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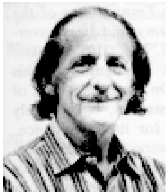

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The 1,000 Articles Most Cited in 1961-1982. 10. Another 100 Citation Classics Cap the Millenary

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This is the last in our 10-part series[1] on the 1,000 papers most cited in the 1961-1982 *Science Citation Index®* (*SCI®*). This 10th group of Citation Classics is listed at the end of this essay. (See Bibliography.) Scanning this list will prove interesting by itself and may refresh one's memory of other high-impact papers now usually taken for granted. We often do not realize how these authors struggled with the creation of these works.

It is extremely difficult to make pithy remarks about a group of papers as diverse as the 1,000 listed in this series. The brief discussion that follows is based on some relatively straightforward data. For example, the 1,000 articles are just 0.004 percent of over 23 million different publications cited in the *SCI* from 1961 to 1982. But these 1,000 papers have accumulated over 1 percent of the 100,000,000 reference citations recorded in that period.

Table 1 lists the 10 citation-frequency ranges in the series. The first list included 100 papers cited at least 2,044 times, while the 10th group was cited between 696 and 664 times. The median number of citations for all 1,000 papers was 1,081. Keep in mind that each of these citation ranges was based solely on what the citation counts happened to be for the 1st and 100th papers in each group.

There is no apparent qualitative significance in the differences among these citation frequencies. They simply indicate those papers that have had the highest impact, as reflected in explicit citation. However difficult it may be to compare the individual papers and their impacts, the group itself is significant. Analyses such as this one often reveal that some of the most influential papers in the history of science are cited less than 1,000 times. Indeed, with few exceptions, this may be the upper limit for any paper that reports a major or revolutionary discovery since, by definition, explicit citation will eventually suffer obliteration by incorporation.[2]

Citation Classics

Of the 1,000 classics identified, 348 have been featured in *Citation Classic®* commentaries. Most of these appeared in *Current Contents®* (*CC®*)/*Life Sciences* from 1977 to 1984. They are among 600 included in the first two volumes of Contemporary Classics in Science,[3] recently published by ISI Press®. (See *Current Book Contents®* for further information.) Thirty-three of these *Classics* are included in the Bibliography in this essay.

Life- and Physical-Sciences Papers

About 745 of the 1,000 papers discuss topics in the life sciences. In Table 2 we summarize the field distributions. The life-sciences articles are subclassified as biochemistry, biomedicine, clinical medicine, molecular biology, and biology. Five papers from psychiatry and psychology journals are included in the clinical medicine totals. As expected from previous studies, the number of papers in the physical sciences is much smaller than that from life sciences. This is largely due to the high volume of journals and papers in life sciences and medicine.

The physical-sciences papers are subdivided among physics, chemistry, mathematics, earth/space sciences, and engineering/technology categories. Among these, physics has 138 articles, followed by chemistry (95), mathematics (10), earth/space sciences (7), and engineering/technology (5). Papers from these last two categories increased slightly in number in the 10th group. Since researchers in smaller disciplines publish fewer papers and therefore generally receive fewer citations, we would expect to encounter more papers from these fields as we identify papers farther down in the citation-frequency ranked list. But there will always be individual exceptions. For example, while individual papers in theoretical biology can turn up in the *SCI* as highly cited, in general such papers are cited less frequently.

In fact, if we compare these categorized groups with those for the research fronts identified from 1983 *SCI* citing papers, we are not surprised at the results. These research fronts, incidentally, are fairly representative of the entire *SCI* file. Thirty-eight percent of them are in biochemistry and biomedicine combined. In our list of 1,000 articles, this percentage is 52. But we expect this number to be somewhat higher because the 1,000 papers are the top most-cited *SCI* papers, 1961-1982. Physics constitutes 18 percent of the research fronts compared to 14 percent of our papers, while these numbers for chemistry are 13 and 9.5 percent, respectively. Mathematics accounts for 6 percent of the 1983 research fronts compared to 1 percent of the 1,000 articles; earth/space sciences are represented by 5 percent compared to less than 1 percent. As suspected, these figures indicate that, as this series is extended, papers from smaller fields will be better represented.

