



Current Comments®

The 1981 Articles Most Cited in 1981 and 1982.

1. Life Sciences

Number 38

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Earlier this year, we listed the most-cited papers published in 1980 for the life sciences,¹ physical sciences,² and chemistry.³ Since we only used two years of data for the first two of these studies, we can now examine articles for 1981. In this essay, we'll cover life sciences papers most cited in 1981 and 1982. In future essays, we'll cover the physical sciences, chemistry, and other areas of research. This is the latest in a long series of reports too numerous to mention here. Articles which become highly cited soon after publication often reveal "where the action is" in science. That they point to areas of intense scientific inquiry is confirmed by their appearance as core papers in the new research fronts or specialties we identify each year for the ISI® Search Network and in our *Index to Scientific Reviews™ (ISR™)*.

Table 1 lists the 104 papers in this study. They appear in alphabetical order by first author. We use this arrangement to inhibit invidious comparisons between papers on the basis of citations alone. Most of these papers will continue to be highly cited in years to come. However, we make no pretense that they constitute the "best" research for 1981. But certainly the list includes many papers that peer review will confirm as major advances. Many papers not listed will eventually become highly cited. We cannot tell precisely why there is so much variation in the "diffusion" rates of high impact work. That is why we emphasize

the need to examine the microstructure of each specialty involved.

The papers in Table 1 averaged 68 citations in the two-year period: 11 in 1981, and 57 in 1982. The most-cited paper received 156 citations, while the least cited received 48. Most of the 4,000,000 articles and books cited each year in *Science Citation Index® (SCI®)* can be expected to receive no more than one or two citations. However, the papers in our study of the most-cited 1980 life sciences papers averaged 82 citations in 1980-1981.

For the first time since we began this series of studies by examining the most-cited articles of 1976,⁴ we have not classified the papers in Table 1 under such traditional subject headings as molecular genetics or cell biology. Such groupings are sometimes arbitrary and certainly subjective. We have used instead the automatic classification scheme represented by the *Index to Research Fronts in ISI/BIOMED®*. The complete "thesaurus" of research fronts, including a detailed alphabetic index, is available from ISI and covers 9,479 topics for 1980, 1981, and 1982.⁵

Seventy-nine of the 104 papers in this study are already included as "core" publications for *ISI/BIOMED* research fronts. These papers are denoted by the numbers following the bibliographic information in Table 1. The technique for co-citation clustering to identify research fronts has been described many

Table 1: The 1981 life sciences articles most cited in 1981-1982. The author addresses follow each citation. Code numbers indicate the *ISI/BIOMED*® research front specialties for which these are *core* papers. Asterisked code numbers indicate papers included in research fronts as *citing* papers. A = cites in 1981. B = cites in 1982. C = total cites for 1981 and 1982.

