



19 November 2011

Top institutions in Mathematics

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Top institutions in Mathematics

Data provided by Thomson Reuters from its Essential Science Indicators database, 1 January 2001-28 February 2011

	Institution	Papers	Citations	Highly cited	% highly cited papers	Citation impact
1	Johns Hopkins University	486	6,246	20	4.12	12.85
2	Stanford University	1,049	12,548	80	7.63	11.96
3	University of California, Berkeley	1,620	14,070	59	3.64	8.69
4	University of Minnesota	1,378	11,375	58	4.21	8.25
5	University of Washington	1,114	8,873	52	4.67	7.96
6	Harvard University	1,122	8,701	60	5.35	7.75
7	Princeton University	1,174	9,060	54	4.60	7.72
8	California Institute of Technology	657	5,056	29	4.41	7.70
9	Brown University	496	3,696	20	4.03	7.45
10	Duke University	492	3,623	31	6.30	7.36
11	University of California, Los Angeles	1,156	8,291	67	5.80	7.17
12	University of Pennsylvania	581	4,077	16	2.75	7.02
13	Imperial College London	777	5,369	20	2.57	6.91
14	University of Michigan	1,551	10,544	34	2.19	6.80
15	Chinese University of Hong Kong	800	5,253	16	2.00	6.57
16	ETH Zürich	734	4,751	22	3.00	6.47
17	Institute for Advanced Study, Princeton	523	3,267	12	2.29	6.25
18	Carnegie Mellon University	564	3,513	16	2.84	6.23
19	Northwestern University	535	3,311	9	1.68	6.19
20	New York University	875	5,367	21	2.40	6.13
21	Arizona State University	550	3,255	17	3.09	5.92

22	Columbia University	887	5,245	28	3.16	5.91
23	North Carolina State University	739	4,343	21	2.84	5.88
24	Cornell University	929	5,445	20	2.15	5.86
25	University of California, Davis	641	3,701	24	3.74	5.77
26	University of Chicago	952	5,451	28	2.94	5.73
27	University of Oxford	1,307	7,255	34	2.60	5.55
28	National Institute for Research in Computer Science and Control (INRIA)	643	3,497	18	2.80	5.44
=29	University of Texas at Austin	825	4,367	16	1.94	5.29
=29	Massachusetts Institute of Technology	1,245	6,586	29	2.33	5.29
31	University of Maryland	815	4,159	12	1.47	5.10
32	University of Wisconsin	1,632	8,270	34	2.08	5.07
33	University of California, San Diego	719	3,632	15	2.09	5.05
34	Paris-Sud II University	1,442	7,263	17	1.18	5.04
35	National University of Singapore	1,086	5,448	23	2.12	5.02
36	Pennsylvania State University	1,253	6,274	30	2.39	5.01
37	University of British Columbia	959	4,706	19	1.98	4.91
38	Australian National University	704	3,434	14	1.99	4.88
39	University of Cambridge	791	3,842	16	2.02	4.86
40	Tel Aviv University	1,016	4,931	10	0.98	4.85
41	Purdue University	1,009	4,871	17	1.68	4.83
42	University of Toulouse 3 Paul Sabatier	1,098	5,252	18	1.64	4.78
43	University of Vienna	752	3,572	14	1.86	4.75
44	Georgia Institute of Technology	1,085	5,144	13	1.20	4.74
45	Texas A&M University	1,344	6,357	25	1.86	4.73
46	University of Missouri	964	4,519	16	1.66	4.69
47	University of Warwick	727	3,396	14	1.93	4.67
48	Catholic University of Leuven	820	3,801	12	1.46	4.64
49	University of North Carolina	1,111	5,123	20	1.80	4.61
50	Ohio State University	1,098	5,019	17	1.55	4.57

The 50 universities and research institutes listed above were among the world's most influential in the field of mathematics - whether by total citations received or by citations per paper - for papers published during the period 1 January 2001 to 28 February 2011. This table ranks the institutions by citation impact, or citations per paper. The number of highly cited papers in the field for each institution is also listed, as well as the percentage of highly cited papers in terms of total output for each. Highly cited papers are defined as papers that rank in the top 1 per cent by citations for their field and year of publication.

In the current edition of Essential Science Indicators, 200 institutions are listed in the field of mathematics, which is defined by a set of journals devoted to pure mathematics, applied mathematics, statistics and probability. Since Essential Science Indicators presents only the top 1 per cent of institutions in a field in terms of total citations earned, this means some 20,000

institutions were surveyed to obtain these results. Of the 200 institutions, 78 received 3,000 or more citations during the period, so all those listed above rank in the top one-half of 1 per cent by citations. The average citation impact in mathematics during the 10-year and two-month period surveyed here was 3.26.

