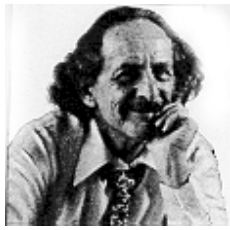
Essays of an Information Scientist, Vol:7, p.353-365, 1984
Current Contents, #45, p.3-15, November 5, 1984

Current Comments®



The 1982 Articles Most Cited in 1982 and 1983. 1. Life Sciences

Number 45 November 5, 1984

Each year, we list and examine current papers that are highly cited soon after publication. Our last reports covered the 1981 articles in life sciences[1] and physical sciences[2] that were most cited in 1981 and 1982. Papers that attract immediate and widespread attention within the research community often indicate the "hot" areas of science. Indeed, many of these papers form the core literature of new research fronts and specialties that we identify each year for the *Science Citation Index®* (*SCI®*) database. In this essay, we'll identify and discuss the 1982 life-sciences articles that were most cited in 1982 and 1983. The most-cited papers for the physical sciences will be the subject of a separate essay to be published in the near future.

Table 1 lists the 100 articles in this study, in alphabetic order by first author. In a study such as this, citation frequency rankings are relevant only for what they tell us about the emergence of new and active areas of research. However, individual papers should *not* be compared on citations alone. As pointed out many times before, these studies do not necessarily identify the best or most important research. Of course, experts in the life sciences will agree that many papers in Table 1 do represent milestone advances of knowledge. But many papers not included in this study will also eventually achieve high impact. Their recognition is delayed for a variety of reasons. We've discussed such cases of delayed recognition and premature discovery in a separate essay,[3] and will have much more to report on this topic in the future.

The articles in Table 1 averaged 75 citations in the two-year period: 13 in 1982 and 62 in 1983. In comparison, the most-cited 1981 life-sciences articles[1] averaged 68 citations, and the 1980 life-sciences papers averaged 82.[4] The most-cited paper in Table 1 was cited 158 times, and the least-cited received 52 citations. Keep in mind that most of the four million articles and books cited each year in *SCI* will receive only about one or two citations. Of course, these cited works represent a small fraction of the millions of articles and books published since the invention of printing. Of the 10 million source articles and book chapters that have been indexed in the *SCI* over the past 30 years, probably less than 25 percent are cited each year.

In past studies, we've tried to categorize papers into various research areas—genetics, virology, oncology, and so on. However, these classifications are both subjective and artificial. They also ignore the overlap between fields and specialties that seems to be built into the structure of science. Contrary to the old adage, there is no one place for every paper, and every paper cannot be put in one place.

Nevertheless, it is useful to categorize these papers by broad subject areas. This can be done by considering the journals involved or by other methods. ISI® has developed an algorithm for categorizing papers based on co-citation analysis. This method has been de-

scribed before,[5] so I won't go into a detailed description. Briefly, when authors cite a paper, they indicate that it is somehow relevant to their research. Furthermore, when several papers are frequently cited together, or co-cited, they presumably share common features—in topics, results, methods, and so on. That is, the citing authors themselves categorize papers into subject-related clusters of research. We use these co-citation groups to identify thousands of research fronts each year. These fronts are named by examining the key words and phrases in the titles of the citing papers. The names we assign are far more detailed and descriptive than are typical broad subject headings. And since the clustering is done systematically, it is more consistent and less ambiguous than traditional indexing methods.

Of the 100 papers in this study, 87 have already been incorporated into the "core" literature of several 1982 and 1983 *SCI* research fronts. The fronts are indicated in Table 1 by the numbers following the references. Numbers with an "82" prefix indicate that the paper was identified as one of several core publications in a 1982 research front. An "83" prefix denotes an article included in the core of a 1983 research front. In 1983, we combined *SCI* data with similar data from *Social Sciences Citation Index*® (*SSCI*®). Of the 13 papers in Table 1 that have not yet been included as core papers in any cluster, many will become part of the core literature of their fields in time, when and if they are co-cited with other high-impact papers. In some cases, however, a key paper may uniquely identify a method or theory for many years, particularly in the social sciences or in smaller pockets of science research.

Table 2 lists the names of the 1982 *SCI* and 1983 *SCI/SSCI* research fronts that include at least two papers from this study as core documents. Forty-four research fronts that included only one paper in Table 1 as a core document are not shown for reasons of space. Readers can obtain the names of these research fronts by contacting ISI. Also shown in Table 2 are the number of papers in this study included in each research front (column C) as well as the total number of core and citing papers (column D).

Scanning the list of research front names gives you a quick impression of the most-active research areas in the life sciences. For example, three papers in this study are core documents in research front #83-0063, "Applications of Nuclear Magnetic Resonance [NMR] Imaging in Medicine." Since their development in the late 1970s, NMR scanners have been increasingly used by radiologists to obtain images of internal organs, much like traditional X-ray machines. However, there are minimal biological risks involved with NMR imaging because the technology relies on magnetic fields rather than on radiation to create images.

Another "hot" topic is research front #83-1973, "Infections of Herpes Simplex and Herpes Zoster Viruses and Their Treatment with Acyclovir and Other Antiviral Drugs." Three papers in this study are included in the core of that research front. They report the results of clinical trials of acyclovir indicating that the new drug is safe and effective in treating herpes infections. As was pointed out in a separate essay on herpes infections,[6] there is no *cure* for this widespread disease. The development of drugs that at least shorten the duration of the painful symptoms of herpes infections is an important advance.

Eighteen papers in this study are core documents in the *SCI/SSCI* research front #83-1740, "Oncogenes and the Genetics of Human Cancer; Viral Transforming Genes and Their DNA Structure." Oncogenes are sequences of DNA that can transform normal cells into malignant cells. Two basic classes of oncogenes have been identified to date. One class is associated with retroviruses and the other is nonviral. Several papers in this study report results indicating that

the two classes of oncogenes are homologous, that is, they share common genetic sequences.

The *SCI/SSCI* research front #83-4277, "Immunoreactivity of the Pituitary and Brain-Related Beta Endorphin, Dynorphin, Enkephalin and Other Opioid Peptides," contains six papers from this study in its core. These include the most-cited paper in this study, published in *Nature*, by Masaharu Noda, Kyoto University, Japan, and colleagues. The paper, entitled "Cloning and sequence analysis of cDNA for bovine adrenal preproenkephalin," reports their success in determining the entire amino acid sequence of bovine preproenkephalin, a protein that is the precursor or "starting point" from which seven smaller opioid peptides are produced by enzymatic cutting of the larger molecules. Opioids are opiate-like substances produced in the body. The paper was cited 46 times in 1982 and 112 times in 1983. In the first nine months of 1984, it was cited 72 times.

The third-most-cited article in this study is a companion paper published side-by-side in *Nature* with Noda's article. Ueli Gubler, Hoffmann-La Roche, Nutley, New Jersey, and colleagues established by DNA sequencing analysis that proenkephalin is indeed the precursor protein for several enkephalins and enkephalin-containing polypeptides (ECPs). The paper received 134 citations—48 in 1982 and 86 in 1983. Interestingly, Noda is one of the coauthors with Hitochi Kakidani, Kyoto University, of a paper in this study that deduced the amino acid sequence of yet another precursor protein for a different set of opioid peptides from porcine hypothalamus, which they called preproenkephalin B. This paper was cited 16 times in 1982 and 91 times in 1983. All three papers are also core documents in the 1982 *SCI* research front #82-1514, "Primary Structure of Human Enkephalins; Location and Regulation of Enkephalin Synthesis in CNS."

