

Current Comments

The 1,000 Contemporary Scientists Most-Cited 1965-1978. Part I. The Basic List and Introduction

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At ISI® we've conducted hundreds of citation studies over the years. But none of them involved as massive an undertaking as that which preceded the compilation of the following list. (See Table 1.) As the title indicates, the list consists of the names of the 1,000 scientist-authors most-cited for work published from 1965-1978. This study took over two years to prepare, required approximately a month of large-scale computer time (over 750 hours), and drew upon the resources of many ISI staff members, especially Linda Cooper, manager of bibliographic research, editorial features. Others are acknowledged below.

We used "all-author" data derived from the *Science Citation Index*® (*SCI*®) data base, 1965-1978. Therefore, the list excludes social scientists. When we first began publishing lists of most-cited authors, we used first-author data only.¹ This was due to a continuing convention in the *Citation Index* section of *SCI*, in which cited and citing articles are listed under the name of only the first author listed on the paper. In the early days, these first-author lists were adequate for many purposes. But increasingly we felt the need to treat all authors in every article as though they were listed first. It is not just that science has become increasingly collaborative. Experienced scientists, already well known to their peers, were often and increasingly listed as secondary or coauthors. So we developed a system to let us do so.

In 1978 we used all-author data to publish a list of the 300 most-cited authors, 1961-1976.² The list which follows provides a new chronological perspective, although it is limited to the 14-year period, 1965-1978. This is an important four-year shift to even more contemporary science.

The list has also been expanded to consist of 1,000 scientists. Contrary to what I had expected, this step does not overcome a serious bias in this study and earlier ones. For a variety of reasons, the life sciences continue to be "overrepresented." Since citation practices vary so drastically among fields, caution must be used in the comparison of raw citation counts.³ We have made no effort in this study to solve this problem by segmenting our files. This in fact will be done in follow-up studies to cover mathematics, earth sciences, physics, chemistry, and other fields outside the life sciences. It will become practical to do so as we implement new discipline-oriented data bases.

Developing all-author lists is considerably more complex than conducting first-author studies. To create this list, more than 67 million references in the *Citation Index* were compared with the entries in the *Source Index of SCI* for the period 1965-1978—more than five million published papers. It is not fully realized by most readers that the *Source Index* does in fact include every author of every article indexed—so we can treat each author as though he or she were the first author.

Table 1: The 1,000 most-cited authors for work published from 1965-1978, presented with their first and last names; field or discipline; birth and (where applicable) death dates; and number of citations received. An asterisk next to a name indicates possible incomplete information. A check mark indicates authors new to the top 300. Since citation practices vary among fields, caution should be used in comparing raw data.

