glasgow	United Kingdom	Bronze	Gold		Bronze
University of Lancaster	United Kingdom	Bronze	Silver		Bronze
University of Leeds	United Kingdom	Bronze	Silver		
University of Liverpool	United Kingdom	Silver	Bronze	Silver	Bronze
University of Manchester	United Kingdom	Gold	Bronze	Gold	Silver
University of Oxford	United Kingdom	Gold	Gold		Bronze
University of Reading	United Kingdom		Silver		
University of Sheffield	United Kingdom	Bronze	Silver		Silver
University of Southampton	United Kingdom	Bronze	Silver		Bronze
University of Sussex	United Kingdom	Bronze	Gold		
University of Wales Institute/Athrofa Prifysgol Cymru, Cardiff	United Kingdom	Bronze	Silver		
University of Wales/Prifysgol Cymru, Bangor	United Kingdom		Gold		

Outlook to the future

The CHE-ExcellenceRanking is regarded as a first and tentative approach towards the identification of excellent universities in certain academic fields. Methods had to be developed and tested and the first round shows the need to adjust these methods in follow-up rounds. One particularly interesting, although not surprising, finding was that the precise formulation of wording in the questionnaires posed many more difficulties than envisioned. Though the research team had been aware of the problem of definitions, understandings of the same word, and different payment systems, it was still possible to observe considerable extra need for explanation, especially concerning budget definitions and the nomenclature of academic positions. According to the philosophy of CHE, this adaptation took and will take place in cooperation with the institutions analysed.

The future direction of the CHE-ExcellenceRanking is the extension into other fields of academia. In this way, the CHE-ExcellenceRanking continues to aim at supporting the idea of the European Higher Education Area (EHEA) while at the same time satisfying the public's thirst for "discovering the best." It will, however, remain one of the major tasks of the project to always reflect the methodological stipulations and boundaries imposed on any kind of ranking.

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Annex A: Methodology

The classification indicators

- **Number of publications⁹ in the web of science (1997 – 2004)**

This is the number of publications found in the web of science with a query by institution and subject: chemistry, mathematics, physics and biology, with the publishing year from 1997 to 2004. This indicator is meant as a “size” indicator describing the overall impact of a science department. A silver medal is given to those institutions which have the largest publication output and belong to the group which comprises of at least 50% of all publications counted. The gold group contains the largest HEIs covering 25% of the output. The remaining universities received a bronze medal, except for those covering together only 5% of the total output. Taken into consideration were those universities with at least 3.000 publications counted in the web of science in the years 1997 to 2004, across all subjects.

- **Citations (normalized to the international standard)**

This indicator compares the average number of citations received by the papers of a research unit (CPP) with its international reference value, namely corresponding to the field-based mean citation score (FCSm) by calculating the ratio. It was developed by Anthony van Raan and the CWTS as a measure for the visibility of a department compared to an international standard. Self-citations are excluded in the calculation of the ratio to prevent the ratio from being affected by divergent self-citation behaviour.

If the ratio $CPP/FCSm$ (= crown indicator) is above (or below) 1.0, this means that the papers of the research unit are cited more (or less) frequently than an ‘average’ publication in the field(s) in which the research unit is active. FCSm constitutes a worldwide field-specific average in a specific (combination of) field(s). In this way, one may obtain an indication of the international position of a research unit in terms of its impact compared to a world average. This world average is calculated for the total population of articles published in CI journals assigned to a particular field. This indicator focuses on the “reception” impact of such a department in its scientific community. The medals for citations are computed in a similar way to the publications top group. The universities with

⁹ The publication and citation indicators were computed by Prof. Dr. van Raan from the CWTS Leiden.

the highest citation indices covering 50% of the sum received a silver medal. The universities covering the top 25% received a gold medal accordingly. To receive a bronze medal, a crown indicator of at least one was needed. In biology, three subjects were mixed so that the average indicator tends to be a little bit smaller; in this case, the limit is 0.9.