The second-most-cited paper was published in *Gene* by Joachim Messing and Jeffrey Vieira, University of Minnesota, St. Paul. The paper describes the construction of two new "bacteriophage vectors," that is, modified bacterial viruses used to produce large quantities of single-stranded bacterial DNA from a particular region of the bacterial chromosome. This "cloned" DNA is used for determinations of the nucleotide sequence of the bacterial DNA. Published in the October issue of *Gene*, the paper was cited just once in 1982 but 145 times in 1983. It has already been cited 150 times in 1984. It is a core paper in the 1983 *SCI/SSCI* research front #83-8552, "Genetic Studies of DNA Nucleotide Sequences, Protein Activation, Messenger RNA Structure, and Related Topics." Messing also coauthored the most-cited 1981 life-sciences paper,[1] which described a "shotgun" method for DNA sequencing.

David D. Sabatini and colleagues, New York University School of Medicine, authored the fourth-most-cited article in this study. This review paper, published in the *Journal of Cell Biology*, considers mechanisms by which newly synthesized proteins are transferred to their functional sites in various membranes and organelles within the eucaryotic cell either during or following synthesis. The authors discuss models that suggest how specific features of proteins can act as signals to direct the proteins to their final destination in the cell. The paper was cited 127 times—33 in 1982 and 94 in 1983. It is a core paper in the 1983 *SCI/SSCI* research front #83-2966, "Membrane Biogenesis and Mechanisms of Protein Insertion and Secretion: Use of cDNA Probes in Protein Processing."

The fifth-most-cited paper is also a review article. Philip Cohen, University of Dundee, Scotland, described how the metabolism of many enzymes and proteins is regulated in the cell by protein phosphorylation, the biochemical process of adding a phosphate group to an organic molecule, and coordinated through this mechanism by neural and hormonal stimuli. Cohen pointed out,

Table 1: The 1982 life-sciences articles most cited in 1982-1983, listed in alphabetic order by first author. The authors' addresses follow each citation. Code numbers indicate the 1982 *SCI*® research front specialties for which these are *core* papers. Code numbers with an asterisk (*) indicate the 1983 *SCI/SSCI*® research front specialties for which these are *core* papers. A = number of citations in 1982, B = number of citations in 1983, C = total number of citations for 1982-1983. D = bibliographic information.

A	B	C	D
4	54	58	**Alfidi R J, Haaga J R, El Yousef S J, Bryan P J, Fletcher B D, LiPuma J P, Morrison S C, Kaufman B, Richey J B, Hinshaw W S, Kramer D M, Yeung H N, Cohen A M, Butler H E, Ament A E & Lieberman J M.** Preliminary experimental results in humans and animals with a superconducting, whole-body, nuclear magnetic resonance scanner. *Radiology* 143:175-81, 1982. Case Western Reserve Univ., Sch. Med.; Univ. Hosps. Cleveland; Technicare Corp., Solon, OH. *83-0063
2	54	56	**Amara S G, Jonas V, Rosenfeld M G, Ong E S & Evans R M.** Alternative RNA processing in calcitonin gene expression generates mRNAs encoding different polypeptide products. *Nature* 298:240-4, 1982. Univ. California, San Diego, Sch. Med., La Jolla; Salk Inst., Tumor Virol. Lab., San Diego, CA.
11	59	70	**Anderson S, de Bruijn M H L, Coulson A R, Eperon I C, Sanger F & Young I G.** Complete sequence of bovine mitochondrial DNA. *J. Mol. Biol.* 156:683-717, 1982. MRC Ctr., Lab. Mol. Biol., Cambridge, UK. *83-0874
10	47	57	**Bittle J L, Houghten R A, Alexander H, Shinnick T M, Sutcliffe J G, Lerner R A, Rowlands D J & Brown F.** Protection against foot-and-mouth disease by immunization with a chemically synthesized peptide predicted from the viral nucleotide sequence. *Nature* 298:30-3, 1982. Scripps Clin., Res. Inst., La Jolla, CA; Anim. Virus Res. Inst., Woking, UK. *83-2152
9	47	56	**Carlson M & Botstein D.** Two differentially regulated mRNAs with different 5′ ends encode secreted and intracellular forms of yeast invertase. *Cell* 28:145-54, 1982. MIT, Dept. Biol., Cambridge, MA. *83-4037
9	62	71	**Carroll B J.** The dexamethasone suppression test for melancholia. *Brit. J. Psychiat.* 140:292-304, 1982. Univ. Michigan, Dept. Psychiat., Ann Arbor, MI. *83-0413
2	62	64	**Castagna M, Takai Y, Kaibuchi K, Sano K, Kikkawa U & Nishizuka Y.** Direct activation of calcium-activated, phospholipid-dependent protein kinase by tumor-promoting phorbol esters. *J. Biol. Chem.* 257:7847-51, 1982. Kobe Univ., Sch. Med.; Natl. Inst. Basic Biol., Dept. Cell Biol., Okazaki, Japan.
19	64	83	**Catovsky D, Rose M, Goolden A W G, White J M, Bourikas G, Brownell A I, Blattner W A, Greaves M F, Galton D A G, McCluskey D R, Lampert I, Ireland R, Bridges J M & Gallo R C.** Adult T-cell lymphoma-leukaemia in blacks from the West Indies. *Lancet* 1:639-43, 1982. MRC, Leukaemia Unit; Univ. London, Roy. Postgrad. Med. Sch. & King's Coll. Hosp. Med. Sch.; Imperial Cancer Res. Fund, Membrane Immunol. Lab.; Cent. Middlesex Hosp., Dept. Haematol., London; St. James Hosp., Dept. Haematol., Balham; Queen's Univ., Dept. Haematol., Belfast, UK; NIH, NCI, Bethesda, MD. 82-0011; *83-2933
9	57	66	**Chang E H, Furth M E, Scolnick E M & Lowy D R.** Tumorigenic transformation of mammalian cells induced by a normal human gene homologous to the oncogene of Harvey murine sarcoma virus. *Nature* 297:479-83, 1982. NIH, NCI, Bethesda, MD. *83-1740
19	40	59	**Chattopadhyay S K, Cloyd M W, Linemeyer D L, Lander M R, Rands E & Lowy D R.** Cellular origin and role of mink cell focus-forming viruses in murine thymic lymphomas. *Nature* 295:25-31, 1982. NIH, NCI, Bethesda, MD & NIAID, Hamilton, MT. 82-0686; *83-4271
37	75	112	**Chavkin C, James I F & Goldstein A.** Dynorphin is a specific endogenous ligand of the κk opioid receptor. *Science* 215:413-5, 1982. Addiction Res. Fdn.; Stanford Univ., Palo Alto, CA. 82-1512; *83-4277
8	111	119	**Cohen P.** The role of protein phosphorylation in neural and hormonal control of cellular activity. *Nature* 296:613-20, 1982. Univ. Dundee, Dept. Biochem., UK. *83-2196
19	63	82	**Cohen S, Ushiro H, Stoscheck C & Chinkers M.** A native 170,000 epidermal growth factor receptor-kinase complex from shed plasma membrane vesicles. *J. Biol. Chem.* 257:1523-31, 1982. Vanderbilt Univ., Sch. Med., Nashville, TN. 82-0083; *83-0069
2	54	56	**Collins S & Groudine M.** Amplification of endogenous *myc*-related DNA sequences in a human myeloid leukaemia cell line. *Nature* 298:679-81, 1982. Vet. Admin. Hosp.; Fred Hutchinson Cancer Res. Ctr.; Univ. Washington Hosp., Seattle, WA. *83-1740