Tibor Braun, Institute of Inorganic and Analytical Chemistry, L. Eötvös University, Budapest, Hungary, recently examined the first 500 papers in our series and identified 133, or 27 percent, as analytical chemistry, although "the overwhelming majority...belong to the bioanalytical subfield. That is why we have to consider that the high percentage [that] analytical chemistry papers represent in the 'most-cited' list is mainly motivated by the explosive growth of biomedical-biochemical research during the last 50 years. The collateral presence of so many analytical chemistry papers seems to be the result of a mutually influencing synergism between biochemistry and analytical chemistry."[4] In Table 2 we identified only 49 of the first 500 and 46 of the second 500 papers as belonging to chemistry. Clearly we have classified many biologically oriented analytical chemistry papers as biochemistry. It would be far more instructive to classify this large group by research fronts. But this type of analysis will follow in later studies.

Purists might question classifying molecular biology papers in the life sciences. They encompass almost 7 percent of the papers. "DNA" explicitly appears in the titles of 49 papers. Allan M. Maxam and Walter Gilbert's 1980 article, the most recent paper in the study, discusses "Sequencing end-labelled DNA with base-specific chemical cleavages."[5] It was cited over 1,200 times.

On the other hand, a more clinically oriented 1968 paper in the 10th list of papers, by James E. Cleaver, University of California, San Francisco, describes the relationship between ultraviolet radiation damage to DNA and skin cancer in patients with xeroderma pigmentosum. This is "a rare hereditary disease...in which the skin is extremely sensitive to sunlight or ultraviolet light. After slight exposure to sunlight the skin develops symptoms which are similar to those seen after chronic exposure of normal skin to X-rays and include frequent skin tumours."[6] Cleaver's research suggests that failure of DNA repair is related to carcinogenesis, another topic discussed frequently in the 1,000 papers.

In fact, at least 11 articles in this series are concerned with carcinogens and mutagens. Four were coauthored by Bruce N. Ames, University of California, Berkeley. They discuss the Ames bacterial test system for the detection and classification of mutagens and carcinogens, the most frequently used short-term test for screening chemical mutagens.[7] Carcinogenesis is clearly a "hot" topic of research. In the 1985 *SCI* alone, there are 853 articles whose titles contain variations of the term "carcinogen."

In a 1982 *CC* essay on risk analysis, Ames commented on the "critical need today for quantitative risk analyses of the large number of man-made and natural toxic substances in order to set priorities."[7] One substance now known to have carcinogenic effects is diethylstilbestrol (DES), a synthetic estrogen prescribed in the 1950s to prevent miscarriages. Some of the daughters of the women who took DES are now developing clear-cell adenocarcinomas of the vagina. The first paper that reported this relationship is included in the Bibliography in this essay. According to the first author, Arthur L. Herbst, then at Massachusetts General Hospital, Boston, "A few months after our publication, a confirmatory study was published in the *New England Journal of Medicine*. [But our] initial report was the first description of the association of a drug ingested during human pregnancy with the appearance of carcinoma in the offspring, which is one of the reasons it has been cited so often. The study has also been misquoted frequently with regard to the nature of the DES link as well as the magnitude of the cancer risk."[8]

The 1,000 papers most cited in the *SCI*, 1961-1982, form a historical record of many of the important discoveries of the twentieth century. Although I mentioned earlier that biochemical and biomedical discoveries predominate, some key papers from other disciplines are also included in the lists. For example, Xavier Le Pichon's classic work on "Sea-floor spreading and continental drift," included in this essay, was the second most-cited paper in our 1982 study on earth-sciences journals.[9] Le Pichon ranks among the 1,000 contemporary scientists most cited from 1965 to 1978.[10] Also included in the Bibliography is M.L. Humason's paper that discusses "Redshifts and magnitudes of extragalactic nebulae." Humason died over 10 years ago, but we expect a commentary from his coauthors, N.U. Mayall and Alan R. Sandage, in the near future. This paper, incidentally, is the most-cited paper from the *Astronomical Journal*.[11]

The classics discussed above are, of course, just a few of the many citation stars that have appeared in the series. In

Table 1: Citation ranges for the papers in each part of this series.