AARONSON, STUART A	ONCOLOGY	1942	6072	BRANTON, DANIEL	CELL BIOL.	1932	3408
* ABRAMS, GERALD STANLEY	PHYSICS	1941	3249	BRÄUNWALD, EUGENE	CARDIOLOGY	1929	13483
ADLER, STEPHEN L.	PHYSICS	1939	3243	BRAWERMAN, GEORGE	MOLEC BIOL.	1927	2623
✓ AGHAJANIAN, GEORGE KEVORK	NEUROPHARMACOL.	1932	4344	BRIGESE, GEORGE RICHARD	PHARMACOLOGY	1936	2979
AKASOFU, SYUN ICHI	AERONOMY	1930	2536	SREIDENBACH, MARTIN	PHYSICS	1934	3789
✓ ALEXANDER, PETER	CELL BIOL.	1922	4828	DRENNER, SYDNEY	MOLEC BIOL.	1927	2611
ALLEN, LELAND CULLEN	INORGANIC CHEM.	1926	2821	✓ BRITTER, RON J.	MOLEC BIOL.	1919	4366
ALLERHAND, ADAM	BIOCHEMISTRY	1927	2908	BRODIE, BERNARD BERYL	PHARMACOLOGY	1929	1558
* ALLFREY, VINCENT GEORGE	BIOCHEMISTRY	1921	4196	BROWN, DONALD D.	MOLEC BIOL.	1931	3218
* ALLINGER, NORMAN LOUIS	ORGANIC CHEM.	1928	5023	BROWN, GERALD E.	PHYSICS	1926	2957
ALLISON, ANTHONY CLIFFORD	IMMUNOLOGY	1925	5846	BROWN, HERBERT C.	ORGANIC CHEM.	1912	8756
* ALPER, CHESTER A.	IMMUNOLOGY	1921	2918	BROWN, JEHODAIDA J.	PHYSIOLOGY	1927	3508
* ALTMAN, JOSEPH	NEUROLOGY	1925	2592	BROWN, MICHAEL S.	BIOCHEMISTRY	1941	3198
* ALVES BRUCE WATHAM	ONCOLOGY	1928	4937	BROWNLEE, G. G.	MOLEC BIOL.	1942	2552
AMOS, DENNIS BERNARD	IMMUNOLOGY	1923	2958	BRUCE, THOMAS CHARLES	ORGANIC CHEM.	1925	2876
ANDEN, NILS-ERIK BIRGER	PHARMACOLOGY	1937	5929	BRUNNER, HANS RUDOLF	CARDIOLOGY	1937	2632
ANDERSON, PHILIP WARREN	PHYSICS	1923	2795	BRUNNER, K.T.	IMMUNOLOGY	1919	2917
ANDREWS, PATRICK	BIOCHEMISTRY	1928	2515	* BULGUS, JOHN	PHYSICS	1925	2658
ANDRUSIK, CHRISTIAN BOEHMER	IMMUNOLOGY	1915	4343	BRUNN, WILLIAM EDWARD	PSYCHIATRY	1931	2743
ANTONINI, ERALDO	BIOCHEMISTRY	1931	3127	BURCH, GEORGE E.	CARDIOLOGY	1910	2765
ADKI, TADAO	IMMUNOLOGY	1930	2854	✓ BURGER, MAX MARCEL	CELL BIOL.	1933	4443
ARIAS, IRWIN MONROE	GASTROENTEROL.	1926	3175	BURGUS, ROGER CECIL	ENDOCRINOLOGY	1934	2982
* ARIMURA, AKIRA	ENDOCRINOLOGY	1923	5520	BURNSTOCK, GEOFFREY	PHARMACOLOGY	1929	3099
ARNAUD, CLAUDE DONALD	ENDOCRINOLOGY	1929	2554	BUSCH, HARRY	PHARMACOLOGY	1923	4921
* ASKANAS, BRIGITTE ALICE	IMMUNOLOGY	1923	2542	BUTCHER, REGINALD WILLIAM	PHYSIOLOGY	1925	6511
ASOFSKY, RICHARD MARCY	IMMUNOLOGY	1933	2556	BUTLER, WARREN LEE	BIOPHYSICS	1925	2454
ATKINSON, DANIEL EDWARD	BIOCHEMISTRY	1921	3301	CAMILL, GEORGE FRANCIS	PHYSIOLOGY	1927	3783
ATTARDI, GIUSEPPE	MOLEC BIOL.	1926	3294	CAMERON, ALASTAIR GRAHAM W.	ASTROPHYSICS	1925	2523
AURBACH, GERALD DONALD	ENDOCRINOLOGY	1927	5245	* CANELLLOS, GEORGE P.	ONCOLOGY	1934	2453
AUSTEN, KARL FRANK	IMMUNOLOGY	1928	8538	CANTOR, CHARLES ROBERT	BIOCHEMISTRY	1931	2818
AUSTEN, WILLIAM GERALD	PHYSIOLOGY	1930	2782	CANTOR, HARVEY	IMMUNOLOGY	1942	2508
AYIOLI, LOUIS V.	ENDOCRINOLOGY	1931	2454	CARBONE, PAUL P.	ONCOLOGY	1931	4982
✓ AYVAZIAN, STRATIS	IMMUNOLOGY	1930	4717	CARODAN, MANUEL	PHYSICS	1936	3190
AxelROD, JULIUS	PHARMACOLOGY	1912	12425	CARLSON, LARS A.	PHYSIOLOGY	1928	3374
* AXEN, ROLF	BIOCHEMISTRY	1930	2573	CARLSON, ARVID	NEUROPHARMACOL.	1923	4118
✓ BACH, FRITZ H.	IMMUNOLOGY	1934	4975	GASDAR, JOHN EDWARD	BIOCHEMISTRY	1928	3101
* BACH, JEAN FRANCOIS	IMMUNOLOGY	1928	2906	CASPERSSON, TORBJORN G.	CELL BIOL.	1910	2599
BAEHRER, ROBERT L.	HEMATOLOGY	1934	2645	* CATT, KEVIN JOHN	ENDOCRINOLOGY	1932	3782
BAGUIONI, CORRADO	CELL BIOL.	1933	2735	CHAKOTIN, JEAN-CHARLES	IMMUNOLOGY	1938	3103
BAHCALL, JOHN NORRIS	ASTROPHYSICS	1934	2502	CHALIKY, ROGER	MOLEC BIOL.	1939	3742
* BAKER, BERNARD RANDALL	ORGANIC CHEM.	1915-76	2657	CHAMBER, PIERRE H.	MOLEC BIOL.	1931	3397
BALDWIN, ROBERT WILLIAM	ONCOLOGY	1927	2203	* CHANCE, BRITTON	BIOCHEMISTRY	1931	7131
BALTIMORE, DAVID	VIROLOGY	1938	8773	CHANGELUX, JEAN-PIERRE	NEUROLOGY	1936	6071
BAME, SAMUEL JARVIS	ASTROPHYSICS	1924	3022	* CHANOCK, ROBERT MERRITT	VIROLOGY	1924	6009
BARGER, VERNON DUANE	PHYSICS	1938	2913	✓ CHAPMAN, DENNIS	BIOPHYSICS	1927	4084
* BARRELL, BARCLAY GEORGE	MOLEC BIOL.	1944	2392	CHATT, JOSEPH	INORGANIC CHEM.	1914	2085
BARTON, DEREK HAROLD RICHARD	ORGANIC CHEM.	1918	3177	* CHINDWY, WILLIAM	PHYSICS	1929	2983
* BARTTER, FREDERIC CROSBY	ENDOCRINOLOGY	1914	2816	* CHOPPIN, PURNELL WHITTINGTON	VIROLOGY	1921	2444
BASERGA, RENATO	CELL BIOL.	1925	3046	* CHOPRA, INDER JIT	ENDOCRINOLOGY	1939	2532
BASTEN, A.	IMMUNOLOGY	1938	2790	CHRAMBACH, ANDREAS C.	BIOCHEMISTRY	1927	2744
* BATTERSBY, ALAN RUSHTON	ORGANIC CHEM.	1925	2584	CHURCHILL, MERVYN ROWEN	INORGANIC CHEM.	1940	3633
BAUJEU, ETIENNE EMILE	ENDOCRINOLOGY	1926	3573	CLAMAN, HENRY NEUMANN	IMMUNOLOGY	1930	3076
* BECKETT, ARNOLD HEYWORTH	PHARMACOLOGY	1920	2741	CLARK, ALAN JOHN	MOLEC BIOL.	1935	2853
SENACERRAF, BARLU	IMMUNOLOGY	1920	5894	CLARK, HOWARD CHARLES	ORGANOMET CHEM.	1939	3026
* BENZER, MYRON LEE	ORGANIC CHEM.	1912	3114	CLARK, ROBIN JON HAWES	INORGANIC CHEM.	1935	2505
SENSCH, REINHOLD	BIOCHEMISTRY	1919	2870	CLEAVER, JAMES EDWARD	GENETICS	1938	3309
SENSCH, RUTH ERICA	BIOCHEMISTRY	1925	2742	CLEGG, JOHN BRIAN	HEMATOLOGY	1938	2992
SENSCH, KLAUS GEORGE	PATHOLOGY	1928	2507	* CLEMENTI, ERICO	THEORETICAL CHEM.	1931	4001
SENSON, SIDNEY WILLIAM	PHYSICAL CHEM.	1918	3334	* COCHRAN, ALAN SEYMOUR	HEMATOLOGY	1934	2020
SERO, PAUL	MOLEC BIOL.	1926	3411	CUNE, MARTIN J.	HEMATOLOGY	1934	2001
DERNARD, JEAN ALFRED	HEMATOLOGY	1907	3558	COBURN, JACK WESLEY	PHYSIOLOGY	1932	2528
* CERNARDI, GIORGIO	MOLEC BIOL.	1928	2438	COCHRANE, CHARLES G.	IMMUNOLOGY	1930	3848
* CERNARD, WILHELM	BIOPHYSICS	1920-78	2881	COGGESHALL, RICHARD E.	NEUROLOGY	1932	3796
* CERNSTEIN, RICHARD BARRY	PHYSICAL CHEM.	1923	3030	COHEN, ALAN SEYMOUR	PATHOLOGY	1928	2749
SEROZA, MORTON	ORGANIC CHEM.	1917	2474	✓ COHEN, MARVIN LEO	PHYSICS	1935	3882
DERSON, SOLOMON A.	ENDOCRINOLOGY	1918-72	3955	COHEN, STANLEY N.	MOLEC BIOL.	1935	2845
DESSER, GORDON MICHAEL	ENDOCRINOLOGY	1936	3567	* COHN, MELVIN	PHYSIOLOGY	1922	2748
REUTER, ERNEST	HEMATOLOGY	1928	4483	✓ COHN, ZANVIL A.	CELL BIOL.	1926	4182
DEANCO, CELSO	IMMUNOLOGY	1941	2844	COLLMAN, JAMES PADDOCK	INORGANIC CHEM.	1932	3198
DERMAN, EDWIN LAWRENCE	ENDOCRINOLOGY	1930	2906	COWINGS, DAVID EDWARD	CELL BIOL.	1935	2682
DIRNBAUMER, LUTZ	ENDOCRINOLOGY	1939	3198	✓ COWAN, JEROME W.	ENDOCRINOLOGY	1935	2944
DISCHOP, JOHN MICHAEL	VIROLOGY	1936	3545	CONNIE, ALLAN HOWARD	PHARMACOLOGY	1930	7988
* BJORKEN, JAMES D.	PHYSICS	1934	3199	COOKS, ROBERT GRAHAM	ORGANIC CHEM.	1941	2594
* BJORKLUND, ANDERS	CELL BIOL.	1945	3549	COOLEY, DENTON ARTHUR	CARDIOLOGY	1920	2392
* BLACK, PAUL H.	VIROLOGY	1930	2890	COON, MINOR J.	ENZYMOLOGY	1921	2947
BLANDEN, ROBERT VINCENT	IMMUNOLOGY	1938	2483	COOPER, MAX DALE	IMMUNOLOGY	1933	5774
✓ BLOBEL, GUNTHER K. J.	CELL BIOL.	1936	4050	CORRY, ELIAS JAMES	ORGANIC CHEM.	1928	9147
BLOCH, KURT JULIUS	IMMUNOLOGY	1929	2901	CORRODI, HANS	PHARMACOLOGY	1929-74	5010
BLOMSTEN, NICOLAAS	PHYSICS	1920	2438	COSTA, ERMINIO	PHARMACOLOGY	1924	6430
BLOOM, FLOYD ELLIOTT	NEUROPHARMACOL.	1936	4938	COTTON, FRANK ALBERT	INORGANIC CHEM.	1930	8359
* BLOOM, STEPHEN ROBERT	GASTROENTEROL.	1942	3725	✓ COVELL, JAMES WACHOB	PHYSIOLOGY	1936	4575
BLOW, DAVID MERVYN	BIOPHYSICS	1931	2485	COWAN, WILLIAM MAXWELL	NEUROLOGY	1921	3100
BLUMBERG, BARUCH SAMUEL	ONCOLOGY	1925	5840	COWLEY, ROGER ARTHUR	PHYSICS	1939	2322
✓ BODEY, GERALD PAUL	ONCOLOGY	1934	4580	COY, DAVID HOWARD	ENDOCRINOLOGY	1944	1655
BODLMANN, FERDINAND	ORGANIC CHEM.	1921	2640	CRAM, DONALD T.	ORGANIC CHEM.	1919	2878
BONNER, JAMES FREDERICK	PHYSICS	1910	7045	CROMER, DON T.	PHYSICS	1923	8743
* BORISY, GARY GUY	MOLEC BIOL.	1942	3110	CUATRECASAS, PEDRO	BIOCHEMISTRY	1926	10643
* BORNSTEIN, PAUL	CELL BIOL.	1934	3071	✓ CURRAN, PETER FERGUSON	NEUROLOGY	1931-74	2801
BORSOS, TIBOR	IMMUNOLOGY	1927	3594	CURTS, DAVID RODERICK	PHARMACOLOGY	1927	3819
BORST, PIET	MOLEC BIOL.	1934	2861	* DAHL, LAWRENCE FREDERICK	PHYSICAL CHEM.	1929	3440
BOESMANN, HAROLD BRUCE	PHARMACOLOGY	1942	3196	DAHLSTROM, ANNICCA B.	HISTOLOGY	1941	2513
BOISWEN, CYRIL HARLING	ENDOCRINOLOGY	1924	3681	✓ DALY, ALEXANDER	ASTROPHYSICS	1928	4127
BOYDE, JOHN HAMILTON	ORGANIC CHEM.	1927	2928	✓ DALY, JOHN W.	PHARMACOLOGY	1933	6903
BOYARSKI, ADAM M.	PHYSICS	1935	3359	✓ DARGO, ANTHONY NICHOLAS	CARDIOLOGY	1930	4551
BOYSE, EDWARD A.	IMMUNOLOGY	1923	10159	DARNELL, JAMES EDWIN	CELL BIOL.	1920	7904
BRADBURY, EDWIN MORTON	CELL BIOL.	1933	2448	* DATTA, NAOMI	MOLEC BIOL.	1922	2796
BRADY, ROSCOE OWEN	NEUROLOGY	1923	5086	DAUGHADAY, WILLIAM HAMILTON	ENDOCRINOLOGY	1918	3973
				DAUSSET, JEAN	IMMUNOLOGY	1918	2861

