

Current Comments

Most-Cited Articles of the 1960s. 4. Clinical Research

Number 6

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With this essay, we conclude our study of the most-cited science articles of the 1960s. Previous essays have discussed highly cited articles in the physical sciences,¹ biochemistry and molecular biology,² and preclinical areas³ for that decade. Now we take a look at clinical research.

As I pointed out before, these lists were compiled from the *Science Citation Index*[®] (*SCI*[®]) data base for the years 1961 to 1978. It bears repeating that limiting the study to the 100 most-cited articles was arbitrary. The list could have been extended further if time and energy allowed. Furthermore, there has been no effort to identify purely clinical work. Rather, these are the papers, out of a group of 400 in this series, that are most readily classified as "clinical." Indeed, the relatively small percentage of papers from purely clinical journals emphasizes this artifact. Therefore, I do not mean to imply that the 100 articles shown in Figure 1 necessarily are the "best" clinical research articles of the 1960s. Nevertheless, I'm sure that many of these articles have made significant contributions to the development of their respective fields.

How do you separate articles in "clinical" medicine from other articles in medical research, especially when many of the papers appear in the same journals? You ask for help from experts, although eventually you make some arbitrary decisions. Even the decision to list all papers cited by the given threshold is arbitrary. In any case they were all heavily cited.

To discourage comparisons of citations to individual papers, we alphabetized the listings under each subject area. This is the same procedure we followed in the other essays in this series.

Each of the papers on this list was cited at least 345 times. Compare this to our list of the 100 most-cited preclinical papers. There, the least cited paper received 521 citations.³ Similarly, each article on our list of physical science papers received at least 500 citations.¹ Thus, it would appear that super-cited papers in clinical research receive fewer citations than do papers in the other categories in this series. On average, preclinical papers cite and are cited by more papers than are clinical papers. In biochemistry the average number of references per paper now exceeds 27.⁴

The average clinical article on our list received 644 citations. This means it was cited about 36 times per year during the 18-year period. By way of comparison, the average paper published in a journal covered by the *SCI* received 3.28 citations during that period.

The articles presented here were published in the 47 journals listed in Table 1. More than a quarter of the papers were published in just four journals: *Journal of Clinical Investigation*, *Journal of Experimental Medicine*, *Lancet*, and *New England Journal of Medicine*. All but two of the papers were written in English. The papers by M. Eggstein and H. Ehringer were written in German. The absence of journals like the *British Medical Journal (BMJ)* emphasizes the bias in this list. It is well-

Table 1: Journals that published the most-cited 1960s articles listed in Figure 1.

J. Clin. Invest.	10
J. Exp. Med.	6
Lancet	6
New Eng. J. Med.	6
J. Clin. Endocrin. Metab.	5
Proc. Nat. Acad. Sci. US Science	5
J. Am. Med. Ass.	4
J. Lab. Clin. Med.	3
Am. J. Clin. Pathol.	2
Am. J. Med.	2
Blood	2
Circulation	2
Clin. Chem. Acta	2
J. Appl. Physiol.	2
J. Clin. Pathol.	2
Klin. Wochenschr.	2
Nature	2
Pediatrics	2
Physiol. Rev.	2
Scand. J. Clin. Lab. Inv.	2
Acta Med. Scand.	1
Acta Physiol. Scand.	1
Adv. Immunol.	1
Am. Heart J.	1
Am. J. Psychiat.	1
Anal. Biochem.	1
Ann. Intern. Med.	1
Biochem. J.	1
Can. Med. Ass. J.	1
Circ. Res.	1
Endocrinology	1
Exp. Cell Res.	1
J. Allergy Clin. Immun.	1
J. Atheroscler. Res.	1
J. Bacteriol.	1
J. Immunol.	1
J. Neurol. Neurosurg. Psychiat.	1
J. Physiol.-London	1
Metabolism	1
Mod. Conc. Cardio. Dis.	1
Pharmacol. Rev.	1
Psychol. Monogr.	1
Psychol. Rep.	1
Prog. Allergy	1
Transplantation	1
Transplant. Rev.	1

known, for example, that *Lancet* attracts many important papers in medical genetics. In a future study, I will list the most-cited articles in *BMJ* and other clinically oriented journals.

Almost a quarter of the papers (23) were single-author works. Twenty-nine had two authors, 20 had three, 20 had four, four had five, and two had six authors. There were two with eight authors. Sixteen of the papers have appeared as *Citation Classics* in *Current Contents*[®].⁵

Twenty-four authors contributed two or more papers to the list. S.A. Berson, S.O. Freedman, P. Gold, and R.S. Yalow authored three papers. Two articles each were authored by P. Astrup, B.S. Blumberg, G.V.R. Born, G.C. Cotzias, K. Engel, S.M. Glick, G. Henle, and W. Henle. Also contributing two articles were C.W. Gottlieb, E. Haber, V. Herbert, O. Hornykiewicz, K. Jørgensen, K.S. Lau, A.R. Midgley, B.E.P. Murphy, J. Roth, O. Siggaard-Anderson, P.I. Terasaki, and T.B. Tomasi. A total of 239 authors appear on the list.

Seventy-six institutions are represented in this study. They are shown in Table 2, along with the number of authors who appear on our list of 100 papers. The number of papers from each institution is also indicated. Just seven institutions account for about 40 percent of the authors listed. Fifty-two of the 76 institutions are in the US. Nine institutions are in the UK, four are in Sweden, and three are in Canada. France, New Zealand, and the Federal Republic of Germany each have two institutions on the list. Denmark and Austria have one each.

McGill University and affiliated institutions in Montreal account for as many papers as the NIH! Two authors who contributed three papers to the list, P. Gold and S.O. Freedman, are affiliated with McGill University.

Three of the authors were Nobel prize winners. B.S. Blumberg won the prize in 1976 for his work on hepatitis. R.S. Yalow won the prize in 1977 for her work on radioimmunoassay. Both of these authors published highly cited papers before winning their awards. P.B. Medawar was presented the prize in 1960 for his work in acquired immunity. He continues to be highly cited both for his 1966 paper with R.H. Levey as well as for his earlier work.