A	B	C	Bibliographic Data
11	37	48	Abramson C S, Kersey J H & LeBien T W. A monoclonal antibody (BA-1) reactive with cells of human B lymphocyte lineage. <i>J. Immunol.</i> 126:83-8, 1981. Univ. Minnesota, Depts. Lab. Med., Pathol. & Pediat., Minneapolis, MN. 82-0522
40	102	142	Anderson S, Bankier A T, Barrell B G, de Bruijn M H L, Coulson A R, Drouin J, Eperon I C, Nierlich D P, Roe B A, Sanger F, Schreier P H, Smith A J H, Staden R & Young I G. Sequence and organization of the human mitochondrial genome. <i>Nature</i> 290:457-65, 1981. MRC Lab. Mol. Biol., Cambridge, UK. 82-0552
5	43	48	Baltimore D. Gene conversion: some implications for immunoglobulin genes. <i>Cell</i> 24:592-4, 1981. Mass. Inst. Technol., Ctr. Cancer Res. & Dept. Biol., Cambridge, MA. 82-0257
0	55	55	Banerji J, Rusconi S & Schaffner W. Expression of a β -globin gene is enhanced by remote SV40 DNA sequences. <i>Cell</i> 27:299-308, 1981. Univ. Zurich, Inst. Mol. Biol. II, Zurich, Switzerland. 82-0045
8	59	67	Behe M & Felsenfeld G. Effects of methylation on a synthetic polynucleotide: the B-Z transition in poly(dG-m ⁵ dC)poly(dG-m ⁵ dC). <i>Proc. Nat. Acad. Sci. US—Biol. Sci.</i> 78:1619-23, 1981. NIH, NIAMDD, Bethesda, MD. 82-1071
37	98	135	Benoist C & Chambon P. <i>In vivo</i> sequence requirements of the SV40 early promoter region. <i>Nature</i> 290:304-10, 1981. Univ. Strasbourg, Lab. Genet. Mol., Unit 184, Biol. Mol. Gen. Genet., & Inst. Chem. Biol., Facult. Med., Strasbourg, France. 81-0397, 82-0048
9	59	68	Bergdoll M S, Crass B A, Reiser R F, Robbins R N & Davis J P. A new staphylococcal enterotoxin, enterotoxin F, associated with toxic-shock syndrome staphylococcus aureus isolates. <i>Lancet</i> 1:1017-21, 1981. Univ. Wisconsin, Dept. Food Microbiol. Toxicol.; Wisconsin Div. Hlth., Bur. Prevention, Madison, WI. 82-1039
14	60	74	Bishop J M. Enzymes within the genesis of retrovirus oncogenes. <i>Cell</i> 23:5-6, 1981. Univ. California, Dept. Microbiol. Immunol., San Francisco, CA. *81-1312, *81-0018
10	42	52	Blythman H E, Casellas P, Gros O, Gros P, Jansen F K, Paolucci F, Pau B & Vidal H. Immunotoxins: hybrid molecules of monoclonal antibodies and a toxin subunit specifically kill tumour cells. <i>Nature</i> 290:145-6, 1981. Ctr. Res. Clin. Midy, Montpellier, France. 82-1560
10	50	60	Bothwell A L M, Paskind M, Reth M, Imanishi-Kari T, Rajewsky K & Baltimore D. Heavy chain variable region contribution to the NP ⁺ family of antibodies: somatic mutation evident in a γ 2a variable region. <i>Cell</i> 24:625-37, 1981. Mass. Inst. Technol., Ctr. Cancer Res. & Dept. Biol., Cambridge, MA; Univ. Cologne, Inst. Genet., Cologne, FRG. 82-0078
3	67	70	Branton D, Cohen C M & Tyler J. Interaction of cytoskeletal proteins on the human erythrocyte membrane. <i>Cell</i> 24:24-32, 1981. Harvard Univ., Biol. Labs., Cambridge, MA; St. Elizabeth's Hosp., Div. Hematol. Oncol.; Tufts Univ., Med. Sch., Boston, MA. 82-0165
6	97	103	Breathnach R & Chambon P. Organization and expression of eucaryotic split genes coding for proteins. <i>Annu. Rev. Biochem.</i> 50:349-83, 1981. Univ. Strasbourg, Lab Genet. Mol., Paris; Unit 184, Biol. Mol. Gen. Genet., & Inst. Chem Biol., Facult. Med., Strasbourg, France. *81-0039, *81-0002, *81-0397, *81-0140, *81-1837
5	74	79	Brown M S, Kovanen P T & Goldstein J L. Regulation of plasma cholesterol by lipoprotein receptors. <i>Science</i> 212:628-35, 1981. Univ. Texas Hlth. Sci. Ctr., Depts. Mol. Genet. & Intern. Med., Dallas, TX. *81-0493, *81-1151, *81-0644, *81-0946, *81-2932
2	50	52	Burnette W N. "Western blotting": electrophoretic transfer of proteins from sodium dodecyl sulfate-polyacrylamide gels to unmodified nitrocellulose and radiographic detection with antibody and radioiodinated protein A. <i>Anal. Biochem.</i> 112:195-203, 1981. Hutchinson Cancer Res. Ctr., Seattle, WA. *81-0700, *81-1640, *81-0170, *81-2904
32	73	105	Cairns J. The origin of human cancers. <i>Nature</i> 289:353-7, 1981. Imperial Cancer Res. Fund. London, UK. *81-0229, *81-0903, *81-1020, *81-1272, *81-0039
4	45	49	Caroni P & Carafoli E. The Ca ²⁺ -pumping ATPase of heart sarcolemma. <i>J. Biol. Chem.</i> 256:3263-70, 1981. Swiss Fed. Inst. Technol., Lab. Biochem., Zurich, Switzerland. 82-0799
22	120	142	Carroll B J, Feinberg M, Greden J F, Tarika J, Albaladejo A A, Haskett R F, James N M, Kronfol Z, Lohr N, Steiner M, de Vigne J P & Young E. A specific laboratory test for the diagnosis of melancholia. <i>Arch. Gen. Psychiat.</i> 38:15-22, 1981. Univ. Michigan, Clin. Studies Unit & Mental Hlth. Res. Inst., Ann Arbor, MI. 82-0717
1	49	50	Chang K-J, Hazum E & Cuatrecasas P. Novel opiate binding sites selective for benzomorphan drugs. <i>Proc. Nat. Acad. Sci. US—Biol. Sci.</i> 78:4141-5, 1981. Wellcome Res. Labs., Dept. Mol. Biol., Research Triangle Park, NC. 82-1282
9	43	52	Coligan J E, Kindt T J, Uehara H, Martinko J & Nathenson S G. Primary structure of a murine transplantation antigen. <i>Nature</i> 291:35-9, 1981. NIH, NIAID, Bethesda, MD; Yeshiva Univ., Albert Einstein Coll. Med., Bronx, NY. 82-0532
3	51	54	Cosimi A B, Colvin R B, Burton R C, Rubin R H, Goldstein G, Kung P C, Hansen W P, Delmonico F L & Russell P S. Use of monoclonal antibodies to T-cell subsets for immunologic monitoring and treatment in recipients of renal allografts. <i>N. Engl. J. Med.</i> 305:308-14, 1981. Mass. Gen. Hosp., Gen. Surg. Serv.; Harvard Univ., Sch. Med., Boston; Ortho Diagnostics, Syst. Inc., Westwood, MA; Ortho Pharmaceut. Corp., Raritan, NJ. *81-2489, *81-2396
4	45	49	Crews S, Griffin J, Huang H, Calame K & Hood L. A single V _H gene segment encodes the humoral response to phosphorylcholine: somatic mutation is correlated with the class of the antibody. <i>Cell</i> 25:59-66, 1981. Calif. Inst. Technol., Div. Biol., Pasadena; Univ. California, Dept. Biol. Chem. & Mol. Biol. Inst., Los Angeles, CA. 82-0078