✓ DAVID, JOHN R	IMMUNOLOGY	1930	4243	✓ GILMAN, ALFRED G	PHARMACOLOGY	1941	3967
✓ DAVIDSON, ERIC HARRIS	MOLEC BIOL	1937	3334	* GLASHOW, SHELDON LEE	PHYSICS	1932	3539
DAVIDSON, ERNEST ROY	PHYSICAL CHEM	1936	5123	GLONOWSKI, J	NEUROPHARMACOL	1929	5382
✓ DAVIDSON, NORMAN RALPH	MOLEC BIOL	1918	4702	✓ GOLD, PHIL	ONCOLOGY	1936	3958
DAVIS, JAMES OTHELLO	PHYSIOLOGY	1916	2483	GOLDBERG, NELSON D	PHARMACOLOGY	1931	2461
DAVIS, JOHN MARCELL	PSYCHIATRY	1933	3462	✓ GOLDHABER, GERSON	PHYSICS	1924	3955
DAWSON, R M C	BIOCHEMISTRY	1924	2477	GOLDSTEIN, AVRAM	PHARMACOLOGY	1918	2524
DE LOUVE, CHRISTIAN RENE	CELL BIOL	1917	4683	GOLDSTEIN, IRWIN JOSEPH	BIOCHEMISTRY	1929	3201
DE ROBERTIS, EDUARDO DIEGO P	CELL BIOL	1913	2638	GOLDSTEIN, JOSEPH LEONARD	GENETICS	1940	3916
DE VITA, VINCENT T	ONCOLOGY	1935	5163	GOLDSTEIN, MENEX	NEUROLOGY	1924	2577
✓ DELUCA, HECTOR FLOYD	BIOCHEMISTRY	1930	12090	GOOD ROBERT ALAN	IMMUNOLOGY	1922	17679
DEWAR, MICHAEL JAMES STEUART	PHYSICAL CHEM	1918	8368	GOODMAN, HOWARD MICHAEL	MOLEC BIOL	1938	2829
✓ DIAMOND, JARED MASON	PHYSIOLOGY	1937	2845	GOODWIN, FREDERICK KING	PSYCHIATRY	1936	2793
DICZFALUSY, EGON	ENDOCRINOLOGY	1920	2758	GOODWIN, TREVOR WALWORTH	BIOCHEMISTRY	1929	25443
DIETSCHY, JOHN MAURICE	CELL BIOL	1932	2504	GORBACH, SHERWOOD LESLIE	MICROBIOL	1934	3460
DIKON, FRANK JAMES	IMMUNOLOGY	1920	7456	GORDEN, PHILIP	ENDOCRINOLOGY	1934	2503
DJERASSI, CARL	ORGANIC CHEM	1923	7704	* GORDON, ROY GERALD	PHYSICAL CHEM	1940	3087
✓ DOLL, RICHARD	ONCOLOGY	1912	2939	* GORLIN, RICHARD	CARDIOLOGY	1926	5894
✓ DOLLERY, COLIN TERENCE	PHARMACOLOGY	1931	3016	GORSKI, JACK	ENDOCRINOLOGY	1931	3225
DOTY, PAUL MEAD	MOLEC BIOL	1920	2782	GRAHAM, RICHARD CYRIL	IMMUNOLOGY	1934	3322
DOUGLAS, STEVEN DANIEL	IMMUNOLOGY	1939	3098	GRANT, DAVID MORRIS	PHYSICAL CHEM	1931	4248
DOWLING, JOHN ELLIOTT	PHYSIOLOGY	1935	2695	GRAY, HARRY B	INORGANIC CHEM	1935	4627
DRAGO, RUSSELL STEPHEN	INORGANIC CHEM	1928	3402	* GREAVES, MELVYN FRANCIS	IMMUNOLOGY	1941	3657
DRAY, SHELDON	IMMUNOLOGY	1920	2764	GREEN, DAVID EZRA	BIOPHYSICS	1910	3507
DRELL, SIDNEY DAVID	PHYSICS	1926	2748	GREEN, HOWARD	CELL BIOL	1925	4229
DRUCKREY, HERMANN	ONCOLOGY	1904	2591	✓ GREEN, IRVING	IMMUNOLOGY	1929	4339
✓ DUBOS, JOSEPH EMILE	PHYSICAL CHEM	1932	2788	GREEN, MAURICE	MOLEC BIOL	1926	3554
DUDRICK, STANLEY J	SURGERY	1935	2535	✓ GREEN, MICHAEL	INORGANIC CHEM	1934	2620
✓ DUESBERG, PETER H	VIROLOGY	1936	3071	GREENGARD, PAUL	CELL BIOL	1925	8033
DUKE, CHARLES BRYAN	PHYSICS	1938	2965	GREINER, WALTER A	PHYSICS	1935	3299
DULBECCO, RENATO	ONCOLOGY	1914	2921	* GREY, HOWARD M	PATHOLOGY	1932	4545
DURIG, JAMES ROBERT	INORGANIC CHEM	1935	3131	GRIFFIN, GERVIL MORTON	ENDOCRINOLOGY	1929	2761
DUSTAN, HARRY PEARSON	CARDIOLOGY	1922	2499	* GROS, FRANCIS	MOLEC BIOL	1925	4941
DUTTON, RICHARD WILLIAM	IMMUNOLOGY	1930	3568	GROSS, DAVID JONATHAN	PHYSICS	1941	2964
EASTMAN, DEAN E	PHYSICS	1940	2891	* GROSS, JEROME	BIOCHEMISTRY	1917	2546
EDELHOCH, HERALD	BIOCHEMISTRY	1922	2644	GROSSMAN, MORTON IRVIN	PHYSIOLOGY	1919	3158
✓ EDELMAN, GERALD MAURICE	IMMUNOLOGY	1929	7875	GROVER, PHILIP L	ONCOLOGY	1933	3693
ELIEL, ERNEST LUDWIG	PHYSICAL CHEM	1915	2870	GRUBBS, MELVIN MALCOLM	ENDOCRINOLOGY	1928	2867
✓ ENGEL, WILLIAM KING	NEUROLOGY	1930	4031	GUGLIEMINI, HOWARD J	INORGANIC CHEM	1923	2673
EPSTEIN, STEPHEN E	CARDIOLOGY	1935	6243	GUILLEMIN, ROGER	ENDOCRINOLOGY	1924	5884
* ERICSSON, JAN LARS-ERIK	PATHOLOGY	1932	3055	GURSKY, HERBERT	ASTRONOMY	1930	3258
✓ ERNSTER, LARS	BIOCHEMISTRY	1920	3592	HABER, EDGAR	IMMUNOLOGY	1932	5650
ESTABROOK, RONALD WINFIELD	BIOCHEMISTRY	1926	4314	HAGEMAN, RICHARD HARRY	PLANT SCIENCES	1917	2687
EXTON, JOHANNES	ENDOCRINOLOGY	1931	3143	HALL, REGINALD	PHARMACOLOGY	1929	2543
✓ EYLAR, EDWIN HAROLD	BIOCHEMISTRY	1934	3209	✓ HALPERN, JACK	ENDOCRINOLOGY	1931	3137
FAHEY, JOHN LESLIE	IMMUNOLOGY	1924	4283	* HAMBERG, MATS	INORGANIC CHEM	1925	2672
FAIRBANKS, GRANT	CELL BIOL	1940	3210	HAMILTON, WALTER CLARK	BIOCHEMISTRY	1944	4915
FALCK, BENGT O F	HISTOLOGY	1927	2721	HAMMOND, GEORGE SIMMS	PHYSICAL CHEM	1931-73	3815
FARBER, EMMANUEL	PATHOLOGY	1918	2875	✓ HANSEN, CORWIN H	ORGANIC CHEM	1921	2959
FAROUHAR, MARJUN GIST	CELL BIOL	1928	2512	HANSEN, OLE	ORGANIC CHEM	1918	2925
FASMAN, GERALD DAVID	BIOCHEMISTRY	1925	4228	HANSON, GAIL G	PHYSICS	1934	2439
✓ FAWCETT, DON WAYNE	HISTOLOGY	1917	2472	HARARI, H	PHYSICS	1947	3242