The list is divided into 13 categories: immunology; endocrinology; cardiopulmonary medicine; clinical chemistry and pathology; hematology; cancer; psychiatry, psychology, and psychopharmacology; allergy; clinical genetics;

Table 2: Institutional affiliations of authors of the most-cited 1960s articles according to number of papers. The number of authors from each institution is indicated in parentheses.

National Institutes of Health		8 (24)
National Heart Institute	(9)	
Lab. Virol. & Immunol.	(6)	
National Institute of Arthritis & Metabolic & Digestive Diseases	(3)	
National Institute of Child Health & Human Development	(3)	
Department unspecified	(2)	
National Institute of Mental Health	(1)	
McGill University, Montreal, Canada		8 (22)
Royal Victoria Hospital	(11)	
McGill University Clinic, Montreal General Hospital	(7)	
Department Invest. Med.	(2)	
Department Physiol.	(2)	
University of California		6 (13)
School Med. Los Angeles	(8)	
San Francisco Med. Ctr.	(3)	
School Med. San Diego	(2)	
Harvard Medical School		6 (10)
Rockefeller University, New York, NY	4 (8)	
Univ. Pennsylvania Sch. Med., Philadelphia, PA	4 (4)	
Columbia Univ. Coll. Phys. & Surg., New York, NY	3 (5)	
Inst. Cancer Research, Philadelphia, PA	3 (8)	
Johns Hopkins Sch. Med., Baltimore, MD	3 (6)	
Massachusetts General Hosp.	3 (3)	**
Mt. Sinai Hospital, New York, NY	3 (8)	
Rigshospitalet, Copenhagen	3 (10)	
University of Washington, Seattle, WA	3 (10)	
Veteran's Hospital Radioisotope Service, New York, NY	3 (10)	
Brookhaven Nat. Lab., Upton, NY	2 (6)	
Children's Hosp. of Philadelphia	2 (3)	
Creighton Univ. Sch. Med., Omaha, NE	2 (2)	
New York Univ. Sch. of Medicine	2 (3)	
Postgraduate Med. Sch. of London	2 (5)	
Queen Mary Vet. Hosp., Montreal, Canada	2 (2)	**
Royal College of Surgeons of England, London	2 (3)	
SUNY	2 (5)	
New York	(3)	
Buffalo	(2)	
University of Colorado Med. Ctr.	2 (5)	
University of Lund, Sweden	2 (3)	
Univ. of Michigan, Ann Arbor, MI	2 (2)	
University of Minnesota Med. Sch.	2 (5)	
University of Vienna, Austria	2 (3)	
Bland-Sutton Inst. of Pathol., Middlesex Hosp., London	1 (3)	
Boston City Hospital	1 (1)	
Boston University Med. Sch.	1 (2)	
Peter Bent Brigham Hosp., Boston, MA	1 (4)	
Case Western Reserve Sch. Med., Cleveland, OH	1 (1)	
Children's Hosp. Med. Ctr., Boston, MA	1 (1)	
Christchurch Hosp., Christchurch, New Zealand	1 (1)	
City of Hope Med. Ctr., Duarte, CA	1 (3)	
Cleveland Clinic, Cleveland, OH	1 (2)	
F. Delafield Hosp., New York, NY	1 (1)	
Albert Einstein College Med., New York, NY	1 (2)	
Fitzsimmons Army Hosp., Denver, CO	1 (1)	
Hosp. Paul-Brousse, Villejuif, France	1 (4)	
Hôtel-Dieu Hosp., Montreal, Canada	1 (4)	
Inst. Gustav Roussy, Villejuif, France	1 (4)	
Jewish Hosp., New York, NY	1 (1)	
Kansas State Univ., Manhattan, KS	1 (1)	
King Gustaf V Research Inst. & Dept. Int. Med., Karolinska Inst., Stockholm, Sweden	1 (1)	
Med. Univ. Marburg, Fed. Rep. Germany	1 (1)	
Med. Univ. Tübingen, Fed. Rep. Germany	1 (1)	
National Institute Med. Res., London	1 (2)	
New York Blood Ctr., New York, NY	1 (1)	
New York Hosp./Cornell Med. Ctr., New York, NY	1 (1)	
Newton-Wellesley Hosp., Newton, MA	1 (3)	
Ohio State Univ. Coll. Med., Columbus, OH	1 (3)	
Presbyterian Hosp., New York, NY	1 (1)	
Queen Victoria Hosp., Sussex, UK	1 (1)	
Royston Hospital Lab., Hastings, New Zealand	1 (2)	
St. Mary's Hosp., London	1 (1)	
Tufts Univ. Sch. Med., Boston, MA	1 (1)	

Univ. of Cambridge, Cambridge, UK	1	(2)
Univ. of Conn., Storrs, CT	1	(1)
Univ. of Göteborg, Sweden	1	(1)
Univ. of Leeds, UK	1	(1)
Univ. of Miami Sch. Med.	1	(1)
Univ. of Minn. Hosp., Minneapolis, MN	1	(1)
Univ. of North Carolina Sch. of Med., Chapel Hill, NC	1	(1)
Univ. of Southern California Med. Sch., Los Angeles, CA	1	(2)
Univ. of Vermont Coll. Med., Burlington, VT	1	(2)
Univ. of Wisconsin, Madison, WI	1	(2)
Uppsala University, Sweden	1	(3)
US Public Health Service Hospital, New York, NY	1	(6)
VA Central Neuropsychiat. Res. Lab., Perry Point, MD	1	(1)
VA Hospital, Seattle, WA	1	(2)
VA Hospital, Houston, TX	1	(1)
Wellcome Res. Labs., Kent, UK	1	(1)
Willowbrook State School, New York, NY	1	(1)
Wistar Inst. Anat. & Biol., Phila., PA	1	(1)
Wood VA Hosp., Milwaukee, WI	1	(2)

*Second affiliation for a single authored paper.