A	B	C	D
26	84	110	**Comb M, Seeburg P H, Adelman J, Eiden L & Herbert E.** Primary structure of the human Met- and Leu-enkephalin precursor and its mRNA. *Nature* 295:663-6, 1982. Univ. Oregon, Eugene, OR; Genentech, Inc., San Francisco, CA; NIH, NIMH, Bethesda, MD. 82-1514; *83-4277
10	46	56	**Corey L, Nahmias A J, Guinan M E, Benedetti J K, Critchlow C W & Holmes K K.** A trial of topical acyclovir in genital herpes simplex virus infections. *N. Engl. J. Med.* 306:1313-9, 1982. Univ. Washington, Sch. Med.; Child. Orthoped. Hosp. Med. Ctr., Seattle, WA; Emory Univ., Sch. Med.; CDC, Vener. Dis. Control Div., Atlanta, GA. *83-1973
12	42	54	**Craig S W & Pollard T D.** Actin-binding proteins. *Trends Biochem. Sci.* 7:88-92, 1982. Johns Hopkins Univ., Sch. Med., Baltimore, MD. *83-2268
5	55	60	**Crooks L, Arakawa M, Hoenninger J, Watts J, McRee R, Kaufman L, Davis P L, Margulis A R & DeGroot J.** Nuclear magnetic resonance whole-body imager operating at 3.5 KGauss. *Radiology* 143:169-74, 1982. Univ. California, Radiol. Imaging Lab. & Dept. Anat., San Francisco, CA. *83-0063
17	40	57	**Crumpacker C S, Schnipper L E, Marlowe S I, Kowalsky P N, Hershey B J & Levin M J.** Resistance to antiviral drugs of herpes simplex virus isolated from a patient treated with acyclovir. *N. Engl. J. Med.* 306:343-6, 1982. Beth Israel Hosp., Charles A. Dana Res. Inst., Harvard-Thorndike Lab. & Dept. Med.; Sidney Farber Cancer Inst., Lab. Clin. Microbiol.; Harvard Univ., Med. Sch., Boston, MA. 82-1043; *83-1973
0	80	80	**Dalla Favera R, Bregni M, Erikson J, Patterson D, Gallo R C & Croce C M.** Human c-*myc onc* gene is located on the region of chromosome 8 that is translocated in Burkitt lymphoma cells. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:7824-7, 1982. NIH, NCI, Bethesda, MD; Wistar Inst. Anat. Biol., Philadelphia, PA; Univ. Colorado, Hlth. Sci. Ctr., Denver, CO. *83-1740
7	62	69	**Darnell J E.** Variety in the level of gene control in eukaryotic cells. *Nature* 297:365-71, 1982. Rockefeller Univ., New York, NY.
14	82	96	**Der C J, Krontiris T G & Cooper G M.** Transforming genes of human bladder and lung carcinoma cell lines are homologous to the *ras* genes of Harvey and Kirsten sarcoma viruses. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:3637-40, 1982. Sidney Farber Cancer Inst.; Harvard Univ., Med. Sch., Boston, MA. *83-1740
9	44	53	**Dickerson R E, Drew H R, Conner B N, Wing R M, Fratini A V & Kopka M L.** The anatomy of A-, B-, and Z-DNA. *Science* 216:475-85, 1982. CalTech, Pasadena, CA. *83-1181
11	74	85	**Ek B, Westermark B, Wasteson A & Heldin C-H.** Stimulation of tyrosine-specific phosphorylation by platelet-derived growth factor. *Nature* 295:419-20, 1982. Uppsala Univ., Inst. Med. Physiol. Chem. & Wallenberg Lab., Sweden. *83-0069
20	52	72	**Eva A, Robbins K C, Andersen P R, Srinivasan A, Tronick S R, Reddy E P, Ellmore N W, Galen A T, Lautenberger J A, Papas T S, Westin E H, Wong-Staal F, Gallo R C & Aaronson S A.** Cellular genes analogous to retroviral *onc* genes are transcribed in human tumour cells. *Nature* 295:116-9, 1982. NIH, NCI, Bethesda, MD. *83-1740
10	53	63	**Evans G A, Margulies D H, Camerini-Otero R D, Ozato K & Seidman J G.** Structure and expression of a mouse major histocompatibility antigen gene, H-2L^d. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:1994-8, 1982. NIH, NICHHD & NIADDKD, Bethesda, MD. *83-1491
0	60	60	**Farrar J J, Benjamin W R, Hilfiker M L, Howard M, Farrar W L & Fuller-Farrar J.** The biochemistry, biology, and role of interleukin 2 in the induction of cytotoxic T cell and antibody-forming B cell responses. *Immunol. Rev.* 63:129-66, 1982. NIH, NIDR & NIAID, Bethesda; Frederick Cancer Res. Ctr., Biol. Carcinogenesis Program, MD; Cleveland Clin. Fdn., Dept. Mol. Cell Biol., OH.
9	53	62	**Fehr J, Hofmann V & Kappeler U.** Transient reversal of thrombocytopenia in idiopathic thrombocytopenic purpura by high-dose intravenous gamma-globulin. *N. Engl. J. Med.* 306:1254-8, 1982. Univ. Hosp., Dept. Med., Zurich, Switzerland. *83-0336
5	57	62	**Follansbee S E, Busch D F, Wofsy C B, Coleman D L, Gullet J, Auriqemma G P, Ross T, Hadley W K & Drew W L.** An outbreak of *Pneumocystis carinii* pneumonia in homosexual men. *Ann. Intern. Med.* 96:705-13, 1982. Univ. California, Sch. Med., San Francisco, CA. *83-1898
15	44	59	**Friedman-Kien A E, Laubenstein L J, Rubinstein P, Buimovici-Klein E, Marmor M, Stahl R, Spigland I, Kim K S & Zolla-Pazner S.** Disseminated Kaposi's sarcoma in homosexual men. *Ann. Intern. Med.* 96:693-700, 1982. NYU Med. Ctr.; NY Blood