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times.⁶ Briefly, a research front is created when a group of current papers cites one or more core papers identified by the analysis.

Table 2 lists the names of 18 research fronts which include two or more papers in this study as core documents. The remaining 50 research fronts, each including one paper as a core document, are not listed. A complete list of research front names can be found in the *Index to Research Fronts in ISI/BIOMED*.⁵ The

names of these research fronts are derived from the words or phrases most frequently used in the titles of articles citing the core documents. These names provide a much more precise label for the subject matter than the broader terms used in previous studies.

Of the 25 papers that have not yet been included as core papers by the co-citation analysis, 21 of them do appear as citing papers in the *ISI/BIOMED* research fronts. These papers are indi-

Table 2: The 1981 and 1982 *ISI/BIOMED*[®] research fronts which contain at least two of the 1981 most-cited life sciences papers as *core* documents. A=research front number. B=research front name. C=number of 1981 most-cited papers in the core of each research front. D=number of cited/citing papers.

A	B	C	D
81-0397	Transcription initiation and termination in eukaryotes	4	(20/186)
81-0857	Influenza hemagglutinin structure, function and translation	2	(16/104)
81-1518	Intracoronary thrombolysis	3	(4/43)
81-1706	Antibody recognition of T-cell subpopulations	2	(2/23)
81-2745	Integration and cloning of viral genes	2	(2/17)
82-0048	Transcription and RNA processing properties of SV40 DNA affecting gene expression	3	(6/153)
82-0073	Role of DNA methylation in altering gene expression in eukaryotes	2	(30/383)
82-0078	Structure and function of the variable and joining segments of immunoglobulin genes	3	(5/131)
82-0273	Isolation and characterization of oncogenes and other cellular transforming genes transformed by various viruses	4	(39/463)
82-0532	Characteristics of genes encoding mouse transplantation antigens	4	(28/338)
82-0799	Purification and characterization of high-affinity calcium-ATPase in plasma membrane	2	(3/106)
82-0953	Immunological characteristics and functional properties of T-cells in patients with human T-cell lymphoproliferative disorders	3	(49/977)
82-0959	Mechanisms of action and clinical diagnostic significance of monoclonal antibodies	2	(2/135)
82-1039	Clinical aspects and demographics of toxic-shock syndrome and Kawasaki's disease	3	(24/259)
82-1071	Spectral studies of conformational transitions in DNA, B-DNA and left-handed Z-DNA	2	(55/574)
82-1161	Nucleotide sequence and molecular mechanisms of influenza virus genes	2	(37/336)
82-1578	Kaposi's sarcoma and other cancers in homosexual men	4	(23/297)
82-2230	Intracoronary thrombolysis with streptokinase in acute myocardial infarction	3	(7/190)