Among the institutions listed in the table, the top three by number of papers published are the University of Wisconsin (1,632), the University of California, Berkeley (1,620) and the University of Michigan (1,551). The three with the highest number of citations are the University of California, Berkeley (14,070), Stanford University (12,548) and the University of Minnesota (11,375). The top three institutions in terms of their percentage of highly cited papers published are Stanford University (7.63 per cent), Duke University (6.3 per cent) and the University of California, Los Angeles (5.8 per cent). By definition, one would expect only 1 per cent of an institution's papers to be highly cited, so these three exceeded expectations by roughly six to eight times.

Finally, as the table shows, top honours in citation impact go to Johns Hopkins University, despite its relatively small output.

The nations represented by the institutions in the group of 50 are: the US (35 institutions), the UK (four), France (three), and Australia, Austria, Belgium, Canada, China, Israel, Singapore and Switzerland (one each).

Mark Newman of the University of Michigan fielded the most-cited paper in mathematics during the period: M.E.J. Newman, "The structure and function of complex networks", *SIAM Review*, 45 (2): 167-256, June 2003. This paper, in an area of growing interest, has received 3,064 citations to date. That is 557 times more than the average number of citations for a mathematics paper published in 2003, which is 5.50. On this subject, see M.E.J. Newman's *Networks: An Introduction* (2010).

For more information, see <http://science.thomsonreuters.com/products/esi>

Readers' comments

- **Marcus** 4 June, 2011

This article gives very clear evidence that citation analysis is bogus.

Mark Newman is a physicist, and his affiliation on the mentioned SIAM Review paper is 'Department of Physics'. According to mathematical reviews, this SIAM article was cited 119 times in the (wider) mathematics literature. So the vast majority of the 3,064 citations that Thomson Reuters picks up is from outside mathematics (probably physics and biology, which have much higher citation rates than mathematics).

- **Sankalp** 5 June, 2011

yeah..glad to be a part of the U Of M

- **Chris** 7 June, 2011

I believe Marcus has missed the point. Would you then say that the work of Nash is of little value, simply because it's main application is in Economics?

A major driving force in mathematics is abstracting and generalising real world systems, or intuitive theoretical ones, and saying all we can about these abstractions, so that others may apply our theorem to their own problem. Who cares if it's physics, computer science, sociology that applies the result?

- **Marcus** 8 June, 2011

@Chris

No, you have missed my point. Citation behavior is very different between different disciplines. The article of Mark Newman seems to reflect citation behavior in his field (physics). I justified this by comparing the number of citations given by Mathematics Reviews to that given by Thomson Reuters.

The average citation rate in physics is much higher. So there is no 'fair' comparison between articles: articles on the boundary between mathematics and physics or mathematics and biology will always dominate citation analyses in mathematics if the citation analysis is done in the way Thomson Reuters does it. Not because those articles are better, but because of the higher citation rates in physics and biology.

This is a fundamental flaw in the Thomson Reuters methodology (and other methodologies will have other fundamental flaws).

- **Hilary F. Naija** 15 June, 2011

The above arguments are neither here nor there. All such bases for any empirical analysis or evaluation is a subject for social critic. It is often said that "EXAMINATION is not a true test of knowledge" but as yet, it remains the most potent. So let's accept the above decision of the 50 top mathematics institutions as a basis for better evaluation in future.

- **Govind yadav** 11 August, 2011

Hello

MTECH COMPUTER

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- **Christopher Heckman** 9 September, 2011

My first impression when reading the article is that the numbers were skewed somehow. I teach at Arizona State, and I can name ten universities in the USA --- right off the top of my head --- which have better mathematics departments than us; so how did we get to be 21st? Most likely because of the sheer number of faculty.

(Yes, I know some worthwhile papers have come from ASU faculty; "Independent Sets in Triangle-Free Cubic Planar Graphs" comes to mind.)

You don't need to look that far to suspect something is wrong; look at #1 and #2 (Johns Hopkins and Stanford). Stanford has beaten JH for number of papers, number of citations, number of highly cited papers, and % of highly cited papers, but they lost closely to JH on "citation impact", and that's evidently the only reason they're not listed in the top spot!

As Benjamin Disraeli* once said, "There are three kinds of lies: lies, damned lies, and statistics." (* This quote is often falsely attributed to Mark Twain.)

- **Christopher Heckman** 12 September, 2011

Some people have evidently mis-intepreted what I have posted above.

1. I mentioned my ASU connections to show that I am familiar with that university. The mathematics "department" (it's actually a school) is a good one and should be rated highly on the list; my only doubts are as to whether it should be ranked as high as it is. After all, there are 5000+ universities in the world.

2. Another aspect of mathematics departments not mentioned above is that of teaching. ASU, with its huge student body (72,000 students at last count) has developed some innovative methods of dealing with large classes, and the sheer number of students to be dealt with.

3. Yes, I co-wrote "Independent Sets in Triangle-Free Cubic Planar Graphs"; it was the example I was most familiar with. However, at least a dozen people consider the paper relevant enough to cite it directly or indirectly in their own research papers.

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