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"Current Comments"

Play the New Game of Twenty Citations! Wherein ISI Reveals the Fifty Most Frequently Cited "Non-Journal" Items

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In 1967, ISI processed about 3.7 million citations to produce the *Science Citation Index®*. Of these, about 20% were to items other than journal articles, and most of them were books. A substantial number of the books were collections of various sorts, with one or more editors.

When reference is made to some part of such a collection, the author of the individual paper or chapter is usually cited; but in many cases, the editor of the collection may be cited as well, or even alone. The most frequently cited of such collections in 1967 was the Colowick and Kaplan *Methods in Enzymology*.[1] Till 1969, we created entries in the *Citation Index* for both editor and author when an individual paper or chapter in such a collection was cited. In 1969, however, we decided for several reasons that we would no longer continue this double entry, giving preference to an individual author whenever his name was given. The effect of the change was quite significant for the ranking of books by frequency of citation. Consider a collection like *The Thymus in Immunobiology*, edited by Good and Gabrielson,[2] with 37 contributions from 72 authors. The work was cited under the first editor's name 199 times in 1967, while authors of individual chapters were cited 164 times. In 1969, the relationship was reversed, with individual authors being cited 134 times and the first editor only 79.

One wonders, by the way, about the importance of publishing such collections when one finds that the citation rate of the papers they contain is surprisingly low compared to that of the average journal article–especially so considering the fact that so many of them are methods papers. It has been suggested that the reason for their low citation rate is that formal or explicit citations drop off as each volume and its contents become increasingly familiar to members of a particular specialty group. Such may be the case for specialists, but an examination of the list which follows this editorial (non-journal items most frequently cited in 1967) shows that even super-classics like Snedecor[3] and Pauling[4] are explicitly cited rather heavily year after year. If the specialists aren't citing them, then newcomers surely continue to do so. In any case, the data show their lasting impact on the scientific community.

Only 1% of all published items are cited more than 15 times a year. It is rare that any journal article or book is cited more than 100 times in one year. All of the books in the list below were cited more than 130 times in 1967. The significance of this number must

be tempered by an "immediacy effect" which obtains in certain fields. A group of prolific molecular biologists, for example, may publish a spate of papers in a short period and find it necessary to cite one another quite frequently--but the same papers will be cited much less frequently in subsequent years. As I've indicated before, one characteristic of Nobel Prize-winning work is that it continues to be cited over a long period of time.[5,6]

The value of "most-cited" lists is admittedly open to discussion. Sometimes, however, it is helpful to have the obvious pointed out and handily arranged. Some young professor wishing to organize a small collection of books for a new biochemistry library may wish to compare his personal collection against such a list. Some other people may even wish to turn their hand and memory to a new parlor game--Twenty Citations--in which the object is to name in twenty guesses as many as possible of the twenty most frequently cited books in science.[7] The outcome of such retrieval exercises can be quite illuminating. Try out with your friends the list which follows to see how well they know the "classics". (A comparable list of the most cited journal articles may provide more exacting sport; for their titles see *Current Contents*,® Number 15, April 14, 1971, pages M38-39.)[8]

1. Colowick, S.P. and Kaplan, N.O., Eds. *Methods in Enzymology*. New York: Academic Press, 1955.
2. Good, R.A. and Gabrielson, A.E., Eds. *The Thymus in Immunobiology: Structure, Function, and Role in Disease, by 72 Authors*. New York: Harper and Row (Hoeber Medical Division), 1964.
3. Snedecor, G.W. *Statistical Methods Applied to Experiments in Agriculture and Biology*. Ames, Iowa: Iowa State College Press, 1938, 1940, 1946, 1956, 1962, 1966.
4. Pauling, L. *The Nature of the Chemical Bond and the Structure of Molecules and Crystals: An Introduction to Modern Structural Chemistry*. Ithaca, New York: Cornell University Press, 1939, 1940, 1960.
5. Garfield, E. and Malin, M.V. "Can Nobel Prize Winners be Predicted?" Paper presented at 135th Annual Meeting of the AAAS, Dallas, 1968.
6. Garfield, E. Citation indexing for studying science. *Nature* 227:669-671, 1970.
7. The list includes 66 items: 16 of them are edited collections, the remaining 50 are single or multiple authored monographs.
8. Garfield, E. "Citation indexing, historio-bibliography, and the sociology of science." In *Proceedings of the Third International Congress of Medical Librarianship, Amsterdam, 5-9, May 1969*. Amsterdam: Excerpta Medica, 1970, pp. 187-204.

