

# Counting the gatekeepers of international science journals a worthwhile science indicator

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**Keywords:** Gatekeepers, science journals, science indicators.

ALTHOUGH the progress and development of science is independent of and not influenced by the nationality of the discoverer, due to its self-organizing nature, scientific research as the human activity of 'making science' is strongly competitive at personal, institutional and national level. It is no exaggeration to say that scientific research is the most competitive of all human activities, even if we compare it, for example, with sports.

At national level, the distribution of world science has a component of national pride and patriotism but it is also of pragmatic importance at government level for ranking, managing and policy-making purposes. Therefore it is no surprise that the national well being and health of nations have been for long time one of the most intensively investigated topics of scientometrics. The literature on it is comprehensive and hence only a relatively short selection is enumerated here<sup>1-17</sup>.

de Solla Price<sup>1,2</sup> first initiated the count of publications, authors and citations as science indicators. All later authors have followed him in the use of journal publications and citation counts, and some of them have given these data certain sophistication by using them for building specific, relative, etc. indicators. The whole effort has been made possible by the *Science Citation Index* database developed by Garfield<sup>18</sup>, first in hardcopy, and later in electronic version by the Institute for Scientific Information.

The literature of science is the true and visible output of basic research. However, its determining factor is the mechanism, which creates this literature. Journal papers and citations are only corollary to this mechanism. As mentioned, they represent only the result but not the determining cause of a self-organizing selection or filtering process, which accepts or refuses manuscripts to enter the science journal publication scene.

The determining factor of the whole publication process of journal papers is the so-called journal gate keeping and its operators the gatekeepers of science journals. Motivated by this, we have introduced a scientometric indicator, which supplements and sometimes avoids the counting of

journal papers and citations. For this purpose, we have been inspired by the French scientist de Candolle<sup>19</sup>. Szabó<sup>20</sup> outlines de Candolle's 'early scientometrics' as follows:

'De Candolle, as a very productive research biologist particularly in botany and heredity, fully realized that no single person can appreciate completely and impartially all works published in different languages and in different fields of science. The diversity of subjects and the possible subjectivism in value judgments made him to search for more objective analytical tools. He found them in the numerical analysis of eminent scientists participating actively in international scientific life.'

De Candolle tabulated the data on the national distribution of the members of the following scientific societies: Academie des Sciences de Paris, Société royale de Londres et Edingbourg, Academie des Sciences Berline, Academie des sciences morales, Academie des inscriptions de l'Institute de France, Academie des Lincei de Rome et de Turin, Academie de Bruxelles (denomination according to de Candolle, 1885). In the case of the academies, data were tabulated for every scientists and branch of science. De Candolle based his work on counting scientists chosen according to the judgment of an 'eminent and knowledgeable' body<sup>20</sup>.

De Candolle himself realized that he was the first in the history of science to undertake this kind of analysis. He also accentuated the essential advantage of the eminent membership analysis, because it explores the collective judgment of a professional community.

It would have been difficult to repeat de Candolle's methodology today. Therefore we have initiated a study in 1982, based on the following.

For the satisfactory operation of the international working mechanism of the sciences, the control and screening activity of journal editorial boards, which guarantee the professional standard of science journals, is of paramount importance. It is considered, the critical mentality and decisions of journal editors have so far protected and will also warrant in the future the social and intellectual integrity of science. The members of the editorial and advisory boards of science journals are rightfully considered the

