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WORLD UNIVERSITY RANKINGS

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Top performers on the global stage take a bow

Students, academics and companies placing research contracts all need to know which are the best universities in the world. And the measures used to identify them are crucial, explains **John O'Leary**

Higher education has become so international that it is no longer enough for the leading universities to know that they are ahead of the pack in their own country.

Students are prepared to look abroad for the best course, even at undergraduate level; firms scour the world to place research contracts; and academics are more mobile than ever. When the newly merged Manchester University was launched last month, among the goals in its first strategic plan was to become one of the top 25 universities in the world. But who is to say which those are and — crucially — how they should be identified?

'The greatest influence has been exerted by those in the best position to judge: the academics'

Domestic league tables are controversial enough, but there are extra pitfalls associated with international comparisons. The rankings that start on the page opposite represent a first attempt to compare the world's top universities in the round. The process has been kept simple, partly because so few indicators of quality in higher education translate reliably across borders, but also to avoid any suggestion that the data have been manipulated to produce a particular outcome. The five indicators have been chosen to reflect strength in teaching, research and international reputation, with the greatest influence exerted by those in the best position to judge: the academics. University staff from every continent have given their verdict on the top institutions in their field, rather than delivering a more impressionistic judgement of quality across the board. Subsequent features will identify the leaders in different disciplines, but here we examine the aggregated results of the survey.

Other measures were considered and discarded for a variety of reasons. Some, such as a survey of graduate recruiters, may be revisited in future but produced too limited a response to be reliable. Others, such as spending on libraries, were too closely linked to national prosperity. Some proved impossible to compile because of a lack of comparable data.

Alan Gilbert, Manchester University's president — a prime example of the globalisation of higher education, having been headhunted from Melbourne University — identified the recruitment of Nobel laureates as one indication of international excellence for his institution. But the leading academic prizes were another factor omitted from our tables to make them as contemporaneous and consistent as possible.

Nobel prizes and Fields medals account for almost a third of the points in the list of top universities compiled this year by Shanghai Jiao Tong University. But why count only these prizes? And why credit the universities where prizewinners studied, some at the turn of the century before last? Why, indeed, credit universities where winners carried out their research, often at least 20 years previously, rather than the institution that now benefits from their presence?

'Despite taking seven top ten places, US universities are less dominant than most would have predicted'

The Shanghai list also awards a fifth of its points on the basis of articles published in *Science* and *Nature*, thereby conferring a big advantage on universities with strengths in the areas covered by these journals. A further 40 per cent rides on two overlapping citation indices, with a final 10 per cent devoted to a complex measure compensating for the advantages enjoyed by big universities. *The Times Higher* ranking rates universities as they are now, or at least as they were at the time of the most recently published statistics. The use of citations and staffing levels helps institutions dominated by the sciences, but the measures are as neutral as possible. When the next rankings are published in 2005, more improvements will no doubt have been made.

It will take a big change to shift Harvard University from top place, however. Strong performances on all five measures confirm what most observers have long suspected: that Harvard is in the position to which all leading universities aspire. The riches of its endowment will make the university hard to challenge, but its performance is not simply a matter of money. A reputation for being the best in the world acts as a magnet for the most talented students and staff.

Other positions in the table are less predictable, and no doubt some are the result of quirks in the methodology or the different ways statistics are compiled worldwide. But despite taking seven of the top ten places, US institutions are certainly less dominant than most would have predicted. The strong showing by the University of California, Berkeley will encourage other public universities but, across the Atlantic, so will the presence of Oxford and Cambridge universities and ETH Zurich in the top ten. The peer review, in particular, demonstrates that there are highly regarded universities in many parts of the world. Japan, Australia, China and Singapore all have representatives in the top 20. And even Australians may be surprised to find six of their universities in the top 50 — more than any country except the US and the UK.

Where scores are close, as they are lower down the table, there is no suggestion that one university is definitively better than another. However, the ranking offers a snapshot of the leading institutions on a set of criteria that are valued around the world.

THE WORLD'S TOP 200 UNIVERSITIES

RANK	NAME	COUNTRY	PEER REVIEW SCORE	INT'L FACULTY SCORE	INT'L STUDENTS SCORE	FACULTY/STUDENT SCORE	CITATIONS/FACULTY SCORE	FINAL SCORE
	Max score		**1000**	**100**	**100**	**400**	**400**	**1000.0**
1	Harvard University	US	643	17	17	50	243	1000.0
2	University of California, Berkeley	US	665	6	7	7	169	880.2
3	Massachusetts Institute of Technology	US	484	13	18	28	221	788.9
4	California Institute of Technology	US	236	19	17	45	400	738.9
5	Oxford University	UK	560	57	18	30	45	731.8
6	Cambridge University	UK	541	65	19	31	46	725.4
7	Stanford University	US	420	9	13	28	197	688.0
8	Yale University	US	347	53	20	65	81	582.8
9	Princeton University	US	353	18	18	19	133	557.5
10	ETH Zurich	Switzerland	170	72	25	4	266	553.7
11	London School of Economics	UK	257	79	100	27	6	484.4
12	Tokyo University	Japan	371	3	3	30	60	482.0
13	University of Chicago	US	254	31	18	58	71	444.0
14	Imperial College London	UK	237	60	51	55	27	443.7
15	University of Texas at Austin	US	183	9	8	8	202	421.5
16	Australian National University	Australia	212	48	31	9	105	417.7
17	Beijing University	China	322	9	11	35	3	391.8
18	National University of Singapore	Singapore	266	35	46	10	18	385.9
19	Columbia University	US	213	10	18	56	75	384.1
20	University of California, San Francisco	US	21	5	0	39	300	376.5
21	McGill University	Canada	132	84	42	11	84	364.1
22	Melbourne University	Australia	207	49	51	12	23	353.2
23	Cornell University	US	202	10	16	19	91	348.8
24	University of California, San Diego	US	96	3	6	7	208	331.5
25	Johns Hopkins University	US	107	16	13	68	116	330.8
26	University of California, Los Angeles	US	180	2	8	12	106	316.4
27	Ecole Polytechnique	France	144	25	55	23	59	315.5
28	Pennsylvania University	US	142	14	23	31	87	306.9
29	Kyoto University	Japan	207	3	3	25	57	303.7
30	Ecole Normale Supérieure, Paris	France	105	11	22	100	51	298.4
31	Michigan University	US	173	17	11	19	65	293.3
32	Ecole Polytechnique Fédérale de Lausanne	Switzerland	56	100	67	13	44	289.4
33	Monash University	Australia	136	49	64	8	19	286.0
34	University College London	UK	108	48	40	44	36	284.2
35	Illinois University	US	152	3	3	15	100	281.6
36	New South Wales University	Australia	140	49	47	19	12	275.7
37	Toronto University	Canada	131	24	16	6	88	272.5
38	Carnegie Mellon University	US	129	35	25	24	37	259.4
39	Hong Kong University	Hong Kong	96	74	14	8	50	249.5
40	Sydney University	Australia	124	49	29	11	24	245.2
41	Indian Institute of Technology	India	209	3	2	13	8	241.7
42	Hong Kong University of Sci & Technol	Hong Kong	135	37	15	8	38	240.6
43	Manchester University and Umist	UK	130	40	23	19	19	238.5
44	School of Oriental and African Studies	UK	62	70	77	20	0	235.8
45	Massachusetts University	US	118	1	4	7	99	235.7
46	University of British Columbia	Canada	114	24	14	6	65	230.4
47	Heidelberg University	Germany	124	11	33	12	41	228.3
48	Edinburgh University	UK	118	32	21	22	29	227.6
49	Queensland University	Australia	95	49	25	6	42	223.9
50	Nanyang University	Singapore	123	32	47	9	0	217.1
51	Tokyo Institute of Technology	Japan	118	3	13	27	50	217.0
52=	Duke University	US	61	12	11	56	66	212.6
52=	Université Catholique de Louvain	Belgium	104	26	41	17	19	212.6
54	Brussels Free University	Belgium	54	41	57	10	36	205.1
55	RMIT University	Australia	60	49	80	8	0	203.9
56	Adelaide University	Australia	69	49	29	5	45	202.7
57	Paris VI, Pierre et Marie Curie University	France	99	7	39	15	33	198.7
58	Sussex University	UK	73	51	23	11	32	196.2
59	Purdue University	US	105	25	14	8	36	194.0
60	Technical University Berlin	Germany	83	11	39	2	50	191.1
61=	Brown University	US	46	39	14	19	65	188.9
61=	Tsing Hua University	China	140	9	7	24	3	188.9
63	Copenhagen University	Denmark	111	18	14	19	22	188.7
64	Erasmus University Rotterdam	Netherlands	70	27	11	11	63	188.4
65	Georgia Institute of Technology	US	117	4	11	9	39	185.7
66	Wisconsin University	US	104	0	8	18	48	184.5

