

Long-Term Vs. Short-Term Journal Impact: Does It Matter?

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Chart 1

Chart 2

The first published report on journal impact factors was included in E. Garfield, I.H. Sher, "New factors in the evaluation of scientific literature through citation indexing," *American Documentation*, 14[3]:195-201, July 1963. The late Irving H. Sher, who then was director of R&D at the Philadelphia-based Institute for Scientific Information (ISI), and I created the impact factor to help evaluate and select journals for *Current Contents*. The current impact factor is determined by counting citations in the current year's publications to papers published in the previous two years and dividing by the number of papers published in the same period. Editors often have complained that this measure, which records average influence in the first and second years after publication, is biased against journals in slow-moving fields. They have argued that measurement of long-term impact would show such journals in a better light.

The original reason for creating the impact factor was to make sure that *Current Contents* covered the most significant journals. Thus, a current impact calculation, based on the two preceding years of publications, served us well enough. Later, ISI started to produce its *Journal Citation Reports (JCR)* as a byproduct of the *Science Citation Index*. Publishing long-term journal impact data was not considered a high priority, but the data were there

for those persistent enough to combine the input from consecutive annual *JCR* volumes.

Recently, ISI's *Journal Performance Indicators* database became available. [For information, contact David Pendlebury at ISI; (215) 386-0100, Ext. 1411.] The 1995 edition, which contains publication and citation data on ISI-indexed journals for each year from 1981 to 1995, helped us examine short- and long-term changes in journal citation rates. We used papers published in 1981-1982 and in 1989-1990 as the source groups of cited articles, and used the database to compile 15-year and seven-year cumulative impact data, from 1981-1995 and 1989-1995, respectively. The study was limited to journals that published more than 200 articles in 1981-1982 and eliminated all review journals regardless of size.

The table that follows includes the 100 journals with the highest cumulative impact based on 15 years of data. The first group of columns shows the number of articles published in 1981-1982, the total cumulated citations over 15 years, the impact measured as citations per article, and the impact rank. This is followed by the ranking for each journal when the then-current impact factors were published in 1983. The second group of columns shows the same data for the 1989-1990 articles, with the rank based on seven-year citation data and the

then-current impact factor measured in 1991.

With few exceptions, the top journals in terms of citations and productivity retain prominent rankings. The top 10-Cell, *New England Journal of Medicine*, *Journal of Experimental Medicine*, *Journal of Cell Biology*, *Proceedings of the National Academy of Sciences*, *Archives of General Psychiatry*, *Journal of Clinical Investigation*, *Nature*, *Journal of Molecular Biology*, and *Science*-are of the highest impact when measured over two-, seven-, or 15-year periods.

Significant changes between current and cumulative impact rankings indeed do occur. *Archives of General Psychiatry*, *Molecular and Cell Biology*, *EMBO Journal*, and *Circulation Research* move up by 12 or more positions when one looks at long-term impact. Even more dramatic shifts occur for the *Journal of Lipid Research*, *Journal of Histochemistry and Cytochemistry*, and several physiology journals, including the *American Journal of Physiology*, *Journal of General Physiology*, *Journal of Neurophysiology*, and *Journal of Physiology (London)*.

On the other hand, significant downward changes in the rankings occur for such journals as *Endocrinology*, *Kidney International*, *Journal of Virology*, and almost all letters journals. These changes can be attributed to a variety of factors. For letters journals, one can assume that the authors went on to publish other work that superseded their earlier short reports.

On the other hand, some journals may have improved long-term ranks owing to cumulative effects of a few highly cited "Citation Classics." More than one third of the citations to articles published in 1981-82 in *Journal of Histochemistry and Cytochemistry* were to a single article by S.M. Hsu et al. (29:577-80, 1981).

My report entitled "The Significant Scientific Literature Appears In A Small Core Of Journals" (*The Scientist*, Sept. 2, 1996, page 13) listed the 50 journals that were most cited in absolute terms in 1994 and the 50 that published the largest numbers of articles. Many of these journals do not appear in the new lists ranked by long-term cumulative impact. These titles include the *Journal of Geophysical Research*, *Physical Review B*, *Journal of Chemical Physics*, *Brain Research*, and *Biochimica et Biophysica Acta*. Few would dispute the significance of these large journals in their respective fields, but further study is required to fully understand these data.

The new data reported here show dramatic changes in impact rankings. How would these data affect journal selection based on current impact? Since meaningful comparisons can be made only within subject categories, the key question is whether these data affect rankings within a field such as physiology. Cross-disciplinary comparisons may not take into account the innate character of physiological research, in which advances may not be absorbed as rapidly as in other fields. Will journal rankings within categories differ significantly using a long-term impact? Or are current data good predictors of future

rankings within the field?

