Essays of an Information Scientist, Vol:2, p.474-478, 1974-76 Current Contents, #19, p.5-9, May 10, 1976

"Current Comments"

The 1972 Articles Most Frequently Cited in the Years 1972-1975

May 10, 1976 Number 19

About two and a half years ago, we published a list of 1972 papers that had been heavily cited in 1972.[1] Almost half were in the physical sciences. We have now compiled a new list of highly cited 1972 articles. We have taken account of all citations received from 1972 to 1975. Only eight out of 50 are in the physical sciences (papers 8, 14, 19, 25, 26, 33, 39, and 47 on the list that follows). Only eight of the original papers are included in the new list.

Citations to most of the original articles were quite heavy in the three-year period 1973-1975. But the cumulated citation record for these papers was not as high as those which follow. This tells us something characteristic of many discoveries, especially in the physical sciences. There is often a spate of activity that lasts about a year and then falls off. Why doesn't this happen as often in the life sciences?

The 50 articles listed below were published mainly in physics, immunology, and review journals. Eight were published in *Proceedings of the National Academy of Sciences USA*, and six in *Science*. The *Science* articles have had particularly high impact. *Nature* accounted for four papers. The *Journal of Experimental Medicine* published five. As I have reported before, this journal is primarily a journal of immunology.[2]

The predominance of immunology in this compilation is interesting. It would be interesting to learn whether immunologists will consider that the most important breakthroughs in immunology for this period have been listed.

There is one artifact to be observed in regard to most of these papers. Only 13 of them were cited at all in 1972. Most of these made the original list. It seems obvious then that not enough time had elapsed for these papers to have been heavily cited. Indeed, 1972 was an eventful year for immunology publications. But the impact of these papers was not felt until 1973. Indeed, for the majority of the articles, 1974 and 1975 proved to be the peak years. Unlike the life sciences, publication patterns in the physical sciences are such as to give them an edge when it comes to 'immediacy'. The role of 'letters' journals in physics is quite prominent. However, while two or three years is required for the superstar life-sciences article to peak, its frequency of citation is much higher than that of the physical-sciences superstar. So, a list based on absolute frequency, as this one is will favor the life sciences.

In general, the well-cited physical-sciences articles appear to have shorter life expectancies than key biomedical articles. Most of the articles that ap-

1972 Articles Most Cited 1972-1975

The parenthesized number after the 72 count indicates the article's rank on original 1972 list.