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67	Auckland University	New Zealand	76	49	30	7	15	183.5
68	Macquarie University	Australia	45	49	62	5	15	182.3
69	Osaka University	Japan	78	3	5	28	63	181.8
70	St Andrews University	UK	39	42	57	19	19	181.0
71	Paris 1 Sorbonne	France	124	3	43	5	0	180.8
72	University of California, Santa Barbara	US	64	9	3	6	93	180.6
73	Northwestern University	US	61	4	12	27	71	180.4
74	Washington University	US	48	16	8	18	82	177.0
75	Boston University	US	78	12	19	17	45	176.6
76	Curtin University of Technology	Australia	35	50	79	6	0	176.2
77	Vienna Technical University	Austria	83	19	45	16	6	175.4
78	Delft University of Technology	Netherlands	106	20	12	20	12	174.2
79	New York University	US	90	8	10	19	41	173.2
80	Warwick University	UK	70	49	25	9	14	170.6
81	Yeshiva University	US	2	14	15	31	103	170.2
82	Minnesota University	US	59	10	5	11	79	169.6
83	Eindhoven University of Technology	Netherlands	45	20	12	11	77	169.5
84	Chinese University of Hong Kong	Hong Kong	81	30	16	12	25	169.2
85	Gottingen University	Germany	72	11	13	4	64	168.5
86	Rochester University	US	49	10	8	49	48	167.8
87	Trinity College, Dublin	Ireland	57	45	29	8	24	167.0
88	Case Western Reserve University	US	23	4	11	49	75	166.8
89	Malaya University	Malaysia	50	29	68	15	0	166.4
90	Alabama University	US	27	10	4	8	112	166.0
91	Bristol University	UK	59	38	16	17	31	165.9
92	Lomonosov Moscow State University	Russia	97	9	15	31	5	161.6
93	Hebrew University of Jerusalem	Israel	81	5	11	16	44	161.4
94	Vienna University	Austria	77	19	30	5	25	161.2
95	Technical University Munich	Germany	72	11	32	23	18	160.7
96=	Western Australia University	Australia	36	49	29	10	31	160.1
96=	King's College London	UK	34	44	27	24	26	160.1
98	Amsterdam University	Netherlands	68	17	14	10	46	159.8
99	Munich University	Germany	82	11	26	12	24	159.7
100	Queen Mary, University of London	UK	41	47	30	23	13	158.8
101	Oslo University	Norway	81	21	18	13	21	158.5
102	National Taiwan University	Taiwan	100	10	11	11	22	157.8
103	Bath University	UK	25	45	39	22	21	155.5
104	Tufts University	US	17	10	15	26	81	153.9
105	Texas A&M University	US	78	12	3	6	49	153.2
106	Iowa University	US	23	10	11	5	99	152.6
107	Colorado University	US	38	17	3	10	79	151.9
108	Massey University	New Zealand	41	49	42	5	8	150.6
109	Washington University, St Louis	US	38	10	10	13	76	150.3
110	Chalmers University of Technology	Sweden	71	17	22	11	25	150.2
111	Sains Malaysia University	Malaysia	26	27	78	15	0	149.6
112	Glasgow University	UK	59	33	10	15	27	148.5
113	University of Technology, Sydney	Australia	46	49	39	7	0	146.1
114	Otago University	New Zealand	25	49	42	10	15	145.9
115	Brandeis University	US	13	26	15	12	75	145.6
116	Michigan State University	US	81	10	7	8	35	145.1
117	North Carolina University	US	37	9	3	17	75	144.3
118=	Virginia University	US	53	6	10	17	54	144.0
118=	Seoul National University	South Korea	83	6	20	9	21	144.0
120	Utrecht University	Netherlands	58	16	9	11	45	143.9
121	Paris XI, Université Paris-Sud	France	47	11	31	10	40	142.6
122	Royal Institute of Technology	Sweden	37	19	30	4	47	142.5
123	Maastricht University	Netherlands	24	20	51	20	23	142.0
124	Stuttgart University	Germany	61	11	39	17	10	141.7
125	Humboldt University Berlin	Germany	69	11	23	7	28	141.3
126	Birmingham University	UK	41	36	19	14	26	140.5
127	Aarhus University	Denmark	59	18	13	26	20	140.0
128	Durham University	UK	52	33	10	11	28	139.3
129	Helsinki University	Finland	75	11	7	13	28	138.6
130	Penn State University	US	64	10	5	10	44	138.4
131	Leiden University	Netherlands	24	20	13	12	65	137.9
132	Strasbourg University	France	29	11	40	9	45	137.6
133	Leeds University	UK	54	31	17	15	16	136.9