FEFER, ALEXANDER	IMMUNOLOGY	1938	2775	HARDMAN, JOEL GARFETH	PHARMACOLOGY	1930	2873
FELSENFIELD, FRED C	GEOPHYSICS	1934	3682	HARRIS, HARRY	GENETICS	1918	3729
FELDMAN, HARVEY	ENDOCRINOLOGY	1933	3123	* HARRIS, HENRY	CELL BIOL	1925	2661
FELDMAN, HARRY JAY	PHYSICS	1942	2452	* HARRISON, DONALD C	CARDIOLOGY	1934	4196
FELDMAN, MARC	IMMUNOLOGY	1944	3750	HARTLEY, BRIAN SELBY	MOLEC BIOL	1926	3209
✓ FELIG, PHILIP	ENDOCRINOLOGY	1936	3961	✓ HARTLEY, JANET WILSON	VIROLOGY	1928	4208
FELSENFIELD, GARY	MOLEC BIOL	1929	3200	* HASZLONEK, ROBERT NEVILLE	ORGANOMET CHEM	1925	2634
✓ FERGUSON, ELDON EARL	AFRONOMOY	1926	3445	HAYTHORNE, MARION FREDERICK	INORGANIC CHEM	1929	2748
FELD, EPHRAIM JOSHUA	NEUROLOGY	1920	2870	HAYASHI, OSAMU	ENZYMOLOGY	1920	3487
FINCH, CLEMENT ALFRED	HEMATOLOGY	1915	2951	HAYLICK, LEONARD	CELL BIOL	1928	2824
FINLAND, MAXWELL	MICROBIOL	1902	3252	* HAYON, ELIE	PHYSICAL CHEM	1932	2523
FISCHER, ERNST OTTO	ORGANOMET CHEM	1918	3472	HEBER, ALAN J	PHYSICS	1936	3450
FISHER, BERNARD	ONCOLOGY	1918	2763	✓ HEBBE, WARREN J	THEORETICAL CHEM	1929	4656
FISHER, DELBERT A	ENDOCRINOLOGY	1929	2476	HEIDENBERGER, CHARLES	ONCOLOGY	1920	4211
✓ FISHER, EDWIN RALPH	PATHOLOGY	1922	2854	* HELBRONNER, EDGAR	ORGANIC CHEM	1921	3156
FISHER, MICHAEL ELLIS	PHYSICS	1931	4604	HELFBANT, RICHARD H	CARDIOLOGY	1937	2484
FISHMAN, WILLIAM HAROLD	ONCOLOGY	1914	2620	HELINSKI, DONALD RAYMOND	GENETICS	1933	3035
FLEISHER, SIDNEY	MOLEC BIOL	1930	2925	HELLSTROM, INGEGERD E	ONCOLOGY	1921	3112
FLORY, PAUL JOHN	PHYSICAL CHEM	1910	5087	HELLSTROM, KARL, ERIK	IMMUNOLOGY	1934	6145
FLYGARE, WILLIS H	CHEM PHYS	1936	2790	* HENDERSON, EDWARD S	ONCOLOGY	1932	2609
✓ FOLKERS, KARL AUGUST	ORGANIC CHEM	1906	2999	HENDERSON, JOSEPH F	BIOCHEMISTRY	1933	2605
FORSHAM, PETER HUGH	ENDOCRINOLOGY	1915	3449	HENLE, GERTRUDE	PHYSICS	1912	6816
FOUTS, JAMES RALPH	PHARMACOLOGY	1929	2504	* HENLE, WERNER	VIROLOGY	1910	6223
FRANK, MICHAEL M	IMMUNOLOGY	1937	2698	✓ HENJES, CHRISTOPHER SCOT	IMMUNOLOGY	1947	3232
FRANKE, WERNER W	CELL BIOL	1940	3031	✓ HERBERMAN, RONALD B	ONCOLOGY	1940	5027
FRANKLIN, EDWARD CLAUDE	GENETICS	1924	9499	HERBERT, VICTOR DANIEL	HEMATOLOGY	1927	4716
FREDRICKSON, DONALD SHARP	IMMUNOLOGY	1928	3148	HEREMANS, JOSEPH FELIX	IMMUNOLOGY	1927-75	3524
FREEDMAN, SAMUEL ORKIN	ONCOLOGY	1924	3909	✓ HERSH, EVAN MANUEL	IMMUNOLOGY	1935	4324
✓ FRIE, EMIL	ONCOLOGY	1927	4735	HERZENBERG, LEONARD ARTHUR	IMMUNOLOGY	1931	3569
✓ FRIEDRICH, EMIL J	ENZYMOLOGY	1929	5141	HERZBERG, LEE	BIOCHEMISTRY	1929	2919
FRIEDRICH, IRWIN	PHYSICS	1918	2868	* HILLEMAN, MAURICE RALPH	VIROLOGY	1919	3447
FRIEDBERG, CARL E	VIROLOGY	1932	2484	HIRSCH, JAMES GERALD	CELL BIOL	1922	2803
✓ FRIEDMAN, ROBERT MORRIS	ENDOCRINOLOGY	1934	2845	HIRSCHHORN, KURT	GENETICS	1926	3070
FRIESEN, HENRY GEORGE	PHYSICS	1931	2851	HOBBS, JOHN RAYMOND	PATHOLOGY	1929	2708
FRYBERGER, DAVID	IMMUNOLOGY	1928	9602	HOPFRANG, ALLAN VICTOR	HEMATOLOGY	1935	2645
RUKE, KJELL G	CELL BIOL	1938	13319	HOFMANN, ROALD	CARDIOLOGY	1925	3096
GALL, JOSEPH GRANTON	MOLEC BIOL	1928	2465	HOFMANN, ROALD	INORGANIC CHEM	1937	7400
✓ GALL, ROBERT C	CELL BIOL	1937	4140	HOFMANN, ALAN F	GENETICS	1931	4963
GARATTINI, SILVIO	PHARMACOLOGY	1928	2833	* HOKFELT, TOMAS	NEUROPHARMACOL	1940	8268
GARITO, ANTHONY FRANK	PHYSICS	1939	2935	HOLBROW, ERIC JOHN	IMMUNOLOGY	1918	3314
GASSMAN, PAUL G	ORGANIC CHEM	1935	2997	HOLDEN, JAMES FREDERICK	ONCOLOGY	1918	3743
✓ GELBON, HARRY VICTOR	MOLEC BIOL	1928	2465	HOLM, OLOF GORAN	HEMATOLOGY	1930	3207
GERGELY, JOHN	BIOCHEMISTRY	1919	2455	HOLM, RICHARD HADLEY	INORGANIC CHEM	1934	2954
GERSHON, RICHARD K	IMMUNOLOGY	1932	2746	HOLTZER, HOWARD	CELL BIOL	1922	3069
GEWURZ, HENRY	IMMUNOLOGY	1936	2930	HONG, RICHARD	IMMUNOLOGY	1929	2861
GIACCONE, RICCARDO	ASTRONOMY	1931	2987	HORECKER, BERNARD LEONARD	BIOCHEMISTRY	1914	3190
GIACOMELLI, GIORGIO M	PHYSICS	1931	2483	* HOUSE, HERBERT O	INORGANIC CHEM	1928	2814
GIBBONS, RONALD J	VIROLOGY	1924	2447	HSU, TAO-CHIH	GENETICS	1917	2820
✓ GIBLET, ELOISE ROSALEE	HEMATOLOGY	1921	4447	HUBEL, DAVID HUNTER	PHYSIOLOGY	1926	3764
GIBSON, QUENTIN HOWESON	PHYSIOLOGY	1918	2588	HUEBNER, ROBERT JOSEPH	ONCOLOGY	1914	7538
✓ GILDEN, RAYMOND VICTOR	IMMUNOLOGY	1935	4391	HUISGEN, ROLF K J	ORGANIC CHEM	1920	5087
GILLESPIE, DAVID H	GENETICS	1940	2709	* HUISMAN, TITUS HENDRIK JAN	BIOCHEMISTRY	1923	3082
GILLETTE, JAMES ROBERT	PHARMACOLOGY	1928	4807				

