Current Comments®

The 1981 Articles Most Cited in 1981 and 1982. 1. Life Sciences

Number 38 September 19, 1983

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.** *J. Immunol.* 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.** *Nature* 290:457-65, 1981. MRC Lab. Mol. Biol., Cambridge, UK. 82-0552
5	43	48	Baltimore D. **Gene conversion: some implications for immunoglobulin genes.** *Cell* 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.** *Cell* 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).** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:1619-23, 1981. NIH, NIAMDD, Bethesda, MD. 82-1071
37	98	135	Benoist C & Chambon P. ***In vivo* sequence requirements of the SV40 early promoter region.** *Nature* 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.** *Lancet* 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. **Enemies within: the genesis of retrovirus oncogenes.** *Cell* 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.** *Nature* 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^b family of antibodies: somatic mutation evident in a γ2a variable region.** *Cell* 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.** *Cell* 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.** *Annu. Rev. Biochem.* 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.** *Science* 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.** *Anal. Biochem.* 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.** *Nature* 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.** *J. Biol. Chem.* 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, Albala 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.** *Arch. Gen. Psychiat.* 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.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 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.** *Nature* 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.** *N. Engl. J. Med.* 305:308-14, 1981. Mass. Gen. Hosp., Gen. Surg. Serv.; Harvard Univ., Sch. Med., Boston; Ortho Diagnost. 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 immune response to phosphorylcholine: somatic mutation is correlated with the class of the antibody.** *Cell* 25:59-66, 1981. Calif. Inst. Technol., Div. Biol., Pasadena; Univ. California, Dept. Biol. Chem. & Mol. Biol. Inst., Los Angeles, CA. 82-0078

A	B	C	Bibliographic Data
14	45	59	Dierks P, van Ooyen A, Mantei N & Weissmann C. **DNA sequences preceding the rabbit β-globin gene are required for formation in mouse L cells of β-globin RNA with the correct 5' terminus.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:1411-5, 1981. Univ. Zurich, Inst. Mol. Biol., Zurich, Switzerland. 81-0397
9	42	51	Drew W L, Mintz L, Miner R C, Sands M & Ketterer B. **Prevalence of cytomegalovirus infection in homosexual men.** *J. Infec. Dis.* 143:188-92, 1981. Mt. Zion Hosp., Med. Ctr., Depts. Path. Lab. Med. & Med.; San Francisco Dept. Publ. Hlth., San Francisco, CA. 82-1578
4	48	52	Ehrlich M & Wang R Y-H. **5-methylcytosine in eukaryotic DNA.** *Science* 212:1350-7, 1981. Tulane Univ., Med. Sch., New Orleans, LA. 82-0073
4	44	48	Engelman D M & Steitz T A. **The spontaneous insertion of proteins into and across membranes: the helical hairpin hypothesis.** *Cell* 23:411-22, 1981. Yale Univ., Dept. Mol. Biophys. Biochem., New Haven, CT. 82-0607