A	B	C	D
			Ctr., Lindsley F. Kimball Res. Inst.; St. Luke's-Roosevelt Hosp. Med. Ctr.; NY State Inst. Basic Res. Mental Retardation, Dept. Virol.; Albert Einstein Coll. Med., Montefiore Hosp. Med. Ctr.; NY Vet. Admin. Med. Ctr., New York, NY.
19	39	58	**Glenney J R, Glenney P, Osborn M & Weber K.** An F-actin- and calmodulin-binding protein from isolated intestinal brush borders has a morphology related to spectrin. *Cell* 28:843-54, 1982. Max Planck Soc. Adv. Sci., Max Planck Inst. Biophys. Chem., Goettingen, FRG. 82-0130
19	44	63	**Goedert J J, Neuland C Y, Wallen W C, Greene M H, Mann D L, Murray C, Strong D M, Fraumeni J F & Blattner W A.** Amyl nitrite may alter T lymphocytes in homosexual men. *Lancet* 1:412-6, 1982. NIH, NCI & NINCDS; Uniformed Servs. Univ. Hlth. Sci.; Naval Med. Res. Inst., Bethesda; Biomed. Res. Inst., Rockville, MD. 82-1893; *83-1898
20	45	65	**Goldfarb M, Shimizu K, Perucho M & Wigler M.** Isolation and preliminary characterization of a human transforming gene from T24 bladder carcinoma cells. *Nature* 296:404-9, 1982. Cold Spring Harbor Lab., NY. 82-0131; *83-1740
27	56	83	**Gray P W, Leung D W, Pennica D, Yelverton E, Najarian R, Simonsen C C, Derynck R, Sherwood P J, Wallace D M, Berger S L, Levinson A D & Goeddel D V.** Expression of human immune interferon cDNA in *E. coli* and monkey cells. *Nature* 295:503-8, 1982. Genentech, Inc., Dept. Mol. Biol., San Francisco, CA; NIH, NCI, Bethesda, MD. *83-0309
22	52	74	**Grosveld G C, de Boer E, Shewmaker C K & Flavell R A.** DNA sequences necessary for transcription of the rabbit β-globin gene *in vivo*. *Nature* 295:120-6, 1982. MRC, Natl. Inst. Med. Res., London, UK.
48	86	134	**Gubler U, Seeburg P, Hoffman B J, Gage L P & Udenfriend S.** Molecular cloning establishes proenkephalin as precursor of enkephalin-containing peptides. *Nature* 295:206-8, 1982. Hoffmann-La Roche, Inc., Dept. Mol. Genet.; Roche Inst. Mol. Biol., Nutley, NJ; Genentech, Inc., Div. Mol. Biol., San Francisco, CA. 82-1514; *83-4277
1	82	83	**Guillemin R, Brazeau P, Bohlen P, Esch F, Ling N & Wehrenberg W B.** Growth hormone-releasing factor from a human pancreatic tumor that caused acromegaly. *Science* 218:585-7, 1982. Salk Inst. Biol. Stud., Lab. Neuroendocrinol., La Jolla, CA. *83-2888
18	41	59	**Hollis G F, Hieter P A, McBride O W, Swan D & Leder P.** Processed genes: a dispersed human immunoglobulin gene bearing evidence of RNA-type processing. *Nature* 296:321-5, 1982. NIH, NICHHD & NCI, Bethesda, MD; Harvard Univ., Med. Sch., Boston, MA. 82-0103; *83-7332
16	70	86	**Howard M, Farrar J, Hilfiker M, Johnson B, Takatsu K, Hamaoka T & Paul W E.** Identification of a T cell-derived B cell growth factor distinct from interleukin 2. *J. Exp. Med.* 155:914-23, 1982. NIH, NIAID & NIDR, Bethesda, MD; Osaka Univ., Med. Sch., Japan. 82-1401; *83-0889
16	91	107	**Kakidani H, Furutani Y, Takahashi H, Noda M, Morimoto Y, Hirose T, Asai M, Inayama S, Nakanishi S & Numa S.** Cloning and sequence analysis of cDNA for porcine β-neo-endorphin/dynorphin precursor. *Nature* 298:245-9, 1982. Kyoto Univ. Fac. Med.; Keio Univ. Sch. Med., Tokyo, Japan. 82-1514; *83-4277
12	41	53	**Kalyanaraman V S, Sarngadharan M G, Nakao Y, Ito Y, Aoki T & Gallo R C.** Natural antibodies to the structural core protein (p24) of the human T-cell leukemia (lymphoma) retrovirus found in sera of leukemia patients in Japan. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:1653-7, 1982. Litton Bionet., Inc., Dept. Cell Biol., Kensington; NIH, NCI, Bethesda, MD; Kobe Univ., Sch. Med.; Kyoto Univ., Fac. Med.; Shinrakuen Hosp., Res. Div., Niigata, Japan. *83-2933
20	69	89	**Kasuga M, Karlsson F A & Kahn C R.** Insulin stimulates the phosphorylation of the 95,000-dalton subunit of its own receptor. *Science* 215:185-7, 1982. NIH, NIADDKD, Bethesda, MD. 82-2398; *83-0069
6	57	63	**Kasuga M, Zick Y, Blithe D L, Crettaz M & Kahn C R.** Insulin stimulates tyrosine phosphorylation of the insulin receptor in a cell-free system. *Nature* 298:667-9, 1982. Harvard Univ., Med. Sch., Boston, MA; NIH, NIADDKD & NICHHD, Bethesda, MD. *83-0069
10	54	64	**Kirsch I R, Morton C C, Nakahara K & Leder P.** Human immunoglobulin heavy chain genes map to a region of translocations in malignant B lymphocytes. *Science* 216:301-3, 1982. NIH, NICHHD & NCI, Bethesda, MD; Virginia Commonwlth. Univ., Med. Coll. Virginia, Richmond, VA; Harvard Univ., Med. Sch., Boston, MA. *83-1740
3	60	63	**Korn E D.** Actin polymerization and its regulation by proteins from nonmuscle cells. *Physiol. Rev.* 62:672-737, 1982. NIH, NHLBI, Bethesda, MD. *83-2268

A	B	C	D
0	76	76	**Kornfeld H, Vande Stouwe R A, Lange M, Reddy M M & Grieco M H.** T-lymphocyte subpopulations in homosexual men. *N. Engl. J. Med.* 307:729-31, 1982. St. Luke's-Roosevelt Hosp. Med. Ctr., New York, NY. *83-1898
7	45	52	**Kyte J & Doolittle R F.** A simple method for displaying the hydropathic character of a protein. *J. Mol. Biol.* 157:105-32, 1982. Univ. California, San Diego, Dept. Chem., La Jolla, CA.
21	84	105	**Land H, Schutz G, Schmale H & Richter D.** Nucleotide sequence of cloned cDNA encoding bovine arginine vasopressin-neurophysin II precursor. *Nature* 295:299-303, 1982. German Cancer Res. Ctr., Inst. Cell Tumor Biol., Heidelberg; Univ. Hamburg, Inst. Physiol. Chem., FRG. 82-1298; *83-3311
15	52	67	**Lane M-A, Sainten A & Cooper G M.** Stage-specific transforming genes of human and mouse B- and T-lymphocyte neoplasms. *Cell* 28:873-80, 1982. Harvard Univ., Med. Sch.; Sidney Farber Cancer Inst., Boston, MA. *83-1740
3	59	62	**Lazarides E.** Intermediate filaments: a chemically heterogeneous, developmentally regulated class of proteins. *Annu. Rev. Biochem.* 51:219-50, 1982. CalTech, Div. Biol., Pasadena, CA. *83-0671
14	68	82	**Levinson B, Khoury G, Vande Woude G & Gruss P.** Activation of SV40 genome by 72-base pair tandem repeats of Moloney sarcoma virus. *Nature* 295:568-72, 1982. NIH, NCI, Bethesda, MD. *83-1740
4	77	81	**Little J W & Mount D W.** The SOS regulatory system of *Escherichia coli*. *Cell* 29:11-22, 1982. Univ. Arizona, Arizona Hlth. Sci. Ctr. & Dept. Biochem., Tucson, AZ. *83-0718
13	41	54	**MacGregor G A, Markandu N D, Best F E, Elder D M, Cam J M, Sagnella G A & Squires M.** Double-blind randomised crossover trial of moderate sodium restriction in essential hypertension. *Lancet* 1:351-5, 1982. Univ. London, Charing Cross Hosp. Med. Sch., UK. *83-0703
18	41	59	**Malissen M, Malissen B & Jordon B R.** Exon/intron organization and complete nucleotide sequence of an *HLA* gene. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:893-7, 1982. CNRS, INSERM, Marseille, France. *83-1491
10	63	73	**McGrath J C.** Evidence for more than one type of post-junctional α-adrenoceptor. *Biochem. Pharmacol.* 31:467-84, 1982. Univ. Glasgow, Inst. Physiol., UK. *83-0327
6	91	97	**McKnight S L & Kingsbury R.** Transcriptional control signals of a eukaryotic protein-coding gene. *Science* 217:316-24, 1982. Fred Hutchinson Cancer Res. Ctr., Seattle, WA. *83-1740
4	52	56	**Means A R, Tash J S & Chafouleas J G.** Physiological implications of the presence, distribution, and regulation of calmodulin in eukaryotic cells. *Physiol. Rev.* 62:1-39, 1982. Baylor Coll. Med., Dept. Cell Biol., Houston, TX. *83-0824
1	145	146	**Messing J & Vieira J.** A new pair of M13 vectors for selecting either DNA strand of double-digest restriction fragments. *Gene* 19:269-76, 1982. Univ. Minnesota, Dept. Biochem., St. Paul, MN. *83-8552
7	79	86	**Mildvan D, Mathur U, Enlow R W, Romain P L, Winchester R J, Colp C, Singman H, Adelsberg B R & Spigland I.** Opportunistic infections and immune deficiency in homosexual men. *Ann. Intern. Med.* 96:700-4, 1982. Beth Israel Med. Ctr., Dept. Med.; Hosp. Joint Dis. Orthopaed. Inst., Erwin S. and Rose F. Wolfson Lab. Cell. Mechs. Dis.; CUNY, Mount Sinai Sch. Med.; Albert Einstein Coll. Med., Montefiore Hosp. Med. Ctr., New York, NY. *83-1898
22	69	91	**Miller R A, Maloney D G, Warnke R & Levy R.** Treatment of B-cell lymphoma with monoclonal anti-idiotype antibody. *N. Engl. J. Med.* 306:517-22, 1982. Stanford Univ., Depts. Med. & Pathol., CA. *83-3616
13	41	54	**Moore K W, Sher B T, Sun Y H, Eakle K A & Hood L.** DNA sequence of a gene encoding a BALB/c mouse L^d transplantation antigen. *Science* 215:679-82, 1982. DNAX Res. Inst., Palo Alto; CalTech, Div. Biol., Pasadena, CA. *83-1491
19	97	116	**Mount S M.** A catalogue of splice junction sequences. *Nucl. Acid. Res.* 10:459-72, 1982. Yale Univ., Dept. Mol. Biophys. Biochem., New Haven, CT. *83-2424
14	39	53	**Murphy K M M & Snyder S H.** Calcium antagonist receptor binding sites labeled with ^{3}H nitrendipine. *Eur. J. Pharmacol.* 77:201-2, 1982. Johns Hopkins Univ., Sch. Med., Baltimore, MD. *83-1006
46	112	158	**Noda M, Furutani Y, Takahashi H, Toyosato M, Hirose T, Inayama S, Nakanishi S & Numa S.** Cloning and sequence analysis of cDNA for bovine adrenal preproenkephalin. *Nature* 295:202-6, 1982. Kyoto Univ., Fac. Med.; Keio Univ., Sch. Med., Tokyo, Japan. 82-1514; *83-4277
8	46	54	**Okayama H & Berg P.** High-efficiency cloning of full-length cDNA. *Mol. Cell. Biol.* 2:161-70, 1982. Stanford Univ., Sch. Med., CA. *83-7023