It is impossible without an article-by-article audit of each journal to make absolute comparisons. For example, more than 20 percent of the articles in *Cell* are reviews. This inflates its already high impact and ranking. Most other journals do not include this proportion of review articles. The *New England Journal of Medicine* does publish a large number of review articles, but most leading biomedical research journals do not.

The data reported here are subject to human error, since they are a derivative of a large database. It is impossible to equate all publishing units involved, but I believe that the results reported will generally support independent peer-review judgments of the importance of

these journals in contemporary life sciences. Every reasonable effort has been made to ensure accuracy, but the original data sources should be consulted to validate the results. The table that follows includes the 100 journals with the highest cumulative impact based on 15 years of data. The first group of columns shows the number of articles published in 1981-1982, the total cumulated citations over 15 years, the impact measured as citations per article, and the impact rank. This is followed by the ranking for each journal when the then-current impact factors were published in 1983. The second group of columns shows the same data for the 1989-1990 articles, with the rank based on seven-year citation data and the then-current impact factor measured in 1991.

Chart 1

Chart 2

Cumulative Impact Factors

15-YEAR (1981-1995) CUMULATIVE DATA

7-YEAR (1989-1995) CUMULATIVE DATA

JOURNAL TITLE

'81-'82 Source Items

Citations '81-'95

15-Year IF*

15-Year Rank

IF Rank in '83

'89-'90 Source Items

Citations '89-'95

7-Year IF

7-Year Rank

IF Rank in '91

<i>Cell</i>	803	110,330	137.4	1	2	977	157,456	161.2	1	1
<i>New England Journal of Medicine</i>	757	89,106	117.7	2	1	742	82,163	110.7	2	2
<i>Journal of Experimental Medicine</i>	665	61,017	91.8	3	4	780	53,340	68.4	5	10
<i>Journal of Cell Biology</i>	812	71,249	87.8	4	7	969	60,194	62.1	7	11
<i>Proceedings of the National Academy of Sciences of the USA-Biological Sciences</i>	3,206	279,206	87.1	5	8	4,262	254,452	59.7	8	12
<i>Archives of General Psychiatry</i>	313	26,213	83.8	6	18	233	11,907	51.1	9	18
<i>Journal of Clinical Investigation</i>	735	59,087	80.4	7	11	1,100	53,456	48.6	10	16
<i>Nature</i>	2,737	216,130	79.0	8	6	2,169	214,942	99.1	4	4
<i>Journal of Molecular Biology</i>	668	48,135	72.1	9	19	800	26,744	33.4	21	38
<i>Science</i>	2,065	146,278	70.8	10	9	1,684	178,622	106.1	3	3
<i>Molecular and Cellular Biology</i>	305	20,783	68.1	11	24	1,528	63,608	41.6	13	21
<i>Journal of Neuroscience</i>	303	19,778	65.3	12	5	774	30,749	39.7	14	31
<i>Brain</i>	89	5,750	64.6	13	215	189	4,746	25.1	37	108
<i>EMBO Journal</i>	227	14,624	64.4	14	25	1,022	68,320	66.9	6	9
<i>Circulation Research</i>	441	27,167	61.6	15	30	629	19,935	31.7	24	40
<i>Neuroscience</i>	469	28,239	60.2	16	23	798	19,138	24.0	43	93
<i>Annals of Internal Medicine</i>	607	35,759	58.9	17	10	509	22,824	44.8	12	13
<i>Journal of Histochemistry and Cytochemistry</i>	365	20,853	57.1	18	52	453	7,061	15.6	86	183
<i>Nucleic Acids Research</i>	1,196	68,174	57.0	19	16	3,473	62,341	18.0	70	144
<i>Journal of General Physiology</i>	163	9,258	56.8	20	110	223	6,278	28.2	27	46
<i>Journal of Comparative Neurology</i>	636	35,524	55.9	21	35	971	23,029	23.7	45	83
<i>Journal of Immunology</i>	1,988	110,005	55.3	22	15	2,508	93,080	37.1	16	24
<i>Journal of Biological Chemistry</i>	4,600	253,489	55.1	23	19	6,627	243,943	36.8	17	25
<i>Astrophysical Journal Supplement Series</i>	136	7,465	54.9	24	48	206	5,693	27.6	28	71
<i>Blood</i>	767	41,550	54.2	25	17	1,413	54,271	38.4	15	19

*IF=Impact Factor

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Journal Impact

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15-YEAR (1981-1995) CUMULATIVE DATA

