

‘Champion works’: how countries pan out?

The term ‘citation classics’ was first used by Eugene Garfield in 1977 to describe articles that had received an unusually large number of citations and had been identified as such by ISI’s citation indexing system. The actual number of citations received is heavily influenced by the field of study, however, and most research fields have intrinsically different citation rates. Trends also change over time¹. In general, a publication cited

more than 400 times should be considered a classic, but in some fields with fewer researchers, 100 citations might qualify a work².

Here we look at ‘champion works’ – papers that have received 1000 or more citations. One hundred and forty-eight countries/territories are listed in the Essential Science Indicators of the Web of Knowledge. *The Science Citation Index Expanded* (1945 onward) was

searched with each of the 148 country names. Figures pertaining to the total number of papers and the number of papers with over 1000 citations for each country were noted. Table 1 lists the countries that have at least one ‘champion work’.

Table 1 shows that 84 out of the 148 countries have one or more papers with 1000 or more citations. USA leads with respect to total number of papers as well

Table 1. Champion works from different countries

Sl. no.	Country	Total number of papers	No. of papers with 1000+ citations	Sl. no.	Country	Total number of papers	No. of papers with 1000+ citations
1	USA	7,916,983	4635	43	Philippines	14,572	5
2	England	2,395,607	1090	44	Romania	84,685	4
3	Germany	1,794,105	502	45	Nigeria	43,703	4
4	Canada	1,419,361	501	46	Slovakia	44,754	3
5	France	1,765,027	475	47	Colombia	26,008	3
6	Japan	2,318,706	444	48	Uganda	7,344	3
7	Switzerland	541,516	336	49	Ukraine	90,283	2
8	The Netherlands	707,032	255	50	Bulgaria	63,744	2
9	Italy	1,167,440	253	51	Croatia	36,975	2
10	Sweden	535,610	246	52	Costa Rica	8,228	2
11	Australia	805,240	230	53	Panama	4,354	2
12	Scotland	357,510	145	54	Luxembourg	5,048	2
13	Israel	336,829	134	55	Indonesia	14,853	2
14	Denmark	290,228	120	56	Malaysia	50,280	1
15	Belgium	382,795	119	57	Yugoslavia	46,952	1
16	Spain	763,012	109	58	Slovenia	39,035	1
17	Austria	265,399	81	59	Venezuela	33,308	1
18	Finland	237,525	79	60	Serbia	25,472	1
19	Norway	188,972	52	61	Tunisia	29,194	1
20	Peoples Republic of China	1,351,383	43	62	Morocco	24,401	1
21	Russia	556,186	39	63	Kenya	22,080	1
22	Mexico	214,297	39	64	Lithuania	19,211	1
23	India	800,496	36	65	Algeria	18,910	1
24	Ireland	114,166	32	66	Estonia	15,543	1
25	Poland	381,735	31	67	Cuba	15,863	1
26	Brazil	421,601	30	68	Vietnam	13,171	1
27	New Zealand	156,159	29	69	Latvia	8,217	1
28	South Korea	480,235	24	70	Uruguay	10,007	1
29	Hungary	164,094	23	71	Tanzania	9,030	1
30	Wales	113,065	22	72	Ethiopia	8,210	1
31	Argentina	147,328	21	73	Zimbabwe	6,470	1
32	Northern Ireland	54,781	17	74	Benin	2,257	1
33	South Africa	167,074	17	75	Syria	3,932	1
34	Chile	79,996	16	76	Bolivia	2,993	1
35	Taiwan	322,588	14	77	Botswana	2,459	1
36	Greece	184,258	13	78	New Caledonia	2,388	1
37	Iceland	11,547	13	79	Mali	2,079	1
38	Singapore	115,103	13	80	Malta	1,699	1
39	Turkey	259,258	9	81	Gambia	1,763	1
40	Thailand	62,891	9	82	Barbados	1,342	1
41	Portugal	120,678	8	83	Bermuda	688	1
42	Czech Republic	123,000	7	84	Guinea Bissau	391	1

as the highest number of champion works. The BRIC countries (Brazil, Russia, India and China) almost club together with champion works being in the range 30–45. Interestingly, Iran and Egypt have 135,290 and 95,413 papers respectively, but do not have any paper with 1000 citations yet.

Muthu *et al.*³, reporting on the highly cited papers from India and China during 1998–2007, found 776 papers from India

and 2260 from China that have received 100 or more citations. However, as regards to papers with 1000 or more citations, it is seen that China and India are more or less closely positioned with 43 and 36 papers respectively.