NETA PEDATUR	ORGANIC CHEM	1938	2460	* REMEIK, J.P.	PHYSICS	1924	2475
NEVILLE, DAVID MICHAEL	MOLEC BIOL	1934	3821	REMMINGTON, JACK SAMUEL	MICROBIOL	1931	3354
✓ NICOLSON, GARTH LAMB	CELL BIOL	1943	6047	* REMMER, HERBERT	PHARMACOLOGY	1919	3013
NILSSON, INGA MARIE	HEMATOLOGY	1923	2914	RENOLD, ALBERT ERNST	ENDOCRINOLOGY	1923	2967
* NIRENBERG, MARSHALL WARREN	GENETICS	1927	2914	* REYNOLDS, JACQUELINE ANN	BIOPHYSICS	1930	2546
NISHIMURA, SIKUMU	MOLEC BIOL	1951	2638	REYNOLDS, ALLEN	PHYSICAL CHEM	1932	2622
NISWENDER, GORDON DEAN	ENDOCRINOLOGY	1940	3749	RICH, ALEXANDER	MOLEC BIOL	1924	4811
NOMURA, MASAYASU	MOLEC BIOL	1927	5174	RICHARDSON, CHARLES CLIFTON	MOLEC BIOL	1935	3078
NORMAN, ANTHONY WESTCOTT	BIOCHEMISTRY	1938	3432	RICHTER, BURTON	PHYSICS	1931	3731
NORTHCOTE, DONALD HENRY	CELL BIOL	1921	2945	RIVIER, JEAN E F	ENDOCRINOLOGY	1941	2443
NOSSAL, GUSTAV J V	IMMUNOLOGY	1931	3409	ROBBINS, JOHN BENNETT	MICROBIOL	1932	2436
NOZKOFF, ALEX BENJAMIN	MOLEC BIOL	1913	2753	ROSEN, KENNETH M	ORGANIC CHEM	1931	5941
NOZUKI, HITOSHI	ORGANIC CHEM	1922	2680	ROBERTS, WILLIAM CLIFFORD	CARDIOLOGY	1932	3342
✓ NUSSENZWEIG, VICTOR	IMMUNOLOGY	1928	3957	ROBERTSON, J I S	CARDIOLOGY	1928	3310
* O'BRIEN, JOHN S	GENETICS	1934	3721	ROBINS, ROLAND KENITH	ORGANIC CHEM	1926	4157
✓ O'WALLEY, BERT W	ENDOCRINOLOGY	1936	6044	ROBSON, GEORGE ALAN	PHARMACOLOGY	1934	4994
OCHOA, SEVERO	BIOCHEMISTRY	1905	2462	ROBPELL, MARTIN D	ENDOCRINOLOGY	1925	4652
ODELL, WILLIAM DOUGLAS	PHYSIOLOGY	1929	4523	ROEDER, ROBERT G	BIOCHEMISTRY	1942	2148
OHNO, SUSUMU	GENETICS	1928	2702	* ROTT, IVAN MAURICE	IMMUNOLOGY	1927	4014
* OKE, JOHN BEVERLEY	ASTRONOMY	1928	2437	ROZMAN, BERNARD	VIROLOGY	1929	3290
OLAH, GEORGE ANDREW	ORGANIC CHEM	1927	7910	ROSEMAN, SAUL	BIOCHEMISTRY	1921	4377
* OLD, LLOYD JOHN	ONCOLOGY	1933	7892	* ROSEN, FRED SAUL	IMMUNOLOGY	1930	4938
OLSON, LARS O	NEUROBIOLOGY	1942	2597	ROSEN, KENNETH M	CARDIOLOGY	1937	2838
OPPENHEIM, JOOST J	PHYSIOLOGY	1934	3631	ROSENBERG, SAUL A	ONCOLOGY	1927	2448
ORCI, LELIO	HISTOLOGY	✓ 1937	3600	ROSENTHAL, ALAN S	IMMUNOLOGY	1939	5938
ORLOFF, JACK	PHYSIOLOGY	1921	2531	✓ ROSS, GRIFF TERRY	ENDOCRINOLOGY	1920	6958
ORRENIUS, STEN G	PHARMACOLOGY	1937	2481	ROSS, JOHN	ENDOCRINOLOGY	1928	7756
OSBORN, JOHN ANTHONY	INORGANIC CHEM	1939	2557	* ROSS, RUSSELL	CELL BIOL	1929	4108
OSBORN, MARY	CELL BIOL	1940	10376	* ROTH, ROBERT HENRY	ENDOCRINOLOGY	1939	6867
OSKI, FRANK A	HEMATOLOGY	1932	2816	* ROWE, DAVID STUART	PHARMACOLOGY	1939	3276
* OSTRIKER, JEREMIAH P	ASTROPHYSICS	1937	2469	ROWE, WALLACE PRESCOTT	IMMUNOLOGY	1925	2652
OSTROVSKY, YU A	BIOCHEMISTRY	1934	2458	RUBBIA, CARLO	VIROLOGY	1926	5595
OWEN, CHARLES ARCHIBALD	HEMATOLOGY	1915	2475	RUBIN, EMANUEL	PHYSICS	1934	2090
OWMAN, CHRISTER SVEN OLLE	HISTOLOGY	1939	3448	RUBIN, MARY	PHYSIOLOGY	1928	2761
PACKER, LESTER	BIOPHYSICS	1929	2650	RUDDLE, FRANCIS HUGH	CELL BIOL	1928	2508
PACKHAM, MARRAN AITCHISON	HEMATOLOGY	1927	3233	* RUOHLAHTI, ERKKI ILMARI	GENETICS	1929	5609
PAGE, IRVINE HERBERT	MOLEC BIOL	1901	2715	RUSSELL, DIANE HADDOCK	PHYSIOLOGY	1924	2580
PALADE, GEORGE E	CELL BIOL	1912	7915	RUTTER, WILLIAM J	ONCOLOGY	1940	2003
PALKOVITS, MIKLOS	NEUROPHARMACOL	1933	2783	RYAN, KENNETH JOHN	PHARMACOLOGY	1935	2458
PAPHADJIOPOULOS, DEMETRIOS P	MOLEC BIOL	1934	3496	SACHS, LEO	MOLEC BIOL	1928	4481
PAQUETTE, LEO ARMAND	ORGANIC CHEM	1934	5116	SAH, CHIH-TANG	ORGANIC CHEM	1924	2478
PARDEE, ARTHUR BECK	CELL BIOL	1921	3110	* SALPETER, EDWIN ERNEST	PHYSICS	1932	2583
PARK, CHARLES RAMKINSON	PHYSIOLOGY	1916	3877	* SALTIN, BENGT	ASTRONOMY	1924	2441
✓ PARKER, CHARLES WARD	IMMUNOLOGY	1930	3586	* SAMBRIDGE, JOE	PHYSIOLOGY	1935	2777
PARKS, W P	IMMUNOLOGY	1941	2568	* SAMUELSSON, BENGT	VIROLOGY	1934	2442
PARMLEY, WILLIAM W	CARDIOLOGY	1936	3512	SANDAGE, ALLAN REY	BIOCHEMISTRY	1933	7372
PASTAN, IRA HARRY	BIOCHEMISTRY	1931	8090	SANDBERG, AVERY ABA	ASTRONOMY	1926	3997
PATERSON, JAMES MCEWAN	PHYSICS	1937	3177	SANDLER, MERTON	CELL BIOL	1921	3027
PAUL, JOHN	MOLEC BIOL	1922	3541	SANGER, FREDERICK	PHARMACOLOGY	1926	2664
PAUL, WILLIAM ERWIN	IMMUNOLOGY	1936	6082	SATOH, GEORGE RAYMOND	MICROBIOL	1918	3194
PEARSE, ANTHONY GUY EYERSON	ENDOCRINOLOGY	1916	6151	SATO, RYO	PHYSICS	1920	3103
PEARSON, RALPH GOTTFRIED	INORGANIC CHEM	1919	2901	SAWYER, CHARLES HENRY	BIOCHEMISTRY	1923	3388
* PENMAN, SHELDON	MOLEC BIOL	1930	7539	SCHAEFER, HENRY FREDERICK	ENDOCRINOLOGY	1915	3341
PERL, MARTIN LOUIS	PHYSICS	1927	3533	SCHAFFNER, FENTON	THEORETICAL CHEM	1944	3166
