

assumption that frequency of citation indicates lesser or greater absolute merit. This assumption would be particularly absurd when comparing articles from different fields.

The papers on this list have been cited a minimum of 186 times. The average number of citations was 279. Compare this to the 10.6 citations the average cited item received, 1969-1977. The most-cited articles received an average 31.2 citations per year, while all cited items averaged only 1.33 per year. Thus, the papers on our list must be considered superstars—or unusual, to say the least.

To say that psychology dominates the disciplines represented on the list would be an understatement. Seventy-seven of the articles are in psychology. Of these, 12 were published in psychiatry journals. Of the psychology articles 16, or 21%, are in the subfield of learning and memory; eight, or 10% in research methodology; eight, or 11%, in social psychology; seven, or 9%, in conditioned learning, and the same number in motivation and behavior. Psychometrics accounted for 7 of the articles (9%), cognition five (6.5%), personality three (4%).

The reason why psychology papers predominate is fairly obvious. While psychology papers only contain an average of 9.4 references per article,³ there is a substantial volume of psychology papers published each year. From

our *SSCI Journal Citation Reports*[®] we can count the numbers of articles published in each journal. Psychology dominates this list because it is the largest of the social science research fields; as I have said for fields like biochemistry, the size of the field increases the chances for superstar papers. It is unlikely that you will find papers that are cited 200 or more times in disciplines that produce only a few thousand papers.

To offset the overshadowing effect of psychology in this list of social sciences articles, we will in the future list articles by each of the leading disciplines. Thus we might list the 50 most-cited articles in sociology, or economics, or law.

Indeed, only six of the articles on this list are in sociology, five in law, and four in economics. Three are in statistics. Political science and education are each represented by one article.

Two physiology articles, both by D.H. Hubel and T.N. Weisel, deal with the eye. The only biochemistry paper is Oliver Lowry's paper on protein determination. The presence of these three articles on the *SSCI* list may be in part attributed to citations in articles from such journals as *Brain Research*, *Vision Research*, etc., which were concerned with the physiological bases of perception.

The articles that appear on the *SSCI* most-cited list have publication dates that span five decades. The oldest paper on the list is a 1935

review article, J. R. Stroop's "Studies of Interference in Serial Verbal Reactions." The most recent article is H. H. Clark's 1973 paper, "Language-as-Fixed-Effect Fallacy: A Critique of Language Statistics in Psychological Research."

Clark's paper is the only one on the list five years old, and Stroop's the only one more than 37 years old. Twenty-two percent of the papers are six to ten years old, 31% 11 to 15 years old, 24% 16 to 20 years old, and 12% 21 to 25 years old. Only 5% of the articles are 26 to 30 years old, and 4% between 31 and 40 years old.

The 100 most-cited items appeared in 43 journals. Four of the journals—*Psychological Review*, *Psychological Bulletin*, *Psychometrika* and *Journal of Abnormal and Social Psychology*—account for over a third of the articles on the list. Seventeen of the most highly cited articles appeared in *Psychological Review*. Other journals that published more than one of the highly cited papers are: *American Journal of Psychiatry*, *American Psychologist*, *American Sociological Review*, *Archives of General Psychiatry*, *Harvard Law Review*, *Journal of Physiology—London*, *Journal of Experimental Psychology*, *Journal of Verbal Learning and Verbal Behavior*, *Journal of the Experimental Analysis of Behavior*, *Journal of Consulting and Clinical Psychology*, *Journal of Applied Behavior Analy-*

sis, *Psychological Monographs*, *Psychological Reports*, and *Science*.

Eleven of the authors appear twice on the most-cited article list. They are: A. Amsel, D. T. Campbell, L. J. Cronbach, D. H. Hubel, T. N. Wiesel, J. B. Kruskal, A. Paivio, R. N. Shepard, G. Sperling, S. Sternberg and E. Tulving. In all, 138 different authors were responsible for the 100 papers. Sixty-seven of the papers were the work of an individual author, and 25 the work of two; three of the papers had three authors, three had four, one had five and another six.