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134	Maryland University	US	35	20	5	14	58	136.7
135	Bonn University	Germany	56	11	37	13	14	135.0
136	Stony Brook, State University of New York	US	26	7	10	11	75	134.3
137	York University	UK	36	39	16	16	22	133.3
138	Dartmouth College	US	18	13	12	20	65	132.5
139	Stockholm University	Sweden	40	19	30	3	35	131.9
140	Uppsala University	Sweden	43	19	30	11	24	131.5
141	Utah University	US	51	10	13	14	40	131.0
142	La Trobe University	Australia	27	49	23	4	25	130.8
143	Waterloo University	Canada	50	25	12	5	35	130.6
144	Toulouse 1 University	France	31	8	40	5	42	130.4
145	Technical University of Denmark	Denmark	49	18	15	23	20	128.6
146	Rice University	US	35	10	7	25	48	128.5
147=	Hamburg University	Germany	66	11	17	9	20	127.3
147=	McMaster University	Canada	28	24	13	11	47	127.3
149	Kiel University	Germany	27	11	15	3	67	127.0
150	Sheffield University	UK	38	33	15	15	22	126.9
151	Liverpool University	UK	32	39	14	13	25	126.8
152	Karlsruhe University	Germany	47	11	29	9	26	126.0
153	Tohoku University	Japan	48	6	2	27	39	125.7
154	China University Sci & Technol	China	85	5	1	24	6	125.2
155	Montpellier 1 University	France	43	11	31	5	31	124.8
156	Vanderbilt University	US	20	2	5	39	55	124.6
157	Frankfurt University	Germany	51	11	30	6	22	124.1
158	Technion — Israel Institute of Technology	Israel	78	0	1	12	30	124.0
159	Madrid Autonomous University	Spain	62	19	11	8	19	123.7
160	Korea Advanced Institute of Sci & Tech	South Korea	86	7	19	8	0	123.5
161	Tasmania University	Australia	27	49	22	6	15	123.3
162	La Sapienza University	Italy	89	4	5	4	16	121.5
163	Pohang University of Sci & Technol	South Korea	22	14	18	8	56	120.9
164	Innsbruck University	Austria	31	19	38	6	23	120.8
165	Georgetown University	US	38	10	10	13	46	120.6
166	Alberta University	Canada	28	24	23	13	28	120.4
167	Nagoya University	Japan	45	3	3	19	47	120.0
168	Dundee University	UK	9	42	21	14	31	119.4
169	Würzburg University	Germany	11	11	15	6	72	118.8
170	Nottingham University	UK	24	39	20	13	19	118.0
171	Lund University	Sweden	36	19	6	11	40	117.3
172	TH Darmstadt	Germany	39	11	28	2	33	116.9
173	Emory University	US	12	1	8	43	48	116.6
174	Indiana University	US	29	0	10	6	68	115.9
175	University of California, Santa Cruz	US	14	5	2	4	87	115.6
176	Helsinki University of Technology	Finland	61	20	8	15	8	115.4
177	Université de Montréal	Canada	35	24	23	14	14	114.2
178	Freiburg University	Germany	26	11	29	14	29	113.0
179	Newcastle upon Tyne University	UK	19	33	19	20	19	112.6
180	University of Southern California	US	40	15	14	4	35	111.4
181	Lancaster University	UK	23	44	16	7	18	111.3
182	University of California, Davis	US	27	1	4	10	65	110.8
183	Arizona University	US	35	5	9	10	49	110.6
184	Aachen RWTH	Germany	60	11	27	9	0	110.5
185	Queen's University Belfast	UK	16	54	16	5	16	110.3
186	Bologna University	Italy	76	4	8	4	14	109.8
187	Norwegian University of Sci & Technol	Norway	30	23	19	22	12	109.6
188	Tulane University	US	27	10	20	33	16	108.9
189	Leicester University	UK	5	32	21	17	29	107.4
190	Rutgers State University	US	24	25	5	10	40	107.3
191	Nijmegen University	Netherlands	22	20	12	33	17	107.1
192	Nanjing University	China	73	4	2	16	7	106.3
193	Southampton University	UK	12	45	11	16	18	105.9
194	Aberdeen University	UK	6	38	22	16	20	105.7
195=	National Autonomous University of Mexico	Mexico	68	7	0	25	1	104.5
195=	Fudan University	China	61	8	13	15	4	104.5
197	Bremen University	Germany	35	11	21	2	32	104.4
198	City University of Hong Kong	Hong Kong	40	47	3	10	0	103.6
199	Virginia Polytechnic Institute	US	56	10	7	11	17	103.0
200	Rensselaer Polytechnic Institute	US	24	19	9	9	38	102.9

Elements that paint a portrait of global powers

The Times Higher's analysis of the world's top universities shows that quality is not the preserve of any single country. **Martin Ince** explains how the positions were worked out

The first lesson of the rankings on these pages is that although the US — the world's biggest economy — houses the top universities, no country has a monopoly on excellence in higher education. Instead, applying a single set of measures consistently across the world reveals that the top 20 universities are spread across seven countries, and the top 200 are in 29 nations.

The measures used to develop this analysis will be altered and improved in future years. They are designed to be as objective as possible and as free as possible from international and cultural bias.

The scores in the final table have been normalised against a score of 1,000 for Harvard University, the top-ranked institution by some distance.

The first element in the score for each institution is based on peer review, the most trusted method for university comparison. It was produced by QS, a London-based company best known for its worldwide activities in MBA and graduate recruitment.

QS surveyed 1,300 academics in 88 countries. Each was asked to nominate both the academic subjects and the geographical areas on which they felt able to comment, and QS sought other respondents to balance nominations in academic discipline and location. The academics were each asked to name the top institutions in the areas and subjects on which they felt able to make an informed judgement. The survey took place during August and September. This unique and groundbreaking material is weighted at half of the total score.

A further 20 per cent of the score is accounted for by a ranking of research impact, which is calculated by measuring citations per faculty member. These data are derived from the Essential Science Indicators database produced by Thomson Scientific (formerly the Institute of Scientific Information, www.isinet.com) in Philadelphia, US, and analysed for *The Times Higher* by Evidence Ltd in Leeds, England, under licence from Thomson Scientific.

A comparison between the institutions that do well in citations and those that perform well in peer review shows that this criterion tends to favour institutions in the US and, to a lesser extent, other English-speaking countries. Researchers in countries such as France, Germany, Switzerland, Italy and Spain, and in Latin America and India, were either absent or performed poorly in terms of citations received. Citations also perform less well for some subjects than for others. Researchers in fields of the social sciences such as law and education, which are based in national systems, tend to publish in national publications, often not in English, which are less likely to be covered by Thomson Scientific's database than work in the natural sciences.

In the course of this exercise, QS collected a wide range of other data on university performance. Rated at a further 20 per cent of the total is a measure of faculty-to-student ratio. While institutional practices and international variations in employment law make staff numbers less than completely comparable across the world, this indicator is a simple and robust one that captures a university's commitment to teaching.

The other two measures weighted here, each at 5 per cent of the total, are designed to encapsulate a university's international orientation. More than 2 million undergraduates now study outside their own country worldwide, and this number is growing at about 20 per cent a year. A university's ability to attract them is one measure of its ambition and is captured by a measure of its percentage of overseas students. Equally important is its ability to bring in the best academics from around the world, measured here via its percentage of international faculty. A university that relies on an influx of ambitious but underqualified immigrants to deliver its lectures could do well on this count. But it is unlikely that such an institution would do well enough on our other criteria to make it into our world top 200.

