

Were the 1972 Papers Most Cited in 1972
the Most Significant?

Number 42

October 17, 1973

At least a million papers were published in scientific and technical journals in 1972. ISI® covered about half of them in its various services. Each and every paper must have served a useful purpose for someone--for its authors, for at least a few readers, and for the editor or journal that published it. But by no stretch of the imagination can even 10% of those million papers be regarded as "significant." How then can one identify by some straightforward, fast and apolitical method those that *are* significant? Polling the memberships of our professional societies would be hopelessly slow and costly. Using award committees is certainly "political".

The "average" paper is cited about 1.7 times during any calendar year after its publication.¹ The average paper will probably not even be cited once *during* the calendar year it's published. If published in January, it obviously stands a better chance of being cited the same year than if published in December. Similarly, if published any time during the *first half of the year*, it has a much better chance of being cited that same year than a paper published during the second half.

Considering the time it takes to prepare and publish a paper, it can be safely assumed that the probability is quite

small that an average paper published in the latter half of the year will be cited the same year. What then would be your estimate of the probability that anything but a significant 1972 paper would be cited 18 or more times the same year? The answer is 1 out of 20,000. In other words, only 25 papers made it. Looking at it another way, any paper that is cited about once each month after it is published is bound to be interesting. And the rate will *increase* in time if it is a candidate for classical status.

The 25 highly cited 1972 papers are listed on page 7. All of them were published during the first half of the year--the latest in May. About two-thirds of them appeared during the first quarter of the year. The journal issues in which they were published also were *delivered* during the first half of the year. One should not rely entirely on cover dates in this sort of analysis. However, such key papers almost invariably appear in journals with prompt publication schedules.

Much has been said about why people cite one another. Admitting that *there are other reasons besides the basic purpose of acknowledging precedents and subject relationships*, can one fail to appreciate their quantitative significance? The papers listed below have

shown an extraordinary frequency and immediacy of citation. In two instances, (the 16th and 25th papers in the list), the high citation may be wholly an artefact of the circumstances of publication--they were key papers in a special symposium issue of a journal, and all of the citations to them were made by other articles in the same issue--a special form of self-citation².

In listing these 25 papers, I don't claim that their authors are obvious candidates for Nobel, Lasker and Priestly awards. I do assert, however, that anyone asked to compile a list of the 25 most interesting, thought-provoking, stimulating, seminal, important, that is, *significant* papers of 1972 would be hard-pressed to come up with a better list. If you polled the membership of the National Academy of Sciences, would their choices be much different, and if so, would they be more valid?

Keep in mind that these 25 papers are the 1972 papers most cited in 1972. (In a subsequent analysis we will also list 1972 papers most cited in 1973, to account for papers published later in 1972!) Disregarding year of publication, the papers most cited in 1972 remain primarily a group of 'super-cited' older classics that I have listed elsewhere³. Eleven of the 25 papers listed are from the physical sciences--almost 50% if

papers 16 and 25 are discounted.

Dozens of award committees will meet to select the best paper in this or that field. Other factors besides citation frequency will be at work in their selection--intuition, special knowledge, politics, etc. But I am relatively confident that the papers listed below, and many others we could similarly identify, selected solely on their citation records, ought to be on the lists of those considered. If there is any doubt about the "lasting" quality of these papers, we can refer to the first six months of the *Science Citation Index*[®] for 1973. In over 75% of the cases, citation rates will increase significantly thereby giving some measure of the research activity involved.

1. Garfield, E. Citation analysis as a tool in journal evaluation. *Science* 178:471-79, 1972.
2. Not surprisingly these papers have not been heavily cited in 1973.
3. Garfield, E. Citation-indexing, historio-bibliography, and the sociology of science. In: *Proc. 3rd Internat. Congress of Medical Librarianship, Amsterdam, 5-9 May 1969*, ed. by K.E. Davis & W.D. Sweeney (Amsterdam: Excerpta Medica, 1970) pp. 187-204. Reprinted in: *Current Contents*[®] No. 15, 14 April 1971, p. M24-41.