Most of the articles on the list will be recognized by social scientists as having some importance for their fields. They are highly cited for a number of reasons. Some are seminal papers, presenting a new finding that stimulated a body of research. Others are comprehensive review papers. Still others present research methods and procedures and are cited primarily by others using those methodologies. At least one of the articles is highly cited because it is controversial.

This article is Arthur Jensen's "How Much Can We Boost IQ and Scholastic Achievement?" The paper, which appeared in the *Harvard Educational Review* in the Winter 1969 issue, received 579 citations, 1969-1977. Some people claim that many of these citations are critical of the paper's content. In the article, Jensen argued that genetic factors may be involved in

Figure 1. The 100 most-cited articles, based on *Social Sciences Citation Index* data from 1969 to 1977.

Total Citations	Bibliographic Data
350	Amsel A. The role of frustrative nonreward in noncontinuous reward situations. <i>Psychol. Bull.</i> 55:102-19, 1958.
230	Amsel A. Frustrative nonreward in partial reinforcement and discrimination learning: some recent history and a theoretical extension. <i>Psychol. Rev.</i> 69:306-28, 1962.
211	Anderson N H. Likableness ratings of 555 personality-trait words. <i>J. Pers. Soc. Psychol.</i> 9:272-9, 1968.
219	Archer E J. Reevaluation of the meaningfulness of all possible CVC trigrams. <i>Psychol. Monogr.</i> 74:1-23, 1960.
203	Argyle M & Dean J. Eye-contact, distance and affiliation. <i>Sociometry</i> 28:289-304, 1965.
217	Asch S E. Forming impressions of personality. <i>J. Abnormal Psychol.</i> 41:258-90, 1946.
258	Baer D M, Wolf M M & Risley T R. Some current dimensions of applied behavior analysis. <i>J. Appl. Behav. Anal.</i> 1:91-7, 1968.
196	Bandura A, Ross D & Ross S A. Imitation of film-mediated aggressive models. <i>J. Abnormal Psychol.</i> 66:3-11, 1963.
255	Bateson G, Jackson D D, Harley J & Weakland J. Toward a theory of schizophrenia. <i>Behav. Sci.</i> 1:251-64, 1956.
210	Becker G S. A theory of the allocation of time. <i>Econ. J.</i> 75:493-517, 1965.
268	Bem D J. Self-perception: an alternative interpretation of cognitive dissonance phenomena. <i>Psychol. Rev.</i> 74:183-200, 1967.
219	Bolles R C. Species-specific defense reactions and avoidance learning. <i>Psychol. Rev.</i> 77:32-48, 1970. (Citation Classics. <i>Current Contents</i> (31):9, 31 July 1978).
186	Bousfield A K & Bousfield W A. Measurements of clustering and of sequential constancies in repeated free recall. <i>Psychol. Rep.</i> 19:935-42, 1966.
204	Broverman I K, Broverman D M, Clarkson F E, Rosencrantz P S & Vogel S R. Sex-role stereotypes and clinical judgments of mental health. <i>J. Consult. Clin. Psychol.</i> 34:1-7, 1970.
220	Brown P L & Jenkins H M. Auto-shaping of the pigeon's key-peck. <i>J. Exp. Anal. Behav.</i> 11:1-8, 1968.
200	Byrne D. Interpersonal attraction and attitude similarity. <i>J. Abnormal Psychol.</i> 62:713-5, 1961.
229	Campbell D T. Reforms as experiments. <i>Amer. Psychol.</i> 24:409-29, 1969.
592	Campbell D T & Fiske D W. Convergent and discriminant validation by the multitrait-multimethod matrix. <i>Psychol. Bull.</i> 56:81-105, 1959.
186	Clark H H. Language-as-fixed-effect fallacy: a critique of language statistics in psychological research. <i>J. Verb. Learn. Verb. Behav.</i> 12:335-59, 1973.