12	48	60	Engleman E G, Warnke R, Fox R I, Dilley J, Benike C J & Levy R. **Studies of a human T lymphocyte antigen recognized by a monoclonal antibody.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:1791-5, 1981. Howard Hughes Med. Inst. Lab.; Stanford Univ., Sch. Med., Stanford, CA. *81-2489, *81-3018, *81-0819, *81-1705
14	58	72	Evans R L, Wall D W, Platsoucas C D, Siegal F P, Fikrig S M, Testa C M & Good R A. **Thymus-dependent membrane antigens in man: inhibition of cell-mediated lympholysis by monoclonal antibodies to the T_H antigen.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:544-8, 1981. Memorial Sloan-Kettering Cancer Ctr.; Mt. Sinai Med. Ctr., New York; SUNY, Downstate Med. Ctr., Brooklyn, NY. 81-1706, 82-0959
19	50	69	Feely J, Wilkinson G R & Wood A J J. **Reduction of liver blood flow and propranolol metabolism by cimetidine.** *N. Engl. J. Med.* 304:692-5, 1981. Vanderbilt Univ., Depts. Med. & Pharmacol., Nashville, TN. 81-1507, 82-2218
10	47	57	Fitzgerald M & Shenk T. **The sequence of 5'-AAUAAA-3' forms part of the recognition site for polyadenylation of late SV40 mRNAs.** *Cell* 24:251-60, 1981. Univ. Connecticut, Hlth. Ctr., Farmington, CT. *81-0081, *81-1771, *81-2073, *81-1642, *81-0817
17	58	75	Ganz W, Buchbinder N, Marcus H, Mondkar A, Maddahi J, Charuzi Y, O'Connor L, Shell W, Fishbein M C, Kass R, Miyamoto A & Swan H J C. **Intracoronary thrombolysis in evolving myocardial infarction.** *Amer. Heart J.* 101:4-13, 1981. Cedars-Sinai Med. Ctr., Divs. Cardiol., Pathol. & Cardiovasc. Surg.; Univ. California, Sch. Med., Los Angeles, CA. 81-1518, 82-2230
25	45	70	Gauss D H & Sprinzl M. **Compilation of tRNA sequences.** *Nucl. Acid. Res.* 9:r1-r23, 1981. Max Planck Inst. Exp. Med., Dept. Chem., Gottingen; Univ. Bayreuth, Dept. Biochem., Bayreuth, FRG. 81-1884
12	55	67	Gearhart P J, Johnson N D, Douglas R & Hood L. **IgG antibodies to phosphorylcholine exhibit more diversity than their IgM counterparts.** *Nature* 291:29-34, 1981. Carnegie Inst. Washington, Dept. Embryol., Baltimore, MD; Calif. Inst. Technol., Div. Biol., Pasadena, CA. 82-0078
8	47	55	Germain R N & Benacerraf B. **A single major pathway of T-lymphocyte interactions in antigen-specific immune suppression.** *Scand. J. Immunol.* 13:1-10, 1981. Harvard Univ., Sch. Med., Boston, MA. *81-0059, *81-2376, *81-1061, *81-2787
29	90	119	Goeddel D V, Leung D W, Dull T J, Gross M, Lawn R M, McCandliss R, Seeburg P H, Ullrich A, Yelverton E & Gray P W. **The structure of eight distinct cloned human leukocyte interferon cDNAs.** *Nature* 290:20-6, 1981. Genentech Inc., Dept. Mol. Biol., San Francisco, CA; Roche Inst. Mol. Biol., Nutley, NJ. 81-0136, 82-0216
2	79	81	Gottlieb M S, Schroff R, Schanker H M, Weisman J D, Fan P T, Wolf R A & Saxon A. ***Pneumocystis carinii* pneumonia and mucosal candidiasis in previously healthy homosexual men.** *N. Engl. J. Med.* 305:1425-31, 1981. Univ. California, Sch. Med.; Wadsworth Med. Ctr., Rheumatol. Sect., Los Angeles, CA. 82-1578
3	66	69	Groudine M, Eisenman R & Weintraub H. **Chromatin structure of endogenous retroviral genes and activation by an inhibitor of DNA methylation.** *Nature* 292:311-7, 1981. Hutchinson Cancer Res. Ctr.; Univ. Washington Hosp., Dept. Radiat. Oncol., Seattle, WA. 82-0073
15	47	62	Gruss P, Dhar R & Khoury G. **Simian virus 40 tandem repeated sequences as an element of the early promoter.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:943-7, 1981. NIH, NCI, Bethesda, MD. 81-0397, 82-0048
4	60	64	Hagiwara S & Byerly L. **Calcium channel.** *Annu. Rev. Neurosci.* 4:69-125, 1981. Univ. California, Sch. Med.; Univ. Southern California, Dept. Biol. Sci., Los Angeles, CA.