Part	Citation Range	Number of Papers
1	*≥ 16,872-2,044	100
2	2,043-1,464	100
3	1,462-1,188	100
4	1,184-1,032	100
5	1,031-936	100
6	935-861	100
7	860-791	100
8	790-740	98
9	739-697	102
10	696-664	100

*Only one paper (Lowry O H *et al. J. Biol. Chem.* 193:265-75, 1951) received more citations—100,639.

Table 2: Field distributions for the papers in each part of this series.

FIELD (Part)	1	2	3	4	5	6	7	8	9	10	TOTAL
Life Sciences	85	77	80	72	70	76	78	68	72	67	745
Biochemistry	38	30	26	26	27	33	25	24	35	26	290
Biomedicine	17	13	24	21	21	26	36	29	21	24	232
Clinical Medicine	16	26	20	14	17	10	9	12	9	12	145
Molecular Biology	12	8	9	10	4	6	6	3	5	3	66
Biology	2	—	1	1	1	1	2	—	2	2	12
Physics	6	11	7	15	20	12	13	19	22	13	138
Chemistry	9	10	10	13	7	11	7	9	7	12	95
Mathematics	—	1	2	—	1	1	2	1	1	1	10
Earth/Space Sciences	—	—	—	—	1	—	—	1	—	5	7
Engineering/Technology	—	1	1	—	1	—	—	—	—	2	5
TOTAL	100	100	100	100	100	100	100	98	102	100	1,000

Figure 1: Publication years of the 1,000 most-cited papers (solid line) and all *SCI*® cited publications, 1961-1982 (dotted line).

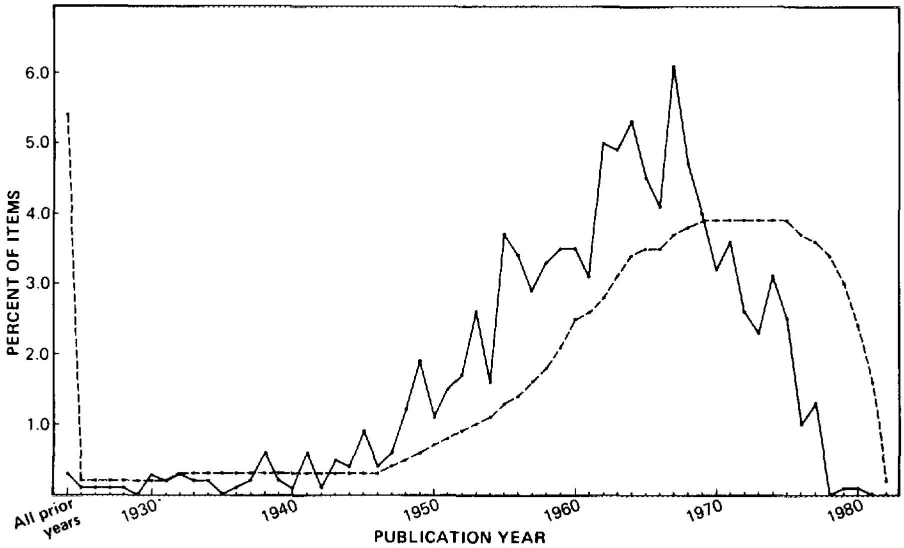


Table 3: Chronologic distribution by decade of publication for the papers in each part of this series.

(Part)	1	2	3	4	5	6	7	8	9	10	TOTAL
1900s	—	—	—	—	—	1	—	—	—	—	1
1910s	—	—	—	—	—	—	—	—	—	1	1
1920s	1	1	1	—	1	—	—	1	—	—	5
1930s	5	3	1	3	2	3	1	1	1	3	23
1940s	8	8	13	9	7	5	3	7	5	3	68
1950s	28	30	19	27	27	28	24	20	23	27	253
1960s	41	51	46	42	47	43	48	42	50	41	451
1970s	17	7	19	19	16	20	24	27	23	25	197
1980s	—	—	1	—	—	—	—	—	—	—	1
TOTAL	100	100	100	100	100	100	100	98	102	100	1,000

each of the preceding nine parts we discussed as many of those papers as space permitted.