A	B	C	D
12	63	75	**Orkin S H, Kazazian H H, Antonarakis S E, Goff S C, Boehm C D, Sexton J P, Waber P G & Giardina P J V.** Linkage of β-thalassaemia mutations and β-globin gene polymorphisms with DNA polymorphisms in human β-globin gene cluster. *Nature* 296:627-31, 1982. Harvard Univ., Med. Sch.; Child. Hosp. Med. Ctr., Div. Hematol. Oncol.; Sidney Farber Cancer Inst., Boston, MA; Johns Hopkins Univ., Sch. Med., & Johns Hopkins Hosp., Baltimore, MD; NY Hosp.-Cornell Med. Ctr., Div. Pediat. Hematol.-Oncol., New York, NY. *83-1010
17	89	106	**Parada L F, Tabin C J, Shih C & Weinberg R A.** Human EJ bladder carcinoma oncogene is homologue of Harvey sarcoma virus *ras* gene. *Nature* 297:474-8, 1982. MIT, Ctr. Cancer Res. & Dept. Biol., Cambridge, MA. 82-0131; *83-1740
30	86	116	**Payne G S, Bishop J M & Varmus H E.** Multiple arrangements of viral DNA and an activated host oncogene in bursal lymphomas. *Nature* 295:209-14, 1982. Univ. California, Depts. Biochem. Biophys. & Microbiol. Immunol., San Francisco, CA. 82-0131; *83-1740
14	46	60	**Pulciani S, Santos E, Lauver A V, Long L K, Robbins K C & Barbacid M.** Oncogenes in human tumor cell lines: molecular cloning of a transforming gene from human bladder carcinoma cells. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:2845-9, 1982. NIH, NCI, Bethesda, MD. *83-1740
6	102	108	**Reddy E P, Reynolds R K, Santos E & Barbacid M.** A point mutation is responsible for the acquisition of transforming properties by the T24 human bladder carcinoma oncogene. *Nature* 300:149-52, 1982. NIH, NCI, Bethesda, MD. *83-1740
16	39	55	**Reinherz E L, Morimoto C, Fitzgerald K A, Hussey R E, Daley J F & Schlossman S F.** Heterogeneity of human T^{4+} inducer T cells defined by a monoclonal antibody that delineates two functional subpopulations. *J. Immunol.* 128:463-8, 1982. Sidney Farber Cancer Inst., Div. Tumor Immunol.; Harvard Univ., Med. Sch., Boston, MA.
39	78	117	**Rivier C, Brownstein M, Spiess J, Rivier J & Vale W.** *In vivo* corticotropin-releasing factor-induced secretion of adrenocorticotropin, β-endorphin, and corticosterone. *Endocrinology* 110:272-8, 1982. Salk Inst. Biol. Stud., Peptide Biol. Lab., San Diego, CA; NIH, NIMH, Bethesda, MD. 82-2222; *83-2999
0	55	55	**Rivier J, Spiess J, Thorner M & Vale W.** Characterization of a growth hormone-releasing factor from a human pancreatic islet tumour. *Nature* 300:276-8, 1982. Salk Inst. Biol. Stud., Peptide Biol. Lab., San Diego, CA; Univ. Virginia, Sch. Med., Charlottesville, VA. *83-2888
18	55	73	**Robert-Guroff M, Nakao Y, Notake K, Ito Y, Sliski A & Gallo R C.** Natural antibodies to human retrovirus HTLV in a cluster of Japanese patients with adult T cell leukemia. *Science* 215:975-8, 1982. NIH, NCI, Bethesda, MD; Kobe Univ., Sch. Med.; Aichi Med. Univ., Nagoya; Kyoto Univ., Fac. Med., Japan. 82-0011; *83-2933
15	39	54	**Robinson S I, Nelkin B D & Vogelstein B.** The ovalbumin gene is associated with the nuclear matrix of chicken oviduct cells. *Cell* 28:99-106, 1982. Johns Hopkins Univ., Sch. Med., Baltimore, MD.
14	40	54	**Rubin G M, Kidwell M G & Bingham P M.** The molecular basis of P-M hybrid dysgenesis: the nature of induced mutations. *Cell* 29:987-94, 1982. Carnegie Inst. Washington, Dept. Embryol., Baltimore, MD; Brown Univ., Div. Biol. Med., Providence, RI; NIH, NIEHS, Research Triangle Park, NC. *83-2783
33	94	127	**Sabatini D D, Kreibich G, Morimoto T & Adesnik M.** Mechanisms for the incorporation of proteins in membranes and organelles. *J. Cell Biol.* 92:1-22, 1982. NYU, Sch. Med., NY. *83-2966
7	61	68	**Santos E, Tronick S R, Aaronson S A, Pulciani S & Barbacid M.** T24 human bladder carcinoma oncogene is an activated form of the normal human homologue of BALB- and Harvey-MSV transforming genes. *Nature* 298:343-7, 1982. NIH, NCI, Bethesda, MD. *83-1740
9	52	61	**Shih C & Weinberg R A.** Isolation of a transforming sequence from a human bladder carcinoma cell line. *Cell* 29:161-9, 1982. MIT, Ctr. Cancer Res. & Dept. Biol., Cambridge, MA. *83-1740
28	37	65	**Sprinzl M & Gauss D H.** Compilation of tRNA sequences. *Nucl. Acid. Res.* 10(2):r1-55, 1982. Univ. Bayreuth, Dept. Biochem.; Max Planck Soc. Adv. Sci., Max Planck Inst. Exp. Med., Goettingen, FRG.
1	53	54	**Stahl R E, Friedman-Kien A, Dubin R, Marmor M & Zolla-Pazner S.** Immunologic abnormalities in homosexual men. *Amer. J. Med.* 73:171-8, 1982. NY Vet. Admin. Med. Ctr.; NYU, Med. Ctr., NY. *83-1898
2	61	63	**Steinmetz M, Minard K, Horvath S, McNicholas J, Srelinger J, Wake C, Long E, Mach B & Hood L.** A molecular map of the immune response region from the major histocompatibility complex of the mouse. *Nature* 300:35-42, 1982. CalTech, Div.