QS collected these data on the top 300 universities as discovered in the peer review, after eliminating a small number of single-subject institutions. It performed the research in several ways. For Germany, the UK and the US, there are national bodies that gather education or higher education statistics. In Japan, student number data are also available from a central national source. The rest was gathered from university websites, from direct email and telephone contact with the institutions in question or from internationally accepted reference sources.

A close look at the table reveals that in a very few cases it was simply impossible to collect some data despite QS's extensive research with national and institutional sources. These gaps were filled with a weighted estimate based on other aspects of the relevant institution's performance in the context of its location and its apparent profile.

In addition to the main table that precedes this article, this supplement to *The Times Higher* contains detailed analyses of our findings about the top institutions in Europe, North America and the rest of the world, and the institutions that do especially well in terms of peer review, citations and staffing.

In future months, *The Times Higher* will publish further analyses of these and other data, which will extend it into specific discipline areas including science, technology, biomedicine, social science and the arts and humanities.

We would welcome reader reaction to this publication.

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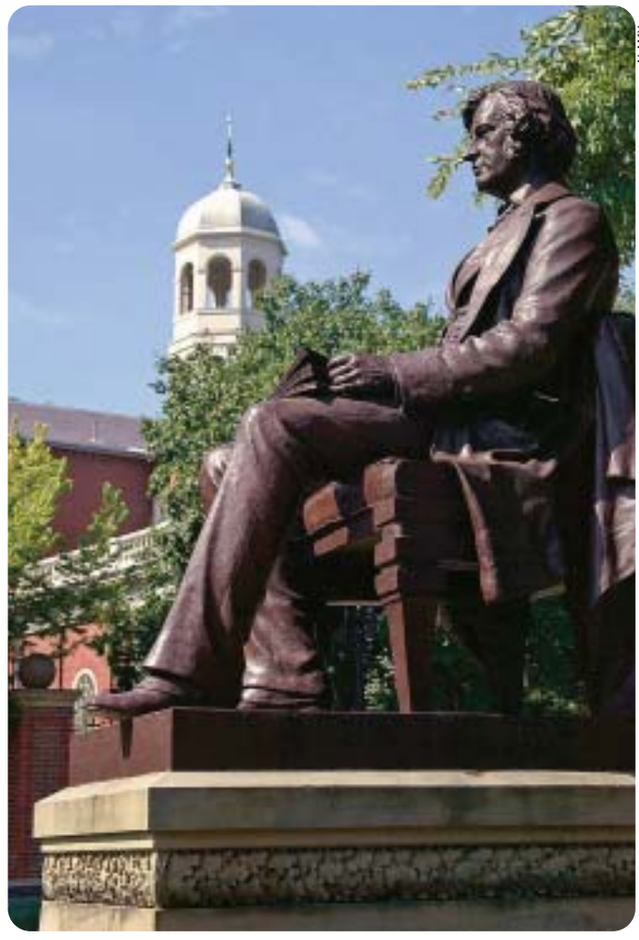
Intellectual cream rises to the top

Harvard enjoys an embarrassment of riches — the nation's best students, the world's elite scholars and a vast endowment — but it is not without its critics, **Jon Marcus** discovers



ALAMY

Harvard was the university benefactor but not its founder

There is a statue at the centre of the Harvard University campus in Cambridge, Massachusetts, famous for telling three lies. The first is that the statue is of the university's founder, the Rev John Harvard. It is not: there were no likenesses of Harvard available when the sculptor set about his work, so an undergraduate descendant of the minister served as a stand-in. Nor was Harvard the university's founder. He was its first benefactor, leaving it his library and half his estate on his death in 1638. The university's date of incorporation is also incorrect. It was opened in 1636, a mere 16 years after the Pilgrims landed, making it the oldest university in the US.

Harvard is, nonetheless, unarguably America's — now the world's — best university. Its faculty members have won 40 Nobel and 44 Pulitzer prizes. It has produced seven presidents, including Franklin D. Roosevelt, John F. Kennedy and George W. Bush. Its library of more than 15 million volumes is bettered only by the Library of Congress in the size of its holdings. It has an endowment of nearly $23 billion (£12.7 billion), second in the world only to the Vatican's.

Harvard has always attracted America's top students. Now, internationally, a Harvard degree is a prized asset, notably sought by the UK's Laura Spence, who was turned down by Oxford University when she applied to read medicine there, and by Yiting Liu, the Chinese student majoring in applied mathematics and economics whose parents' book, *Harvard Girl*, became a bestseller in 2000.

The world's top academics are also drawn to Harvard's prestigious medical, law and business schools, and the university as a whole receives $300 million a year in government research funding. There are few areas of scholarship in which its academics are not engaged, from stem cell and genetics research at its medical school to analysis of American democracy and the global response to terrorism at the John F. Kennedy School of Government. The most recent additions to Harvard's long list of Nobel laureates include David Hubel and Torsten Wiesel (medicine 1981), Nicolaas Bloembergen (physics 1981), Carlo Rubbia (physics 1984), Amartya Sen (economics 1998) and Riccardo Giacconi (physics 2002).

Inevitably, Harvard's pre-eminence has made it a popular target of critics. Grade inflation has been one area of criticism, after it was revealed that 91 per cent of students had received honours. Other critics object to the way it invests its endowment, which they say is so vast it could be used to influence corporate and government policy. Conscious of the impact on diversity of its annual costs of nearly $40,000 for tuition, room and board, the university has — in common with other top schools — beefed up its financial aid for low-income and hard-pressed middle-class students.

HARVARD FACTFILE

ACADEMIC STAFF

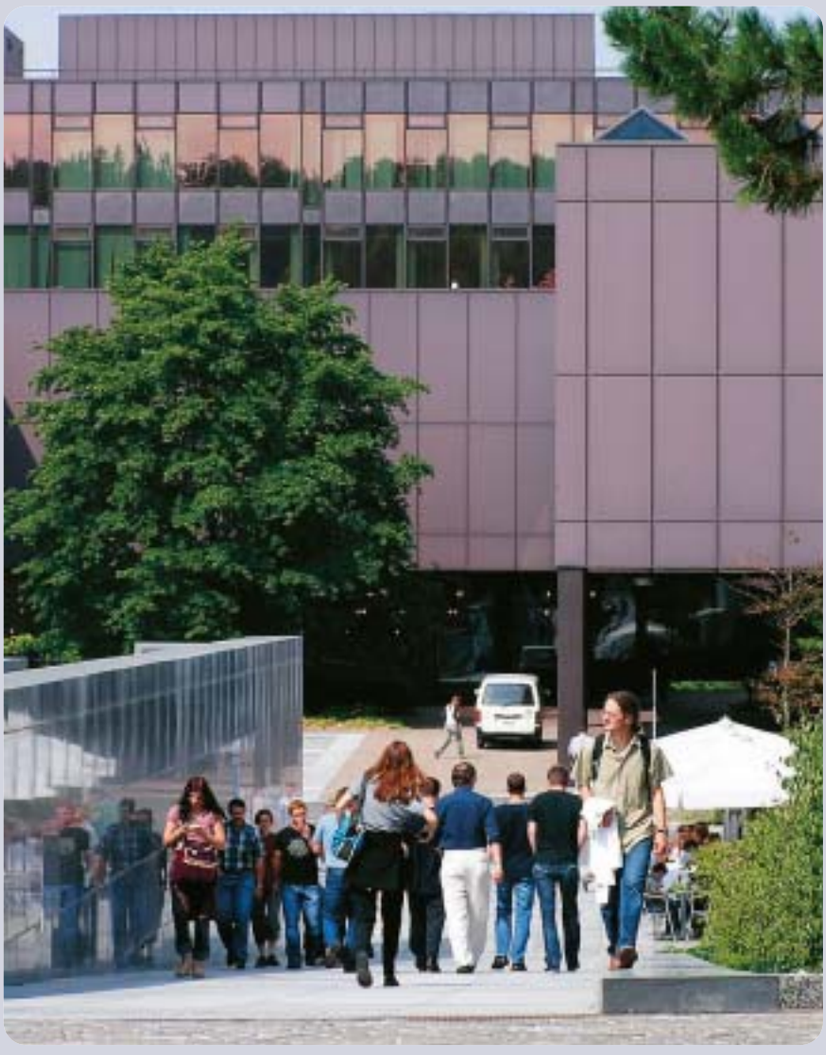
About 2,000 non-medical;
9,000 medical school