Figure 1. The 100 most-cited social science articles (continued)

Total Citations	Bibliographic Data
303	Cohen J. Multiple regression as a general data-analytic system. <i>Psychol. Bull.</i> 70:426-43, 1968.
264	Conrad R. Acoustic confusions in immediate memory. <i>Brit. J. Psychol.</i> 55:75-84, 1964.
329	Craik F I M & Lockhart R S. Levels of processing: a framework for memory research. <i>J. Verb. Learn. Verb. Behav.</i> 11:671-84, 1972.
202	Crandall V C, Katkovsky W & Crandall V J. Children's beliefs in their own control of reinforcements in intellectual-academic achievement situations. <i>Child. Develop.</i> 36:91-109, 1965.
263	Cronbach L J. Coefficient alpha and the internal structure of tests. <i>Psychometrika</i> 16:297-334, 1951. (Citation Classics. <i>Current Contents</i> (13):8, 27 March 1978.)
205	Cronbach L J & Meehl P E. Construct validity in psychological tests. <i>Psychol. Bull.</i> 52:281-302, 1955.
265	Crowne D P & Marlowe D. A new scale of social desirability independent of psychopathology. <i>J. Consult. Psychol.</i> 24:349-54, 1960.
257	Douglas R J. The hippocampus and behavior. <i>Psychol. Bull.</i> 67:416-42, 1967.
219	Duncan D B. Multiple range and multiple F tests. <i>Biometrics</i> 11:1-42, 1955. (Citation Classics. <i>Current Contents</i> (4):10, 24 January 1977.)
277	Duncan O D. Path analysis: sociological examples. <i>Amer. J. Sociol.</i> 72:1-16, 1966.
210	Estes W K & Skinner B F. Some quantitative properties of anxiety. <i>J. Exp. Psychol.</i> 29:390-400, 1941.
408	Feighner J P, Robins E, Guze S B, Woodruff R A, Winokur G & Munoz R. Diagnostic criteria for use in psychiatric research. <i>Arch. Gen. Psychiat.</i> 26:57-63, 1972.
320	Festinger L. A theory of social comparison processes. <i>Hum. Relat.</i> 7:117-40, 1954.
192	Flacks R. The liberated generation: an exploration of the roots of student protest. <i>J. Soc. Issues</i> 23:52-75, 1967.
193	Glanzer M & Cunitz A R. Two storage mechanisms in free recall. <i>J. Verb. Learn. Verb. Behav.</i> 5:351-60, 1966.
256	Goodman L A & Kruskal W H. Measures of association for cross classifications. <i>J. Amer. Statist. Ass.</i> 49:732-64, 1954.
243	Gouldner A W. The norm of reciprocity: a preliminary statement. <i>Amer. Sociol. Rev.</i> 25:161-78, 1960.
188	Graham F K & Clifton R K. Heart-rate change as a component of the orienting response. <i>Psychol. Bull.</i> 65:305-20, 1966. (Citation Classics. <i>Current Contents</i> (7):16, 13 February 1978.)
309	Gunther G. The Supreme Court 1971 term—forward: In search of evolving doctrine on a changing court: a model for a newer equal protection. <i>Harvard Law Rev.</i> 86:1-48, 1972.

Figure 1. The 100 most-cited social science articles (continued)