	Times Cited in:				Total	
	72	73	74	75	72-75	Bibliographical Data
1.	54 (1)	254	291	256	855	**Singer S J & Nicolson G L.** The fluid mosaic model of the structure of cell membranes. *Science* 175:720-31, 1972.
2.	0	89	201	245	535	**Jondal M, Holm G & Wigzell H.** Surface markers on human T and B lymphocytes; large population of lymphocytes forming nonimmune rosettes with sheep red blood cells. *J. Exp. Med.* 136:207-15, 1972.
3.	0	42	163	162	367	**Taylor A L & Trotter C D.** Linkage map of *Escherichia coli* strain K-12. *Bacteriol. Revs.* 36:504-24, 1972.
4.	25 (7)	87	110	91	313	**Benacerraf B & McDevitt H O.** Histocompatibility-linked immune response genes. *Science* 175:273-79, 1972.
5.	0	50	114	114	278	**Sharon N & Lis H.** Lectins; cell-agglutinating and sugar-specific proteins. *Science* 177:949-59, 1972.
6.	0	33	102	102	237	**Aviv H & Leder P.** Purification of biologically-active globin *m*RNA by chromatography on oligothymidylic-acid-cellulose. *Proc. Nat. Acad. Sci. USA* 69:1408-12, 1972.
7.	0	48	93	96	237	**Black J W, Duncan W A M, Durant C J, Ganellin C R & Parsons E M.** Definition and antagonism of histamine *H-2* receptors. *Nature* 236:385-90, 1972.
8.	20 (20)	76	82	46	224	**Wilson K G.** Feynman-graph expansion for critical exponents. *Phys. Rev. Letters* 28:548-51, 1972.
9.	0	60	74	78	212	**Basten A, Miller J F A P, Sprent J & Pye J.** Receptor for antibody on B lymphocytes. 1. Method of detection and functional significance. *J. Exp. Med.* 135:610-26, 1972.
10.	0	52	81	71	204	**Katz D H & Benacerraf B.** Regulatory influence of activated T-cells on B-cell responses to antigen. *Adv. Immunology* 15:1-94, 1972.
11.	15	62	66	56	199	**Sheppard J R.** Difference in cyclic adenosine 3'5'-monophosphate levels in normal and transformed cells. *Nature-New Biol.* 236:14-16, 1972.
12.	0	24	83	87	194	**Dickler H B & Kunkel H G.** Interaction of aggregated gamma-globulin with B lymphocytes. *J. Exp. Med.* 136:191-96, 1972.
13.	0	56	81	55	192	**Borst P.** Mitochondrial nucleic acids. *Annu. Rev. Biochemistry* 41:333-76, 1972.
14.	23 (11)	54	65	50	192	**Wilson K G & Fisher M E.** Critical exponents in 3.99 dimensions. *Phys. Rev. Letters* 28:240-43, 1972.
15.	0	37	70	77	184	**Buhler F R, Laragh J H, Baer L. Vaughan E D & Brunner H R.** Propranolol inhibition of renin secretion; specific approach to diagnosis and treatment of renin-dependent hypertensive diseases. *New Engl. J. Med.* 287:1209-14, 1972.
16.	16	68	46	48	178	**Stobo J D, Rosenthal A S & Paul W E.** Functional heterogeneity of murine lymphoid cells. 1. Responsiveness to and surface binding of concanavalin-A and phytohemagglutinin. *J. Immunology* 108:1-17, 1972.

17.	0	26	51	97	174	**Weisenberg R C.** Microtubule formation *in-vitro* in solutions containing low calcium concentrations. *Scienee* 177:1104-05, 1972.
18.	0	20	67	84	171	**Udenfriend S, Stein S, Bohlen P, Dairman W, Leimgruber W & Weigele M.** Fluorescamine; reagent for assay of amino acids, peptides, proteins, and primary amines in picomole range. *Science* 178:871-72, 1972.
19.	0	40	60	69	169	**Bambynek W, Crasemann B, Fink R W, Frend H U, Mark H, Swift C D, Price R E & Rao P V.** X-ray fluorescence yields, auger, and Coster-Kronig transition probabilities. *Rev. Mod. Physics* 44:716-813, 1972.
20.	0	34	54	81	169	**Ling C M & Overby L R.** Prevalence of hepatitis-B virus antigen as revealed by direct radioimmune assay with I-125 antibody. *J. Immunology* 109:834-41, 1972.
21.	0	54	68	45	167	**Loor F, Forni L & Pernis B.** Dynamic state of lymphocyte membrane; factors affecting distribution and turnover of surface immunoglobulins. *Eur. J. Immunology* 2:203-12, 1972.
22.	20 (19)	44	55	48	167	**Sheldon R, Jurale C & Kates J.** Detection of polyadenylic acid sequences in viral and eukaryotic RNA. *Proc. Nat. Acad. Sci. USA* 69:417-21, 1972.
23.	0	17	62	87	166	**Seeman P.** The membrane actions of anesthetics and tranquilizers. *Pharmacological Revs.* 24:583-655, 1972.
24.	14	49	55	47	165	**Hadden J W, Hadden E M, Haddox M K & Goldberg N D.** Guanosine 3'-5'-cyclic monophosphate; possible intracellular mediator of mitogenic influences in lymphocytes. *Proc. Nat. Acad. Sci. USA* 69:3024-27, 1972.
25.	0	24	59	82	165	**Weinberg S.** Effects of a neutral intermediate boson in semileptonic processes. *Phys. Rev. D.* 5:1412-17, 1972.
26.	0	93	57	14	164	**Charlton G *et al.*** Charged-particle multiplicity distribution from 200-Gev pp interactions. *Phys. Rev. Letters* 29:518-18, 1972.
27.	14	59	46	44	163	**Greaves M F & Bauminger S.** Activation of T and B lymphocytes by insoluble phytomitogens. *Nature-New Biol.* 235:67-70, 1972.
28.	0	59	61	43	163	**Sugino A, Hirose S & Okazaki R.** RNA-linked nascent DNA fragments in *Escherichia coli.* *Proc. Nat. Acad. Sci. USA* 69:1863-67, 1972.
29.	0	20	62	76	158	**Kebabian J W, Petzold G L & Greengard P.** Dopamine-sensitive adenylate cyclase in caudate nucleus of rat brain, and its similarity to dopamine reception. *Proc. Nat. Acad. Sci USA* 69:2145-49, 1972.
30.	0	62	60	34	156	**Marchalonis J J, Cone R E & Atwell J L.** Isolation and partial characterization of lymphocyte surface immunoglobulins. *J. Exp. Med.* 135:956-71, 1972.
31.	0	33	65	58	156	**Perry R P, Latorre J, Kelley D E & Greenberg J R.** On the lability of poly(A) sequences during extraction of *m*RNA from polyribosomes. *Biochimica Biophysica Acta* 262:220-26, 1972.
32.	0	39	65	50	154	**Carlson L A & Bottiger L E.** Ischemic heart disease in relation to fasting values of plasma triglycerides and cholesterol; Stockholm perspective study *Lancet* 1:865-68, 1972.