cated by an asterisk preceding the research front number in Table 1. Table 3 lists the names of these research fronts. In the future, no doubt, many of these papers will eventually be co-cited with other highly cited papers, and thereby become part of the "core" literature for their fields.

Nine of the papers in Table 1 are single author works. There were just four single author papers in our study of the 1980 life sciences papers.¹ Nevertheless, the data confirm the common notion that science is an increasingly collaborative enterprise. Twenty-one papers in this study list two authors, 22 list three, and 12 list four authors. Fourteen papers have five authors, ten papers have six, and four have seven. There are three papers with eight authors, three with 12, two papers with nine authors, and two with 14. One paper lists ten authors, and another one, 11.

Twenty-seven authors have more than one paper listed in Table 1. L. Hood, California Institute of Technology, Pasadena, coauthored four papers in this study. He had seven papers listed in our study of the 1980 life sciences papers as well. Three authors have three papers in Table 1—P. Chambon, G. Goldstein, and P.C. Kung. Twenty-three authors have two papers listed.

The 104 papers in Table 1 were published in 29 journals. These are listed in Table 4. Just four journals account for nearly 60 percent of the papers in this study. They are *Nature* (21 papers), *Cell* (20), *New England Journal of Medicine* (10), and *Proceedings of the National Academy of Sciences of the USA—Biological Sciences* (9). These journals usually dominate our studies of the most-cited life sciences papers. Fields such as molecular biology and biochemistry are highly visible in these "superstar"

Table 3: ISI/BIOMED* research fronts in which those 1981 most-cited life sciences papers not yet incorporated into clusters appear as *citing* papers. For this list we included only those research fronts to which two or more *citing* papers were assigned. In parentheses are the number of cited/citing papers.

81-0002	Small nuclear RNA (90/501)
81-0018	Sarcoma virus transforming proteins (92/398)
81-0039	Organization, rearrangement and immunoglobulin gene expression (54/318)
81-0042	Modulation and regulation of collagen synthesis (12/85)
81-0397	Transcription initiation and termination in eukaryotes (20/186)
81-0819	Specific surface antigens of T-cell subpopulations (5/56)
81-2489	T-cell imbalance in disease (8/290)

Table 4: The 29 journals which published the 104 1981 life sciences papers most cited in 1981-1982. The numbers in parentheses are the impact factors. (1981 impact factor equals the number of citations received by 1979-1980 articles in 1981 divided by the number of articles published by the journal during 1979-1980.) Data were taken from the 1981 *SCT*[†] *JCR*[™].

Journal	Number of Papers
Nature (7.2)	21
Cell (14.3)	20
N. Engl. J. Med. (14.2)	10
*Proc. Nat. Acad. Sci. US—Biol. Sci. (Not Available)	9
Science (6.2)	6
J. Exp. Med. (9.7)	5
J. Biol. Chem. (5.7)	4
Anal. Biochem. (2.4)	2
Annu. Rev. Biochem. (26.7)	2
Circulation (6.8)	2
J. Cell Biol. (8.9)	2
J. Immunol. (6.1)	2
J. Infect. Dis. (3.2)	2
Nucl. Acid. Res. (5.3)	2
Amer. Heart J. (1.6)	1
Ann. Intern. Med. (5.8)	1
Annu. Rev. Neurosci. (11.7)	1
Annu. Rev. Physiol. (6.3)	1
Arch. Gen. Psychiat. (5.1)	1
Biochem. Biophys. Res. Commun. (2.9)	1
Biochem. J. (3.2)	1
Blood (5.0)	1
Brit. Med. J. (2.9)	1
Collagen Rel. Res. (Not Available)	1
Lancet (9.0)	1
Neuroscience (4.4)	1
Physiol. Rev. (15.5)	1
Scand. J. Immunol. (3.5)	1
Trends Biochem. Sci. (2.3)	1