Chronologic Distribution and Language of Papers

Over 45 percent of the 1,000 most-cited articles were published in the 1960s. In Table 3 we show the publication-year breakdowns by decade for each of the 10 groups in the series. There do not appear to be any significant chronological differences between groups. When we map the year-by-year divisions for the 10 groups combined (see Figure 1), we see that the greatest number of papers published in any one single year occurs in 1967. By contrast, for the millions of papers cited in the *SCI* from 1961 to 1982, this peak is actually a plateau from 1969 to 1975. The graph shows clearly that the 1,000 most-cited papers are older on average than the total population of all cited works, with an age difference of about four to five years.

The oldest paper in the series, by Gustav Mie, Institute of Physics, Ernst-Moritz-Arndt University of Greifswald, Germany, was published in German in 1908. It was discussed previously in Part 6.[1] The second oldest is the 1913 paper by Leonor Michaelis and Maud L. Menten, Berlin Municipal Hospital. It was also written in German, as were 16 other papers in the series. Over half of these were published before 1955. The vast majority (976) of the 1,000 papers are in English; 4 were written in French and 2 in Russian.

Incidentally, the Michaelis-Menten classic on the kinetics of invertase action continues to be cited quite regularly. In 1985 alone, **72 years after publication** in the *Biochemische Zeitschrift*, it received 23 citations. In fact, this paper has been consistently cited over 25 times each year since 1955.

The 1947 paper by Ernest B. Verney, Department of Pharmacology, University of Cambridge, UK, and the 1931 article by Lars Onsager, Department of Chemistry, Brown University, Providence, Rhode Island, (see Bibliography) also are older but still highly cited works. Verney's paper, "The antidiuretic hormone and the factors which determine its release," is a review and has been cited 98 times since 1983. The *Physical Review* paper by Onsager is the first of two that considers "examples of coupled irreversible processes like the thermoelectric phenomena, the transference phenomena in electrolytes and heat conduction in an anisotropic medium...."[12]

Nobel Prize Recipients

Onsager died in 1976, eight years after he received the Nobel Prize in chemistry. He is one of 80 Nobel Prize winners in this study; they wrote 139 of the 1,000 papers. However, these authors represent only 4 percent of the 1,803 authors in the series. Thirty-six of the 80 received the Nobel in physiology or medicine, 23 in physics, and 21 in chemistry. Most of the prizes (32) were awarded in the 1970s, followed by 18 in the 1980s, 17 in the 1960s, 12 in the 1950s, and 3 from 1920 to 1949. (Two authors—J. Bardeen and F. Sanger—won twice.) Fifty of the Nobelists are Americans, while 14 are from the UK. Three recipients each are from the Federal Republic of Germany (FRG), Denmark, and Sweden, while two are French. Argentina, Belgium, Taiwan, prewar Germany, and Switzerland each produced one Nobelist.

Geographic and Institutional Affiliations

Although it may be obvious to some readers, others may not realize that the institutional affiliations listed in the papers do not always reflect the nationalities of the authors. For example, some affiliations may be the temporary addresses of researchers who are studying abroad. We always rely on the affiliations listed in these articles; it would be a monumental task to identify each author's actual *national* affiliation or country of birth. It is often more important to identify those countries that supported the researchers' work and the institutions that trained them.