8	46	54	Hasilik A, Waheed A & von Figura K. **Enzymatic phosphorylation of lysosomal enzymes in the presence of UDP-N-acetylglucosamine. Absence of the activity in I-cell fibroblasts.** *Biochem. Biophys. Res. Commun.* 98:761-7, 1981. Univ. Munster, Inst. Physiol. Chem., Munster, FRG. 83-0983
5	46	51	Haynes B F, Metzgar R S, Minna J D & Bunn P A. **Phenotypic characterization of cutaneous T-cell lymphoma.** *N. Engl. J. Med.* 304:1319-23, 1981. Duke Univ., Sch. Med., Durham, NC; NCI-VA Med. Ctr., Washington, DC. 82-0953
20	132	152	Hayward W S, Neel B G & Astrin S M. **Activation of a cellular *onc* gene by promoter insertion in ALV-induced lymphoid leukosis.** *Nature* 290:475-80, 1981. Rockefeller Univ., New York, NY; Fox Chase Cancer Ctr., Inst. Cancer Res., Philadelphia, PA. 82-0273
8	42	50	Hofstetter H, Kressmann A & Birnstiel M L. **A split promoter for a eucaryotic tRNA gene.** *Cell* 24:573-85, 1981. Univ. Zurich, Inst. Mol. Biol. II, Zurich, Switzerland. 82-0040
0	49	49	Holmes D S & Quigley M. **A rapid boiling method for the preparation of bacterial plasmids.** *Anal. Biochem.* 114:193-7, 1981. SUNY, Dept. Biol. Sci. & Ctr. Biol. Macromol., Albany, NY.
3	60	63	Hubbard S C & Ivatt R J. **Synthesis and processing of asparagine-linked oligosaccharides.** *Annu. Rev. Biochem.* 50:555-83, 1981. Mass. Inst. Technol., Ctr. Cancer Res., Cambridge, MA. *81-0549, *81-0370, *81-1152, *81-1092, *81-1748

A	B	C	Bibliographic Data
7	41	48	Hui D Y, Innerarity T L & Mahley R W. **Lipoprotein binding to canine hepatic membranes.** *J. Biol. Chem.* 256:5646-55, 1981. Univ. California, Cardiovasc. Res. Inst. & Dept. Pathol., San Francisco, CA. 82-0757
6	59	65	Hunkeler W, Mohler H, Pieri L, Polc P, Bonetti E P, Cumin R, Schaffner R & Haefely W. **Selective antagonists of benzodiazepines.** *Nature* 290:514-6, 1981. F. Hoffmann-La Roche & Co. Ltd., Pharmaceut. Res. Dept., Basel, Switzerland. 82-1361
11	37	48	Janossy G, Tidman N, Papageorgiou E S, Kung P C & Goldstein G. **Distribution of T lymphocyte subsets in the human bone marrow and thymus: an analysis with monoclonal antibodies.** *J. Immunol.* 126:1608-13, 1981. Royal Free Hosp., Sch. Med., London, UK; Ortho Pharmaceut. Corp., Immunobiol. Div., Raritan, NJ. *81-2489, *81-0425, *81-0304, *81-0819
17	62	79	Kamoun M, Martin P J, Hansen J A, Brown M A, Siadak A W & Nowinski R C. **Identification of a human T lymphocyte surface protein associated with the E-rosette receptor.** *J. Exp. Med.* 153:207-12, 1981. Hutchinson Cancer Res. Ctr.; Puget Sound Blood Ctr.; Univ. Washington, Sch. Med., Seattle, WA. 82-0953
4	59	63	Kappler J W, Skidmore B, White J & Marrack P. **Antigen-inducible, *H-2*-restricted, interleukin-2-producing T-cell hybridomas.** *J. Exp. Med.* 153:1198-214, 1981. Nat. Jewish Hosp. Res. Ctr., Dept. Med., Denver, CO. *81-0312, *81-0403, *81-2375, *81-1329, *81-0679
7	45	52	Kitamura N, Semler B L, Rothberg P G, Larsen G R, Adler C J, Dorner A J, Emini E A, Hanecak R, Lee J J, van der Werf S, Anderson C W & Wimmer E. **Primary structure, gene organization and polypeptide expression of poliovirus RNA.** *Nature* 291:547-53, 1981. SUNY, Sch. Med., Stony Brook; Brookhaven Nat. Lab., Dept. Biol., Upton, NY. 82-2152
0	58	58	Klein G. **The role of gene dosage and genetic transpositions in carcinogenesis.** *Nature* 294:313-8, 1981. Karolinska Inst., Dept. Tumor Biol., Stockholm, Sweden. 82-1434