7-YEAR (1989-1995) CUMULATIVE DATA

JOURNAL TITLE	15-YEAR (1981-1995) CUMULATIVE DATA					7-YEAR (1989-1995) CUMULATIVE DATA				
	'81-'82 Source Items	Citations '81-'95	15-Year IF	15-Year Rank	IF Rank in '83	'89-'90 Source Items	Citations '89-'95	7-Year IF	7-Year Rank	IF Rank in '91
<i>Circulation</i>	928	49,945	53.8	26	12	990	36,424	36.8	18	14
<i>Journal of Neurophysiology</i>	337	17,593	52.2	27	56	465	11,673	25.1	38	86
<i>Lancet</i>	1,288	66,336	51.5	28	3	942	44,982	47.8	11	6
<i>Hepatology</i>	189	9,699	51.3	29	199	522	11,389	21.8	54	74
<i>Gastroenterology</i>	647	32,583	50.4	30	21	887	21,287	24.0	42	35
<i>American Journal of Medicine</i>	625	30,354	48.6	31	28	987	13,660	13.8	93	180
<i>Journal of Physiology-London</i>	900	43,442	48.3	32	77	866	23,001	26.6	32	43
<i>Diabetes</i>	473	22,682	48.0	33	26	547	13,275	24.3	41	50
<i>Physical Review Letters</i>	2,028	95,971	47.3	34	14	3,054	109,227	35.8	20	22
<i>Laboratory Investigation</i>	292	13,299	45.5	35	36	330	8,381	25.4	36	53
<i>Analytical Biochemistry</i>	1,181	53,431	45.2	36	118	1,026	14,046	13.7	95	238
<i>Gene</i>	334	14,945	44.8	37	29	1,163	23,878	20.5	58	141
<i>American Journal of Cardiology</i>	794	35,288	44.4	38	20	1,701	21,759	12.8	98	234
<i>Journal of Molecular Evolution</i>	105	4,606	43.9	39	13	214	3,976	18.6	66	152
<i>Annals of Neurology</i>	406	17,744	43.7	40	78	419	13,150	31.4	25	37
<i>Geochimica et Cosmochimica Acta</i>	405	17,620	43.5	41	67	542	10,456	19.3	62	125
<i>Journal of the American Chemical Society</i>	3,717	160,615	43.2	42	33	3,968	97,647	24.6	40	60
<i>Pflugers Archiv-European Journal of Physiology</i>	429	18,443	43.0	43	105	489	7,711	15.8	84	137
<i>European Journal of Immunology</i>	377	15,951	42.3	44	22	814	22,215	27.3	29	49
<i>Journal of Lipid Research</i>	310	13,077	42.2	45	53	442	9,760	22.1	52	100
<i>Molecular Pharmacology</i>	395	16,501	41.8	46	32	503	14,566	29.0	26	56
<i>Ecology</i>	431	17,560	40.7	47	168	423	7,430	17.6	73	189
<i>Journal of Clinical Endocrinology and Metabolism</i>	891	35,565	39.9	48	55	913	20,765	22.7	49	101
<i>Journal of Membrane Biology</i>	295	11,674	39.6	49	47	303	5,767	19.0	63	106
<i>American Journal of Pathology</i>	349	13,785	39.5	50	70	567	18,158	32.0	22	44
<i>Developmental Biology</i>	662	26,125	39.5	51	69	557	13,272	23.8	44	75
<i>Biochemistry</i>	2,193	85,882	39.2	52	40	2,947	79,470	27.0	31	52
<i>Cancer Research</i>	1,701	65,597	38.6	53	54	2,480	67,374	27.2	30	66
<i>Journal of Allergy and Clinical Immunology</i>	277	10,679	38.6	54	81	491	8,269	16.8	78	120
<i>American Review of Respiratory Disease</i>	695	26,573	38.2	55	39	1,039	24,255	23.3	46	62
<i>Journal of Pharmacology and Experimental Therapeutics</i>	938	35,442	37.8	56	68	1,393	28,406	20.4	59	98
<i>Journal of Infectious Diseases</i>	539	20,216	37.5	57	46	743	19,273	25.9	34	55
<i>Hypertension</i>	364	13,646	37.5	58	57.1	453	11,886	26.2	33	42
<i>Contributions to Mineralogy and Petrology</i>	241	9,004	37.4	59	181	241	3,526	14.6	91	132
<i>American Journal of Physiology</i>	1,999	74,138	37.1	60	101	4,133	78,621	19.0	64	124
<i>Endocrinology</i>	1,410	52,215	37.0	61	38	1,707	43,836	25.7	35	61