FACULTIES

Ten principal academic units;
nine faculties oversee 11 schools and colleges

STUDENTS (academic year 2003-04)

Undergraduate 6,597
Graduate and professional students 12,014
Extension 1,079
Total 19,638 (less 52 dual-degree students)



ETH ZURICH

ETH Zurich, Switzerland's oldest national polytechnic, has a striking international profile.

Some 58 per cent of its 360 professors come from abroad. In the past century, 21 of its academics won Nobel prizes and there are several home-grown geniuses among its laureates. Among them is Albert Einstein who studied there and Gottfried Semper, the renowned German architect who designed its main lecture halls in 1858 and who was also ETH's first tenured professor of architecture.

ETH is a federal institute, while its neighbour, Zurich University, is a cantonal institution.

Originally ETH focused on engineering, but the natural sciences, including nanotechnology and biochemistry, now also feature prominently. It has departments of architecture, humanities, social and political sciences.

Olaf Kuebler, president, says it strives to recruit the best faculty from all over the world.

Competition and collaboration have also kept it on its toes. Konrad Osterwalder, rector, says that the Ecole Polytechnique Fédérale de Lausanne has been a major research partner. "There is rivalry for the best professors, but that's healthy."

Tania Peitzker

Wealthy set to challenge US while others languish

An EU research area is fast becoming a reality, but Europe's North-South divide lives on, argues **Martin Ince**

This analysis of Europe's top 50 universities might suggest that the English language is a powerful aid to academic excellence. The UK is home to 18 of the 50, with another in Ireland. But the figures show too that good universities are to be found across the continent. There are three countries on the list — Norway, Switzerland and Russia — outside the European Union. Lomonsov Moscow State University's appearance is especially impressive given the severe financial and political problems of operating in Russia. It is well liked by academic peers across the world but shows up poorly in citations per staff member.

It seems, too, that the EU may be pushing against an open door in its ambition to

NASIR HAMID

Oxford University: Europe's leading institution

create a European research area with free movement of researchers. The top universities of Europe have immense numbers of overseas students and staff. The London School of Economics is the world leader in international student appeal, while the Ecole Polytechnique Fédérale de Lausanne in Switzerland is top in international faculty. The EU's ambition is to create a talent pool as deep as that of the US.

As a producer of new knowledge, Europe fares less well. Its citations champion, ETH Zurich, is second only to the California Institute of Technology in the world on this measure. But few other European universities come close to it or to the big US universities. There may be differences between countries in how staff are counted. In addition, many universities in continental Europe are oriented more towards teaching than their North American counterparts are. State-run and independent research institutions such as the CNRS in France and the Max Planck and Fraunhofer societies in Germany attract researchers who might be in universities in other countries. Future editions of this survey will show how well the EU's ambition to raise European research spending to 3 per cent of gross domestic product translates into research success.

The results for Europe also show that institutions that can become large while retaining a focus on science and technology are especially well placed. The point is proved in the US by the Massachusetts Institute of Technology and Caltech, and in Asia by institutions in Tokyo, Hong Kong and Singapore. In Europe, ETH Zurich, Imperial College London and those such as the Technical University Munich and institutions in Sweden and the Netherlands are examples. Imperial is building an especially striking position by acquiring London medical schools, restructuring its business school and even absorbing the University of London's agricultural college to bolster an already a strong position in traditional science and engineering. Two London institutions with a specialist social sciences focus, the LSE and the School of Oriental and African Studies, also do well in our analysis.

In our other major criterion, peer popularity, European institutions start strong with good showings from Oxford and Cambridge universities. But perhaps because specialist institutions find it difficult to attract esteem across the board, they do not maintain this standard lower down the table. This accounts for much of their lag behind the big-name US universities in the world table. For example, Ecole Normale Supérieure is 30th in the world and seventh in Europe, but has a score for peer opinion that would be appropriate to a general university 20 places lower in our world 200.

The overall lesson is that national affluence matters more than size in generating and enhancing academic success.

'While research may be the driver of economic success, it is hard to have the first without the second'

While research may be a driver of economic success, it is hard to have the first without the second. The strong showing of small, rich countries such as Denmark and Sweden, each with two institutions listed, and the Netherlands with six, is evidence of the link. By contrast, Ireland's total of one, Trinity College Dublin, may reflect the fact that its recent economic success has been based on inward investment rather than domestic innovation. Munich's status as home to two ranked universities may well owe much to Bavaria's status as a European centre for electronics and biotechnology.

But perhaps the most striking feature of the European top 50 is the invisibility of southern Europe. Spain, Portugal, Italy and Greece are all absent. They begin to appear only at positions 67 and 68, beyond the number we are able to publish here, when Madrid and Rome's La Sapienza universities respectively put in an appearance. This is ominous for these countries' prospects in the continent-wide knowledge economy of which European and national planners dream.