✓ PERLMANN, PETER	IMMUNOLOGY	1919	4372	SCHAEFFNER, FENTON	PATHOLOGY	1920	3526
✓ PERLIN, ROBERT PALESE	MOLEC BIOL	1931	3577	SCHALCH, DON SYLVESTER	ENDOCRINOLOGY	1925	2522
PERUTZ, MAX FERDINAND	MOLEC BIOL	1914	4821	SCHALLY, ANDREW VICTOR	ENDOCRINOLOGY	1925	15340
PETERLIN, ANTON	PHYSICS	1908	3073	SCHERAGA, HAROLD ABRAHAM	PHYSICAL CHEM	1921	6062
PHILIPSON, LENNART	MICROBIOL	1929	2911	SCHERLAG, BENJAMIN J	CARDIOLOGY	1932	2571
PHILLIPS, DAVID CHILTON	MOLEC BIOL	1924	2481	SCHILDKRAUT, JOSEPH JACOB	PSYCHIATRY	1934	3026
PHILLIPS, JAMES CHARLES	PHYSICS	1933	2763	SCHMKE, ROBERT T	MOLEC BIOL	1932	4810
PHILLIPS, R J	PHYSICS	1930	2627	SCHLESINGER, DAVID	MOLEC BIOL	1906	2626
PHILLIPS, ROBERT ALLAN	IMMUNOLOGY	1937	2487	SCHLESYER, PAUL VON RAEGE	PHYSICAL CHEM	1930	5736
PIETZ, KARL ANTON	BIOCHEMISTRY	1924	3067	SCHMELTZKOPF, ARTHUR L	PHYSICS	1932	2530
PITOT, HENRY C	ONCOLOGY	1930	2678	* SCHMID, HANS	PHYSICAL CHEM	1917-78	2674
PIZZ, BERTRAM	CARDIOLOGY	1932	2626	SCHMIDBAUER, HUBERT	ORGANOMET CHEM	1934	2576
PLETSCHER, ALFRED	NEUROPHARMACOL	1917	3674	SCHRAUZER, GERHARD N	INORGANIC CHEM	1932	2663
POLAK, JULIA MARGARET	HISTOLOGY	1939	3158	SCHULZ, STANLEY GEORGE	PHYSIOLOGY	1931	3029
POLANYI, JOHN CHARLES	PHYSICAL CHEM	1929	2831	SCHUR, PETER H	IMMUNOLOGY	1933	3261
* POPLE, JOHN ANTHONY	THEORETICAL CHEM	1925	12714	✓ SCHWARTZ, ARNOLD	PHARMACOLOGY	1929	4525
POPPER, HANS	PATHOLOGY	1903	3367	SCHWARTZ, ROBERT STEWART	IMMUNOLOGY	1928	2840
✓ PORATH, JERKER OLOF	BIOCHEMISTRY	1921	3349	* SCHWITTERS, ROY FREDERICK	PHYSICS	1944	2938
✓ PORTE, DANIEL	ENDOCRINOLOGY	1931	4584	SCOLNICK, EDWARD M	VIROLOGY	1940	3493
PORTER, JOHN CHARLES	PHYSIOLOGY	1925	2730	SEEMILLER, JARVIS EDWIN	IMMUNOLOGY	1920	4753
PORTER, JOHN WILLARD	BIOCHEMISTRY	1915	2619	SEEMAN, PHILIP	NEUROLOGY	1934	3278
PORTER, KEITH ROBERTS	MOLEC BIOL	1912	2635	SEGAL, GERALD A	PHYSICS	1934	4159
PORTER, KENDRICK ARTHUR	PATHOLOGY	1925	2761	SELA, MICHAEL	IMMUNOLOGY	1924	4785
* POSTE, GEORGE HENRY	PATHOLOGY	1944	2585	SELDIN, DONALD WAYNE	PHYSIOLOGY	1920	2924
* POTTER, MICHAEL	ONCOLOGY	1924	3042	SELIGMAN, MAXIME G	HEMATOLOGY	1927	4248
POTTER, VAN RENSSELAER	CELL BIOL	1911	3754	SELL, STEWART	IMMUNOLOGY	1932	2718
POTTS, JOHN THOMAS	ENDOCRINOLOGY	1932	5402	SETLOW, RICHARD BURTON	BIOPHYSICS	1921	2879
POWELL, THOMAS PHILIP STROUD	NEUROLOGY	1923	3646	SEVER, JOHN LOUIS	MICROBIOL	1932	3444
PRESSMAN, BERTON CHARLES	PHARMACOLOGY	1926	2595	SEYFERTH, DIETMAR	ORGANOMET CHEM	1929	3749
* PRESSMAN, DAVID	IMMUNOLOGY	1916	3184	* SHAPIRO, ARNOLD L	BIOPHYSICS	1930	2999
PREUSSMANN, R	ONCOLOGY	1928	2692	SHARON, NATHAN	BIOCHEMISTRY	1925	3525
PRINCE, ALFRED M	VIROLOGY	1928	3754	* SHARP, PHILIP ALLEN	MOLEC BIOL	1944	2693
* PROCKOP, DARWIN J	BIOCHEMISTRY	1929	3555	SHARVIN, AARON JEFFREY	VIROLOGY	1934	3347
✓ PURCELL, ROBERT HARRY	VIROLOGY	1935	4406	SHAW, BERNARD LESLIE	INORGANIC CHEM	1930	3545
✓ QUIE, PAUL GERHARDT	IMMUNOLOGY	1925	3877	SHERLOCK, SHEILA	GASTROENTEROL	1918	5670
RABINOWITZ, MURRAY	MOLEC BIOL	1927	2532	SHEVACH, ETHAN MENAHEM	IMMUNOLOGY	1943	2456
* RACKER, EFRAIM	BIOCHEMISTRY	1913	6206	* SHIRANE, GEN	PHYSICS	1924	4124
✓ RAFF, MARTIN C	CELL BIOL	1938	4499	SHIRLEY, DAVID ARTHUR	PHYSICAL CHEM	1931	4278
RAUSZ, LAWRENCE GIDEON	ENDOCRINOLOGY	1925	2569	SHREFFER, DONALD CECIL	GENETICS	1933	3658
RAMIREZ, FLUSTO	ORGANIC CHEM	1929	2902	* SHULMAN, NATHAN RAPHAEL	HEMATOLOGY	1925	3592
RAPP, FRED	VIROLOGY	1929	3903	* SHULMAN, ROBERT GERSON	CHEM PHYS	1924	3551
RAPP, HERBERT JOSEPH	IMMUNOLOGY	1923	4397	SIEKEVITZ, PHILIP	CELL BIOL	1918	3428
RASMUSSEN, HOWARD	CELL BIOL	1925	4558	SIESJO, BO K	NEUROLOGY	1930	2883
RATNOFF, OSCAR DAVID	HEMATOLOGY	1916	2945	* SIMONOVICH, LOUIS	GENETICS	1920	2655
RAWLINS, WILLIAM EDGAR	VIROLOGY	1933	3112	* SIMMONS, RICHARD LAWRENCE	IMMUNOLOGY	1934	4285
RAZIN, SHMUEL	MICROBIOL	1928	2451	* SIMPSON, WILLIAM TRACEY	THEORETICAL CHEM	1920	4316
RECTOR, FLOYD CLINTON	PHYSIOLOGY	1920	3623	✓ SIMS, PETER	MOLEC BIOL	1920	4617
REDDING, TOMMIE W	ENDOCRINOLOGY	1933	2487	SINGER, SEYMOUR JONATHAN	CELL BIOL	1924	5647
REEDER, DON DAVID	PHYSICS	1935	2477	SINSHEMER, ROBERT LOUIS	MOLEC BIOL	1920	4162
✓ REESE, THOMAS SARIGENT	CELL BIOL	1935	2584	* SJOGREN, ALBERT	PHARMACOLOGY	1924	4758
REICH, EDWARD	BIOCHEMISTRY	1927	2753	* SJOGREN, HANS OLOF	ONCOLOGY	1935	3467
REICHERT, LEO E J	ENDOCRINOLOGY	1921	3613	* SJOQVIST, FOLKE F G	PHARMACOLOGY	1933	2867
REISFELD, RAUPH ALFRED	IMMUNOLOGY	1926	3680				