5	56	61	Klein J, Juretic A, Baxevanis C N & Nagy Z A. **The traditional and a new version of the mouse *H-2* complex.** *Nature* 291:455-60, 1981. Max Planck Inst. Biol., Dept. Immunogenet., Tubingen, FRG. *81-1307, *81-1761, *81-2088, *81-1729, *81-0623
6	94	100	Kleinman H K, Klebe R J & Martin G R. **Role of collagenous matrices in the adhesion and growth of cells.** *J. Cell Biol.* 88:473-85, 1981. NIH, NIDR, Bethesda, MD; Univ. Texas, Med. Branch, Galveston, TX. *81-0125, *81-0594, *81-0598, *81-0042, *81-1215
14	36	50	Kung P C, Berger C L, Goldstein G, LoGerfo P & Edelson R L. **Cutaneous T cell lymphoma: characterization by monoclonal antibodies.** *Blood* 57:261-6, 1981. Ortho Pharmaceut. Corp., Div. Immunosci., Raritan, NJ; Columbia Univ., Coll. Phys. Surg., New York, NY. 82-0953
22	93	115	Ledbetter J A, Evans R L, Lipinski M, Cunningham-Rundles C, Good R A & Herzenberg L A. **Evolutionary conservation of surface molecules that distinguish T lymphocyte helper/inducer and cytotoxic/suppressor subpopulations in mouse and man.** *J. Exp. Med.* 153:310-23, 1981. Stanford Univ., Sch. Med., Stanford, CA. 81-1706, 82-0959
3	46	49	Limbird L E. **Activation and attenuation of adenylate cyclase.** *Biochem. J.* 195:1-13, 1981. Vanderbilt Univ., Sch. Med., Nashville, TN. *81-0690, *81-0097, *81-0067, *81-2565, *81-2056
16	35	51	MacMahon B, Yen S, Trichopoulos D, Warren K & Nardi G. **Coffee and cancer of the pancreas.** *N. Engl. J. Med.* 304:630-3, 1981. Harvard Univ., Sch. Publ. Hlth., Boston, MA. 82-1725
1	62	63	Masur H, Michelis M A, Greene J B, Onorato I, Vande Stouwe R A, Holzman R S, Wormser G, Brettman L, Lange M, Murray H W & Cunningham-Rundles S. **An outbreak of community-acquired *pneumocystis carinii* pneumonia.** *N. Engl. J. Med.* 305:1431-8, 1981. Cornell Univ., Dept. Med.; Rockefeller Univ., Dept. Med.; New York Univ., Dept. Med.; Long Island Jewish-Hillside Med. Ctr.; St. Luke's-Roosevelt Hosp. Ctr.; Bronx Vet. Admin. Med. Ctr.; Brooklyn Vet. Admin. Med. Ctr.; Memorial Sloan-Kettering Cancer Ctr., New York, NY. 82-1578
15	47	62	Mathey D G, Kuck K-H, Tilsner V, Krebber H-J & Bleifeld W. **Nonsurgical coronary artery recanalization in acute transmural myocardial infarction.** *Circulation* 63:489-97, 1981. Univ. Hosp. Eppendorf, Depts. Cardiol., Blood Coagulat. Disorders & Cardiac Vasc. Surg., Hamburg, FRG. 81-1518, 82-2230
20	47	67	Mathis D J & Chambon P. **The SV40 early region TATA box is required for accurate *in vitro* initiation of transcription.** *Nature* 290:310-5, 1981. Univ Strasbourg, Lab. Genet. Mol., Paris; Univ 184, Biol. Mol. Gen. Genet., & Inst. Chem. Biol., Facult. Med., Strasbourg, France. 81-0397, 82-0048
3	61	64	McKnight S L, Gavis E R, Kingsbury R & Axel R. **Analysis of transcriptional regulatory signals of the HSV thymidine kinase gene: identification of an upstream control region.** *Cell* 25:385-98, 1981. Carnegie Inst. Washington, Dept. Embryol., Baltimore, MD; Columbia Univ., Coll. Phys. Surg., New York, NY. *81-0397, *81-0002, *81-0655, *81-0366, *81-1877
7	83	90	Merrill C R, Goldman D, Sedman S A & Ebert M H. **Ultrasensitive stain for proteins in polyacrylamide gels shows regional variation in cerebrospinal fluid proteins.** *Science* 211:1437-8, 1981. NIH, NIMH, Bethesda, MD.