33.	10	62	56	25	153	**Georgi H & Glashow S L.** Unified weak and electromagnetic interactions without neutral currents. *Phys. Rev. Letters* 28:1494-97, 1972.
34.	0	42	55	55	152	**Andersson J, Moller G & Sjoberg O.** Selective induction of DNA synthesis in T and B lymphocytes. *Cellular Immunology* 4:381-93, 1972.
35.	0	30	52	69	151	**Feighner J P, Robins E, Guze S B, Woodruff R A, Winokur G & Munoz R.** Diagnostic criteria for use in psychiatric research. *Arch. General Psychiat.* 26:57-63, 1972.
36.	0	43	52	56	151	**Marchesi V T, Tillack T W, Jackson R L, Segrest J P & Scott R E.** Chemical characterization and surface orientation of major glycoprotein of human erythrocyte membrane. *Proc. Nat. Acad. Sci. USA* 69:1445-49, 1972.
37.	21(15)	46	52	32	151	**Wickner W, Brutlag D, Schekman R & Kornberg A.** Synthesis initiates *in vitro* conversion m13DNA to its replicative form. *Proc. Nat. Acad. Sci. USA* 69:965-69, 1972.
38.	0	17	59	73	149	**Wybran J, Carr M C & Fudenberg H H.** Human rosette-forming cell as a marker of a population of thymus-derived cells. *J. Clin. Invest.* 51:2537-43, 1972.
39.	0	56	62	30	148	**Koba Z, Nielsen H B & Olesen P.** Scaling of multiplicity distributions in high-energy hadron collisions. *Nuclear Physics B.* 40:317-34, 1972.
40.	0	30	62	55	147	**Harold F M.** Conservation and transformation of energy by bacterial membranes. *Bacteriol. Revs.* 36:172-230, 1972.
41.	0	14	58	75	147	**Perlmann P, Perlmann H & Wigzell H.** Lymphocyte mediated cytotoxicity *in vitro;* induction and inhibition by humoral antibody and nature of effector cells. *Transplantation Revs.* 13:91-114, 1972.
42.	0	52	50	45	147	**Studier F W.** Bacteriophage T7; genetic and biochemical analysis of this simple phage gives information about basic genetic processes. *Science* 176:367-76, 1972.
43.	0	37	55	52	144	**Aisenberg A C & Bloch K J.** Immunoglobulins on surface of neoplastic lymphocytes. *New Engl. J. Med.* 287:272-86, 1972.
44.	0	27	44	73	144	**Cowan W M, Gottlieb D I, Hendrickson A E, Price J L & Woolsey T A.** Autoradiographic demonstration of axonal connections in the central nervous system. *Brain Res.* 37:21-51, 1972.
45.	0	33	69	42	144	**Kaback H R.** Transport across isolated bacterial cytoplasmic membranes. *Biochimica Biophysica Acta* 265:367-416, 1972.
46.	22 (12)	50	45	27	144	**Nossal G J V, Warner N L, Lewis H & Sprent J.** Quantitative features of a sandwich radioimmunolabeling technique for lymphocyte surface receptors. *J. Exp. Med.* 135:405-28, 1972.
47.	0	33	49	62	144	**Nuckolls J, Wood L, Thiessen A & Zimmerman G.** Laser compression of matter to super-high densities; thermonuclear (CTR) applications. *Nature* 239:139-42, 1972.
48.	0	20	55	66	141	**Andersson J, Sjoberg O & Moller G.** Mitogens as probes for immunocyte activation and cellular cooperation. *Transplantation Revs.* 11:131-77, 1972.
49.	0	55	49	37	141	**Todaro G J & Huebner R J.** Viral oncogene hypothesis; new evidence. *Proc. Nat. Acad. Sci. USA* 69:1009-15, 1972.
50.	28 (4)	44	34	34	140	**Danzinger R G, Hofmann A F, Schoenfield L J & Thistle J L.** Dissolution of cholesterol gallstones by chenodeoxycholic acid. *New Engl. J. Med.* 286:1-8, 1972.