A	B	C	D
			Biol., Pasadena; Stanford Univ., Dept. Biol. Sci.; USC, Sch. Med., Los Angeles, CA; Univ. Geneva, Med. Sch., Switzerland. *83-1491
20	63	83	**Steinmetz M, Winoto A, Minard K & Hood L.** Clusters of genes encoding mouse transplantation antigens. *Cell* 28:489-98, 1982. CalTech, Div. Biol., Pasadena, CA. 82-1217; *83-1491
8	46	54	**Storb R, Doney K C, Thomas E D, Appelbaum F, Buckner C D, Clift R A, Deeg H J, Goodell B W, Hackman R, Hansen J A, Sanders J, Sullivan K, Welden P L & Witherspoon R P.** Marrow transplantation with or without donor buffy coat cells for 65 transfused aplastic anemia patients. *Blood* 59:236-46, 1982. Fred Hutchinson Cancer Res. Ctr.; Univ. Washington, Sch. Med., Seattle, WA. *83-1042
3	105	108	**Tabin C J, Bradley S M, Bargmann C I, Weinberg R A, Papageorge A G, Scolnick E M, Dhar R, Lowy D R & Chang E H.** Mechanism of activation of a human oncogene. *Nature* 300:143-9, 1982. Whitehead Inst. Biomed. Res.; MIT, Ctr. Cancer Res. & Dept. Biol., Cambridge, MA; Merck Labs., West Point, PA; NIH, NCI, Bethesda, MD. *83-1740
0	100	100	**Taub R, Kirsch I, Morton C, Lenoir G, Swan D, Tronick S, Aaronson S & Leder P.** Translocation of the c-*myc* gene into the immunoglobulin heavy chain locus in human Burkitt lymphoma and murine plasmacytoma cells. *Proc. Nat. Acad. Sci. US—Biol. Sci.* 79:7837-41, 1982. Harvard Univ., Med. Sch.; Child. Hosp. Med. Ctr., Boston, MA; NIH, NICHHD & NCI, Bethesda, MD; Intl. Agcy. Res. Cancer, Lyon, France. *83-1740
18	48	66	**Tsien R Y, Pozzan T & Rink T J.** T-cell mitogens cause early changes in cytoplasmic free Ca^{2+} and membrane potential in lymphocytes. *Nature* 295:68-71, 1982. Univ. Cambridge, Physiol. Lab., UK; Inst. Gen. Pathol., Padova, Italy. *83-9037
5	53	58	**Tycko B & Maxfield F R.** Rapid acidification of endocytic vesicles containing α_2-macroglobulin. *Cell* 28:643-51, 1982. NYU, Med. Ctr., NY. *83-0860
5	85	90	**Varmus H E.** Form and function of retroviral proviruses. *Science* 216:812-20, 1982. Univ. California, Dept. Microbiol. Immunol., San Francisco, CA.
19	43	62	**Verbi W, Greaves M F, Schneider C, Koubek K, Janossy G, Stein H, Kung P & Goldstein G.** Monoclonal antibodies OKT 11 and OKT 11A have pan-T reactivity and block sheep erythrocyte 'receptors.' *Eur. J. Immunol.* 12:81-6, 1982. Imperial Cancer Res. Fund, Membrane Immunol. Lab.; Univ. London, Roy. Free Hosp., UK; Christian Albrechts Univ., Inst. Pathol., Kiel, FRG; Ortho Pharmaceut. Corp., Raritan, NJ. 82-2290
1	71	72	**Vieira J & Messing J.** The pUC plasmids, an M13mp7-derived system for insertion mutagenesis and sequencing with synthetic universal primers. *Gene* 19:259-68, 1982. Univ. Minnesota, Dept. Biochem., St. Paul, MN.
12	42	54	**Wade J C, Newton B, McLaren C, Flournoy N, Keeney R E & Meyers J D.** Intravenous acyclovir to treat mucocutaneous herpes simplex virus infection after marrow transplantation. *Ann. Intern. Med.* 96:265-9, 1982. Univ. Washington, Sch. Med.; Fred Hutchinson Cancer Res. Ctr., Seattle, WA; Burroughs Wellcome Co., Research Triangle Park, NC. *83-1973
10	47	57	**Wagner G & Wuthrich K.** Sequential resonance assignments in protein ^1H nuclear magnetic resonance spectra. *J. Mol. Biol.* 155:347-66, 1982. Swiss Fed. Inst. Technol., Inst. Mol. Biol. Biophys., Zurich, Switzerland.*83-1380
18	47	65	**Watson S J, Akil H, Fischli W, Goldstein A, Zimmerman E, Nilaver G & van Wimersma Greidanus T B.** Dynorphin and vasopressin: common localization in magnocellular neurons. *Science* 216:85-7, 1982. Univ. Michigan, Mental Hlth. Res. Inst., Ann Arbor, MI; Stanford Univ., Dept. Pharmacol., Palo Alto, CA; Columbia Univ., Dept. Neurol., New York, NY; Univ. Utrecht, Rudolf Magnus Inst. Pharmacol., Netherlands. 82-1512; *83-4277
5	56	61	**Weeds A.** Actin-binding proteins—regulators of cell architecture and motility. *Nature* 296:811-6, 1982. MRC, Lab. Mol. Biol., Cambridge, UK. *83-2268
9	66	75	**Weisbrod S.** Active chromatin. *Nature* 297:289-95. Cold Spring Harbor Lab., NY.
14	55	69	**Whitehouse P J, Price D L, Struble R G, Clark A W, Coyle J T & DeLong M R.** Alzheimer's disease and senile dementia: loss of neurons in the basal forebrain. *Science* 215:1237-9, 1982. Johns Hopkins Univ., Sch. Med., Baltimore, MD. *83-1981
12	42	54	**Williams A F & Gagnon J.** Neuronal cell Thy-1 glycoprotein: homology with immunoglobulin. *Science* 216:696-703, 1982. Univ. Oxford, Sir William Dunn Sch. Pathol., Oxford, UK. *83-9006
15	64	79	**Yoshida M, Miyoshi I & Hinuma Y.** Isolation and characterization of retrovirus from cell lines of human adult T-cell leukemia and its implication in the disease. *Proc.*

A B C D

Nat. Acad. Sci. US—Biol. Sci. 79:2031-5, 1982. Cancer Inst., Dept. Viral Oncol., Tokyo; Kochi Med. Sch., Dept. Intern. Med.; Kyoto Univ., Inst. Virus Res., Japan. *83-2933

11 51 62 **Young I R, Bailes D R, Burl M, Collins A G, Smith D T, McDonnell M J, Orr J S, Banks L M, Bydder G M, Greenspan R H & Steiner R E.** Initial clinical evaluation of a whole body nuclear magnetic resonance (NMR) tomograph. *J. Comput. Assist. Tomogr.* 6:1-18, 1982. Thorn-EMI Ltd., Cent. Res. Lab.; Univ. London, Roy. Postgrad. Med. Sch., UK; Yale Univ., Sch. Med., New Haven, CT. *83-0063

"Almost 35 enzymes and countless other proteins are now known to be regulated in this manner, and protein phosphorylation is clearly the major general mechanism by which intracellular events respond to external physiological stimuli." This paper, published in *Nature*, was cited in 119 publications—8 in 1982 and 111 in 1983. It also is a core document in the 1983 *SCI/SSCI* research front #83-2196, "Studies on Cyclic AMP-Dependent Protein Kinases and Protein Phosphorylation."

