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

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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.

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Cumulative Impact Factors

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
Cell	803	110,330	137.4	1	2	977	157,456	161.2	1	1
New England Journal of Medicine	757	89,106	117.7	2	1	742	82,163	110.7	2	2
Journal of Experimental Medicine	665	61,017	91.8	3	4	780	53,340	68.4	5	10
Journal of Cell Biology	812	71,249	87.8	4	7	969	60,194	62.1	7	11
Proceedings of the National Academy of Sciences of the USA-Biological Sciences	3,206	279,206	87.1	5	8	4,262	254,452	59.7	8	12
Archives of General Psychiatry	313	26,213	83.8	6	18	233	11,907	51.1	9	18
Journal of Clinical Investigation	735	59,087	80.4	7	11	1,100	53,456	48.6	10	16
Nature	2,737	216,130	79.0	8	6	2,169	214,942	99.1	4	4
Journal of Molecular Biology	668	48,135	72.1	9	19	800	26,744	33.4	21	38
Science	2,065	146,278	70.8	10	9	1,684	178,622	106.1	3	3
Molecular and Cellular Biology	305	20,783	68.1	11	24	1,528	63,608	41.6	13	21
Journal of Neuroscience	303	19,778	65.3	12	5	774	30,749	39.7	14	31
Brain	89	5,750	64.6	13	215	189	4,746	25.1	37	108
EMBO Journal	227	14,624	64.4	14	25	1,022	68,320	66.9	6	9
Circulation Research	441	27,167	61.6	15	30	629	19,935	31.7	24	40
Neuroscience	469	28,239	60.2	16	23	798	19,138	24.0	43	93
Annals of Internal Medicine	607	35,759	58.9	17	10	509	22,824	44.8	12	13
Journal of Histochemistry and Cytochemistry	365	20,853	57.1	18	52	453	7,061	15.6	86	183
Nucleic Acids Research	1,196	68,174	57.0	19	16	3,473	62,341	18.0	70	144
Journal of General Physiology	163	9,258	56.8	20	110	223	6,278	28.2	27	46
Journal of Comparative Neurology	636	35,524	55.9	21	35	971	23,029	23.7	45	83
Journal of Immunology	1,988	110,005	55.3	22	15	2,508	93,080	37.1	16	24
Journal of Biological Chemistry	4,600	253,489	55.1	23	19	6,627	243,943	36.8	17	25
Astrophysical Journal Supplement Series	136	7,465	54.9	24	48	206	5,693	27.6	28	71
Blood	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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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
Circulation	928	49,945	53.8	26	12	990	36,424	36.8	18	14
Journal of Neurophysiology	337	17,593	52.2	27	56	465	11,673	25.1	38	86
Lancet	1,288	66,336	51.5	28	3	942	44,982	47.8	11	6
Hepatology	189	9,699	51.3	29	199	522	11,389	21.8	54	74
Gastroenterology	647	32,583	50.4	30	21	887	21,287	24.0	42	35
American Journal of Medicine	625	30,354	48.6	31	28	987	13,660	13.8	93	180
Journal of Physiology-London	900	43,442	48.3	32	77	866	23,001	26.6	32	43
Diabetes	473	22,682	48.0	33	26	547	13,275	24.3	41	50
Physical Review Letters	2,028	95,971	47.3	34	14	3,054	109,227	35.8	20	22
Laboratory Investigation	292	13,299	45.5	35	36	330	8,381	25.4	36	53
Analytical Biochemistry	1,181	53,431	45.2	36	118	1,026	14,046	13.7	95	238
Gene	334	14,945	44.8	37	29	1,163	23,878	20.5	58	141
American Journal of Cardiology	794	35,288	44.4	38	20	1,701	21,759	12.8	98	234
Journal of Molecular Evolution	105	4,606	43.9	39	13	214	3,976	18.6	66	152
Annals of Neurology	406	17,744	43.7	40	78	419	13,150	31.4	25	37
Geochimica et Cosmochimica Acta	405	17,620	43.5	41	67	542	10,456	19.3	62	125
Journal of the American Chemical Society	3,717	160,615	43.2	42	33	3,968	97,647	24.6	40	60
Pflugers Archiv-European Journal of Physiology	429	18,443	43.0	43	105	489	7,711	15.8	84	137
European Journal of Immunology	377	15,951	42.3	44	22	814	22,215	27.3	29	49
Journal of Lipid Research	310	13,077	42.2	45	53	442	9,760	22.1	52	100
Molecular Pharmacology	395	16,501	41.8	46	32	503	14,566	29.0	26	56
Ecology	431	17,560	40.7	47	168	423	7,430	17.6	73	189
Journal of Clinical Endocrinology and Metabolism	891	35,565	39.9	48	55	913	20,765	22.7	49	101