EUROPE'S TOP 50 UNIVERSITIES

EURO RANK	NAME	COUNTRY
1	Oxford University	UK
2	Cambridge University	UK
3	ETH Zurich	Switzerland
4	London School of Economics	UK
5	Imperial College London	UK
6	Ecole Polytechnique	France
7	Ecole Normale Supérieure, Paris	France
8	Ecole Polytech Fédérale de Lausanne	Switzerland
9	University College London	UK
10	Manchester University and Umist	UK
11	School of Oriental and African Studies	UK
12	Heidelberg University	Germany
13	Edinburgh University	UK
14	Université Catholique de Louvain	Belgium
15	Brussels Free University	Belgium
16	Paris VI, Pierre et Marie Curie University	France
17	Sussex University	UK
18	Technical University Berlin	Germany
19	Copenhagen University	Denmark
20	Erasmus University Rotterdam	Netherlands
21	St Andrews University	UK
22	Paris 1 Sorbonne	France
23	Vienna Technical University	Austria
24	Delft University of Technology	Netherlands
25	Warwick University	UK
26	Eindhoven University of Technology	Netherlands
27	Gottingen University	Germany
28	Trinity College Dublin	Ireland
29	Bristol University	UK
30	Lomonosov Moscow State University	Russia
31	Vienna University	Austria
32	Technical University Munich	Germany
33	King's College London	UK
34	Amsterdam University	Netherlands
35	Munich University	Germany
36	Queen Mary University of London	UK
37	Oslo University	Norway
38	Bath University	UK
39	Chalmers University of Technology	Sweden
40	Glasgow University	UK
41	Utrecht University	Netherlands
42	Paris XI, Université Paris-Sud	France
43	Royal Institute of Technology	Sweden
44	Maastricht University	Netherlands
45	Stuttgart University	Germany
46	Humboldt University Berlin	Germany
47	Birmingham University	UK
48	Aarhus University	Denmark
49	Durham University	UK
50	Helsinki University	Finland

Bounty won by declarations of independence

Freedom from central government control helped US institutions to claim 11 of the top 20 slots in the global rankings, as did an emphasis on biomedical sciences, observes **Martin Ince**

The US has more than 4,000 accredited degree-granting institutions. They range from modest establishments with a local emphasis to the multibillion-dollar universities of world repute found in this table. In the US, in contrast to most European countries, there is little control over the title "university", and the federal government has little say in higher education. Responsibility for education rests at state level.

The inescapable message of these rankings is that such diversity works. We find that the top four universities in the world are in the US and that US institutions take 11 of the top 20 slots. The world's top institution, Harvard, is weighted at 1,000, while the second, the University of California, Berkeley, manages 880 and the third, Massachusetts Institute of

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BERKELEY

Clark Kerr once said of the University of California, Berkeley: "If you are bored with Berkeley, you are bored with life."

He should know. Dr Kerr was its chancellor when the free-speech movement began there, giving rise to the Sixties student rebellion.

Today, Berkeley is one of the few US institutions that have balked at federal demands to bar foreign researchers from sensitive government-sponsored research. Its students, too, continue to protest — against tuition rises and the war in Iraq.

Berkeley is consistently ranked as the top public university in the US, on a par with large private universities on the East Coast.

It is one of the most selective US universities. Only one in four undergraduate applicants is accepted. Nearly all its graduate programmes rank in the top ten in their fields in the US. Its faculty have won 18 Nobel and five Pulitzer prizes.

Since its foundation, Berkeley has worked to lure top faculty. The human polio virus was isolated there.

Government budget cuts forced Berkeley to raise tuition fees last year by 37 per cent. Alumni did their part, contributing more than $1.3 billion (£710 million) in a recent campaign.

Jon Marcus

Technology, nearly 789. The highest ranking non-US institution, Oxford University, gets a score of 732.

The overall lesson is that the US system offers a number of ways of getting ahead of the competition and staying there. Harvard opened its doors in 1636 and would be old even in European terms. It covers almost every discipline and has big money-spinners, including highly rated business and medical schools. Although it is highly dependent on funding from national government, in the form of student support and research grants, it is a free-standing, independent organisation.

By contrast, US and world number two Berkeley is part of the more prestigious of California's two state university systems. It has profited from the state's technology-driven growth but, again, offers a full array of courses, unlike MIT and the California Institute of Technology, which also feature high in our table.

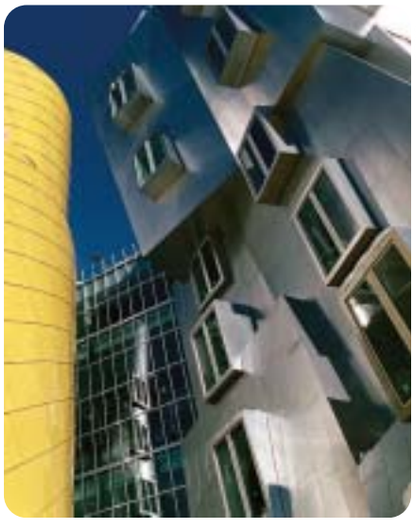
The top US institutions have gained high rankings by strength in depth. Our peer review shows that academics worldwide regard Harvard as an excellent institution, although they rate Berkeley more highly.

Harvard has reached the pinnacle by doing well in both of our most highly weighted criteria — peer review and the number of paper citations per faculty member. Here, Harvard is beaten by overall citations champion Caltech, as well as by ETH Zurich and the University of California, San Francisco. But they are far less well liked in the peer review.

The tables give some comfort to those fearful of the powerful pull that the money-raising power of the big US universities gives them in the global competition for the most creative people.

On the criterion of international faculty numbers, Berkeley does less well than ETH Zurich, Oxford and Cambridge universities and the London School of Economics. Indeed, on this count, of the prominent US universities only Yale has anything like a respectable score by top European standards.

The citations data in these tables do not favour size, but they contain at least some unavoidable bias towards institutions that have a significant commitment to biomedical science. The ferocious publishing and citation culture means that universities with a major commitment in this area are bound to generate more citations than institutions that are more committed to other subject areas. In these tables, MIT does well on this score — even without a medical school — because of its powerful biological science departments.



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Third-ranked MIT comes world fifth on citations

The map of US academic excellence revealed here matches the major centres of US innovation, with the focus on California and New England. Austin in Texas — the Silicon Valley of the South — is the top institution outside these two regions.

The top 50 institutions include three from Canada, with McGill, Toronto and British Columbia universities at 12, 20 and 23 respectively. All three are also in the world top 50. McGill has by far the most international faculty of any university in North America's top 50, and it also has the highest percentage of international students. However, all three score badly on the faculty-per-student measure.

'Non-US observers may note that the big US universities gain from political independence and the clout of large endowments'

Non-US observers may note that the big US universities gain from political independence and the clout of their large financial endowments, which are steadily enhanced by a culture of alumni giving and a tax regime that encourages it.

The spending power of the US Government via the National Science Foundation and the National Institutes of Health agencies — and of the large US foundations — also means that the research wealth of these universities is hard to match. But our tables show that the vast sums these universities bring in are being spent to formidable effect.