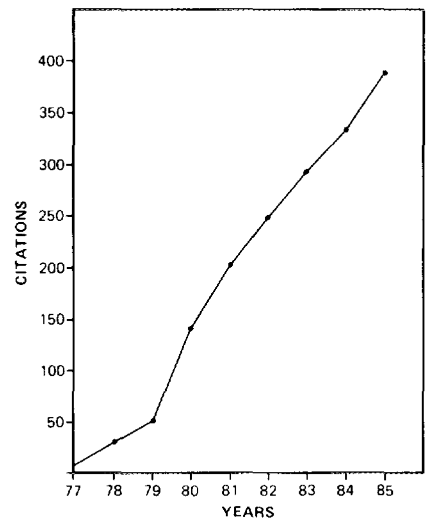
Of the 1,000 articles in this series, 704 list US affiliations. Of these, only 18 were coauthored with researchers at foreign universities or institutes. The UK contributed 149 papers from 44 universities and research institutes. Sweden and Canada produced 41 and 22 papers, respectively, while France had 17, and the FRG and Switzerland had 16 each. Australia contributed 14 articles and Japan, 11. The Japanese articles were written in the 1950s and 1960s. Israel produced six articles, all from the Weizmann Institute of Science, Rehovot. These national affiliations are summarized in Table 4. In Table 5 we list the 61 institutions that appeared at least five times in the series. Many of these frequently contribute articles to our annual lists of most-cited papers. About 300 institutions are represented in the series; over half—166—appear just once.

Types of Papers

Lists of Citation Classics usually include review articles. Many turned up in this study. More significant is the fact that nearly half of the 1,000 papers describe new or modified methods. The first list of papers in this series contained the greatest number of these works—70. Scientists have ambivalent feelings about the importance of these articles. Some new methods do not involve major conceptual discoveries but are simply clever. Others are the result of deep insights. Collectively their importance to progress in science is reflected in this study.

An interesting example of an important methodological work is also one of the most recent papers in the list. This 1977 paper describes a procedure for producing large amounts of recombinant DNA. In just nine years it has been cited over 1,600 times. These citations are graphed in Figure 2. According to the paper's authors, W. David Benton and Ronald W. Davis, Department of Biochemistry, Stanford University School of Medicine, the method makes "it possible, in principle, to isolate large quantities of DNA corresponding to any single gene.... It allow[s] the isolation of eukaryotic unique genes by screening all the recombinants produced through shotgun cloning the entire genome."[13] It is reasonable to expect this paper's almost exponential growth to continue unabated in 1986. The field of recombinant DNA is growing quite rapidly. However, since the Benton-Davis paper is methodological in scope, it is possible that it will be superseded by new methodologies within the next few years. In fact Benton recently noted[14] that at least one modification to it has already been published.[15]

Figure 2: Annual citations to the Benton-Davis paper (*Science* 196:180-2, 1977).



Prolific Authors and Journals

Many of the authors in this series are prolific as well as highly cited. Two hundred fifty-one researchers contributed 2 or more of the 1,000 papers. Seven of these wrote seven or more papers (B.N. Ames, M.J. Karnovsky, S. Moore, W.H. Stein, E.W. Sutherland, and S. Udenfriend). John A. Pople, Carnegie-Mellon University, Pittsburgh, Pennsylvania, wrote eight, six of which were published in the *Journal of Chemical Physics*. Several of these articles are installments of multipart studies.

All the journals that published at least five articles in this study are listed in Table 6. As you can see, a small number of journals published the majority of the articles; the top 10 account for over 40 percent of the papers. Fifty-eight percent of the articles are represented when we add another 10 journals; 38 journals published 70 percent of the 1,000 articles. This breakdown is illustrative of my law of concentration.[16] Nevertheless, 222 periodicals turn up in the list. Of these, 116 published just one paper each. In an ideal Bradford distribution, about 6 journals should account for one-third of the references, 36 journals for the next third, and 216 for the remaining one-third.[17] It will be interesting to observe the changes as we extend the list of most-cited papers.

Conclusion

This concludes our study on the 1,000 most-cited papers from the 1961-1982 *SCI*. In general each list of approximately 100 papers has been representative of the entire series; most of the 1,000 articles are from the life sciences, describe new methodologies, and were published in the 1960s. This bias toward older papers is not surprising. As we have seen from our annual studies of recent most-cited papers, it takes at least five years for such papers to be cited over 600 times, the threshold for this list.

Table 4: Ranked distribution of national affiliations of the institutions that produced the 1,000 articles most cited in the *SCI*®, 1961-1982. A = total number of papers in which each nation's institutions appeared. B = number of papers coauthored with scientists affiliated with institutions in other countries. C = national institutional affiliations of coauthors.