peared in *Physical Review Letters* have experienced significant citation reductions. From 1973 to 1975 paper 33 dropped from 62 to 25, while paper 26 dropped from 93 to 14. Papers 8 and 14, by K.G. Wilson, are notable exceptions. In comparison, most of the life-sciences counts increased during the same period. The articles by Perlman (41) and Andersson (48) are all the more remarkable if one remembers how deceiving publication dates can be for certain journals. What is the 'official' date for *Transplantation Reviews*. The two 1972 articles listed here arrived at ISI® in February 1973! And it would not be difficult to cite other similar examples of discrepancies in publication dates.

The superstar for 1972 clearly is the paper by Singer and Nicolson, "The fluid mosaic model of the structure of cell membranes." Since most of the 855 papers that cited it were not published in *Journal of Membrane Biology*, this may indicate that there is room for another new journal in this hot area of science. There can be little doubt that the publishers of *Journal of Membrane Biology* recognized in 1969, when it started, that this need existed. Fortunately, no international cartel of biology journals prevented the birth of this new journal.

The next most cited survivor from the original 1972 list is the paper by Benacerraf *et al.* (4). In addition, he was also coauthor with Katz of paper 10, published in *Advances in Immunology*. When one considers the importance of *E. coli* in modern research, it is remarkable that no one has launched a journal linked to this organism. Paper 3 by Taylor and Trotter, "Linkage map of *E. coli* strain K-12," is the second of two highly cited papers Taylor published in *Bacteriological Reviews*. The earlier paper appeared in 1970.

Every paper on this list was cited 140 or more times between 1972 and 1975. This means that many papers on the original 1972 list may still be heavily cited, when compared with most other papers. Had we extended the list a little further many would show up again. But I have deliberately avoided listing all of the original 25, particularly a few which were included because of special circumstances.

As I have stated many times in the past, these lists are published as a journalistic *tour de force*. It is not intended that anyone should compare the importance of a paper on hypertensive disease (15) to a paper on x-ray fluorescence yields (19). The *potpourri* presented here is no less valid, however, than the simultaneous announcement of Nobel Prizes in physics, medicine and chemistry in the same week. It is ISI's intention one day to publish an *Atlas of Science* with complete clusters of highly cited papers so that appropriate comparisons can be made between similar fields or topics.

1. Garfield E. Were the 1972 papers most cited in 1972 the most significant? *Current Contents*® (*CC*®) No. 42, 17 October 1973, p. 5-7.

2. ————.Journal citation studies. 3. *Journal of Experimental Medicine* compared with *Journal of Immunology;* or how much of a clinician is the immunologist? *CC* No. 23, 7 June 1972, p. M1-M4.