*In 1980, the journal *Proc. Nat. Acad. Sci. US* split into two sections. The 1981 impact factor for *Proc. Nat. Acad. Sci. US* is 8.7.

studies, both because there are so many papers published in these fields, and because papers in these fields cite an average of about 30 references per paper.⁷ There are also significant differences in the ages of papers cited. But it is

the higher than average quality that accounts for the fact that these same journals regularly publish the cream of the crop.

The authors in this study were affiliated with 83 institutions located in nine countries. Table 5 lists these institutions in order of the number of papers in Table 1 that they produced. The US accounts for 58 institutions, more than two-thirds of the total. In our study of the 1980 papers, 47 of the 78 institutions represented were located in the US.

Seven of the institutions in Table 5 are located in the Federal Republic of Germany. Switzerland and the UK have five each. France has two institutions; the Netherlands, two; and Italy, two. Japan and Sweden each have one institution.

All of the papers in Table 1 were written in English. Nevertheless, authors of nine nationalities have papers in this study. Table 6 shows the number of papers authors from each country produced. US authors appeared on 79 papers. Of these, fully 72 papers were written by US authors alone. The rest were coauthored with scientists from the Federal Republic of Germany, Italy, the Netherlands, the UK, and Switzerland.

The list of research fronts in Table 2 provides a good indication of those subjects of special interest to life scientists in 1981. Some of the research fronts are more heavily represented by papers in Table 1 than others. In fact, four research fronts contain four each of the highly cited papers as core documents, perhaps indicating intense activity in these areas.

Research front #81-0397, "Transcription initiation and termination in eukaryotes," contains four papers in this study as core documents. All are concerned with the conditions under which genetic transcription can occur. Briefly, "transcription" refers to the formation of messenger RNA from information encoded in a segment of DNA. Two papers in this group were produced by the Uni-

Table 5: Institutional affiliations of the authors on the list ranked in descending order of number of times they appear in Table 1.