The 100 papers in this study were published in 28 journals. These journals are listed in Table 3. Just four journals account for 60 percent of the most-cited 1982 life-sciences papers. They are *Nature* (31 papers), *Science* (12), *Cell* (9), and *Proceedings of the National Academy of Sciences of the USA—Biological Sciences* (8). These journals tend to dominate citation-based studies of the most-cited literature. Also shown in Table 3 are the 1982 impact factors for the listed journals. These impact factors

Table 2: The 1982 *SCI*® and 1983 *SCI/SSCI*® research fronts that contain at least two of the 1982 most-cited life-sciences papers as core documents. A = research front number. B = research front name. C = number of 1982 most-cited life-sciences papers included in the core of each research front. D = number of core/citing documents.

A	B	C	D
82-0011	Pathogenesis, virology and clinical spectrum of T-cell lymphomas and leukemias induced by viruses	2	47/NA
82-0131	Characterization of oncogene activation caused by DNA rearrangement and resulting malignant transformation of cells and role of retroviruses	3	25/NA
82-1512	Immunohistochemical localization and binding of dynorphin to kappa opioid receptors in CNS, ileum and other organs in rodents	2	17/NA
82-1514	Primary structure of human enkephalins: location and regulation of enkephalin synthesis in CNS	4	4/NA
83-0063	Applications of nuclear magnetic resonance imaging in medicine	3	54/551
83-0069	Effects of epidermal growth factor, platelet-derived growth factor and others on tyrosine and protein phosphorylation by protein kinase	4	51/1172
83-1491	Major histocompatibility genes of mouse and man: structure, genetics, polymorphism and their role in T-cell immunocompetency	5	47/931
83-1740	Oncogenes and the genetics of human cancer; viral transforming genes and their DNA structure	18	57/1200
83-1898	Kaposi's sarcoma, cytomegalovirus infection, immunological factors and other aspects of the pathogenesis of acquired immune deficiency syndrome in homosexual men and other populations	5	52/521
83-1973	Infections of herpes simplex and herpes zoster viruses and their treatment with acyclovir and other antiviral drugs	3	47/500
83-2268	Role of actin and actin-binding proteins in polymerization, filament assembly and other aspects of cytoskeletal organization	3	15/361
83-2888	Neurostatin, somatostatin, and growth-hormone releasing peptides: distribution and localization in rat brain	2	23/497
83-2933	Human T-cell lymphoma virus and adult T-cell leukemia; nucleic acid analysis of virus and expression induced by interleukin-2	4	45/843
83-4277	Immunoreactivity of the pituitary and brain-related beta endorphin, dynorphin, enkephalin and other opioid peptides	6	32/672

Table 3: The 28 journals represented on the list of the 100 1982 life-sciences papers most cited in 1982-1983. The numbers in parentheses are the impact factors for the journals. (1982 impact factor equals the number of citations received by 1980-1981 articles in a journal divided by the number of articles published by the journal during the same period.) Data were taken from the 1982 *JCR*™. The figures at the right indicate the number of papers from each journal which appears on the list.

Journal	Number of Papers
Nature (8.75)	31
Science (6.81)	12
Cell (16.44)	9
Proc. Nat. Acad. Sci. US—Biol. Sci. (9.28)	8
N. Engl. J. Med. (15.60)	5
Ann. Intern. Med. (6.44)	4
J. Mol. Biol. (6.32)	3
Lancet (8.76)	3
Gene (4.85)	2
J. Biol. Chem. (5.87)	2
Nucl. Acid. Res. (6.96)	2
Physiol. Rev. (20.65)	2
Radiology (2.79)	2
Amer. J. Med. (4.56)	1
Annu. Rev. Biochem. (29.36)	1
Biochem. Pharmacol. (2.36)	1
Blood (5.20)	1
Brit. J. Psychiat. (2.26)	1
Endocrinology (3.77)	1
Eur. J. Immunol. (5.60)	1
Eur. J. Pharmacol. (3.47)	1
Immunol. Rev. (15.43)	1
J. Cell Biol. (9.42)	1
J. Comput. Assist. Tomogr. (2.61)	1
J. Exp. Med. (11.69)	1
J. Immunol. (6.51)	1
Mol. Cell. Biol. (4.24)	1
Trends Biochem. Sci. (2.74)	1

are calculated by dividing the number of 1982 citations to a journal's 1980 and 1981 articles by the number of articles published in those two years. Clearly, the journals that published the "superstar" life-sciences papers tend to publish articles of higher than average quality in general. The median 1982 impact for all *SCI* journals was 0.6, compared to 8.8 for *Nature*, 6.8 for *Science*, 16.4 for *Cell*, and so on.

The authors of the most-cited life-sciences articles were affiliated with 96 institutions located in nine countries. These institutions are listed in Table 4 in order of the number of times they appeared in Table 1. Sixty-two of these institutions (65 percent) are located in the US. In our study of the 1981 papers, the US accounted for 70 percent of the institutional affiliations.

In Table 1, authors from various divisions of the National Institutes of Health (NIH), Bethesda, Maryland, were listed 35 times on 24 of the 1982 papers. In our study of 1981 papers,[1] the NIH was listed only nine times on eight papers.

Twelve institutions listed in Table 4 are based in the UK, nine in Japan, five in the Federal Republic of Germany (FRG), three in Switzerland, and two in France. Italy, the Netherlands, and Sweden each account for one institution.

Table 4: The institutional affiliations of the authors on the list. Institutions are listed in descending order of the number of times they appear in Table 1.

NIH, Bethesda, MD		35
NCI	17	
NICHHD	5	
NIADDKD	3	
NIAID	3	
Bethesda, MD	2	
Hamilton, MT	1	
NIDR	2	
NIMH	2	
NHLBI	1	
NIEHS, Research Triangle Park, NC	1	
NINCDS	1	
Harvard Univ., Boston, MA		9
Univ. California, CA		6
San Francisco	4	
La Jolla	2	
CalTech, Pasadena, CA		5
Johns Hopkins Univ., Baltimore, MD		5
Sch. Med.	4	
Univ. Hosp.	1	
Kyoto Univ., Japan		5
Sidney Farber Cancer Inst., Boston, MA		5
Stanford Univ., CA		5
Univ. London, UK		5
Roy. Postgrad. Med. Sch.	2	
Charing Cross Hosp.	1	
King's Coll. Hosp.	1	
Roy. Free Hosp.	1	
Fred Hutchinson Cancer Res. Ctr., Seattle, WA		4
MIT, Cambridge, MA		4
MRC, UK		4
Lab. Mol. Biol., Cambridge	2	
Leukaemia Unit, Balham	1	
Natl. Inst. Med. Res., London	1	