Journal of Membrane Biology	295	11,674	39.6	49	47	303	5,767	19.0	63	106
American Journal of Pathology	349	13,785	39.5	50	70	567	18,158	32.0	22	44
Developmental Biology	662	26,125	39.5	51	69	557	13,272	23.8	44	75
Biochemistry	2,193	85,882	39.2	52	40	2,947	79,470	27.0	31	52
Cancer Research	1,701	65,597	38.6	53	54	2,480	67,374	27.2	30	66
Journal of Allergy and Clinical Immunology	277	10,679	38.6	54	81	491	8,269	16.8	78	120
American Review of Respiratory Disease	695	26,573	38.2	55	39	1,039	24,255	23.3	46	62
Journal of Pharmacology and Experimental Therapeutics	938	35,442	37.8	56	68	1,393	28,406	20.4	59	98
Journal of Infectious Diseases	539	20,216	37.5	57	46	743	19,273	25.9	34	55
Hypertension	364	13,646	37.5	58	57.1	453	11,886	26.2	33	42
Contributions to Mineralogy and Petrology	241	9,004	37.4	59	181	241	3,526	14.6	91	132
American Journal of Physiology	1,999	74,138	37.1	60	101	4,133	78,621	19.0	64	124
Endocrinology	1,410	52,215	37.0	61	38	1,707	43,836	25.7	35	61
Limnology and Oceanography	260	9,599	36.9	62	155	299	5,061	16.9	77	199
Kidney International	415	15,041	36.2	63	37	609	13,953	22.9	47	36
Earth and Planetary Science Letters	394	14,161	35.9	64	84	344	6,300	18.3	68	145
Annals of Surgery	448	15,939	35.6	65	112	392	8,878	22.7	50	122
Neuroendocrinology	273	9,711	35.6	66	76	425	7,444	17.5	75	128
Journal of Virology	1,007	35,686	35.4	67	35	1,658	52,623	31.7	23	29
American Journal of Epidemiology	348	12,309	35.4	68	145	480	9,500	19.8	60	131
Proceedings of the Royal Society of London Series B-Biological Sciences	178	6,261	35.2	69	102	195	2,899	14.9	90	311
Journal of Magnetic Resonance	530	18,623	35.1	70	123	705	11,239	15.9	83	206
International Journal of Cancer	458	16,077	35.1	71	61	791	13,447	17.0	76	155
Nuclear Physics B	1,014	35,366	34.9	72	31	1,251	26,502	21.2	55	51
Diabetologia	360	12,549	34.9	73	41	259	5,718	22.1	53	63
Pain	153	5,308	34.7	74	232	310	5,585	18.0	69	102
Brain Research	2,383	82,465	34.6	75	99	3,212	53,591	16.7	79	188
Astrophysical Journal	2,707	93,577	34.6	76	48	2,955	52,917	17.9	72	116
Evolution	256	8,790	34.3	77	211	301	6,682	22.2	51	140
Journal of Neurochemistry	1,042	34,221	32.8	78	73	1,144	26,060	22.8	48	76
Naunyn-Schmiedebergs Archives of Pharmacology	364	11,936	32.8	79	57	424	6,955	16.4	81	112
Cancer	1,835	59,958	32.7	80	136	1,736	25,890	14.9	89	228
Biochemical Journal	1,673	54,267	32.4	81	89	2,073	42,817	20.7	56	88
Gut	364	11,775	32.4	82	64	558	8,506	15.2	88	129
Life Sciences	1,519	48,959	32.2	83	67.1	1,158	11,629	10.0	100	363
American Journal of Psychiatry	651	20,917	32.1	84	94	476	11,725	24.6	39	68
European Journal of Biochemistry	1,522	48,627	32.0	85	72	1,461	27,496	18.8	65	133
Stroke	*264*	*8,400*	*31.8*	*86*	*148*	*556*	*10,895*	*19.6*	*61*	*130*
American Journal of Clinical Nutrition	699	22,044	31.5	87	139	708	10,949	15.5	87	221
Neurology	575	18,114	31.5	88	214	847	17,491	20.7	57	79
Clinical Pharmacology and Therapeutics	434	13,671	31.5	89	42	319	5,026	15.8	85	113
Cancer Genetics and Cytogenetics	172	5,336	31.0	90	63	429	5,093	11.9	99	253
British Journal of Haematology	434	13,426	30.9	91	87	603	9,935	16.5	80	146
Journal of Investigative Dermatology	415	12,791	30.8	92	66	564	10,122	18.0	71	81
British Journal of Psychiatry	349	10,724	30.7	93	184	626	8,298	13.3	97	275
Experimental Brain Research	441	13,513	30.6	94	170	662	9,571	14.5	92	211
American Journal of Surgical Pathology	151	4,620	30.6	95	594	260	4,770	18.4	67	119
Journal of Applied Physiology	972	29,635	30.5	96	164	1,437	19,095	13.3	96	376
American Naturalist	364	11,034	30.3	97	218	210	3,354	16.0	82	205
Journal of the National Cancer Institute	635	19,174	30.2	98	110	397	14,206	35.8	19	23
European Journal of Pharmacology	1,120	33,769	30.2	99	65	1,616	28,368	17.6	74	97
Journal of Catalysis	599	17,985	30.0	100	189	611	8,409	13.8	94	219