24	132	156	Messing J, Crea R & Seeburg P H. **A system for shotgun DNA sequencing.** *Nucl. Acid. Res.* 9:309-21, 1981. Univ. California, Dept. Bacteriol., Davis; Genentech Inc., Divs. Org. Chem. & Mol. Biol., San Francisco, CA. 81-0216, 82-3276
9	40	49	Mohandas T, Sparkes R S & Shapiro L J. **Reactivation of an inactive human X chromosome: evidence for X inactivation by DNA methylation.** *Science* 211:393-6, 1981. Harbor-Univ. California Med. Ctr., Torrance; Univ. California, Ctr. Hlth. Sci., Los Angeles, CA. 82-0107
22	96	118	Neel B G, Hayward W S, Robinson H L, Fang J & Astrin S M. **Avian leukosis virus-induced tumors have common proviral integration sites and synthesize discrete new RNAs: oncogenesis by promoter insertion.** *Cell* 23:323-34, 1981. Rockefeller Univ., New York, NY; Worcester Fdn. Exp. Biol., Shrewsbury, MA; Fox Chase Cancer Ctr., Inst. Cancer Res., Philadelphia, PA. 81-2745, 82-0273

A	B	C	Bibliographic Data
9	41	50	Neupert W & Schatz G. **How proteins are transported into mitochondria.** *Trends Biochem. Sci.* 6:1-4, 1981. Univ. Gottingen, Inst. Physiol. Chem., Gottingen, FRG; Univ. Basel, Biol. Ctr., Basel, Switzerland. 82-0745
16	39	55	Niggli V, Adunyah E S, Penniston J T & Carafoli E. **Purified (Ca^{2+}-Mg^{2+})-ATPase of the erythrocyte membrane.** *J. Biol. Chem.* 256:395-401, 1981. Swiss Fed. Inst. Technol., Lab. Biochem., Zurich, Switzerland; Mayo Fdn., Dept. Cell Biol., Rochester, MN. 81-1912, 82-0799
11	55	66	Pastan I H & Willingham M C. **Receptor-mediated endocytosis of hormones in cultured cells.** *Annu. Rev. Physiol.* 43:239-50, 1981. NIH, NCI, Bethesda, MD.
17	70	87	Payne G S, Courtneidge S A, Crittenden L B, Fadly A M, Bishop J M & Varmus H E. **Analysis of avian leukosis virus DNA and RNA in bursal tumors: viral gene expression is not required for maintenance of the tumor state.** *Cell* 23:311-22, 1981. Univ. California, Depts. Biochem. Biophys. & Microbiol. Immunol., San Francisco, CA; USDA, SEA Region Poultry Res. Lab., East Lansing, MI. 81-2745, 82-0273
14	40	54	Pilkis S J, El-Maghrabi M R, Pilkis J, Claus T H & Cumming D A. **Fructose 2, 6-bisphosphate.** *J. Biol. Chem.* 256:3171-4, 1981. Vanderbilt Univ., Depts. Physiol. & Mol. Biol., Nashville, TN. 81-1852, 82-0225
5	47	52	Ploegh H L, Orr H T & Strominger J L. **Major histocompatibility antigens: the human (HLA-A, -B, -C) and murine (H-2K, H-2D) class I molecules.** *Cell* 24:287-99, 1981. Harvard Univ., Biol. Labs., Cambridge, MA. 82-0532
11	61	72	Poppema S, Bhan A K, Reinherz E L, McCluskey R T & Schlossman S F. **Distribution of T cell subsets in human lymph nodes.** *J. Exp. Med.* 153:30-41, 1981. Mass. Gen. Hosp., Dept. Pathol.; Harvard Univ., Sch. Med.; Sidney Farber Cancer Inst., Div. Tumor Immunol., Boston, MA. 82-1477
13	39	52	Poston L, Sewell R B, Wilkinson S P, Richardson P J, Williams R, Clarkson E M, MacGregor G A & de Wardener H E. **Evidence for a circulating sodium transport inhibitor in essential hypertension.** *Brit. Med. J.* 282:847-9, 1981. King's Coll. Hosp., Liver Cardiac Unit; Charing Cross Hosp., Med. Sch., London, UK. 82-0661
20	35	55	Preston F E, Whipps S, Jackson C A, French A J, Wyld P J & Stoddard C J. **Inhibition of prostacyclin and platelet thromboxane A_2 after low-dose aspirin.** *N. Engl. J. Med.* 304:76-9, 1981. Royal Hallamshire Hosp., Depts. Haematol. & Surg., Sheffield, UK. 82-0408