Total Citations	Bibliographic Data
204	Hamilton M. A rating scale for depression. <i>J. Neurol. Neurosurg. Psychiat.</i> 23 :56-62, 1960.
194	Hardin G. Tragedy of the commons. <i>Science</i> 162 :1243-7, 1968.
232	Hebb D O. Drives and the C.N.S. (Conceptual Nervous System). <i>Psychol. Rev.</i> 62 :243-54, 1955.
298	Holmes T H & Rahe R H. The social readjustment rating scale. <i>J. Psychosom. Res.</i> 11 :213-8, 1967.
203	Hubel D H & Wiesel T N. Receptive fields and functional architecture of monkey striate cortex. <i>J. Physiol. London</i> 195 :215-43, 1968.
297	Hubel D H & Wiesel T N. Receptive fields, binocular interactions and functional architecture in the cat's visual cortex. <i>J. Physiol. London</i> 160 :106-54, 1962.
579	Jensen A R. How much can we boost IQ and scholastic achievement? <i>Harvard Educ. Rev.</i> 39 :1-123, 1969.
311	Johnson S C. Hierarchical clustering schemes. <i>Psychometrika</i> 32 :241-54, 1967.
498	Kaiser H F. The varimax criterion for analytic rotation in factor analysis. <i>Psychometrika</i> 23 :187-200, 1958.
229	Kanner L. Autistic disturbances of affective contact. <i>Nerv. Child.</i> 2 :217-50, 1943.
197	Keller F S. Good-bye, teacher. <i>J. Appl. Behav. Anal.</i> 1 :79-89, 1968.
233	Kendler H H & Kendler T S. Vertical and horizontal processes in problem solving. <i>Psychol. Rev.</i> 69 :1-16, 1962. (Citation Classics. <i>Current Contents</i> (9):15, 27 February 1978.)
186	Kimble D P. Hippocampus and internal inhibition. <i>Psychol. Bull.</i> 70 :285-95, 1968.
200	Kimura D. Cerebral dominance and the perception of verbal stimuli. <i>Can. J. Psychol.</i> 15 :166-71, 1961.
450	Kruskal J B. Multidimensional scaling by optimizing goodness of fit to a non-metric hypothesis. <i>Psychometrika</i> 29 :1-27, 1964.
262	Kruskal J B. Nonmetric multidimensional scaling: a numerical method. <i>Psychometrika</i> 29 :115-29, 1964.
283	Lefcourt H M. Internal versus external control of reinforcements: a review. <i>Psychol. Bull.</i> 65 :206-20, 1966.
298	Liberman A M, Cooper F S, Schankweiler D P & Studdert-Kennedy M. Perception of the speech code. <i>Psychol. Rev.</i> 74 :431-61, 1967.
243	Lindemann E. Symptomatology and management of acute grief. <i>Amer. J. Psychiat.</i> 101 :141-8, 1944.
438	Lowry O H, Rosebrough N J, Farr A L & Randall R J. Protein measurement with the folin phenol reagent. <i>J. Biol. Chem.</i> 193 :265-75, 1951. (Citation Classics. <i>Current Contents</i> (1):7, 3 January 1977).

Figure 1. The 100 most-cited social science articles (continued)

Total Citations	Bibliographic Data
193	Mandler G & Sarason S B. A study of anxiety and learning. <i>J. Abnormal and Social Ps.</i> 47:166-73, 1952.
655	Miller G A. The magical number seven, plus or minus two: some limits on our capacity for processing information. <i>Psychol. Rev.</i> 63:81-97, 1956.
240	Miller N E. Learning of visceral and glandular responses. <i>Science</i> 163:434-45, 1969.
595	Orne M T. On the social psychology of the psychological experiment: with particular reference to demand characteristics and their implications. <i>Amer. Psychol.</i> 17:776-83, 1962.
218	Osgood C E & Tannenbaum P H. The principle of congruity in the prediction of attitude change. <i>Psychol. Rev.</i> 62:42-55, 1955.
443	Overall J E & Gorham D R. The brief psychiatric rating scale. <i>Psychol. Rep.</i> 10:799-812, 1962.
321	Paivio A. Mental imagery in associative learning and memory. <i>Psychol. Rev.</i> 76:241-63, 1969.
274	Paivio A & Madigan S A. Imagery and association value in paired-associate learning. <i>J. Exp. Psychol.</i> 76:35-9, 1968.
359	Peterson L R & Peterson M J. Short-term retention of individual verbal items. <i>J. Exp. Psychol.</i> 58:193-8, 1959.
203	Pratt J W. Risk aversion in the small and in the large. <i>Econometrica</i> 32:122-36, 1964.
202	Reich C A. The new property. <i>Yale Law J.</i> 73:733-87, 1964.
194	Rescorla R A. Pavlovian conditioning and its proper control procedures. <i>Psychol. Rev.</i> 74:71-80, 1967.
199	Reynolds G S. Behavioral contrast. <i>J. Exp. Anal. Behav.</i> 4:57-71, 1961.
200	Robinson W S. Ecological correlations and the behavior of individuals. <i>Amer. Sociol. Rev.</i> 15:351-57, 1950.
1345	Rotter J B. Generalized expectancies for internal versus external control of reinforcement. <i>Psychol. Monogr.</i> 80:1-28, 1966.
206	Samuelson P A. The pure theory of public expenditure. <i>Rev. Econ. Statist.</i> 36:387-9, 1954.
347	Schachter S & Singer J E. Cognitive, social, and physiological determinants of emotional state. <i>Psychol. Rev.</i> 69:379-99, 1962.
311	Schildkraut J J. The catecholamine hypothesis of affective disorders: a review of supporting evidence. <i>Amer. J. Psychiat.</i> 122:509-22, 1965.
212	Schou M. Lithium in psychiatric therapy and prophylaxis. <i>J. Psychiat. Res.</i> 6:67-95, 1968.
215	Seeman M. On the meaning of alienation. <i>Amer. Sociol. Rev.</i> 24:783-91, 1959.