NYU, NY		4
Med. Ctr.	3	
Sch. Med.	1	
Salk Inst. Biol. Stud., San Diego, CA		4
Univ. Washington, Seattle, WA		4
Sch. Med.	3	
Univ. Hosp.	1	
Beth Israel Hosp., Boston, MA		3
Charles A. Dana Res. Inst.	1	
Dept. Med.	1	
Harvard-Thorndike Lab.	1	
Genentech, Inc., San Francisco, CA		3
Kobe Univ., Japan		3
Albert Einstein Coll. Med., New York, NY		2
Children's Hosp. Med. Ctr., Boston, MA		2
Cold Spring Harbor Lab., NY		2
Hoffmann-La Roche, Inc., Nutley, NJ		2
Dept. Mol. Genet.	1	
Roche Inst. Mol. Biol.	1	
Imperial Cancer Res. Fund, UK		2
Balham	1	
London	1	
Keio Univ., Tokyo, Japan		2
Max Planck Soc. Adv. Sci., Goettingen, FRG		2
Inst. Biophys. Chem.	1	
Inst. Exp. Med.	1	
NY Vet. Admin. Med. Ctr., NY		2
St. Luke's-Roosevelt Hosp. Med. Ctr., New York, NY		2
Univ. Arizona, Tucson, AZ		2
Arizona Hlth. Sci. Ctr.	1	
Dept. Biochem.	1	
Univ. Michigan, Ann Arbor, MI		2
Univ. Minnesota, St. Paul, MN		2
Yale Univ., New Haven, CT		2
Addiction Res. Fdn., Palo Alto, CA		1
Aichi Med. Univ., Nagoya, Japan		1
Anim. Virus Res. Inst., Woking, UK		1
Baylor Coll. Med., Houston, TX		1
Beth Israel Med. Ctr., New York, NY		1
Biomed. Res. Inst., Rockville, MD		1
Brown Univ., Providence, RI		1
Burroughs-Wellcome Co., Research Triangle Park, NC		1
Cancer Inst., Tokyo, Japan		1
Carnegie Inst. Washington, Baltimore, MD		1
Case Western Reserve Univ., Cleveland, OH		1
Cent. Middlesex Hosp., London, UK		1
Children's Orthoped. Hosp. Med. Ctr., Seattle, WA		1
Christian Albrechts Univ., Kiel, FRG		1
Cleveland Clin. Fdn., OH		1
CNRS, Marseille, France		1
Columbia Univ., New York, NY		1
CDC, Atlanta, GA		1
CUNY, NY		1
DNAX Res. Inst., Palo Alto, CA		1
Emory Univ., Atlanta, GA		1
Frederick Cancer Res. Ctr., MD		1
German Cancer Res. Ctr., Heidelburg, FRG		1
Hosp. Joint Dis. Orthopaed. Inst., New York, NY		1
Inst. Gen. Pathol., Padova, Italy		1
Intl. Agcy. Res. Cancer, Lyon, France		1
Kochi Med. Sch., Japan		1
Litton Bionet., Inc., Kensington, MD		1
Merck Labs., West Point, PA		1
Natl. Inst. Basic Biol., Okazaki, Japan		1
Naval Med. Res. Inst., Bethesda, MD		1
NY Blood Ctr., NY		1
NY Hosp.-Cornell Med. Ctr., NY		1
NY State Inst. Basic Res. Mental Retardation, NY		1
Ortho Pharmaceut. Corp., Raritan, NJ		1
Osaka Univ., Japan		1
Queen's Univ., Belfast, UK		1
Rockefeller Univ., New York, NY		1
Scripps Clin., Res. Inst., La Jolla, CA		1
Shinrakuen Hosp., Niigata, Japan		1
St. James Hosp., Balham, UK		1
Swiss Fed. Inst. Technol., Zurich, Switzerland		1
Technicare Corp., Solon, OH		1
Thorn-EMI, Ltd., London, UK		1
Uniformed Servs. Univ. Hlth. Sci., Bethesda, MD		1
Univ. Bayreuth, FRG		1
Univ. Cambridge, UK		1
Univ. Colorado, Denver, CO		1
Univ. Dundee, UK		1
Univ. Geneva, Switzerland		1
Univ. Glasgow, UK		1
Univ. Hamburg, FRG		1
Univ. Hosps. Cleveland, OH		1
Univ. Oregon, Eugene, OR		1
Univ. Oxford, UK		1
Univ. Utrecht, the Netherlands		1
Univ. Virginia, Charlottesville, VA		1
Univ. Zurich, Switzerland		1
USC, Los Angeles, CA		1
Uppsala Univ., Sweden		1
Vanderbilt Univ., Nashville, TN		1
Vet. Admin. Hosp., Seattle, WA		1
Virginia Commonwlth. Univ., Richmond, VA		1
Whitehead Inst. Biomed. Res., Cambridge, MA		1
Wistar Inst. Anat. Biol., Philadelphia, PA		1

Even though authors of nine nationalities appear in this study, all 100 papers were published in English. Table 5 provides information on the number of papers each nation's authors produced. For example, 81 papers listed US authors. Of these, 71 were published by US authors *alone*. Ten were coauthored with researchers from France, the FRG, Japan, the Netherlands, Switzerland, and the UK. It is interesting to note that Japan accounts for seven papers in this study,

Table 5: National affiliations of the authors of the 1982 life-sciences papers most cited in 1982-1983, in order of the total number of papers on which each nation's authors appeared (column A). B = number of papers coauthored with scientists from other countries. C = nationality of coauthors.

Country	A	B	C
US	81	10	France, FRG, Japan, the Netherlands, Switzerland, UK
UK	12	5	FRG, Italy, US
Japan	7	3	US
FRG	4	1	UK, US
Switzerland	3	1	US
France	2	1	US
Italy	1	1	UK
the Netherlands	1	1	US
Sweden	1	0	

three of which were coauthored with US researchers. Japan accounted for only one of the 1981 most-cited papers in the life sciences.[1]

Ten of the papers in Table 1 are single-author works. Fifteen papers list two authors, 12 list three, 15 list four, 11 list five, and 15 list six. Seven authors were listed on three papers, eight on five papers, and nine on seven papers. One paper each listed 10, 11, and 12 authors. Three papers list 14 authors, and one lists 16 authors.

Of the 434 authors in this study, 51 appeared on more than one paper in Table 1. R.C. Gallo, National Cancer Institute, Bethesda, coauthored five papers on retroviruses associated with various human cancers, particularly T cell leukemia. Gallo has received much attention in the media recently for having isolated HTLV-III (human T cell leukemia virus), the virus thought to be responsible for acquired immune deficiency syndrome (AIDS). Eight authors have three papers: S.A. Aaronson, M. Barbacid, L. Hood, P. Leder, D.R. Lowy, E. Santos, S.R. Tronick, and R.A. Weinberg. Forty-two authors each have two papers in this study.

This concludes our report on the 1982 life-sciences papers most cited in 1982 and 1983. In the coming weeks, we'll identify and discuss the most-cited physical-sciences papers for the same time period.

* * * * *

My thanks to Thomas Atkins and Alfred Welljams-Dorof for their help in the preparation of this essay.

REFERENCES

1. **Garfield E.** The 1981 articles most cited in 1981 and 1982. 1. Life sciences. *Essays of an information scientist*. Philadelphia: ISI Press, 1984. Vol. 6. p. 301-11.
2. ----------. The 1981 articles most cited in 1981 and 1982. 2. Physical sciences. *Essays of an information scientist*. Philadelphia: ISI Press, 1984. Vol. 6. p. 373-83.
3. ----------. Premature discovery or delayed recognition—why? *Essays of an information scientist*. Philadelphia: ISI Press, 1981. Vol. 4. p. 488-93.
4. ----------. The 1980 articles most cited in 1980 and 1981. 1. Life sciences. *Essays of an information scientist*. Philadelphia: ISI Press, 1984. Vol. 6. p. 63-73.
5. ----------. ABCs of cluster mapping. Parts 1 & 2. Most active fields in the life and physical sciences in 1978. *Essays of an information scientist*. Philadelphia: ISI Press, 1981. Vol. 4. p. 634-49.
6. ----------. Herpes simplex virus infections. Part 1. How widespread they are, and who is most threatened. Part 2. Sexually transmitted diseases without a cure. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 143-56.