19	66	85	Rentrop P, Blanke H, Karsch K R, Kaiser H, Kostering H & Leitz K. **Selective intracoronary thrombolysis in acute myocardial infarction and unstable angina pectoris.** *Circulation* 63:307-17, 1981. Univ. Gottingen, Med. Thorax Surg. Clin., Gottingen, FRG. 81-1518, 82-2230
16	38	54	Robins D M, Ripley S, Henderson A S & Axel R. **Transforming DNA integrates into the host chromosome.** *Cell* 23:29-39, 1981. Columbia Univ., Coll. Phys. Surg., New York, NY. 81-0366, 82-0136
3	49	52	Roos A & Boron W F. **Intracellular pH.** *Physiol. Rev.* 61:296-434, 1981. Washington Univ., Sch. Med., St. Louis, MO; Yale Univ., Sch. Med., New Haven, CT. *81-1016, *81-0485, *81-0202, *81-0080, *81-2228
23	85	108	Ruoslahti E, Engvall E & Hayman E G. **Fibronectin: current concepts of its structure and functions.** *Collagen Rel. Res.* 1:95-128, 1981. La Jolla Cancer Res. Fdn., La Jolla, CA. 81-0125, 82-0041
8	44	52	Saral R, Burns W H, Laskin O L, Santos G W & Lietman P S. **Acyclovir prophylaxis of herpes-simplex-virus infections.** *N. Engl. J. Med.* 305:63-7, 1981. Johns Hopkins Univ., Sch. Med., Baltimore, MD. 82-0872
10	49	59	Schlievert P M, Shands K N, Dan B B, Schmid G P & Nishimura R D. **Identification and characterization of an exotoxin from *Staphylococcus-aureus* associated with toxic-shock syndrome.** *J. Infec. Dis.* 143:509-16, 1981. Univ. California, Sch. Med., Los Angeles, CA; Ctrs. Dis. Control, Atlanta, GA. 82-1039
8	48	56	Sefton B M, Hunter T, Ball E H & Singer S J. **Vinculin: a cytoskeletal target of the transforming protein of Rous sarcoma virus.** *Cell* 24:165-74, 1981. Salk Inst., Tumor Vir. Lab., San Diego; Univ. California, Dept. Biol., La Jolla, CA. *81-0018, *81-0309, *81-0019, *81-1013, *81-0579
2	50	52	Shackelford D A, Mann D L, van Rood J J, Ferrara G B & Strominger J L. **Human B-cell alloantigens DC1, MT1, and LB12 are identical to each other but distinct from the HLA-DR antigen.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:4566-70, 1981. Harvard Univ., Biol. Labs., Cambridge, MA; NIH, NCI, Bethesda, MD; Leiden State Univ., Med. Ctr., Leiden, Netherlands; AVIS Bergamo; Gen. Prov. Hosp., Massa, Italy. 82-0526
15	46	61	Sharp P A. **Speculations on RNA splicing.** *Cell* 23:643-6, 1981. Mass. Inst. Technol., Ctr. Cancer Res. & Dept. Biol., Cambridge, MA. *81-0716, *81-0042, *81-0002, *81-2745
20	33	53	Shekelle R B, Shryock A M, Paul O, Lepper M, Stamler J, Liu S & Raynor W J. **Diet, serum cholesterol, and death from coronary heart disease.** *N. Engl. J. Med.* 304:65-70, 1981. Rush-Presbyterian-St. Luke's Med. Ctr., Dept. Prevent. Med.; Northwestern Univ., Sch. Med., Chicago, IL; Univ. Michigan, Sch. Nursing, Ann Arbor, MI; Harvard Univ., Sch. Med., Boston, MA. 82-0779
9	40	49	Shih C, Padhy L C, Murray M & Weinberg R A. **Transforming genes of carcinomas and neuroblastomas introduced into mouse fibroblasts.** *Nature* 290:261-4, 1981. Mass. Inst. Technol., Dept. Biol. & Ctr. Cancer Res., Cambridge, MA. 82-0273
14	34	48	Shimizu A, Takahashi N, Yamawaki-Kataoka Y, Nishida Y, Kataoka T & Honjo T. **Ordering of mouse immunoglobulin heavy chain genes by molecular cloning.** *Nature* 289:149-53, 1981. Osaka Univ., Med. Sch., Osaka, Japan. 81-0039, 82-0030