SJOVALL, JAN	BIOCHEMISTRY	1928	2814	LARRY, DAN WESLEY	BIOPHYSICS	1935	3386
* SKOOG, FOLKE	PLANT SCIENCES	1908	2501	* LUTHER, L. O.	ENDOCRINOLOGY	1931	3304
* SMALL, DONALD MACFARLAND	BIOPHYSICS	1931	3322	VAGELOS, PINDAROS ROY	BIOCHEMISTRY	1929	2633
SMITH, EMIL L.	BIOCHEMISTRY	1911	3812	✓ VALE, WYLIE WALKER	NEUROENDOCRINOLOGY	1941	4123
SMITH, IAN CORMACK PALMER	BIOPHYSICS	1939	2976	VALLÉE, BÉRT L.	BIOCHEMISTRY	1919	4829
✓ SMITH, THOMAS WOODWARD	CARDIOLOGY	1936	4037	VAN DENEN, LAURENS L. M.	BIOCHEMISTRY	1928	8267
SNYDER, FRED	BIOCHEMISTRY	1931	3172	VAN ROOD, JOHANNES JOSEPH	PHARMACOLOGY	1926	2582
SNYDER, SOLOMON HALBERT	PHARMACOLOGY	1938	31449	* VAN UTER, L. S. D.	PHYSICS	1922	2460
✓ SOBEL, BURTON E.	CARDIOLOGY	1937	4534	VANE, JOHN ROBERT	PHARMACOLOGY	1927	2971
SOELDNER, JOHN STUART	ENDOCRINOLOGY	1932	2750	VANNUCCI, FRANCOIS M.	PHYSICS	1944	2066
SOHNENSLICK, EDMUND H.	CARDIOLOGY	1932	8301	VAUGHAN, MARTHA	BIOCHEMISTRY	1926	2572
* SORNI, FRANTISEK	ORGANIC CHEM.	1913	4890	VENABLE, JOHN HOWARD	CELL BIOL.	1929	3241
SPECTOR, SYDNEY	PHARMACOLOGY	1923	3702	VENEZIANO, G.	PHYSICS	1926	2385
SPRELLACK, WILLIAM NELSON	ENDOCRINOLOGY	1933	2679	VEREJ, ELI-GOT.	PHARMACOLOGY	1933	2562
SPICER, SAMUEL, SHERMAN	PATHOLOGY	1914	3131	VINOGRAD, JEROME	MOLEC. BIOL.	1913-78	4185
SPICER, WILLIAM EDWARD	PHYSICS	1929	3433	VINUELA, ELADIO	VIROLOGY	1937	3471
SPRIGELMAN, SOLOMON	MOLEC. BIOL.	1914	8415	* VOGT, PETER KLAUS	VIROLOGY	1932	3728
SPYRO, ROBERT GUNTER	BIOCHEMISTRY	1929	3258	WABER, JAMES T.	PHYSICS	1920	3555
SPRENT, JONATHAN	IMMUNOLOGY	1941	3045	WAGNER, HENRY NICHOLAS	NUCLEAR MED.	1927	4454
SPURR, ARTHUR RICHARD	PLANT SCIENCES	1915	2716	WAKSMAN, BRIAN HALSTEAD	IMMUNOLOGY	1919	3405
STADTMAN, EARL PEECE	BIOCHEMISTRY	1919	2636	WALDMANN, THOMAS A.	IMMUNOLOGY	1930	4094
* STANIER, ROGER YATE	MICROBIOLOGY	1916	2506	* WALLACH, DONALD F. H.	ONCOLOGY	1926	5623
STARZL, THOMAS E.	IMMUNOLOGY	1926	5119	WALSH, DONALD HARTEUR	IMMUNOLOGY	1938	2490
✓ STECK, THEODORE LYLE	BIOCHEMISTRY	1939	4457	WALSH, JOHN ARTHUR	GASTROENTEROL.	1938	2967
STEIN, YEHUZEHEL	CELL BIOL.	1925	2436	WALTER, ROBERTICH	PHYSIOLOGY	1916-79	2452
STENBERG, ALFRED DAVID	IMMUNOLOGY	1940	2573	✓ WARD, PETER A.	PATHOLOGY	1934	4044
STENBERG, DANIEL	BIOCHEMISTRY	1922	3025	WARNER, NOEL L.	IMMUNOLOGY	1939	3436
STEINER, ALTON L.	CELL BIOL.	1936	3235	WARREN, KENNETH S.	IMMUNOLOGY	1929	2447
STEINER, DONALD FREDERICK	ENDOCRINOLOGY	1930	3421	WEATHERALL, DAVID JOHN	HEMATOLOGY	1933	3252
* STEINER, FRANK SAMUEL	THEORETICAL CHEM.	1931	2789	WEISS, KLAUS	BIOCHEMISTRY	1937	3457
* STEINERSON, J. R.	VIROLOGY	1942	2582	WEIBEL, EDWARD RUDOLF	PHYSIOLOGY	1929	2958
* STEWART, ROBERT F.	PHYSICS	1936	5611	* WEIGLE, WILLIAM O.	IMMUNOLOGY	1927	2723
STOECKENIUS, WALTHER	BIOPHYSICS	1921	2471	WEINSTEIN, STEVEN	PHYSICS	1933	7687
✓ STONE, FRANCIS GORDON ALBERT	ORGANOMET CHEM.	1925	4013	WEINSTEIN, LOUIS	MICROBIOLOGY	1909	3003
STORB, RAINER F.	IMMUNOLOGY	1931	3648	WEISBURGER, JOHN HANS	PHARMACOLOGY	1921	2457
* STROEBER, WARREN	IMPROLOGY	1937	2821	WEISS, HARVEY JEROME	PHARMACOLOGY	1927	2588
* STROMINGER, JACK L.	VIROLOGY	1925	6312	WEISSBACH, HERBERT	HEMATOLOGY	1929	3260
✓ STUDER, FREDERICK WILLIAM	MOLEC. BIOL.	1936	4203	WEISSMANN, GERALD	MOLEC. BIOL.	1932	3392
SUGIMURA, TAKASHI	ONCOLOGY	1926	2837	WENKERT, ERNEST	CELL BIOL.	1930	3272
SUMMERSKILL, WILLIAM HEDLEY	GASTROENTEROL.	1926-77	2637	WEST, THOMAS SUMMERS	CELL BIOL.	1932	2791
✓ SUNDARALINGAM, MUTTAIYA	BIOPHYSICS	1931	4022	* WESTPHAL, OTTO HERMANN E.	PHYSIOLOGY	1913	3129
SUTHERLAND, EARL WILBUR	ONCOLOGY	1915-74	10297	WHITAKER, J. S.	PHYSICS	1948	2874
SUTNICK, ALTON IVAN	ONCOLOGY	1928	2798	✓ WHITE, JAMES G.	PATHOLOGY	1929	4002
SUZUKI, KUNIHKO	NEUROLOGY	1932	2842	WHITESIDES, GEORGE M.	ORGANIC CHEM.	1939	2625
SVEJGAARD, ARNE	IMMUNOLOGY	1937	2438	* WIDERG, KENNETH BERLE	ORGANIC CHEM.	1927	2769
* SWAN, HAROLD JAMES	PHYSIOLOGY	1922	4196	WIDET, TORSTEN N.	ENDOCRINOLOGY	1924	2654
SWEELEY, CHARLES CRAWFORD	ORGANIC CHEM.	1930	2851	WIGZELL, HANS L. R.	PHYSIOLOGY	1924	3534
* SYMONS, MARTYN CHRISTIAN R.	INORGANIC CHEM.	1925	4593	* WILKINSON, GEOFFREY	IMMUNOLOGY	1938	7243
* SZWARC, MICHAEL	PHYSICAL CHEM.	1909	2593	✓ WILLIAMS, DUDLEY HOWARD	ORGANOMET CHEM.	1921	5444
SZYBALSKI, WACLAW	MOLEC. BIOL.	1921	2890	✓ WILLIAMS, DUDLEY HOWARD	ORGANIC CHEM.	1931	5561
✓ TAKEUCHI, TOMIO	MICROBIOLOGY	1923	4480	WILLIAMS, RALPH C. H.	PHARMACOLOGY	1926-70	2360
TALAL, NORMAN	IMMUNOLOGY	1934	3553	✓ WILLIAMS, RALPH C. H.	IMMUNOLOGY	1928	4037
TAN, ENG M.	IMMUNOLOGY	1926	2783	WILLIAMS, ROBERT HARDIN	ENDOCRINOLOGY	1909-79	1289
* TANFORD, CHARLES	BIOCHEMISTRY	1921	5924	WILLIAMS, ROBERT JOSEPH P.	INORGANIC CHEM.	1926	2948
TAPPEL, ALOYS LOUIS	BIOCHEMISTRY	1926	4258	✓ WILLIAMS, ROGER	GASTROENTEROL.	1933	5234
✓ TASHJIAN, ARMAN HAIG	ENDOCRINOLOGY	1932	3911	WILLIAMSON, JOHN RICHARD	BIOCHEMISTRY	1933	2958
* TATA, JAMSHED RUSTOM	BIOCHEMISTRY	1930	2837	* WILSON, DAVID F.	BIOCHEMISTRY	1938	2713
TAUBE, HENRY	INORGANIC CHEM.	1915	2802	WILSON, JEAN DONALD	ENDOCRINOLOGY	1932	3398
TAYLOR, EDWIN WILLIAM	NEUROLOGY	1929	4431	* WILSON, KENNETH GEORGE	PHYSICS	1936	3061
TEMIN, HOWARD MARTIN	ONCOLOGY	1934	3570	WINEFORDER, JAMES D.	PHYSICS	1931	2811
TERASAKI, PAULICHIRO	IMMUNOLOGY	1929	7379	WINSTEIN, SAUL	PHYSICAL CHEM.	1912-69	3146
TERRY, WILLIAM DAVID	IMMUNOLOGY	1933	2817	* WITKOP, BERNHARD	ORGANIC CHEM.	1917	3921
✓ THÖNEN, HANS FRIEDRICH E.	NEUROLOGY	1928	4506	WITTMANN, HEINZ GUENTER	MOLEC. BIOL.	1927	2776
THOMAS, CHARLES ALLEN	GENETICS	1927	2707	WOLFF, JAN	ENDOCRINOLOGY	1925	2564
✓ THOMAS, EDWARD DONNALL	ONCOLOGY	1920	4702	WOLFF, SHELDON M.	IMMUNOLOGY	1930	2981
TILL, JAMES EGGAR	BIOPHYSICS	1931	2488	WOODWARD, ROBERT BURNS	ORGANIC CHEM.	1917-78	3644
TODARO, GEORGE JOSEPH	ONCOLOGY	1937	8535	WURTMAN, RICHARD JAY	ENDOCRINOLOGY	1936	6330
TOLBERT, NATHAN EDWARD	PLANT SCIENCES	1919	2731	WYMAN, JEFFRIES	MOLEC. BIOL.	1901	4133
TOMASI, THOMAS B.	IMMUNOLOGY	1927	3315	* YAGI, HARUKYO	ORGANIC CHEM.	1939	2841
TOMKINS, GORDON M.	BIOCHEMISTRY	1926-75	7252	YALOW, ROSALYN SUSSMAN	ENDOCRINOLOGY	1921	4500
TRILLING, GEORGE HENRY	PHYSICS	1930	3773	YANOFSKY, CHARLES	MOLEC. BIOL.	1925	6554
TROST, BARRY M.	ORGANIC CHEM.	1941	3097	* YEN, SAMUEL SHOW-CHH	ENDOCRINOLOGY	1927	4108
TRUMP, BENJAMIN FRANKLIN	PATHOLOGY	1932	3581	YOUNG, ROBERT C.	ONCOLOGY	1940	2503
TSO, PAUL ON PONG	BIOPHYSICS	1929	2477	* YUNIS, EDMOND J.	IMMUNOLOGY	1929	3511
TURK, JOHN LESLIE	PATHOLOGY	1930	3243	* ZBAR, BERTON	ONCOLOGY	1938	3131
TURKINGTON, ROGER W.	ENDOCRINOLOGY	1938	2716	ZECH, LORE	GENETICS	1923	3393
* TURRO, NICHOLAS JOHN	ORGANIC CHEM.	1938	3101	ZIFF, MORRIS	IMMUNOLOGY	1913	2742
LYDENFRIEND, SIDNEY	BIOCHEMISTRY	1918	8641	ZIMMERMAN, HOWARD ELLIOT	ORGANIC CHEM.	1926	3226
UHR, JONATHAN WILLIAM	IMMUNOLOGY	1927	3825	ZINDER, NORTON DAVID	MOLEC. BIOL.	1928	2528
* UMEZAWA, HAMAO	MICROBIOLOGY	1914	7808	* ZUMMO, BRUNO	PHYSICS	1923	2500
✓ UNANUE, EMIL R.	IMMUNOLOGY	1934	5100				
UNGER, ROGER HAROLD	ENDOCRINOLOGY	1924	8036				
✓ UNGERSTEDT, URBAN	PHARMACOLOGY	1942	4982				