**One of the authors represents a second affiliation for a single authored paper.

neurology; gastroenterology; and pediatrics. Three papers on the list do not fit neatly into any of the previous subject categories so they are described as miscellaneous.

Twenty-one papers on the list are from the field of immunology. Most-cited among them is the paper by K.K. Mittal and colleagues. That paper deals with organ transplantation, as do several other papers in this group.

Sixteen papers were from clinical endocrinology, including two papers on protein-binding by B.E.P. Murphy. The paper by C.N. Hales and P.J. Randle, which describes an immunoassay of insulin, received more than 2,000 citations. Only about 50 papers in the history of science have been cited more than 2,000 times.

Eleven papers fall within the category of clinical chemistry and pathology, including the most-cited paper on the list. D.S. Fredrickson, R.I. Levy, and R.S. Lees' "Fat Transport in Lipoproteins—An Integrated Approach to Mechanisms and Disorders" received 5,138 citations during the 18-year period. However, this article was published in five parts: part one receiving 1,241 citations, part two 937, part three 1,037, part four 953, and part five 970. The number of papers citing the article is far less than the number of citations because one paper could have cited all five parts. From a comparison

of the citations to the different parts, we estimate that approximately 1,800 different papers cited the article.

Fredrickson, Levy, and Lees' paper discussed two methods of separating lipoproteins, combinations of lipids and proteins. Levy has written, "One...of the reasons for the volume of citation received by our articles is that they drew attention to an important group of diseases [hyperlipoproteinemia] that are common and often potentially fatal."⁶

The field of cardiopulmonary medicine contributed 11 papers to the list, indicating the long-term clinical interest in heart diseases.

Nine papers on the list fall under the heading of hematology. Of note in this group are two papers by G.V.R. Born dealing with the aggregation of blood platelets. Born's 1962 paper introduced "aggregometry," a method for quantifying platelet reactions.

Eight papers were classified under the heading of cancer. The three papers on which P. Gold and S.O. Freedman appear as authors discuss cancer of the digestive system. Three other papers in this group discuss cancer of the lymphatic system.

Psychiatry, psychology, and psychopharmacology contributed six papers to the list. Four of them also appeared on our list of the 100 most-cited articles selected from our *Social Sciences Citation Index*TM (SSCITM).⁷ This is not sur-

prising since both the *SCI* and the *SSCI* cover psychiatry and experimental psychology.

Five clinical genetics papers appear on the list. The most-cited among them is P.S. Moorhead's paper, which describes a method for preparing the chromosomes of white blood cells for study.

Three allergy papers appear here. The article by L.M. Lichtenstein and A.G. Osler discusses the release of histamine from white blood cells upon exposure to pollen antigen. A. Szentivanyi's paper is on bronchial asthma. The paper by L. Wide and colleagues discusses allergy diagnosis.

There are three papers under neurology, including two by G.C. Cotzias on the treatment of Parkinson's disease. The fields of gastroenterology and pediatrics each contributed two papers to the list.

We hope that these studies of the scientific literature of the 1960s will provide students and others with a useful reminder of some of the work of that decade that has had particularly long-lasting impact. Biomedical research is a large-scale activity. To provide a complete picture of just the high-impact work, one would have to list several thousand articles. For this reason, I look forward to the publication of our

Atlas of Science.⁸ In it, we hope to identify almost every significant paper in every field. The first installment of this *Atlas* is scheduled for completion during the coming year. Not only will key papers and clusters be identified, but they will be briefly "reviewed" by qualified scientists.

There has been some speculation that the change in research funding in the US may have shifted the balance of American impact on international science. Of the 400 papers in our studies of the 1960s, 73 percent were authored by Americans. It will be interesting to observe whether there is a significant change in the percentage of superstar papers published by American scientists in the 1970s. Alternatively, one would hope that larger commitments to basic research in other countries may have increased their contribution of superstar papers enough to affect their percentage. Science is international, and breakthroughs are welcome wherever they occur. These questions will be the subject of future investigations at ISI®.

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REFERENCES

1. Garfield E. Most-cited articles of the 1960s. 1. Physical sciences. *Current Contents* (21):5-15, 21 May 1979.
2. Most-cited articles of the 1960s. 2. Biochemistry and molecular biology. *Current Contents* (35):5-14, 27 August 1979.
3. Most-cited articles of the 1960s. 3. Preclinical basic research. *Current Contents* (5):5-13, 4 February 1980.
4. Trends in biochemical literature. *Trends Biochem. Sci.* 4(12):N290-5, 1979.
5. Introducing *Citation Classics*: the human side of scientific reports. *Current Contents* (1):5-6, 3 January 1977.
6. Levy R I. *Citation Classics*. Fat transport in lipoproteins—an integrated approach to mechanisms and disorders. *Current Contents* (3):11, 16 January 1978.
7. Garfield E. The 100 articles most-cited by social scientists, 1969-1977. *Current Contents* (32):5-14, 7 August 1978.
8. ISI's *Atlas of Science* may help students in choice of career in science. *Current Contents* (29):5-11, 21 July 1975. (Reprinted in: Garfield E. *Essays of an information scientist*. Philadelphia: ISI Press, 1977. Vol. 2. p. 311-2.)