NORTH AMERICA'S TOP 50 UNIVERSITIES

NTH AM RANK	NAME	COUNTRY
1	Harvard University	US
2	University of California, Berkeley	US
3	Massachusetts Institute of Technology	US
4	California Institute of Technology	US
5	Stanford University	US
6	Yale University	US
7	Princeton University	US
8	University of Chicago	US
9	University of Texas at Austin	US
10	Columbia University	US
11	University of California, San Francisco	US
12	McGill University	Canada
13	Cornell University	US
14	University of California, San Diego	US
15	Johns Hopkins University	US
16	University of California, Los Angeles	US
17	Pennsylvania University	US
18	Michigan University	US
19	Illinois University	US
20	Toronto University	Canada
21	Carnegie Mellon University	US
22	Massachusetts University	US
23	University of British Columbia	Canada
24	Duke University	US
25	Purdue University	US
26	Brown University	US
27	Georgia Institute of Technology	US
28	Wisconsin University	US
29	University of California, Santa Barbara	US
30	Northwestern University	US
31	University of Washington	US
32	Boston University	US
33	New York University	US
34	Yeshiva University	US
35	Minnesota University	US
36	Rochester University	US
37	Case Western Reserve University	US
38	Alabama University	US
39	Tufts University	US
40	Texas A&M University	US
41	Iowa University	US
42	Colorado University	US
43	Washington University in St Louis	US
44	Brandeis University	US
45	Michigan State University	US
46	North Carolina University	US
47	Virginia University	US
48	Penn State University	US
49	Maryland University	US
50	Stony Brook, State University of New York	US

West is best but there's a rich feast in the East

Citations might sometimes be lacking, finds **Martin Ince**, but numerous Asian and Australian universities are well regarded by academics around the world

In terms of higher education, the rest of the world beyond Europe and North America means Asia and Australia. Only one university from Latin America makes the top 50 — Unam, Mexico's National Autonomous University, possibly the world's largest by student numbers. It is ranked at 42, just outside our top 40 table. (We publish only the top 40 for the rest of the world to confine the table to institutions within the world's top 200 universities.) Anyone with hopes for the future of Africa will find little comfort in its complete absence.

This analysis leaves few doubts that North America and Europe are home to most of the world's academic excellence. The institutions ranked 40th in our North American and European tables (Texas A&M University and Glasgow University) stand at 105 and 112 respectively in our world rankings, suggesting that these

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TOKYO

Tokyo University, Japan's first national university, is rising above the bureaucratic paralysis of tight Ministry of Education control to consolidate a strong international reputation.

This year it and the other national universities won autonomy from the ministry in the biggest reform for a century, giving its president freedom to set budgets and hire and fire staff.

Tokyo (Toukyou Daigaku' or "Toudai" for short) is perhaps most famous for graduating elite politicians and bureaucrats, including prime ministers.

The university consists of three campuses with about 28,000 students, including about 2,100 from overseas, mostly from Korea and China. There are some 2,800 academic staff.

Tokyo has a range of taught programmes, post-graduate research, and professional schools such as its legendary law school.

Takeshi Sasaki, Tokyo's president, says that as the oldest university in Japan, Tokyo has always been in the vanguard when it comes to tackling new challenges.

"Tokyo's record in developing important human resources for Japanese society is well known, but now, as evidenced by the hundreds of exchange agreements with overseas universities, it is playing an important role in the international academic community, too."

Charles Jannuzi

'One fascinating issue to track in future will be the pace at which Chinese universities grow'

THE REST OF THE WORLD'S TOP 40 UNIVERSITIES

RANK	NAME	COUNTRY	RANK	NAME	COUNTRY
1	Tokyo University	Japan	21	Osaka University	Japan
2	Australian National University	Australia	22	Curtin University of Technology	Australia
3	Beijing University	China	23	Chinese University of Hong Kong	Hong Kong
4	National University of Singapore	Singapore	24	Malaya University	Malaysia
5	Melbourne University	Australia	25	Hebrew University of Jerusalem	Israel
6	Kyoto University	Japan	26	Western Australia University	Australia
7	Monash University	Australia	27	National Taiwan University	Taiwan
8	New South Wales University	Australia	28	Massey University	New Zealand
9	Hong Kong University	Hong Kong	29	Sains Malaysia University	Malaysia
10	Sydney University	Australia	30	University of Technology, Sydney	Australia
11	Indian Institute of Technology	India	31	Otago University	New Zealand
12	Hong Kong University of Sci & Technol	Hong Kong	32	Seoul National University	South Korea
13	Queensland University	Australia	33	La Trobe University	Australia
14	Nanyang University	Singapore	34	Tohoku University	Japan
15	Tokyo Institute of Technology	Japan	35	University of Sci & Technol of China	China
16	RMIT University	Australia	36	Technion – Israel Institute of Technology	Israel
17	Adelaide University	Australia	37	Korea Advanced Institute of Sci & Tech	South Korea
18	Tsing Hua University	China	38	Tasmania University	Australia
19	Auckland University	New Zealand	39	Pohang University of Sci & Technol	South Korea
20	Macquarie University	Australia	40	Nagoya University	Japan

two areas offer broadly similar strength in depth in their university systems. But the 40th ranked institution outside these two regions, Nagoya University in Japan, comes 167th in our world table.

Australia dominates this table with 14 universities, starting with the Australian National University ranked at two. ANU has the most cited academics in the rest of the world by a considerable distance. But its score on this criterion would not stand out in our North America rankings. Other Australian institutions do even worse in the citations stakes.

But the Australian universities are popular in our peer review and do especially well in our rankings of international success. They are among the world's most enthusiastic recruiters of international staff and students, with years of recruiting in Asia and beyond now visibly paying off.

Neither citations success nor peer esteem is notable in our tables as respecters of size. Small states with stable political systems, such as Hong Kong, Singapore and New Zealand, have well-regarded universities that attract admiration in peer review and in some cases also do well in citations.

Japan, the world's second-largest economy, has six of the top 40 universities in the rest of the world, including Tokyo and Kyoto, traditional sources of the country's most prominent political and business leaders.

Tokyo is by some distance the highest ranking university in this group on the peer review criterion and overall. Its strong peer review success also propels it to 12th place in the world overall. By contrast, it is poor at attracting both staff and students from overseas and middling at citations.

Japan's six appearances on the list put it ahead of China, which has three entries. The highest ranking institutions in both countries are clearly major world universities, with Tokyo 12th in our top 200 and Beijing 17th. One of the most fascinating points to track in future surveys will be the pace at which Chinese universities grow. Will this be in line with China's emergence on the world economic stage?

Despite its recent technology-driven growth, India, the only country apart from China with a population exceeding 1 billion, makes only one appearance in this analysis. This may not be a fair reflection, however, because the Indian Institute of Technology is a seven-centre complex with a wide range of interests and is highly placed at 11 (and ranked 41st in the world). IIT performs well in peer review but has few citations per staff member and does poorly in attracting international staff and students.

Specialist science and technology institutions in Hong Kong, India, Korea, Japan, Australia, China and Israel take ten of the top 40 slots. These may be subject areas in which English is used as the main language of publication more than it is in the social sciences and humanities, one of the most familiar accusations against the use of citations as a measure of research success.

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Sydney University just makes it into the top ten

However, there are notable gaps even within Asia. The world's fourth most populous country, Indonesia, does not appear. Nor do Bangladesh or Pakistan, each of which is home to more than 100 million people. Outside Asia, the same applies to Nigeria and Brazil.

By contrast, the smaller states of East Asia — South Korea, Singapore, Hong Kong and Malaysia — are taken seriously around the world as locations for academic excellence. They tend to do better in peer review than at citations. They are also attracting international staff and students, especially Hong Kong. South Korea's ambitions in areas such as stem-cell research may translate into citations success over time.

Other future trends to follow will be the status of Hong Kong's universities and the possible emergence of institutions in South America that failed to make the top 40 this time, such as Chile's Catholic University, ranked 53rd in the rest of the world. South Africa, Brazil and the Philippines are also home to universities that may do better in years to come.