	A	B	C
US	704	18	Argentina, Belgium, Canada, France, FRG, New Zealand, Sweden, Switzerland, Taiwan, UK
UK	149	13	Belgium, France, FRG, New Zealand, Norway, Sweden, Switzerland, US
Sweden	41	4	France, UK, US
Canada	22	2	Switzerland, US
France	17	5	FRG, Italy, Sweden, UK, US
FRG	16	3	France, The Netherlands, New Zealand, Switzerland, UK, US
Switzerland	16	5	Canada, FRG, New Zealand, UK, US
Australia	14		
Japan	11		
The Netherlands	9	1	FRG
Belgium	6	3	UK, US
Denmark	6		
Israel	6		
*Germany	5		
USSR	4		
Austria	3		
New Zealand	2	1	FRG, Switzerland, UK, US
Italy	2	1	France
Norway	2	1	UK
Argentina	1	1	US
Finland	1		
GDR	1		
Taiwan	1	1	US

*Articles published before World War II.

Table 5: The institutional affiliations occurring at least five times in this series, in descending order of the number of times they appear. All campuses, branches, and other locations for each institution are included in the totals of the main headings.

NIH, MD	86	Pasteur Inst., France	8
Harvard Univ., MA	62	Carnegie Inst. Washington, MD	7
Univ. California, CA	55	Duke Univ., NC	7
Rockefeller Univ. (Inst.), NY	44	Lund Univ., Sweden	7
Univ. Cambridge, UK	31	McGill Univ., Canada	7
Univ. London, UK	27	Northwestern Univ., IL	7
Univ. Wisconsin, WI	22	Roy. Coll. Surgeons, UK	7
Caltech, CA	20	Sloan-Kettering Inst. Cancer Res., NY	7
Cornell Univ., NY	20	Tufts Univ., MA	7
Univ. Chicago, IL	19	Veterans Admin., DC	7
MIT, MA	18	Dupont Co., DE	6
Columbia Univ., NY	17	IBM, NY	6
Univ. Washington, WA	17	Max Planck Soc. Adv. Sci., FRG	6
Carnegie-Mellon Univ., PA	16	Princeton Univ., NJ	6
MRC, UK	16	Univ. Edinburgh, UK	6
Stanford Univ., CA	16	Univ. Pittsburgh, PA	6
Yale Univ., CT	16	Univ. Rochester, NY	6
Karolinska Inst., Sweden	15	Weizmann Inst. Sci., Israel	6
Univ. Pennsylvania, PA	15	Yeshiva Univ. (Albert Einstein Coll. Med.), NY	6
Johns Hopkins Univ., MD	13		
Washington Univ., MO	12	ARC, UK	5
Univ. Colorado, CO	11	CNRS, France	5
Univ. Toronto, Canada	11	Jewish Hosp. St. Louis, MO	5
NYU, NY	9	Mount Sinai Hosp., NY	5
Univ. Illinois, IL	9	Oak Ridge Natl. Lab., TN	5
Univ. Oxford, UK	9	Pub. Hlth. Res. Inst. NY, NY	5
Uppsala Univ., Sweden	9	USDA, DC	5
Bell Labs., NJ	8	Univ. Glasgow, UK	5
Brookhaven Natl. Lab., NY	8	Univ. Minnesota, MN	5
Case Western Reserve Univ., OH	8	Univ. Texas, TX	5
Gothenburg Univ., Sweden	8	Vanderbilt Univ., TN	5

Table 6: Journals that published at least 5 of the 1,000 papers most cited in the *SCI*®, 1961-1982. A = journal title. B = number of papers. C = 1983 impact factor. (The 1983 impact factor is equal to the number of 1983 citations received by the 1981-1982 articles in a journal, divided by the number of articles published by the journal during the same period.)