Univ. California	13	Univ. Texas, TX	2
Los Angeles	6	Hlth. Sci. Ctr., Dallas	1
San Francisco	4	Med. Branch, Galveston	1
Davis	1	Vet. Admin. Med. Ctr., New York	2
Harbor Med. Ctr., Torrance	1	Bronx	1
La Jolla	1	Brooklyn	1
Harvard Univ., MA	10	AVIS Bergamo, Massa, Italy	1
Sch. Med., Boston	4	Brookhaven Nat. Lab., Upton, NY	1
Biol. Labs., Cambridge	3	Cedars-Sinai Med. Ctr., Los Angeles, CA	1
Gibbs Lab., Cambridge	2	Cornell Univ., Ithaca, NY	1
Sch. Publ. Hlth., Boston	1	Ctrs. Dis. Control, Atlanta, GA	1
National Institutes of Health, Bethesda, MD	9	Ctr. Res. Clin. Midy, Montpellier, France	1
NCI	5	Duke Univ., Durham, NC	1
NIAID	1	Gen. Provincial Hosp., Massa, Italy	1
NIAMDD	1	F. Hoffmann-La Roche & Co. Ltd., Basel, Switzerland	1
NIDR	1	Imperial Cancer Res. Fund, London, UK	1
NIMH	1	Johns Hopkins Univ., Baltimore, MD	1
Massachusetts Inst. Technology, Cambridge, MA	6	Karolinska Inst., Stockholm, Sweden	1
California Inst. Technology, Pasadena, CA	4	La Jolla Cancer Res. Fdn., CA	1
Hutchinson Cancer Res. Ctr., Seattle, WA	4	Long Island Jewish-Hillside Med. Ctr., New York, NY	1
Memorial Sloan-Kettering Cancer Ctr., New York, NY	4	Mayo Fdn., Rochester, MN	1
Ortho	4	Mt. Zion Hosp., Med. Ctr., San Francisco, CA	1
Pharmaceut. Corp., Raritan, NJ	3	Nat. Jewish Hosp. Res. Ctr., Denver, CO	1
Diagnost. Syst. Inc., Westwood, MA	1	New York Univ., NY	1
Stanford Univ., CA	4	Northwestern Univ., Chicago, IL	1
Sch. Med.	2	Osaka Univ., Japan	1
Howard Hughes Med. Inst. Lab.	1	Puget Sound Blood Ctr., Seattle, WA	1
Dept. Biol. Sci.	1	Roche Inst. Mol. Biol., Nutley, NJ	1
Columbia Univ., New York, NY	3	Royal Coll. Surg. England, London, UK	1
MRC, UK	3	Rush-Presbyterian-St. Luke's Med. Ctr., Chicago, IL	1
Nat. Inst. Med. Res., London	2	San Francisco Dept. Publ. Hlth., CA	1
Lab. Mol. Biol., Cambridge	1	St. Louis Park Med. Ctr., MN	1
Rockefeller Univ., New York, NY	3	St. Luke's-Roosevelt Hosp. Ctr., New York, NY	1
Salk Inst. Biol. Studies, San Diego, CA	3	St. Paul-Ramsey Med. Ctr., St. Paul, MN	1
SUNY, NY	3	Sidney Farber Cancer Inst., Boston, MA	1
Dept. Biol. Sci. & Ctr. Biol. Macromol., Albany	1	Swiss Inst. Exp. Cancer Res., Lausanne, Switzerland	1
Downstate Med. Ctr., Brooklyn	1	Tulane Univ., New Orleans, LA	1
Sch. Med., Stony Brook	1	USDA, SEA Region Poultry Res. Lab., East Lansing, MI	1
Univ. London, UK	3	Univ. Basel, Switzerland	1
Charing Cross Hosp.	1	Univ. Bayreuth, FRG	1
King's Coll. Hosp.	1	Univ. Cologne, FRG	1
Royal Free Hosp.	1	Univ. Connecticut, Farmington, CT	1
Univ. Strasbourg, France	3	Univ. Hamburg, Eppendorf Hosp., FRG	1
Univ. Washington, Seattle, WA	3	Univ. Heidelberg, FRG	1
Univ. Zurich, Switzerland	3	Univ. Minnesota, Minneapolis, MN	1
Vanderbilt Univ., Nashville, TN	3	Univ. Munster, FRG	1
Yale Univ., New Haven, CT	3	Univ. Nijmegen, Netherlands	1
Yeshiva Univ., New York, NY	3	Univ. Sheffield, Royal Hallamshire Hosp., UK	1
Carnegie Inst. Washington, Baltimore, MD	2	Univ. Southern California, Los Angeles, CA	1
Fox Chase Cancer Ctr., Philadelphia, PA	2	Univ. Wisconsin, Madison, WI	1
Genentech Inc., San Francisco, CA	2	Wadsworth Med. Ctr., Los Angeles, CA	1
Leiden State Univ., Netherlands	2	Washington Univ., St. Louis, MO	1
Massachusetts Gen. Hosp., Boston, MA	2	Wellcome Res. Labs., Research Triangle Park, NC	1
Max Planck Soc. Advan. Sci., FRG	2	Wisconsin Div. Hlth., Bur. Prevention, Madison, WI	1
Inst. Exp. Med., Gottingen	1	Worcester Fdn. Exp. Biol., Shrewsbury, MA	1
Inst. Biol., Tubingen	1		
Mt. Sinai Med. Ctr., New York, NY	2		
Swiss Fed. Inst. Technology, Zurich, Switzerland	2		
Tufts Univ., Boston, MA	2		
Med. Sch.	1		
St. Elizabeth's Hosp.	1		
Univ. Gottingen, FRG	2		
Univ. Michigan, Ann Arbor, MI	2		

versity of Strasbourg, Institute of Biological Chemistry, Laboratory of Eukaryotic Molecular Genetics, & Unit 184, Molecular Biology and Genetic Engineering Group, in Strasbourg. The paper by C. Benoist and P. Chambon, published in *Nature*, examines transcription in simian virus 40 (SV40) genes. It received 135 citations in the two-year period, making

Table 6: National affiliations of the authors of the 1981 life sciences papers most cited in 1981-1982. A=total number of papers on which each nation's authors appeared. B=number of papers coauthored with scientists from other countries. C=nationality of coauthors.