1. 54 Singer, S.J. & Nicolson, G.L. The fluid mosaic model of the structure of cell membranes. *Science* 175(4023):720-31, 18 February 1972.
2. 31 Lee, B.W. Renormalizable massive vector meson theory; perturbation theory of the Higgs phenomenon. *Physical Review D* 5(4):823-35, 15 February 1972.
3. 29 Schreier, E., Levinson, R., Gursky, H., Kellogg, E., Tananbaum, H. & Giacconi, R. Evidence for the binary nature of Centaurus X-3 from *Uhuru* x-ray observations. *Astrophysical Journal* 172 (3/2):L79-89, 15 March 1972.
4. 28 Danziger, R.G., Hofmann, A.F., Schoenfield, L.J. & Thistle, J.L. Dissolution of cholesterol gallstones by chenodeoxycholic acid. *New England Journal of Medicine* 286(1):1-8, 6 January 1972.
5. 27 Lai, M.C.M. & Duesberg, P.H. Adenylic acid-rich sequence in RNAs of Rous sarcoma virus and Rauscher mouse leukaemia virus. *Nature* 235(5338):383-6, 18 February 1972.
6. 26 Bertin, A., Capiluppi, P., Cristallini, A., D'Agostino-Bruno, M., Ellis, R.J., Giacomelli, G., Maroni, C., Mercatali, F., Rossi, A.M. & Vannini, G. Negative particle production at the CERN Intersecting Storage Rings. *Physics Letters B* 38B(4):260-4, 21 February 1972.
7. 25 Benacerraf, B. & McDevitt, H.O. Histocompatibility-linked immune response genes. *Science* 175(4019):273-9, 21 January 1972.
8. 25 Webster, B.L. & Murdin, P. Cygnus X-1; a spectroscopic binary with a heavy companion? *Nature* 235(5332):37-8, 7 January 1972.
9. 24 Renwick, J.H. Hypothesis: anencephaly and spina bifida are usually preventable by avoidance of a specific but unidentified substance present in certain potato tubers. *British Journal of Preventive & Social Medicine* 26(2):67-88, May 1972.
10. 23 Olah, G.A. The general concept and structure of carbocations based on differentiation of trivalent ("classical") carbenium ions from three-center bound penta- or tetracoordinated ("non-classical") carbonium ions; the role of carbocations in electrophilic reactions. *Journal of the American Chemical Society* 94(3):808-20, 9 February 1972.
11. 23 Wilson, K.G. & Fisher, M.E. Critical exponents in 3.99 dimensions. *Physical Review Letters* 28(4):240-3, 24 January 1972.
12. 22 Nossal, G.J.V., Warner, N.L., Lewis, H. & Sprent, J. Quantitative features of a sandwich radioimmunolabeling technique for lymphocyte surface receptors. *Journal of Experimental Medicine* 135(2):405-28, 1 February 1972.
13. 21 Gillespie, D., Marshall, S. & Gallo, R.C. RNA of RNA tumour viruses contains Poly A. *Nature New Biology* 236(69):227-31, 26 April 1972.
14. 21 Ross, J., Haim, A., Scolnick, E. & Leder, P. *In vitro* synthesis of DNA complementary to purified rabbit globin mRNA. *Proc. Nat. Acad. Sci. USA* 69(1):264-8, January 1972.
15. 21 Wickner, W., Brutlag, D., Schekman, R. & Kornberg, A. Synthesis initiates *in vitro* conversion M13 DNA to its replicative form. *Proc. Nat. Acad. Sci. USA* 69(4):965-9, April 1972.
16. 20 Bianchi, C., Lumachi, B. & Marazzi-Uberti, E. Pharmacological investigations of 4-prenyl-1, 2-diphenyl-3, 5-pyrazolidinedione (DA 2370). 1. Anti-inflammatory, analgesic and antipyretic properties. *Arzneimittelforschung* 22(1a):183-91, January 1972.
17. 20 Gerber, P. Activation of Epstein-Barr virus by 5-bromodeoxyuridine in "virus-free" human cells. *Proc. Nat. Acad. Sci. USA* 69(1):83-5, January 1972.
18. 20 Jacob, M. & Slansky, R. Nova model of inclusive reactions. *Physical Review D* 5(7):1847-70, 1 April 1972.
19. 20 Sheldon, R., Jurale, C. & Kates, J. Detection of polyadenylic acid sequences in viral and eukaryotic RNA. *Proc. Nat. Acad. Sci. USA* 69(2):417-21, February 1972.
20. 20 Wilson, K.G. Feynman-graph expansion for critical exponents. *Physical Review Letters* 28(9):548-51, 28 February 1972.
21. 19 Bolton, C.T. Identification of Cygnus X-1 with HDE 226868. *Nature* 235(5336):271-3, 4 February 1972.
22. 19 Frazer, W.R., Ingber, L., Mehta, C.H., Poon, C.H., Silverman, D., Stowe, K., Ting, P.D., & Yesian, H.J. High-energy multiparticle reactions. *Reviews of Modern Physics* 44(2):284-319, April 1972.
23. 19 Lark, K.G. Evidence for the direct involvement of RNA in the initiation of DNA replication in *Escherichia coli* 15T⁻. *Journal of Molecular Biology* 64(1):47-60, 28 February 1972.
24. 18 Almehed, S. & Lovelace, C. New pi-N phase-shift analysis. *Nuclear Physics B* B40:157-72, 15 April 1972.
25. 18 Marazzi-Uberti, E., Bianchi, C., Gaetani, M. & Pozzi, L. Pharmacological investigations of 4-prenyl-1, 2-diphenyl-3, 5-pyrazolidinedione (DA 2370). 2. Ulcerogenic effects in rats and dogs. *Arzneimittelforschung* 22 (1a):191-6, January 1972.