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## SPECIAL SECTION: 50 YEARS OF CITATION INDEXING

**Table 1.** The percentage of gatekeepers of 50 nations in the field of science

Country	Sum of the 12 disciplines								
	Gatekeepers			Papers			Citations		
	Rank	Number	%	Rank	Number	%	Rank	Number	%
USA	1	6734	53.87	1	24526	32.07	1	1627684	35.32
UK	2	1265	10.12	3	6356	8.31	2	412217	8.94
Germany	3	797	6.38	2	6899	9.02	3	364841	7.92
France	4	493	3.94	4	4944	6.47	5	247247	5.36
Japan	5	427	3.42	5	4359	5.70	4	313590	6.80
Canada	6	405	3.24	7	2941	3.85	6	190696	4.14
Australia	7	284	2.27	12	1511	1.98	10	104726	2.27
Italy	8	267	2.14	6	3422	4.48	7	165009	3.58
Switzerland	9	256	2.05	10	1874	2.45	11	103734	2.25
Netherlands	10	235	1.88	9	2100	2.75	8	123716	2.68
Sweden	11	160	1.28	13	1316	1.72	12	91707	1.99
Spain	12	113	0.90	8	2238	2.93	9	106744	2.32
Belgium	13	101	0.81	15	1011	1.32	14	57684	1.25
Denmark	14	95	0.76	17	813	1.06	16	50529	1.10
Austria	15	94	0.75	19	797	1.04	20	38680	0.84
Israel	16	91	0.73	16	862	1.13	17	47052	1.02
China PR	17	74	0.59	11	1570	2.05	13	71208	1.55
Finland	18	72	0.58	21	681	0.89	18	44302	0.96
Russia	19	55	0.44	14	1064	1.39	15	50546	1.10
Norway	20	50	0.40	26	354	0.46	25	25992	0.56
India	21	42	0.34	20	717	0.94	21	36145	0.78
Ireland	22	38	0.30	35	207	0.27	33	12582	0.27
Hungary	23	37	0.30	27	324	0.42	28	15778	0.34
South Korea	24	29	0.23	18	801	1.05	19	44004	0.95
Brazil	25	28	0.22	22	610	0.80	22	32329	0.70
New Zealand	26	28	0.22	32	220	0.29	26	18558	0.40
Poland	27	25	0.20	24	574	0.75	23	30261	0.66
Czech Republic	28	25	0.20	30	268	0.35	30	15001	0.33
Mexico	29	23	0.18	29	269	0.35	29	15069	0.33
Argentina	30	21	0.17	28	282	0.37	31	14037	0.30
Greece	31	20	0.16	25	376	0.49	27	17743	0.38
South Africa	32	20	0.16	37	151	0.20	35	11955	0.26
Taiwan	33	18	0.14	23	588	0.77	24	28504	0.62
Portugal	34	11	0.09	31	221	0.29	32	13066	0.28
Slovenia	35	8	0.06	41	75	0.10	39	4740	0.10
Singapore	36	7	0.06	34	212	0.28	36	11441	0.25
Turkey	37	6	0.05	36	161	0.21	34	12257	0.27
Thailand	38	6	0.05	38	95	0.12	41	4470	0.10
Chile	39	5	0.04	33	219	0.29	37	7068	0.15
Venezuela	40	5	0.04	43	53	0.07	45	2282	0.05
North Korea	41	5	0.04	50	0	0.00	50	0	0.00
Uganda	42	4	0.03	46	28	0.04	47	1346	0.03
Malaysia	43	4	0.03	47	14	0.02	46	1899	0.04
Slovakia	44	3	0.02	40	88	0.12	38	4995	0.11
Estonia	45	3	0.02	45	43	0.06	44	2385	0.05
Philippines	46	3	0.02	48	13	0.02	48	1257	0.03
Ethiopia	47	3	0.02	49	9	0.01	49	541	0.01
Bulgaria	48	2	0.02	39	90	0.12	42	3645	0.08
Romania	49	2	0.02	42	66	0.09	40	4619	0.10
Croatia	50	2	0.02	44	53	0.07	43	2849	0.06

Data sources: Gatekeepers: ISSRU (own) database built from 240 science journals.

Papers: ISI's World Web of Science.

Citations: ISI's World Web of Science.

gatekeepers of the science journals. The gatekeepers, in controlling the systems of manuscript evaluation and selection, occupy powerful strategic positions in the collec-

tive activity of science<sup>21-26</sup>. Taking into account their vital strategic importance in the orchestration of science, we hypothesize that similar to the 'invisible colleges'<sup>27,28</sup>

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**Table 2.** Ratios of US to UK, EU(15) and EU(25) gatekeepers, publications and citations

	Science			Agriculture and environment			Biology			Biosciences			Biomedical research		
	G	P	C	G	P	C	G	P	C	G	P	C	G	P	C
UK	5.32	3.86	3.95	5.76	4.09	3.36	5.78	4.43	3.30	3.96	4.01	4.25	5.16	3.54	4.63
EU (15)	1.79	0.78	0.93	1.54	0.75	0.78	2.22	1.10	0.88	1.80	1.26	1.14	2.23	0.89	1.14
EU (25)	1.74	0.75	0.89	1.48	0.72	0.75	2.19	1.10	0.88	1.78	1.24	1.12	2.21	0.87	1.12

  