1. Smith, D. R., *Occup. Med.*, 2008, **58**, 80–82.
2. <http://garfield.library.upenn.edu/classics.html>

3. Muthu, M., Chandrasekar, G. and Arunachalam, S., *Curr. Sci.*, 2010, **99**, 738–749.

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Characterizing the funded scientific collaboration network

Collaborative innovation, which can be naturally explored by the collaboration networks^{1,2}, emerges as a typical pattern of modern scientific innovation. Nowadays, more than half of the scientific articles indexed by *Web of Science* (WoS) are supported by science funding³. As the fundamental resource, science funds provide financial foundation for many aspects of basic research, including international collaborative innovation. With the comprehensive extraction of funding information in the article database, the large-scale study of science funding has become available in recent years^{3–7}. Thus, based on a large sample data in 2009–2011, we construct the funded scientific collaboration networks of the main countries/territories to reflect the innovation structure of international collaboration in basic research supported by science funding.

The data include 1,871,699 funded research articles in *Science Citation Index (SCI) Expanded* and *Social Sciences Citation Index (SSCI)* of the WoS during 2009–2011. While we set countries/territories as the analysing unit and then abstract 40 major countries/territories which have more than 10,000 funded papers, we construct the funded scientific collaboration network based on the collaborative relationships among these countries/territories. In the network the nodes are countries/territories, and the links are the funded collaborative relationships between two countries/territories. The relationships can be categorized as follows: (1) The country/territory on one side of the link is supported by one or more science fund(s). (2) The countries/territories on both sides of the link are supported by one or more science fund(s) at the same time. (3) The coun-

tries/territories on both sides of the link are supported by different science funds. Regardless of any form, the funding promotes collaborative research directly or indirectly, and its financial resources could be interacted by regular or unofficial pathway.

Figure 1 shows the funded scientific collaboration network of the major countries/territories in 2009–2011, where the thickness of the links is an indication of collaboration strength (i.e. the number of

Table 1. The high-strength collaboration links (top 20) in the funded scientific collaboration network of the main countries/territories during 2009–2011

Rank	Node 1	Node 2	Link strength
1	USA	PRC	35,034
2	USA	Germany	27,799
3	USA	England	25,139
4	USA	Canada	24,598
5	USA	France	18,064
6	USA	Japan	15,243
7	USA	Italy	13,795
8	Germany	England	13,509
9	USA	SK	12,675
10	Germany	France	11,877
11	USA	Spain	11,692
12	USA	Australia	11,675
13	England	France	10,139
14	USA	The Netherlands	9,794
15	USA	Switzerland	9,166
16	Germany	Switzerland	8,927
17	Germany	Italy	8,601
18	France	Italy	8,042
19	Germany	The Netherlands	7,976
20	PRC	Japan	7,780

Ranks are according to the descending order of link strength. PRC, People's Republic of China; SK, South Korea.

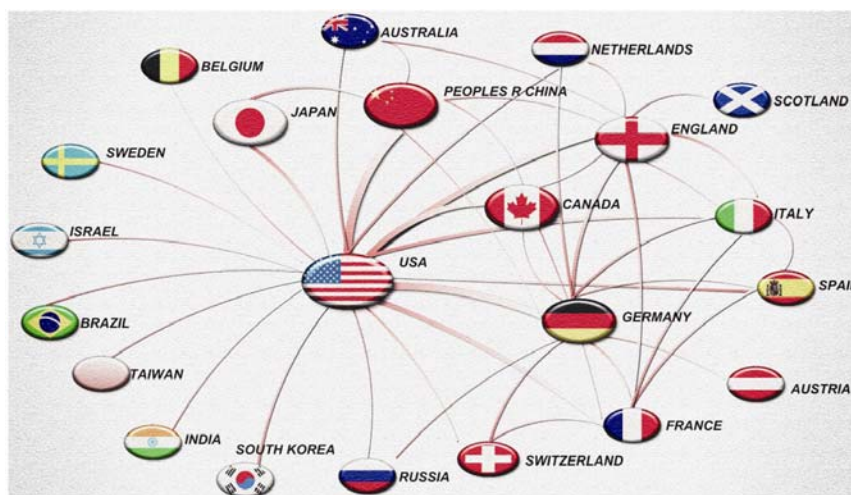


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