CLINICAL ENDOCRINOLOGY

- 448 **Caball G F, Herrera M G, Morgan A P, Soeldner J S, Steinke J, Levy P L, Reichard G A & Kipnis D M.** Hormone-fuel interrelationships during fasting. *J. Clin. Invest.* 45:1751-69, 1966. Harvard Med. Sch., E.P. Joslin Res. Lab., Dept. Med. & Surg. & P.B. Brigham Hosp. and Diabetes Fdn., Inc., Boston, MA
- 1112 **Heber E, Koerner T, Page L B, Klibanski B & Purnode A.** Application of a radioimmunoassay for angiotensin I to the physiologic measurements of plasma renin activity in normal human subjects. *J. Clin. Endocrinol. Metab.* 29:1349-55, 1969. Harvard Med. Sch., Dept. Med. & Mass. Gen. Hosp., Med. Serv., Cardiac Unit, Boston, MA; Tufts Univ. Sch. Med. & Newton-Wellesley Hosp., Med. Serv., Newton, MA
- 500 **Hägglund J.** An improved method for fluorimetric determination of small amounts of adrenaline and noradrenaline in plasma and tissues. *Acta Physiol. Scand.* 59:242-54, 1963. Univ. Goteborg, Dept. Pharmacol., Sweden
- 2058 **Hales C N & Randle P J.** Immunoassay of insulin with insulin-antibody precipitate. *Biochem. J.* 88:137-46, 1963. Univ. Cambridge, Dept. Biochem., Cambridge, UK
- 1145 **Herbert V¹, Lau K S¹, Gottlieb C W¹ & Bleicher S J².** Coated charcoal immunoassay of insulin. *J. Clin. Endocrinol. Metab.* 25:1375-84, 1965. (1) Mount Sinai Hosp., Dept. Hematol. & (2) Jewish Hosp. Brooklyn, Metab. Res. Unit, New York, NY
- 1180 **Mattigley D.** A simple fluorimetric method for the estimation of free 11-hydroxycorticoids in human plasma. *J. Clin. Pathol.* 15:374-9, 1962. Postgrad. Med. Sch., Dept. Med., London, UK [Citation Classics. *Current Contents/CP* (8):14, 19 February 1979.]
- 444 **Midgley A R.** Radioimmunoassay for human follicle-stimulating hormone. *J. Clin. Endocrinol. Metab.* 27:295-9, 1967. Univ. Michigan, Dept. Pathol., Ann Arbor, MI
- 610 **Midgley A R.** Radioimmunoassay: a method for human chorionic gonadotropin and human luteinizing hormone. *Endocrinology* 79:10-18, 1966. Univ. Michigan, Dept. Pathol., Ann Arbor, MI
- 458 **Murphy B E P & Pattee C J.** Determination of thyroxine utilizing the property of protein-binding. *J. Clin. Endocrinol. Metab.* 24:187-96, 1964. Queen Mary Vet. Hosp., Clin. Invest. Unit. & McGill Univ., Dept. Invest. Med., Montreal, Canada
- 1549 **Murphy B E P.** Some studies of the protein-binding of steroids and their application to the routine micro and ultramicro measurement of various steroids in body fluids by competitive protein-binding radioassay. *J. Clin. Endocrinol. Metab.* 27:973-90, 1967. McGill Univ., Dept. Invest. Med. & Queen Mary Vet. Hosp., Invest. Unit, Montreal, Canada
- 391 **Odeh W D, Ross G T & Rayford P L.** Radioimmunoassay for luteinizing hormone in human plasma or serum: physiological studies. *J. Clin. Invest.* 46:248-54, 1967. NIH, NICHHD, Endocrin. Metab. Br., Bethesda, MD
- 494 **Porte D, Graber A L, Kazuya T & Williams R H.** The effect of epinephrine on immunoreactive insulin levels in man. *J. Clin. Invest.* 45:228-36, 1966. Univ. Wash., Dept. Med., Seattle, WA
- 767 **Roth J, Glick S M, Yalow R S & Berson S A.** Hypoglycemia: a potent stimulus to secretion of growth hormone. *Science* 140:987-8, 1963. VA Hosp., Radioisotope Serv., New York, NY
- 594 **Roth J, Glick S M, Yalow R S & Berson S A.** Secretion of human growth hormone: physiologic and experimental modification. *Metabolism* 12:577-9, 1963. VA Hosp., Radioisotope Serv., New York, NY
- 345 **Salans L B, Kralite J L & Hirsch J.** The role of adipose cell size and adipose tissue insulin sensitivity in the carbohydrate intolerance of human obesity. *J. Clin. Invest.* 47:153-65, 1968. Rockefeller Univ., New York, NY
- 1368 **Yalow R S & Berson S A.** Immunoassay of endogenous plasma insulin in man. *J. Clin. Invest.* 39:1157-75, 1960. VA Hosp., Radioisotope Serv., New York, NY [Citation Classics. *Current Contents* (14):9, 4 April 1977.]

CLINICAL CHEMISTRY AND PATHOLOGY

- 1211 **Szzer A W, Kirby W M M, Sherrin J C & Turek M.** Antibiotic susceptibility testing by a standardized single disk method. *Am. J. Clin. Pathol.* 45:493-6, 1966. Univ. Washington Sch. Med., Depts. Microbiol. & Med., Seattle, WA
- 702 **Boucher R, Veyrat R, de Chazelles J & Genest J.** New procedures for measurement of human plasma angiotensin and renin activity levels. *Can. Med. Ass. J.* 90:194-201, 1964. Hôpital-Dieu Hosp., Clin. Res. Dept., Montreal, Canada [Citation Classics. *Current Contents* (2):13, 9 January 1978.]
- 460 **Carbena L A.** Determination of serum triglycerides. *J. Atheroscler. Res.* 3:334-6, 1963. King Gustaf V Res. Inst. & Dept. Internal Med., Karolinska Inst., Stockholm, Sweden [Citation Classics. *Current Contents/LS* (2):10, 8 January 1979.]
- 509 **Duncombe W G.** The colorimetric micro-determination of non-esterified fatty acids in plasma. *Clin. Chem. Acta* 9:122-5, 1964. Wellcome Res. Lab., Kent, UK
- 593 **Eggstein M & Kreutz F H.** Eine neue bestimmung der neutralfette im blutserum und gewebe. [New method for the determination of neutral fats in blood serum and tissue.] *Klin. Wochenschr.* 44:262-7, 1966. Med. Univ. Tubingen & Med. Univ. Marburg, FRG
- 5138 **Fredrickson D S¹, Levy R I¹ & Lee R S².** Fat transport in lipoproteins—an integrated approach to mechanisms and disorders. *New Eng. J. Med.* 276:34-44; 94-103; 148-56; 215-25; 273-81, 1967. (1) NIH, NHI, Lab. Molec. Dis., Bethesda, MD & (2) Rockefeller Univ., New York, NY [Citation Classics. *Current Contents* (3):11, 16 January 1978.]