Most Cited Non-Journal Items (1967 Ranking)

Rank	Times Cited	Item
1.	2237	S.P. Colowick, N.O. Kaplan, Eds. *Methods in Enzymology*. New York: Academic Press, 1955.
2.	880	G.W. Snedecor. *Statistical Methods Applied to Experiments in Agriculture and Biology*. Ames, Iowa: Iowa State College Press, 1938, 1940, 1946, 1956, 1962, 1966.

3.	728	H.U. Bergmeyer, Ed. *Methods of Enzymatic Analysis.* New York: Academic Press, 1963, 1965.
4.	657	P.D. Boyer, H. Lardy, K. Myrback, Eds. *The Enzymes.* New York: Academic Press, 1959-63.
5.	543	L. Pauling. *The Nature of the Chemical Bond and the Structure of Molecules and Crystals: An Introduction to Modern Structural Chemistry.* Ithaca, N.Y.: Cornell University Press, 1939, 1940, 1960.
6.	541	A.G.E. Pearse. *Histochemistry, Theoretical and Applied.* Boston: Little, Brown, 1953, 1960.
7.	510	F. Seitz, D. Turnbull, Eds. *Solid State Physics, Vol. 17.* New York: Academic Press, 1962.
8.	461	D. Glick, Ed. *Methods of Biochemical Analysis, Vol. 8.* New York: Interscience, 1960.
9.	420	J.O. Hirschfelder, C.F. Curtiss, R.B. Bird. *Molecular Theory of Gases and Liquids.* New York: Wiley, 1954, 1965.
10.	420	S. Siegel. *Nonparametric Statistics for the Behavioral Sciences.* New York: McGraw-Hill, 1956.
11.	419	L.J. Bellamy. *The Infra-Red Spectra of Complex Molecules.* New York: Wiley, 1954, 1958, 1964, 1966.
12.	413	L.S. Goodman, A. Gilman, Eds. *The Pharmacological Basis of Therapeutics: A Textbook of Pharmacology, Toxicology and Therapeutics for Physicians and Students.* New York: Macmillan, 1941, 1943, 1947, 1955, 1965.
13.	381	W.W. Umbreit, R.H. Burris, J.F. Stauffer. *Manometric Techniques; A Manual Describing Methods Applicable to the Study of Tissue Metabolism.* Minneapolis: Burgess, 1945, 1949, 1964.
14.	371	J. Brachet, A.E. Mirsky, Eds. *The Cell; Biochemistry, Physiology, Morphology.* New York: Academic Press, 1959-1964.
15.	368	E.A. Kabat, M. Mayer. *Experimental Immunochemistry.* Springfield, Illinois: C.C. Thomas, 1948, 1961.
16.	352	E. Chargaff, J. Davidson, Eds. *The Nucleic Acids: Chemistry and Biology.* New York: Academic Press, 1955-60.
17.	336	E. Stahl. *Dunnschicht-Chromatographie. Ein Laboratoriumshandbuch.* Berlin, Springer-Verlag, 1962.
18.	322	M. Hansen. *Constitution of Binary Alloys.* New York: McGraw-Hill, 1958.
19.	300	M. Born, E. Wolf. *Principles of Optics.* New York, Pergamon Press, 1959.
20.	296	J.B. Stanbury, J. Wyngaarden, D. Fredrickson, Eds. *The Metabolic Basis of Inherited Disease.* New York, McGraw-Hill (Blakison Division), 1960, 1966.
21.	293	I. Smith. *Chromatographic and Electrophoretic Techniques.* New York: Interscience, 1960, 1961.
22.	290	M. Dixon, E.C. Webb. *Enzymes.* New York: Academic Press, 1958, 1964.
23.	285	B.J. Winer. *Statistical Principles in Experimental Design.* New York: McGraw-Hill, 1962.
24.	284	P. McC. Morse, H. Feshbach. *Methods of Theoretical Physics.* New York: McGraw-Hill, 1953.
25.	284	A. Streitwieser. *Molecular Orbital Theory for Organic Chemists.* New York: Wiley, 1961.
25.	266	H.S. Harned, B.B. Owen. *The Physical Chemistry of Electrolytic Solutions.* New York: Reinhold, 1943, 1950, 1958.
27.	263	E.L. Eliel, et al. *Conformational Analysis.* New York: Interscience, 1965.
28.	261	R.G.D. Steel, J. Torrie. *Principles and Procedures of Statistics, with Special Reference to the Biological Sciences.* New York: McGraw-Hill, 1960.
29.	252	I.C. Gunsalus, R.Y. Stanier, Eds. *The Bacteria: A Treatise on Structure and Function.* New York, Academic Press, 1960-64.
30.	249	A. Erdelyi. *Higher Transcendental Functions.* New York, McGraw-Hill, 1953-55.
31.	247	H.S. Carslaw, J.C. Jaeger. *Conduction of Heat in Solids.* Oxford: Clarendon Press, 1948, 1959, 1968.