- **Outstanding Researchers**

This indicator identifies institutions with outstanding researchers. Only researchers that are still teaching at the specific institution were counted. Thomson Scientific provides a list of "Highly Cited Researchers," each of whom are among the 250 most cited researchers for their published articles within a specific time period.¹⁰

To identify highly cited researchers, ISI begins with all articles indexed in the Thomson Scientific Citation Databases over a 20-year rolling time period; the period 1984-2003 was used for HEI pre-selection. Each article in the database is assigned to one or more of the 21 categories in ISI HighlyCited.com based on the ISI classification of the journal in which the article was published. Categories counted were chemistry, mathematics, physics, and biology - in particular, biology & biochemistry, microbiology, molecular biology & genetics, and plant & animal science. This indicator stresses the "lighthouse" factor of a department within its community. A silver medal is granted to those universities with at least one outstanding researcher working in the respective field. A gold medal was given to those HEIs where more than one outstanding researcher is working, except for biology, where a HEI needed two in order to qualify. This takes into account that for biology four subfields were analysed and thus more highly cited authors were found. The limits given here were computed using the same 50% approach applied to the above mentioned two indicators. No bronze medals were awarded in this category.

- **Number of projects in the Marie Curie programme¹¹**

This indicator measures European activity. The Sixth Framework Programme's Human Resources and Mobility (HRM) activity is largely based on the financing of training and mobility activities for researchers. These activities, known as the Marie Curie Actions, are aimed at the development and transfer of research competencies, the consolidation and widening of researchers' career prospects, and the promotion of excellence in European research. Data was taken from the Cordis database of the European Commission (<http://cordis.europa.eu/fp6/projects.htm>). The following activity lines were taken into

¹⁰ See: <http://hcr3.isiknowledge.com/home.cgi>

¹¹ See: <http://cordis.europa.eu/fp6/projects.htm>

account relative to their financial impact and availability (i.e. EXCs are very scarce but heavily funded whereas EIFs or IIFs are rather abundant but substantially less funded):

- *Marie Curie Intra-European Fellowships (EIF)*
- *Marie Curie Incoming International Fellowships (IIF)*
- *Marie Curie Research Training Networks (RTN)*
- *Marie Curie Host Fellowships for Early Stage Research Training (EST)*
- *Marie Curie Excellence Grants (EXT)*
- *Marie Curie Chairs (EXC)*

This indicator highlights the European dimension of the departments. In computing the top group in this indicator, the intra-European fellowships (EIF) and Incoming International fellowships (IIF) received a single weight, the research training networks (RTN) and the host fellowships (EST) a double weight, and the excellence grants (EXT) and chairs (EXC), a triple weight. The method used to identify the medals was similar to the method used for grouping the publication indicator. In biology, chemistry and mathematics, four points were needed for a gold medal and three points were sufficient for a silver medal. In physics, gold was awarded for six points and silver for four or five points.

Department surveys

In order to identify the right contact person, the universities chosen for the in-depth analysis were contacted on a central level, usually the office of the vice-chancellor, president or equivalent. In addition, where the information was available, international offices were often identified as first contact points. The institutions were asked to name a contact person for the project. In the end, this varied from one person for the entire project or different persons for each subject, from academics to administrators. Not all institutions answered and others did, but stated that they were not interested in participating.

Table 23: Response rates in the department surveys

Subject	Universities included in the survey	Universities answering the questionnaire
Biology	23	15 (65,2%)
Chemistry	25	17 (68%)
Mathematics	19	10 (52,6%)
Physics	24	17 (70,8%)

The questionnaire can be found at www.che-excellenceranking.eu.

Student surveys

The student surveys used an online questionnaire created by the CHE. One version was intended for master's students and another for doctoral students. The questionnaire was accessible only via a certain web link and with a personal code. The universities could choose whether they wanted to send out paper letters or e-mails containing the link and a personalised code.

Table 24: Universities participating in the student surveys

Subject	Universities included in the survey	Universities conducting a student survey
Biology	23	14 (60,9%)
Chemistry	25	12 (48%)
Mathematics	19	7 (36,8%)
Physics	24	11 (45,8%)

The questionnaire can be found at www.che-excellenceranking.eu.

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