Figure 1: 100 most-cited articles of the 1960s in clinical medicine. Authors' affiliations follow each citation. If an article has appeared as a *Citation Classic*, a reference follows the author affiliation.

**Total
Citations
1961-1978**

Bibliographic Data

IMMUNOLOGY

- 447 **Bach F H & Voynow N K.** One-way stimulation in mixed leukocyte cultures. *Science* 153:545-7, 1966. Univ. Wisconsin, Dept. Med. Genet. & Dept. Med., Madison, WI
- 766 **Bloom B R & Bennett B.** Mechanism of a reaction *in vitro* associated with delayed-type hypersensitivity. *Science* 153:80-2, 1966. Albert Einstein Coll. Med., Dept. Microbiol. Immunol. & Dept. Pathol., New York, NY [Citation Classics. *Current Contents/LS* (4):12, 22 January 1979.]
- 410 **Blumberg B S, Gerstley B J S, Hangerford D A, London W T & Satalick A I.** A serum antigen (Australia antigen) in Down's syndrome, leukemia, and hepatitis. *Ann. Intern. Med.* 66:924-31, 1967. Inst. Cancer Res., Phila., PA
- 528 **Blumberg B S¹, Alter H J² & Vinnich S².** A "new" antigen in leukemia sera. *J. Am. Med. Ass.* 191:541-6, 1965. (1) Inst. Cancer Res., Phila., PA & (2) NIH, Bethesda, MD [Citation Classics. *Current Contents/LS* (51):14, 17 December 1979.]
- 421 **Claman H N & Chaperon E A.** Immunologic complementation between thymus and marrow cells—a model for the two-cell theory of immunocompetence. *Transplant. Rev.* 1:92-113, 1969. Univ. Colorado Med. Ctr., Div. Clin. Immunol., Denver, CO & Creighton Univ. Sch. Med., Dept. Microbiol., Omaha, NE
- 450 **Clyde W A.** Mycoplasma species identification based upon growth inhibition by specific antisera. *J. Immunol.* 92:958-65, 1964. Univ. North Carolina Sch. Med., Dept. Pediat., Chapel Hill, NC
- 465 **David J R.** Delayed hypersensitivity *in vitro*: its mediation by cell-free substances formed by lymphoid cell-antigen interaction. *Proc. Nat. Acad. Sci. US* 56:72-7, 1966. New York Univ. Sch. Med., Dept. Med., New York, NY
- 445 **Koffler D, Schur P H & Kunkel H G.** Immunological studies concerning the nephritis of systemic lupus erythematosus. *J. Exp. Med.* 126:607-23, 1967. Rockefeller Univ. & Mt. Sinai Sch. Med., Dept. Pathol., New York, NY
- 382 **Krugman S¹, Giles J P¹ & Hammond J².** Infectious hepatitis. *J. Am. Med. Ass.* 200:365-73, 1967. (1) NYU Sch. Med., Dept. Pediat. & (2) Willowbrook State Sch., New York, NY
- 526 **Levey R H & Medawar P B.** Nature and mode of action of antilymphocytic antiserum. *Proc. Nat. Acad. Sci. US* 56:1100-7, 1966. Nat. Inst. Med. Res., London, UK
- 803 **Mittal K K, Mickey M R, Singal D P & Terasaki P I.** Serotyping for homotransplantation. 18. Refinement of microdroplet lymphocyte cytotoxicity test. *Transplantation* 6:913-27, 1968. Univ. Calif. Sch. Med., Dept. Surg., Dept. Biomath., Los Angeles, CA [Citation Classics. *Current Contents/LS* (26):14, 25 June 1979.]
- 414 **Park B H, Fikrig S M & Smithwick E M.** Infection and nitroblue-tetrazolium reduction by neutrophils. *Lancet* 2:532-4, 1968. SUNY, Dept. Pediat., New York, NY
- 396 **Pearns G¹, Lycette R R¹ & Fitzgerald P H².** Tuberculin-induced mitosis in peripheral blood leucocytes. *Lancet* 1:637-8, 1963. (1) Royston Hosp. Lab., Hastings & (2) Christchurch Hosp., Br. Emp. Cancer Campaign, Cytogen. Unit, Christchurch, New Zealand
- 655 **Prince A M.** An antigen detected in the blood during the incubation period of serum hepatitis. *Proc. Nat. Acad. Sci. US* 60:814-21, 1968. NY Blood Ctr., Lab. Virol. & NY Hosp./Cornell Med. Ctr., Dept. Pathol., New York, NY
- 433 **Shmone M.** Graft versus host reactions. Their natural history, and applicability as tools of research. *Prog. Allergy* 6:349-467, 1962. Queen Victoria Hosp., McIndoe Memorial Res. Unit, Blond Labs., East Grinstead, Sussex, UK
- 418 **Soborg M & Bendixen G.** Human lymphocyte migration as a parameter of hypersensitivity. *Acta Med. Scand.* 181:247-56, 1967. Rigshospitalet, Med. Depts., Copenhagen, Denmark
- 409 **Stewart G L, Parkman P D, Hepps H E, Douglas R D, Hamilton J P & Meyer H M.** Rubella-virus hemagglutination-inhibition test. *New Eng. J. Med.* 276:554-7, 1967. NIH, Lab. Viral Immunol., Div. Biol. Stds., USPHS, Bethesda, MD
- 411 **Stiehm ER & Fudenberg H H.** Serum levels of immune globulins in health and disease: a survey. *Pediatrics* 37:715-27, 1966. Univ. Calif. Sch. Med., Dept. Pediat. & Hematol. Unit, Dept. Med., San Francisco, CA [Citation Classics. *Current Contents/CP* (51):14, 17 December 1979.]
- 533 **Terasaki P I & McClelland J D.** Microdroplet assay of human serum cytotoxins. *Nature* 204:998-1000, 1964. Univ. Calif. Sch. Med., Dept. Surg., Los Angeles, CA
- 657 **Tomasi T B, Tan E M, Solomon A & Prendergast R A.** Characteristics of an immune system common to certain external secretions. *J. Exp. Med.* 121:101-24, 1965. Univ. Vermont Coll. Med., Div. Exp. Med., Burlington, VT & Rockefeller Univ., New York, NY
- 481 **Tomasi T B & Blenkestock I.** Secretory immunoglobulins. *Adv. Immunol.* 9:1-96, 1968. SUNY, Buffalo, NY