1	58	59	Siegal F P, Lopez C, Hammer G S, Brown A E, Kornfeld S J, Gold J, Hassett J, Hirschman S Z, Cunningham-Rundles C, Adelsberg B R, Parham D M, Siegal M, Cunningham-Rundles S & Armstrong D. **Severe acquired immunodeficiency in male homosexuals, manifested by chronic perianal ulcerative herpes simplex lesions.** *N. Engl. J. Med.* 305:1439-44, 1981. Mt. Sinai Med. Ctr., Divs. Clin. Immunol. & Infect. Dis.; Memorial Sloan-Kettering Cancer Ctr., Clin. Immunol. & Infect. Dis. Servs., New York, NY. 82-1578

A	B	C	Bibliographic Data
6	71	77	Steinbusch H W M. **Distribution of serotonin-immunoreactivity in the central nervous system of the rat-cell bodies and terminals.** *Neuroscience* 6:557-618, 1981. Univ. Nijmegen, Dept. Anat. Embryol., Nijmegen, Netherlands. 82-1339
11	56	67	Steinmetz M, Frelinger J G, Fisher D, Hunkapiller T, Pereira D, Weissman S M, Uehara H, Nathenson S & Hood L. **Three cDNA clones encoding mouse transplantation antigens: homology to immunoglobulin genes.** *Cell* 24:125-34, 1981. Calif. Inst. Technol., Div. Biol., Pasadena, CA; Yale Univ., Sch. Med., New Haven, CT; Yeshiva Univ., Albert Einstein Coll. Med., Bronx, NY. 82-0532
0	53	53	Steinmetz M, Moore K W, Frelinger J G, Sher B T, Shen F-W, Boyse E A & Hood L. **A pseudogene homologous to mouse transplantation antigens: transplantation antigens are encoded by eight exons that correlate with protein domains.** *Cell* 25:683-92, 1981. Calif. Inst. Technol., Div. Biol., Pasadena, CA; Memorial Sloan-Kettering Cancer Ctr., New York, NY. 82-0532
9	44	53	Stuber D & Bujard H. **Organization of transcriptional signals in plasmids pBR322 and pACYC184.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:167-71, 1981. Univ. Heidelberg, Dept. Mol. Genet., Heidelberg, FRG. *81-1302
10	92	102	Timonen T, Ortaldo J R & Herberman R B. **Characteristics of human large granular lymphocytes and relationship to natural killer and K cells.** *J. Exp. Med.* 153:569-82, 1981. NIH, NCI, Bethesda, MD. 82-3430
11	41	52	Tofte R W & Williams D N. **Toxic shock syndrome: clinical and laboratory features in 15 patients.** *Ann. Intern. Med.* 94:149-56, 1981. St. Paul-Ramsey Med. Ctr., Infect. Dis. Sect., St. Paul; St. Louis Park Med. Ctr., Infect. Dis. Sect., St. Louis Park, MN. 82-1039
6	43	49	Trowbridge I S & Omary M B. **Human cell surface glycoprotein related to cell proliferation is the receptor for transferrin.** *Proc. Nat. Acad. Sci. US—Biol. Sci.* 78:3039-43, 1981. Salk Inst. Biol. Studies, Dept. Cancer Biol., San Diego, CA. 82-2548
1	113	114	Vale W, Spiess J, Rivier C & Rivier J. **Characterization of a 41-residue ovine hypothalamic peptide that stimulates secretion of corticotropin and β-endorphin.** *Science* 213:1394-7, 1981. Salk Inst. Biol. Studies, Peptide Biol. Lab., La Jolla, CA. 82-1538
13	41	54	Valenzuela P, Quiroga M, Zaldivar J, Rutter W J, Kirschner M W & Cleveland D W. **Nucleotide and corresponding amino acid sequences encoded by α and β tubulin mRNAs.** *Nature* 289:650-5, 1981. Univ. California, Sch. Med., San Francisco, CA. 81-1252, 82-0167
24	47	71	Wang A H-J, Quigley G J, Kolpak F J, van der Marel G, van Boom J H & Rich A. **Left-handed double helical DNA: variations in the backbone conformation.** *Science* 211:171-6, 1981. Mass. Inst. Technol., Dept. Biol., Cambridge, MA; Univ. Leiden, Gorlaeus Labs., Leiden, Netherlands. 81-0287, 82-1071