TOP 10 UNIVERSITIES BY CITATIONS

CITATIONS RANK	OVERALL RANK	NAME	COUNTRY	CITATIONS/ FACULTY SCORE
		Max score		**400**
1	4	California Institute of Technology	US	400
2	20	University of California, San Francisco	US	300
3	10	ETH Zurich	Switzerland	266
4	1	Harvard University	US	243
5	3	Massachusetts Institute of Technology	US	221
6	24	University of California, San Diego	US	208
7	15	University of Texas at Austin	US	202
8	7	Stanford University	US	197
9	2	University of California, Berkeley	US	169
10	9	Princeton University	US	133

SPL

Right wavelength: Caltech cleans up in citations

Caltech's focus pays off

This table shows that whatever stresses the US university system may be experiencing, its personnel cannot be faulted on their research output.

North American universities come close to a clean sweep on the measure of citations per staff member for the past decade — only ETH Zurich, at number three, breaks into the top ten. On this criterion the US also takes nine of the following ten places, with the Australian National University at 14.

This finding can be seen in a number of ways. To achieve these high impacts, academics have to be productive. It is possible for a researcher to write a single paper, such as Einstein's 1905 paper on relativity, that is an almost mandatory citation for all later authors in the field. But more often, highly cited authors are those who have produced many papers to cite. This favours institutions such as our overall citations winner, the California Institute of Technology, which has fewer than 700 undergraduates and is strongly focused on research.

It is also worth being in the right subject. Biomedicine and other areas of science clean up here because of their high publishing rate and their tendency to have many citations per article. People in this area write dozens of articles in a career, not a single big book.

These figures may reignite discussion of English-language bias in bibliometric measurement. Most journals indexed are in English, critics point out, and the members of their editorial boards tend to be in Boston rather than Bombay. Much has been done to counter this problem in recent years, and the superior performance of high-profile US institutions shown here is probably genuine.

Teaching provides a firm base

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Top for teaching: Ecole Normale Supérieure

Although it may not always be apparent from the pay packets they receive, staff are the biggest budget item for most universities. But this analysis suggests that not all prominent universities feel that large staff numbers are indispensable to academic success.

The faculty-to-student ratio seen here is weighted at 20 per cent of the total score in our World University Rankings. But the top ten universities in terms of this measure are found at a wide range of positions in our overall rankings, from world top dog Harvard University to Case Western Reserve University at number 88.

The fact that nine of the top ten are US institutions suggests that this disparity is no artefact because staff and student numbers for all US institutions are collected on a consistent basis by the National Center for Education Statistics.

Instead, the table may well reflect the wide range of US university missions. It is dominated by large city-based universities with a heavy commitment to teaching and, in many cases, with a broad access and outreach mission. The overall champion, the Ecole Normale Supérieure in Paris, is also a teaching-based institution, providing research-based training for aspiring teachers and academics.

Research-heavy universities with a technology orientation show up less well here than they do in our citations rankings or in our peer review. The exception is Imperial College London, which has a high faculty-to-student ratio, is rich in overseas staff and students, and well liked in our peer review. But perhaps because of its

Where the old show they are truly gold

This listing of the most-esteemed universities in the world, compiled on the basis of a peer review of 1,300 academics and weighted by area and subject, shows that old is beautiful.

The top two are Berkeley and Harvard in the US — the second a 17th-century foundation and the first set up as the Harvard of the West 200 years later — and they are followed by the medieval foundations of Oxford and Cambridge.

More encouragingly, this analysis shows that academics find excellence across the world, with Japan and China joining the UK and the US in the top ten. Singapore's National University comes in at 11 and the next nine places go to universities from the UK, the US, India, Australia and Japan.

The discipline balance achieved in this analysis removes some of the bias in favour of science and technology that is apparent in our citations-based data, as well as eroding the advantage the US enjoys in the citations count. The California Institute of Technology, fourth in our overall rankings, plummets to 15th on this count, while ETH Zurich, tenth in the world overall, falls to number 25. ETH is a specialist science and technology university and does not have a medical school. An exception to this rule is the Indian Institute of Technology, which is 18th in our peer review but 41st in the world overall.

Peer review favours large universities with a wide range of subject coverage. The Massachusetts Institute of Technology is the only specialist institution in the top ten, and its agenda now runs far beyond technology.

Beijing, at number ten in this ranking, has seen its reputation outside China rise rapidly in recent years across a wide range of subjects, including science and technology. It is already widely regarded as a substantial institution, and this reputation may grow and be followed by success in citations and by our other criteria in future years. By the same token, Tokyo University, like many other pillars of Japanese society, is involved in a slow process of modernisation in response to social and economic change in Japan. Its prestige may rise or fall in line with trends over which it has little control.

Future analysis will show whether this peer-review exercise predicts future success or reflects past glory. Institutions such as Harvard and Cambridge have enormous financial advantages over their newer and less prestigious rivals but can stay ahead of the game only by reinventing themselves continuously.

substantial staff numbers, it performs less well on citations per staff member than its reputation might suggest. By contrast, the California Institute of Technology, fourth in the world overall, drops down to 11th on this analysis despite its low student numbers.

This analysis shows that the most student-oriented institutions vary widely in attractiveness to overseas staff and students. The Ecole Polytechnique Fédérale de Lausanne, Switzerland, is top at attracting foreign students, but it comes in at joint 117th on the faculty-to-student count. The top institution for overseas students, the London School of Economics, is 29th on this measure.

But despite the wide variety in institutional behaviour this measure reveals, it is notable that the world's top university, Harvard, is also prominent in this ranking, where it appears in eighth place.

TOP 10 UNIVERSITIES BY PEER REVIEW

PEER RANK	OVERALL RANK	NAME	COUNTRY	PEER REVIEW SCORE
		Max score		**1000**
1	2	University of California, Berkeley	US	665
2	1	Harvard University	US	643
3	5	Oxford University	UK	560
4	6	Cambridge University	UK	541
5	3	Massachusetts Institute of Technology	US	484
6	7	Stanford University	US	420
7	12	Tokyo University	Japan	371
8	9	Princeton University	US	353
9	8	Yale University	US	347
10	17	Beijing University	China	322

TOP 10 UNIVERSITIES BY STAFFING LEVELS

WORLD RANK	OVERALL RANK	NAME	COUNTRY	INT'L FACULTY SCORE	INT'L STUDENTS SCORE	STUDENT/FACULTY SCORE
		Max score		**100**	**100**	**400**
1	30	Ecole Normale Supérieure Paris	France	11	22	100
2	25	Johns Hopkins University	US	16	13	68
3	8	Yale University	US	53	20	65
4	13	Chicago University	US	31	18	58
5	52	Duke University	US	12	11	56
6	19	Columbia University	US	10	18	56
7	14	Imperial College London	UK	60	51	55
8	1	Harvard University	US	17	17	50
9	88	Case Western Reserve University	US	4	11	49
10	86	Rochester University	US	10	8	49