- 384 **Laurell C B & Eriksson S.** The electrophoretic α_1 -globulin pattern of serum in α_1 -antitrypsin deficiency. *Scand. J. Clin. Lab. Invest.* 15:132-40, 1963. Malmö Gen. Hosp., Univ. Lund, Depts. Clin. Chem. & Int. Med., Malmö, Sweden
- 428 **Pisaao J J, Croat J R & Abraham D.** Determination of 3-methoxy-4-hydroxymandelic acid in urine. *Clin. Chim. Acta* 7:285-91, 1962. NIH, NHI, Lab. Clin. Bioch. & Sect. Exp. Therapeut., Bethesda, MD
- 507 **Rozalki S B.** An improved procedure for serum creatine phosphokinase determination. *J. Lab. Clin. Med.* 69:696-705, 1967. St. Mary's Hosp., London, UK
- 449 **Sjgaard-Andersen O, Engel K, Jørgensen K & Astrup P.** A micro method for determination of pH, carbon dioxide tension, base excess and standard bicarbonate in capillary blood. *Scand. J. Clin. Lab. Inv.* 12:172-6, 1960. Rigshospitalet, Dept. Clin. Chem., Copenhagen, Denmark
- 464 **Smith T W, Butler V P & Haber E.** Determination of therapeutic and toxic serum digoxin concentrations by radioimmunoassay. *New Eng. J. Med.* 281:1212-16, 1969. Mass. Gen. Hosp., Med. Serv., Cardiac Unit; Harvard Med. Sch., Dept. Med., Boston, MA & Columbia Univ. Coll. Surg. Phys., Dept. Med., New York, NY [Citation Classics. *Current Contents/CP* (47):14, 19 November 1979.]

CARDIOLOGY AND PULMONARY MEDICINE

- 407 **Bell W C, Stewart P B, Newsham L G S & Bates D V.** Regional pulmonary function studied with xenon. *J. Clin. Invest.* 41:519-31, 1962. Royal Victoria Hosp. & McGill Univ., Joint Cardioresp. Serv. & Dept. Radiol., Montreal, Canada
- 400 **Berns R M.** Regulation of coronary blood flow. *Physiol. Rev.* 44:1-29, 1964. Case Western Reserve Univ. Sch. Med., Dept. Physiol., Cleveland, OH
- 487 **Dodge H T, Sandler H, Ballew D W & Lord J D.** The use of biplane angiocardiology for the measurement of left ventricular volume in man. *Am. Heart J.* 60:762-76, 1960. VA Hosp., Med. Serv. & Univ. Wash. Sch. Med., Dept. Med., Seattle, WA
- 545 **Kory R C¹, Callahan R¹, Boren H G² & Syner J C³.** The Veterans Administration-Army cooperative study of pulmonary function. *Am. J. Med.* 30:243-58, 1961. (1) Wood VA Hosp., Milwaukee, WI. (2) VA Hosp., Houston, TX & (3) Fitzsimmons Army Hospital, Denver, CO
- 409 **Kouwenhoven W B, Jude J R & Kalkreuth G G.** Closed-chest cardiac massage. *J. Am. Med. Ass.* 173:1064-7, 1960. Johns Hopkins Univ. Sch. Med., Baltimore, MD
- 394 **Milic-Emili J, Henderson J A M, Dolovich M B, Trop D & Kaneko K.** Regional distribution of inspired gas in the lung. *J. Appl. Physiol.* 21:749-59, 1966. Royal Victoria Hosp. & McGill Univ., Joint Cardioresp. Serv., Montreal, Canada
- 547 **Rudolph A M & Heymann M A.** The circulation of the fetus *in utero*. *Circ. Res.* 21:163-84, 1967. Univ. Calif., SF Med. Ctr., Cardiovas. Res. Unit & Dept. Pediat., San Francisco, CA
- 665 **Scherlag B J, Lau S H, Helfant R H, Berkowitz W D, Stein E & Damato A N.** Catheter technique for recording His bundle activity in man. *Circulation* 39:13-8, 1969. USPHS Hosp., Cardiopulmonary Lab., New York, NY
- 640 **Severinghaus J W.** Blood gas calculator. *J. Appl. Physiol.* 21:1108-16, 1966. Univ. Calif. Med. Sch., Dept. Anesthes. & Cardiovas. Res. Inst., San Francisco, CA
- 480 **Soares F M & Shiley E K.** Cine coronary arteriography. *Modern Conc. Cardiov. Dis.* 31:735-8, 1962. Cleveland Clin., Dept. Pediat. Cardiol. & Cardiac Lab., Cleveland, OH
- 476 **Webster A M, Harris W S & Schonfeld C D.** Systolic time intervals in heart failure in man. *Circulation* 37:149-58, 1968. Ohio State Univ. Coll. Med., Dept. Med., Columbus, OH