Country	A	B	C
US	79	7	FRG, Italy, Netherlands, UK, Switzerland
FRG	8	2	Switzerland, US
Switzerland	8	2	FRG, US
UK	8	3	US
France	4	0	
Netherlands	3	2	Italy, US
Italy	1	1	Netherlands, US
Japan	1	0	
Sweden	1	0	

it the fifth most-cited paper in this study. The paper by R. Breathnach and Chambon in *Annual Review of Biochemistry* surveys the literature on "split genes." Transcription genes are divided, or "split," into nucleic acid sequences to be transcribed, called exons, and sequences which separate the exons, called introns.

Of the four papers in Table 1 which are core documents for research front #82-0273, "Isolation and characterization of oncogenes and other cellular transforming genes transformed by various viruses," three concern avian leukosis viruses (ALVs). These tumor-causing RNA viruses are of interest to researchers in part because unlike other RNA tumor viruses, they lack discrete "transforming genes," which trigger tumor growth. The paper by W.S. Hayward and B.G. Neel, Rockefeller University, New York, and S.M. Astrin, Fox Chase Cancer Center, Philadelphia, concludes that ALV promotes tumors by activating the *c-myc* gene contributed to the cellular DNA by another virus, known as MC29. This paper, published in *Nature*, is the second most cited in this study, receiving 152 citations during the two-year period.

All four of this study's core papers in research front #82-0532, "Characteristics of genes encoding mouse transplantation antigens," discuss the major histocompatibility complex (MHC) and the various proteins MHC encodes for.

MHC is a series of genes which play a fundamental role in immune responses. The two papers by M. Steinmetz, California Institute of Technology, and colleagues examine transplantation antigens, one of the groups of MHC proteins, which define the determinants of each individual's immunologic "identity."

Of special interest is the appearance of research front #82-1578, "Kaposi's sarcoma and other cancers in homosexual men." Kaposi's sarcoma, an otherwise rare form of skin cancer, is one of the "opportunistic" diseases which strike victims of acquired immune deficiency syndrome (AIDS). Four core papers from this research front appear in Table 1. They describe other opportunistic diseases, such as disseminated viral diseases and a rare protozoal infection, *pneumocystis carinii* pneumonia, which afflict AIDS victims. Given the enormous public concern, not to mention publicity, that AIDS has engendered, we will no doubt see a proliferation of related research fronts in the years to come.

The most-cited paper in this study, by J. Messing, University of California, Davis, and colleagues R. Crea and P.H. Seeburg, Genentech Inc., San Francisco, is a core document for two research fronts: #81-0216, "DNA sequences of individual genes"; and #82-3276, "Nucleotide sequences of DNA from viruses, mitochondria and other structures." The paper, published in *Nucleic Acids Research*, describes a new method for use in DNA sequencing, that is, determining the nucleotide sequence of a strand of DNA. The paper was cited 156 times in the period 1981-1982.

Two papers in Table 1 received 142 citations each, tying them for the third most cited in this study. One of these is by S. Anderson and colleagues, MRC Laboratory of Molecular Biology, Cambridge, UK. The paper, published in *Nature*, is a core document for research

front #82-0552, "Analysis of the location and sequence of cytochrome oxidase gene in mitochondria." The paper presents the entire nucleotide sequence of human mitochondria DNA. Mitochondria are the rod-shaped structures within cells which are responsible for cell respiration. The work by Anderson and colleagues represents a landmark in defining a complete human genome. Their paper is also interesting because it investigates a nonnuclear form of DNA.

Also receiving 142 citations during the two-year period is the paper by B.J. Carroll and colleagues, University of Michigan, Ann Arbor. It describes the use of the dexamethasone suppression test (DST) for diagnosing depressive illness. Soon after this paper was published,

DST was touted as providing a biochemical marker for depression. I mentioned it in an essay on depression published in *Current Contents*[®] two years ago.⁸ However, since that time, DST has become controversial, and some now question its effectiveness in diagnosing depressive illness.⁹

The next essay in this series will examine the 1981 physical sciences papers that were most cited in 1981 and 1982.

* * * * *

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