A	B	C
J. Biol. Chem.	94	5.80
Biochem. J.	41	3.25
# Phys. Rev.	41	—
Proc. Nat. Acad. Sci. US	41	8.72
Nature	39	9.26
Science	35	7.41
• J. Cell Biol.	33	9.24
J. Chem. Phys.	33	2.96
J. Amer. Chem. Soc.	31	4.47
J. Mol. Biol.	24	6.67
J. Exp. Med.	22	11.10
Anal. Biochem.	18	2.86
Biochim. Biophys. Acta	18	2.41
Meth. Enzymology	18	1.31
Anal. Chem.	17	3.36
Biochemistry—USA	17	4.05
+ Acta Crystallogr.	14	—
Arch. Biochem. Biophys.	14	2.44
J. Physiol.—London	13	3.41
J. Histochem. Cytochem.	11	3.86
J. Clin. Invest.	10	7.00
Proc. Soc. Exp. Biol. Med.	10	1.38
Rev. Mod. Phys.	10	19.85
Phys. Rev. Lett.	9	6.46
Pharmacol. Rev.	8	8.16
Exp. Cell Res.	7	2.89
J. Immunol.	7	6.45
J. Lab. Clin. Med.	7	2.65
J. Pharm. Exp. Ther.	7	3.52
N. Engl. J. Med.	7	16.46
Acta Physiol. Scand.	6	2.29
Biochem. Biophys. Res. Commun.	6	2.41
Chem. Rev.	6	9.15
J. Lipid Res.	6	3.82
Lancet	6	12.25
Amer. J. Clin. Pathol.	5	0.66
Eur. J. Biochem.	5	3.46
•• Nucl. Phys.	5	—

Includes articles from *Phys. Rev. [Sect.] A* (1964-1965) and *Phys. Rev. D—Part. Fields* (1970-).
• Includes articles from its former title *J. Biophys. Biochem. Cytol.* (1955-1961).
+ Includes articles from *Acta Crystallogr. A—Cryst. Phys.* (1968-1982) and *Acta Crystallogr. B—Struct. Cryst.* (1968-1982).
•• Includes one article from *Nucl. Phys. A* (1967-).

As a final interesting exercise, we compared the 10 lists to a list of 100 papers that was published in the appendix of volume 1 of our compendium of life-sciences *Classics*.[3] These 100 articles were chosen by determining every 10th article that had not yet been featured as a *Citation Classic*. If the 10th paper had already been a *Classic*, we simply picked the next one that had not. The purpose of this list was primarily to provide our readers with examples of classic papers not included in the two volumes published to date.[3] Not surprisingly, the 100 papers in the appendix prove to be similar in chronological and other characteristics to the 10 groups in this series.

Several years have now elapsed since we began this 10-part series. In the future we intend to draw upon our now-30-year cumulative database of citations to supplement the lists of papers in this analysis. Citation data for 1955-1960 were not available when we started the project. But we recently published the 1955-1964 *SCI* cumulation, and a new five-year cumulation for the *SCI* covering 1980-1984 will be published this year. The annual volume for 1985 will also appear in a few months.

The citations from 1955 to 1960 may significantly affect the ranking of older papers that peaked in citations in the late 1950s. In fact, we expect some previously unlisted papers to be included in the new 1,000 most-cited list. For example, consider the 1952 article by A.T. James and A.J.P. Martin, National Institute for Medical Research, London, in the *Biochemical Journal*.[18] It ranked 1,015th among papers most cited from 1961 to 1982. In contrast it ranks 880th in the 1955-1985 *SCI*. Of the next nine articles published before 1955 and ranked below the 1,000 point for the 1961-1982 file, two move up in the expanded database. One of these papers was published in 1920 by A.A. Griffith, Royal Aircraft Establishment, London.[19] It discusses "Phenomena of rupture and flow in solids" and was cited 61 times from 1955 to 1960. In 1983, 1984, and 1985 it received 120 citations.

It is, of course, always frustrating when one has to decide at what point to cut off a most-cited papers list. But since we are not constrained to end this list at the 1,000 point, it will be instructive to observe what papers and patterns emerge as we extend it using 1955-1985 *SCI* citation data. However, since the world will not wait while we "catch up," our new lists will inevitably blend the old with the new. The result will continue to demonstrate that both deserve to be studied.

* * * * *

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