32.	229	M. Abramowitz, I. Stegun, Eds. *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables.* Washington, D.C.: U.S. Government Printing Office, 1964, 1966.
33.	225	R.A. Robinson, R.H. Stokes. *Electrolyte Solutions.* London: Butterworths, 1959.
34.	223	R. Courant, D. Hilbert. *Methods of Mathematical Physics.* New York: Interscience, 1953-62.
35.	216	K. Nakamoto. *Infrared Spectra of Inorganic and Coordination Compounds.* New York: Wiley, 1961.
36.	214	A. Abragam. *The Principles of Nuclear Magnetism.* New York: Oxford University Press, 1961.
37.	211	J.N. Davidson, W.E. Cohn, Eds. *Progress in Nucleic Acid Research and Molecular Biology, Vol. 3.* New York: Academic Press, 1964.
38.	208	N.S. Bhacca, D.H. Williams. *Applications of NMR Spectroscopy in Organic Chemistry.* San Francisco, Holden-Day, 1964.
39.	206	J.M. Tager et al., Eds. *Regulation of Metabolic Processes in Mitochondria (Proceedings).* New York: Elsevier, 1966.
40.	203	M.S. Newman. *Steric Effects in Organic Chemistry.* New York, Wiley, 1956.
41.	199	J.W. Emsley, J. Feeney, L.H. Sutcliffe. *High Resolution Nuclear Magnetic Resonance Spectroscopy.* New York, Pergamon Press, 1965, 1966.
42.	199	R.A. Good, A.E. Gabrielson, Eds. *The Thymus in Immunobiology: Structure, Function, and Role in Disease.* New York: Harper & Row (Hoeber Medical Division), 1964.
43.	199	K. Siegbahn, Ed. *Alpha- Beta- and Gamma-Ray Spectroscopy.* Amsterdam, North Holland, 1965.
44.	198	G.C. Pimentel, A. McClellan. *The Hydrogen Bond.* New York: Reinhold, 1960.
45.	195	G. Herzberg. *Infrared and Raman Spectra of Polyatomic Molecules.* New York: Van Nostrand, 1945.
46.	194	P.J. Flory. *Principles of Polymer Chemistry.* New York: Cornell University Press, 1953.
47.	189	L.M. Jackman, S. Sternhell. *Applications of Nuclear Magnetic Resonance Spectroscopy in Organic Chemistry.* New York: Pergamon Press, 1960.
48.	184	T.E. King, H. Mason, M. Morrison, Eds. *Oxidases and Related Redox Systems.* New York: Wiley, 1964-67.
49.	178	S. Glasstone et al. *Theory of Rate Processes.* New York: McGraw-Hill, 1941.
50.	174	C.K. Ingold. *Structure and Mechanism in Organic Chemistry.* Ithaca, N.Y.: Cornell University Press, 1953.
51.	164	C. Walling. *Free Radicals in Solution.* New York: Wiley, 1957.
52.	154	N. Dunford. *Linear Operators.* New York: Wiley, 1963.
53.	152	G. Gomori. *Microscopic Histochemistry.* Chicago: University of Chicago Press, 1952.
54.	149	E.F. Lindquist. *Design and Analysis of Experiments in Psychology and Education.* Boston, Houghton-Mifflin, 1942.
55.	149	M. Born, K. Huang. *Dynamical Theory of Crystal Lattices.* New York: Oxford University Press, 1954.
56.	142	H. Lamb. *Hydrodynamics.* Dover Publications, 1932.
57.	142	W. Feller. *Introduction to Probability Theory, and its Applications.* New York: Wiley, 1968.
58.	139	M. Born, E. Wolf. *Principles of Optics.* New York, Pergamon, 1966.
59.	139	J. Crank. *Mathematics of Diffusion.* New York: Oxford University Press, 1956.
60.	139	H. Budzikiewicz et al. *Interpretation of Mass Spectra of Organic Compounds.* San Francisco, Holden-Day, 1964.
61.	137	E.L. Eliel. *Stereochemistry of Carbon Compounds.* New York: McGraw-Hill, 1962.
62.	136	M.M. Wintrobe. *Clinical Hematology.* Philadelphia: Lea & Febiger, 1967.

63. 136 G. Herzberg. *Spectra of Diatomic Molecules.* Dover Publications, 1950.
64. 135 L.F. Fieser. *Steroids.* New York: Van Nostrand-Rheinhold, 1959.
65. 131 J.G. Calvert, J.N. Pitts. *Photochemistry.* New York: Wiley, 1966.
66. 131 J. Bonner, P.D. Ts'O. *Nucleohistones.* San Francisco: Holden-Day, 1964.