Figure 1. The 100 most-cited social science articles (continued)

Total Citations	Bibliographic Data
238	Sharpe W F. Capital asset prices: a theory of market equilibrium under conditions of risk. <i>J. Finan.</i> 19 :425-42, 1964.
264	Shepard R N. The analysis of proximities: multidimensional scaling with an unknown distance function. 1. <i>Psychometrika</i> 27 :125-40, 1962.
186	Shepard R N. The analysis of proximities: multidimensional scaling with an unknown distance function. 2. <i>Psychometrika</i> 27 :219-46, 1962.
236	Sperling G. A model for visual memory tasks. <i>Hum. Factors</i> 5 :19-31, 1963.
291	Sperling G. The information available in brief visual presentations. <i>Psychol. Monogr.</i> 74 :1-29, 1960.
228	Srole L. Social integration and certain corollaries: an exploratory study. <i>Amer. Sociol. Rev.</i> 21 :709-16, 1956.
302	Sternberg S. High-speed scanning in human memory. <i>Science</i> 153 :652-4, 1966.
216	Sternberg S. Memory-scanning: mental processes revealed by reaction-time experiments. <i>Amer. Sci.</i> 57 :421-57, 1969.
254	Stevens S S. On the psychophysical law. <i>Psychol. Rev.</i> 64 :153-81, 1957.
234	Stroop J R. Studies of interference in serial verbal reactions. <i>J. Exp. Psychol.</i> 18 :643-62, 1935.
540	Taylor J A. A personality scale of manifest anxiety. <i>J. Abnormal and Social Ps.</i> 48 :285-90, 1953.
191	Thompson R F & Spencer W A. Habituation: a model phenomenon for the study of neuronal substrates of behavior. <i>Psychol. Rev.</i> 73 :16-43, 1966.
191	Tulving E. Subjective organization in free recall of "unrelated" words. <i>Psychol. Rev.</i> 69 :344-54, 1962.
218	Tulving E & Pearlstone Z. Availability versus accessibility of information in memory for words. <i>J. Verb. Learn. Verb. Behav.</i> 5 :381-91, 1966.
198	Tussman J & ten Broek J. The equal protection of the laws. <i>Calif. Law Rev.</i> 37 :341-81, 1949.
213	Van Alstyne W W. The demise of the right-privilege distinction in constitutional laws. <i>Harvard Law Rev.</i> 81 :1439-64, 1968.
359	Waugh N C & Norman D A. Primary memory. <i>Psychol. Rev.</i> 72 :89-104, 1965.
190	Wechsler H. Toward neutral principles of constitutional law. <i>Harvard Law Rev.</i> 73 :1-35, 1959.
344	White R W. Motivation reconsidered: the concept of competence. <i>Psychol. Rev.</i> 66 :297-333, 1959.
194	Wickens D D. Encoding categories of words: an empirical approach to meaning. <i>Psychol. Rev.</i> 77 :1-15, 1970.
228	Zajonc R B. Social facilitation. <i>Science</i> 149 :269-74, 1965.
252	Zung W W K. A self-rating depression scale. <i>Arch. Gen. Psychiat.</i> 12 :63-70, 1965.

the one-standard-deviation IQ difference (15 IQ points) between blacks and whites. The Jensen article is lengthy—123 pages. It presents many opportunities for citation. Without further analysis we do not know whether these citations are critical or not. We are investigating this and in a future essay I will report on our findings.