HEMATOLOGY

- 485 **Aster R H & Jandl J H.** Platelet sequestration in man. Methods. *J. Clin. Invest.* 43:843-55, 1964. Boston City Hosp., Thorndike Mem. Lab., Harvard Med. Serv. & Harvard Med. Sch., Dept. Med., Boston, MA
- 529 **Baba B, Vas M R & Lowenstein L.** The development of large immature mononuclear cells in mixed leukocyte cultures. *Blood* 23:108-16, 1964. Royal Victoria Hosp. & McGill Univ., Dept. Med., Div. Hematol., Montreal, Canada [Citation Classics. *Current Contents/CP* (11):14, 12 March 1979.]
- 514 **Bentler E, Duron O & Kelly B M.** Improved method for the determination of blood glutathione. *J. Lab. Clin. Med.* 61:882-8, 1963. City of Hope Med. Ctr., Dept. Med., Duarte, CA
- 1035 **Born G V R.** Aggregation of blood platelets by adenosine diphosphate and its reversal. *Nature* 194:927-9, 1962. Royal College Surgeons, Dept. Pharmacol., London, UK [Citation Classics. *Current Contents* (37):8, 12 September 1977.]
- 629 **Born G V R & Cross M J.** The aggregation of blood platelets. *J. Physiol.-London* 168:178-94, 1963. Royal College Surgeons, Dept. Pharmacol., London, UK
- 468 **Gottlieb C, Lau K S, Wasserman L R & Herbert V.** Rapid charcoal assay for intrinsic factor (IF), gastric juice unsaturated B₁₂ binding capacity antibody to IF, and serum unsaturated B₁₂ binding capacity. *Blood* 25:875, 1965. Mount Sinai Hosp., Dept. Hematol., New York, NY
- 527 **Proctor R R & Rapoport S I.** The partial thromboplastin time with kaolin. *Am. J. Clin. Pathol.* 36:212-9, 1961. Univ. Southern Calif. Med. Sch., Los Angeles, CA
- 517 **Salzman E W.** Measurement of platelet adhesiveness. *J. Lab. Clin. Med.* 62:724-35, 1963. Harvard Med. Sch., Dept. Surg. & Mass. Gen. Hosp., Surg. Services, Boston, MA

- 449 **Waters A H, Molin D L, Pope J & Towler T.** Studies on the folic acid activity of human serum. *J. Clin. Pathol.* 14:335-44, 1961. Postgrad. Med. Sch. London, Dept. Hematol., UK

CANCER

- 524 **Epstein M A, Achong B G & Barr Y M.** Virus particles in cultured lymphoblasts from Burkitt's lymphoma. *Lancet* 1:702-3, 1964. Bland-Sutton Inst. Pathol., Middlesex Hosp. Med. Sch., London, UK [Citation Classics. *Current Contents/LS* (14):10, 2 April 1979.]
- 679 **Gold P & Freedman S O.** Demonstration of tumor-specific antigens in human colonic carcinomata by immunological tolerance and absorption techniques. *J. Exp. Med.* 121:439-62, 1965. McGill Univ. Clin., Montreal Gen. Hosp. & McGill Univ., Dept. Physiol., Montreal, Canada
- 731 **Gold P & Freedman S O.** Specific carcinoembryonic antigens of the human digestive system. *J. Exp. Med.* 122:467-81, 1965. McGill Univ. Clin., Montreal Gen. Hosp. & McGill Univ., Dept. Physiol., Montreal, Canada
- 755 **Henle G & Henle W.** Immunofluorescence in cells derived from Burkitt's lymphoma. *J. Bacteriol.* 91:1248-56, 1966. Children's Hosp. Phila., Virus Lab. & Univ. Penn., Sch. Med., Phila., PA
- 551 **Henle G, Henle W & Diehl V.** Relation of Burkitt's tumor-associated herpes-type virus to infectious mononucleosis. *Proc. Nat. Acad. Sci. US* 59:94-101, 1968. Children's Hosp. Phila., Virus Lab. & Univ. Penn., Sch. Med., Phila., PA
- 454 **Mathé G, Amler J L, Schwarzenberg L, Schneider M, Cattani A, Schlumberger J R, Hayat M & DeVassal F.** Active immunotherapy for acute lymphoblastic leukaemia. *Lancet* 1:697-9, 1969. Hosp. Paul-Brousse, Inst. Cancerol. Immunogenet. & Inst. Gustave Roussy, Dept. Hematol., Villejuif, France
- 537 **Osserman E F & Lawlor D P.** Serum and urinary lysozyme (muramidase) in monocytic and monomyelocytic leukemia. *J. Exp. Med.* 124:921-51, 1966. Columbia Univ. Coll. Physicians & Surgeons, Dept. Med. & F. Delafield Hosp., New York, NY
- 505 **Thomson D M P, Krupcy J, Freedman S O & Gold P.** The radioimmunoassay of circulating carcinoembryonic antigen of the human digestive system. *Proc. Nat. Acad. Sci. US* 64:161-7, 1969. McGill Univ. Clin., Montreal Gen. Hosp., Canada

PSYCHIATRY, PSYCHOLOGY, AND PSYCHOPHARMACOLOGY

- 612 **Hamilton M.** A rating scale for depression. *J. Neurol. Neurosurg. Psychiat.* 23:56-62, 1960. Univ. Leeds, Dept. Psychiat., Leeds, UK
- 776 **Hornykewicz O.** Dopamine (3-hydroxytyramine) and brain function. *Pharmacol. Rev.* 18:925-64, 1966. Univ. Vienna, Dept. Pharmacol., Vienna, Austria
- 409 **Laragh J H, Angers M, Kelly W G & Lieberman S.** Hypotensive agents and pressor substances. *J. Am. Med. Ass.* 174:234-40, 1960. Columbia Univ., Coll. Physicians & Surgeons, Depts. Med., Ob. Gyn., Biochem. & Presbyterian Hosp., New York, NY [Citation Classics. *Current Contents/CP* (35):16, 27 August 1979.]
- 613 **Overall J E¹ & Gorham D R².** The brief psychiatric rating scale. *Psychol. Rep.* 10:799-812, 1962. (1) Kansas State Univ., Manhattan, KS & (2) VA Central Neuropsychiat. Res. Lab., Perry Point, MD [Citation Classics. *Current Contents/S&BS* (2):10, 8 January 1979.]
- 488 **Rotter J B.** Generalized expectancies for internal versus external control of reinforcement. *Psych. Monogr.* 80:1-28, 1966. Univ. Conn., Storrs, CT
- 512 **Schädkraut J J.** The catecholamine hypothesis of affective disorders: a review of supporting evidence. *Am. J. Psychiat.* 122:509-22, 1965. NIH, NIMH, Lab. Clin. Sci., Bethesda, MD