	Clinical and experimental medicine I			Clinical and experimental medicine II			Neuroscience and behaviour			Chemistry			Physics		
	G	P	C	G	P	C	G	P	C	G	P	C	G	P	C
UK	11.24	5.72	3.90	5.66	3.24	3.97	5.43	3.76	4.81	4.68	4.83	3.97	3.95	3.06	3.53
EU (15)	3.06	1.12	0.96	2.19	0.85	1.03	2.02	0.99	1.35	1.22	0.72	0.70	0.82	0.52	0.59
EU (25)	2.97	1.11	0.94	2.17	0.84	1.02	1.97	0.96	1.32	1.15	0.68	0.66	0.81	0.49	0.56

  

	Geoscience and Space Sciences			Engineering			Mathematics		
	G	P	C	G	P	C	G	P	C
UK	2.16	2.48	3.08	5.68	3.76	3.85	5.96	4.07	4.67
EU (15)	0.86	0.40	0.82	1.84	0.89	0.89	1.60	0.88	0.91
EU (25)	0.83	0.38	0.79	1.75	0.85	0.85	1.54	0.85	0.85

G, Gatekeepers (2003); P, Papers (2002); C, Citations (articles 2000, citations 2000–2002)  
 Source: idem as in Table 1

Ratio (example):  $\frac{US\%}{UK\%} = \frac{53.87\%}{10.12\%} = 5.32.$

of individual researchers, in the world of science there is at work also an ‘invisible college’ of journal gatekeepers as an eminent group of scientists selected by a self-organization system of science.

Price redefined the seventeenth-century term ‘invisible college’ as being an informal, widely dispersed group of people with a common scientific interest who ‘effectively solve a communication crisis’.

The gate keeping process has a built-in automatic feedback mechanism that works to increase its strength and power within science in relation to social and political forces.

Gate keeping has, of course, not to be viewed as some gathering of conspirators, but along with the characterization of Prize’s and Crane’s invisible colleges, we consider that gatekeepers automatically and instinctively share a common goal of which the main component is the value system and the national educational background they were socialized with.

The initial steps of the methodology have been reported elsewhere<sup>21</sup>. We have built a machine-readable database of journal gatekeepers. Science journals were defined as ‘international’ if their editorial board included scientists from e.g., eight countries at least, irrespective of the title of the journal in question. The ‘international’ label in the title of some journals may hide a truly national journal. On the contrary, for example, in the editorial board of the *American Heart Journal* there are, in

addition to US, scientists from ten, mostly European, countries.

The database contains data for the year 2003. Two hundred and forty journals in 12 fields were studied. The leading 20 journals were selected (by impact) in each of the 12 fields according to the journal classification system of Glänzel and Schubert<sup>29</sup>.

The necessary data were obtained by counting and country-wise pooling of the editors. In so doing, we considered as editors the editor-in-chief, the editor(s), the deputy editor(s) (in-chief), the managing editor, the members of the editorial board and advisory board, excepting only the technical editor(s), i.e. most of those whose name appeared on the cover of the journals.

Table 1 shows results for 2003, in all science fields together. It also shows the data for the national percentage of authors of papers in the same journals for 2002, and the citations in 2000–2002 for papers in 2000.

Table 2 shows the ratios of percentages of the US gatekeepers, authors and citations in the 12 disciplines, by the world nations to the percentages for the UK, EU(15), and EU(25). The table reveals how many times the number of US gatekeepers exceeds those of the UK, EU(15) and EU(25). For comparison, the table also includes the percentage ratio of US citations to citations to the three entities.

On the basis of these measurements, we are inclined to think that the invisible college of science journal gate-

keepers is a decisive factor in the self-organizing system of sciences. The national distribution of the gatekeepers seems to be a determining component factor in influencing the state of health of science in the world's nations.

We also consider that the results published until now on the wealth, impact, performance, etc., of nations, which are based on counting publications and citations, show only one face of the medal and are only indirectly related to the real scope of those investigations. The main factor in the scientific health of nations is the decision power the invisible college of journal gatekeepers disposes of.

The recent reports<sup>30–32</sup> on the decline of US science are based on the data derived from non-conclusive indicators. As gatekeeping indicators show the US has been since 1982, the leading scientific power and it does not show any decline in this respect. On the contrary, it has significantly increased its power and dominance in all fields of science.

A more comprehensive version of our results has been published recently<sup>33</sup>.

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