13	35	48	Wedmore C V & Williams T J. **Control of vascular permeability by polymorphonuclear leukocytes in inflammation.** *Nature* 289:646-50, 1981. Royal Coll. Surg. England, Inst. Basic Med. Sci., London, UK. *81-3073, *81-0371, *81-1756, *81-1360, *81-0325
5	51	56	Weintraub H, Larsen A & Groudine M. **α-Globin-gene switching during the development of chicken embryos: expression and chromosome structure.** *Cell* 24:333-44, 1981. Hutchinson Cancer Res. Ctr.; Univ. Washington, Dept. Radiat. Oncol., Seattle, WA. 82-0096
16	37	53	Wiley D C, Wilson I A & Skehel J J. **Structural identification of the antibody-binding sites of Hong Kong influenza haemagglutinin and their involvement in antigenic variation.** *Nature* 289:373-8, 1981. Harvard Univ., Gibbs Lab., Cambridge, MA; Nat. Inst. Med. Res., London, UK. 81-0857, 82-1161
24	60	84	Wilson I A, Skehel J J & Wiley D C. **Structure of the haemagglutinin membrane glycoprotein of influenza virus at 3 resolution.** *Nature* 289:366-73, 1981. Harvard Univ., Gibbs Lab., Cambridge, MA; Nat. Inst. Med. Res., London, UK. 81-0857, 82-1161
16	67	83	Yanofsky C. **Attenuation in the control of expression of bacterial operons.** *Nature* 289:751-8, 1981. Stanford Univ., Dept. Biol. Sci., Stanford, CA. 82-0667
21	42	63	Yen S-H & Fields K L. **Antibodies to neurofilament, glial filament, and fibroblast intermediate filament proteins bind to different cell types of the nervous system.** *J. Cell Biol.* 88:115-26, 1981. Yeshiva Univ., Albert Einstein Coll. Med., Bronx, NY. 81-0579
12	57	69	Young R A, Hagenbuchle O & Schibler U. **A single mouse α-amylase gene specifies two different tissue-specific mRNAs.** *Cell* 23:451-8, 1981. Swiss Inst. Exp. Cancer Res., Lausanne, Switzerland. 82-2744

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

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.

* * * * *

My thanks to John Dale, Tom Di Julia, and Abby Grissom for their help in the preparation of this essay.

REFERENCES

1. **Garfield E.** The 1980 articles most cited in 1980 and 1981. 1. Life sciences. *Current Contents* (10):5-15, 7 March 1983.
2. ----------. The 1980 articles most cited in 1980 and 1981. 2. Physical sciences. *Current Contents* (20):5-16, 16 May 1983.
3. ----------. The 1980 chemistry articles most cited in 1980-1982. *Current Contents* (35):5-15, 29 August 1983.
4. ----------. The 1976 articles most cited in 1976 and 1977. Part I. Life sciences. *Essays of an information scientist*. Philadelphia: ISI Press, 1981. Vol. 4. p. 81-99. (Reprinted from: *Current Contents* (13):5-23, 26 March 1979.)
5. **Institute for Scientific Information.** *Index to research fronts in ISI/BIOMED 1983.* Philadelphia: ISI, 1983. 544 p.
6. **Garfield E.** 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. (Reprinted from: *Current Contents* (40):5-12, 6 October 1980 and (41):5-12, 13 October 1980.)
7. ----------. The number of biochemical articles is growing, but why also the number of references per article? *Essays of an information scientist*. Philadelphia: ISI Press, 1981. Vol. 4. p. 414-25. (Reprint of: Trends in biochemical literature. *Trends Biochem. Sci.* 4:N290-5, 1979.)
8. ----------. What do we know about depression? Part 2: diagnosis and treatment. *Current Contents* (20):5-12, 18 May 1981.
9. **Herbert W.** Test for depression called unreliable. *Sci. News* 123(21):326, 1983.