CLINICAL GENETICS

- 432 **Baehner R L¹ & Nathan D G².** Quantitative nitroblue tetrazolium test in chronic granulomatous disease. *New Eng. J. Med.* 278:971-6, 1968. (1) Children's Hosp. Med. Ctr., Hematol. Res. Lab., Dept. Med. & (2) Harvard Med. Sch., Dept. Pediat., Boston, MA
- 395 **Lesch M¹ & Nyhan W L².** A familial disorder of uric acid metabolism and central nervous system function. *Am. J. Med.* 36:561-70, 1964. (1) Johns Hopkins Univ. Sch. Med., Dept. Pediat., Baltimore, MD & (2) Univ. Miami Sch. Med., Miami, FL
- 3102 **Moorhead P S¹, Nowell P C², Mellman W J³, Battlra D M⁴ & Hungerford D A⁴.** Chromosome preparations of leukocytes cultured from human peripheral blood. *Exp. Cell Res.* 20:613-6, 1960. (1) Wistar Inst. Anat. Biol.; (2) Univ. Penn., Dept. Pathol., Sch. Med.; (3) Univ. Penn. Hosp., Dept. Pediat. & (4) Inst. Cancer Res., Phila., PA
- 409 **Okada S & O'Brien J S.** Tay-Sachs disease: generalized absence of a beta-D-N-acetylhexosaminidase component. *Science* 165:698-700, 1969. Univ. Calif. San Diego, Sch. Med., Dept. Neurosci., La Jolla, CA
- 506 **Seegmiller J E, Rosenbloom F M & Kelley W N.** Enzyme defect associated with a sex-linked human neurological disorder and excessive purine synthesis. *Science* 155:1682-4, 1967. NIH, NIAMDD, Sect. Human Bioc. Genet., Bethesda, MD

ALLERGY

- 444 Liebschutz L M & Osler A G. Studies on the mechanisms of hypersensitivity phenomena. Histamine release from human leukocytes by ragweed pollen antigen. *J. Exp. Med.* 120:507-30, 1964. Johns Hopkins Univ. Sch. Med., Dept. Microbiol. & Med., Baltimore, MD
- 389 Szentivanyi A. The beta adrenergic theory of the atopic abnormality in bronchial asthma. *J. Allergy Clin. Immunol.* 42:203-32, 1968. Creighton Univ. Sch. Med., Dept. Microbiol., Omaha, NE
- 432 Wide L¹, Boman H² & Johansson S G O³. Diagnosis of allergy by an *in-vitro* test for allergen antibodies. *Lancet* 2:1105-7, 1967. (1) Uppsala Univ. Hosp., Dept. Clin. Chem.; (2) Uppsala Univ., Inst. Biochem. & (3) Uppsala Univ. Hosp., Blood Ctr., Uppsala, Sweden

NEUROLOGY

- 420 Cotzias G C, Van Woert M H & Schiffer I M. Aromatic amino acids and modification of Parkinsonism. *New Eng. J. Med.* 276:374-9, 1967. Brookhaven Nat. Lab., Med. Res. Ctr., Upton, NY
- 522 Cotzias G C, Papavasiliou P S & Gellera R. Modification of Parkinsonism—chronic treatment with L-dopa. *New Eng. J. Med.* 280:337-45, 1969. Brookhaven Nat. Lab., Med. Res. Ctr., Upton, NY
- 565 Ehringer H & Hornykiewicz O. Verteilung von noradrenalin und dopamin (3-hydroxytyramin) im gehirn des menschen und ihr verhalten bei erkrankungen des extrapyramidalen systems. [Distribution of noradrenaline and dopamine (3-hydroxytyramine) in the human brain and their effect in disorders of the extrapyramidal system.] *Klin. Wochenschr.* 38:1236-9, 1960. Univ. Vienna, Vienna, Austria

GASTROENTEROLOGY

- 463 Adolphson W H & Szasz D M. The physicochemical basis of cholesterol gallstone formation in man. *J. Clin. Inv.* 47:1043-52, 1968. Boston Univ. Med. Sch., Dept. Med., Sect. Gastroenterol., Boston, MA
- 634 Dahlqvist A. Method for assay of intestinal disaccharidases. *Anal. Biochem.* 7:18-25, 1964. Univ. Lund. Dept. Physiol. Chem., Sweden [Citation Classics. *Current Contents/LS* (16):12, 16 April 1979.]

PEDIATRICS

- 433 Lubchenco L O, Hazleman C, Dressler M & Boyd E. Intrauterine growth as estimated from liveborn birth-weight data at 24 to 42 weeks of gestation. *Pediatrics* 32:793-800, 1963. Univ. Colorado Med. Ctr., Child Res. Council & Premature Infant Ctr., Dept. Pediat., Denver, CO
- 435 Qule P G, White J G, Holmes B & Good R A. *In vitro* bactericidal capacity of human polymorphonuclear leukocytes: diminished activity in chronic granulomatous disease of childhood. *J. Clin. Invest.* 46:668-79, 1967. Univ. Minn. Med. Sch., Depts. Pediat. & Microbiol., Minneapolis, MN

MISCELLANEOUS

- 530 Astrup P, Jørgensen K, Siggaard-Anderson O, Engel K. The acid-base metabolism. *Lancet* 1:1035-9, 1960. Rigshospitalet, Dept. Clin. Chem., Copenhagen, Denmark
- 435 Dirks J H, Chikara W J, Berthier R W & Green N. The effect of saline infusion on sodium reabsorption by the proximal tubule of the dog. *J. Clin. Invest.* 44:1160-70, 1965. NIH, NHI, Lab. Kidney & Electrolyte Metab., Bethesda, MD
- 426 Tobian L. Interrelationship of electrolytes, juxtaglomerular cells and hypertension. *Physiol. Rev.* 40:280-312, 1960. Univ. Minn. Sch. Med. Dept. Med. & Univ. Minn. Hosp., Minneapolis, MN