Some of the papers on the list have imprecise titles that really do not describe the information or ideas contained in the paper. One such article is Garret Hardin's "Tragedy of the Commons." In it, Hardin draws an analogy between the overuse of common land by herdsmen in 18th-century Britain and the world population problem. The herdsmen, in order to increase their profits, added animals to their herds at the expense of the overgrazed land. The land then could not support all the animals. According to Hardin, the world's people, too, have children at an unlimited rate in a limited world. "No technical solution can rescue us from the misery of overpopulation," he concludes. "Freedom to breed will bring misery to all."⁴

Another "soft"-titled paper is Fred Keller's "Good-bye, Teacher..." which deals with a method of personalized individual instruction. He and his colleagues devised the method for an introductory course in general psychology. He also reviews methods developed by others. Of the method Keller says: "The teacher of tomor-

row will not, I think, continue to be satisfied with 10% efficiency (at best)... No longer will he need to live, like Ichabod Crane, in a world that increasingly begrudges providing him room and lodging for a doubtful service to its young. A new kind of teacher is in the making. To the old kind, I, for one, will be glad to say, 'Good-bye!'"⁵

The title of a third article may give some readers pause. It is D. O. Hebb's "Drives and the C.N.S. (Conceptual Nervous System)." Since C.N.S. usually stands for Central Nervous System, many readers may wonder if "conceptual" is a typographical error.

According to Dr. Hebb, the title "was a little joke. B. F. Skinner had said that in psychology C.N.S. stands for 'conceptual' nervous system (instead of 'central'). True enough—we're still far from an adequate understanding of the brain's activity—but we have to use what conceptions are available. The moral is to make them as good as possible, so I proposed to bring Skinner's CNS, and mine, up to date."⁶ Hebb's article is a review of the then-new conceptions of brain function which were changing psychologists' ideas about behavior.

One article on the list, noteworthy for its 1345 citations, is Julian B. Rotter's "Generalized Expectancies for Internal versus External Control of Reinforcement." A seminal paper, the article describes investigations into whether people perceive that

rewards are contingent upon their own behavior or whether they feel that rewards are controlled by forces outside themselves. According to Rotter, the 1966 paper, which included a test for these internal and external control factors, presented a classic example of test development. However, the article may have received so much attention for another reason. As Rotter states in a soon-to-be-published book, the body of research which cited his article is due in part to "the Vietnam War, the student revolution, the black riots, the political scandals of Watergate and the assassinations.... Certainly these events have brought home to many both their inability to control events and the lack of predictability of

events which are important in their lives." The interests of social scientists "often reflect what is happening out there in the real world."⁷

In an upcoming essay we will take a look at the 100 most-cited *SSCI* books. In a later essay we will list highly cited authors as well. While many of them will have appeared as authors of highly cited articles or books, there will be some who have not.

Unfortunately, for the reasons given, we do not get a complete or rounded picture of the social sciences from this list. We can only attain this by extending the analysis further and subdividing by journals or some other criterion so that all disciplines are adequately represented.

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2. ----- . To cite or not to cite. *Current Contents* (35):5-7, 29 August 1977.
3. **Narin F.** *Evaluative bibliometrics: the use of publication and citation analysis in the evaluation of scientific activity*. Cherry Hill, NJ: Computer Horizons, Inc., 1976, p. 140. NTIS-PB252339/AS.
4. **Hardin G.** Tragedy of the commons. *Science* 162:1243-7, 1968.
5. **Keller F S.** Good-bye, teacher. *J. Appl. Behav. Anal.* 1:79-89, 1968.
6. **Hebb D O.** Citation Classics. *Current Contents* (in press).
7. **Rotter J B.** Comments on the effects of individual differences on perceived control (Perlmutter LC & Monty RA eds.) *Choice and Perceived Control*. Hillsdale, N.J.: Lawrence Earlbaum Associates (in press).