<i>Limnology and Oceanography</i>	260	9,599	36.9	62	155	299	5,061	16.9	77	199
<i>Kidney International</i>	415	15,041	36.2	63	37	609	13,953	22.9	47	36
<i>Earth and Planetary Science Letters</i>	394	14,161	35.9	64	84	344	6,300	18.3	68	145
<i>Annals of Surgery</i>	448	15,939	35.6	65	112	392	8,878	22.7	50	122
<i>Neuroendocrinology</i>	273	9,711	35.6	66	76	425	7,444	17.5	75	128
<i>Journal of Virology</i>	1,007	35,686	35.4	67	35	1,658	52,623	31.7	23	29
<i>American Journal of Epidemiology</i>	348	12,309	35.4	68	145	480	9,500	19.8	60	131
<i>Proceedings of the Royal Society of London Series B-Biological Sciences</i>	178	6,261	35.2	69	102	195	2,899	14.9	90	311
<i>Journal of Magnetic Resonance</i>	530	18,623	35.1	70	123	705	11,239	15.9	83	206
<i>International Journal of Cancer</i>	458	16,077	35.1	71	61	791	13,447	17.0	76	155
<i>Nuclear Physics B</i>	1,014	35,366	34.9	72	31	1,251	26,502	21.2	55	51
<i>Diabetologia</i>	360	12,549	34.9	73	41	259	5,718	22.1	53	63
<i>Pain</i>	153	5,308	34.7	74	232	310	5,585	18.0	69	102
<i>Brain Research</i>	2,383	82,465	34.6	75	99	3,212	53,591	16.7	79	188
<i>Astrophysical Journal</i>	2,707	93,577	34.6	76	48	2,955	52,917	17.9	72	116
<i>Evolution</i>	256	8,790	34.3	77	211	301	6,682	22.2	51	140
<i>Journal of Neurochemistry</i>	1,042	34,221	32.8	78	73	1,144	26,060	22.8	48	76
<i>Naunyn-Schmiedebergs Archives of Pharmacology</i>	364	11,936	32.8	79	57	424	6,955	16.4	81	112
<i>Cancer</i>	1,835	59,958	32.7	80	136	1,736	25,890	14.9	89	228
<i>Biochemical Journal</i>	1,673	54,267	32.4	81	89	2,073	42,817	20.7	56	88
<i>Gut</i>	364	11,775	32.4	82	64	558	8,506	15.2	88	129
<i>Life Sciences</i>	1,519	48,959	32.2	83	67.1	1,158	11,629	10.0	100	363
<i>American Journal of Psychiatry</i>	651	20,917	32.1	84	94	476	11,725	24.6	39	68
<i>European Journal of Biochemistry</i>	1,522	48,627	32.0	85	72	1,461	27,496	18.8	65	133
<i>Stroke</i>	264	8,400	31.8	86	148	556	10,895	19.6	61	130
<i>American Journal of Clinical Nutrition</i>	699	22,044	31.5	87	139	708	10,949	15.5	87	221
<i>Neurology</i>	575	18,114	31.5	88	214	847	17,491	20.7	57	79
<i>Clinical Pharmacology and Therapeutics</i>	434	13,671	31.5	89	42	319	5,026	15.8	85	113
<i>Cancer Genetics and Cytogenetics</i>	172	5,336	31.0	90	63	429	5,093	11.9	99	253
<i>British Journal of Haematology</i>	434	13,426	30.9	91	87	603	9,935	16.5	80	146
<i>Journal of Investigative Dermatology</i>	415	12,791	30.8	92	66	564	10,122	18.0	71	81
<i>British Journal of Psychiatry</i>	349	10,724	30.7	93	184	626	8,298	13.3	97	275
<i>Experimental Brain Research</i>	441	13,513	30.6	94	170	662	9,571	14.5	92	211
<i>American Journal of Surgical Pathology</i>	151	4,620	30.6	95	594	260	4,770	18.4	67	119
<i>Journal of Applied Physiology</i>	972	29,635	30.5	96	164	1,437	19,095	13.3	96	376
<i>American Naturalist</i>	364	11,034	30.3	97	218	210	3,354	16.0	82	205
<i>Journal of the National Cancer Institute</i>	635	19,174	30.2	98	110	397	14,206	35.8	19	23
<i>European Journal of Pharmacology</i>	1,120	33,769	30.2	99	65	1,616	28,368	17.6	74	97
<i>Journal of Catalysis</i>	599	17,985	30.0	100	189	611	8,409	13.8	94	219