Keep in mind, however, that we have eliminated from this study not only all citations to work published before 1965, but also citations to any articles not included in our source files. Books and book chapters were not added to the source file until 1977 and they have been excluded from the study. Citations to books are therefore also excluded. Since we cover all of the most important

journals of science it is not a great limitation. But there is always a chance that some highly cited individual may be adversely affected by these selection criteria.

Of course, many scientists who published their most-cited papers before the starting date of this study, 1965, do not appear on this list. So there is a chronological bias in this study favoring those

who have published mainly during this period. As we change the chronological scope of our studies the list will change. In fact, if you compare the 300 most-cited authors on this list to those in the earlier study,² you would find that only one third of them are new names which did not appear on the 1961-1976 list. The new names are indicated by a check mark in Table 1. As a rough estimate, about 7.5 percent of the names will change as the base year is shifted annually.

I would like to mention a few of the mechanics involved in preparing these lists to show what care is taken to avoid errors of one kind or another. Once we had matched the citations with the source entries, the computer was programmed to generate a ranked list of authors' "names" (surname and up to three initials), a bibliography of papers associated with those names, and the number of citations each of those articles received. Actually, about 85 percent of the names could be used immediately but, unfortunately, about 15 percent represented homographs. Many journals do not provide the authors' first names in by-lines. And practically all journals only include initials for first names in reference citations. So we could not easily include first names in the *Citation Index* even if we wished to use the extra space.

When you look up a name like R.A. Fisher in *SCI*, the boldface entry is really a heading for the homograph which includes several people with the same last name and initials. It is never a problem to locate a particular paper, and ordinarily it is not a problem to differentiate the papers of the geneticist from the physicist. But in this study we religiously checked out each homograph to determine which papers belonged to each of the two or more persons involved.

We went about making this determination in a number of ways. One of the methods we used involved checking

IST's *Current Bibliographic Directory of the Arts & Sciences*[®] for the authors involved. Although we could confidently eliminate some of the addresses by comparing journal titles with department names, we sent letters to the authors at the remaining addresses. The letter asked them to fill out a questionnaire and provide a complete list of their publications. A large percentage of authors responded to this initial contact. For those who did not, or for those for whom we had obsolete addresses, we sent out second letters or attempted to contact them by telephone. In this way we were able to establish complete first and middle name information and discover which articles belonged to which authors.

As a result of these efforts, we eliminated many names and resolved the homograph problem. Thus, we counted only the number of citations and papers properly attributable to most authors. However, some authors may find that they are credited with a few extra papers or citations. In these cases, the few papers and citations provided insignificant "noise."

The average number of citations for all authors listed here was 3,811—over 272 citations per year. As it turns out, the minimum threshold for inclusion in this study was 2,436 citations—an average of about 174 citations per year. The average *cited* author is cited less than one tenth as often.

The average author in this study published 121 papers; on 32 of these his or her name appeared as first author and on 89 as one of the subsequent authors. The average author received 1,178 citations to papers on which he or she appeared as first author and 2,633 as coauthor. This clearly demonstrates the importance of all-author data for the most-cited scientists.

The list is provided in alphabetical, rather than ranked, order. For each author we have identified the field. To avoid further delay in publishing the list

we decided to provide this initial look now. In future parts of this study we will discuss groups of authors by disciplines. A cautionary note is needed here. Citation practices vary among disciplines so the reader should be careful in comparing raw citation counts for authors in one field with counts for authors in another. More detailed information about each author will be given in the latter parts of this study.

You will notice that for the first time in one of these studies we are giving the complete first and middle names of authors to better identify them. Based on purely feminine given names, it seems that at least 24 women appear on this list. We are not sure of the exact number because we did not ask the authors to state their gender on the questionnaire. In the future I plan an essay about women in science. The women identified in this study will be a good starting point.

We have also listed the date of birth for each author and, where applicable, date of death. The oldest author on this list is F.A. Lipmann, born in 1899, and the youngest is J.S. Whitaker, born in 1948. The average age of the authors on the list is 53. Table 2 shows the number of authors by decade of birth. Now it is clear that it would have been of interest

Table 2: Number of authors by decade of birth.

Decade	Number of authors
1899	1
1900-1909	25
1910-1919	122
1920-1929	390
1930-1939	381
1940-1948	80

(One birth date was unavailable.)

to use the age at which their first paper was published, but we did not ask for this information.

The questionnaires sent to the authors asked them to name their own field or discipline. The authors are thus self-categorized. Thirty-eight fields are

represented on the list. Table 3 lists the number of authors in each field. Immunology is the largest group.

An asterisk next to an author's name indicates that some of our information about that author may be incomplete. Such authors may never have sent us a bibliography or didn't fill out the questionnaire completely so we were unable to verify a piece of information. The information presented is accurate to the best of our knowledge. But errors may occur in such large studies.

With little effort, readers can scan the list to learn who is the most-cited author. In the vast majority of cases appearance on this list is an *indicator* that the person involved is of *Nobel class*.⁴ Harriet Zuckerman, in her book *Scien-*

Table 3: Number of authors per field.

Field	Number of authors
Aeronomy	2
Astronomy	5
Astrophysics	7
Biochemistry	84
Biophysics	26
Cardiology	33
Cell Biology	57
Chemical Physics	2
Endocrinology	74
Enzymology	6
Gastroenterology	10
Genetics	21
Geophysics	2
Hematology	21
Histology	8
Immunology	128
Inorganic Chemistry	27
Microbiology	18
Molecular Biology	67
Nephrology	1
Neurobiology	2
Neuroendocrinology	1
Neurology	13
Neuropharmacology	9
Nuclear Medicine	1
Oncology	48
Organic Chemistry	51
Organometallic Chemistry	10
Pathology	23
Pharmacology	59
Physical Chemistry	24
Physics	77
Physiology	36
Plant Sciences	6
Psychiatry	4
Surgery	1
Theoretical Chemistry	7
Virology	29

tific Elite, likens this group to the "immortals," who, though equal in stature, are not included in the French Academy's limited membership of 40. She refers to these individuals "...who are peers of prizewinners in every sense except that of having the award" as occupants of the "forty-first chair."⁵ (p. 42) Such people can be identified as *of Nobel class*. In fact, 41 Nobelists do appear on the list. However, one would have to examine the data for each individual on the list, in combination with other factors, to determine whether appearance on this list is primarily due to productivity, citation impact, or both. One cannot conclude that the most-cited or the most published author is necessarily the most important or the one who has made the greatest contribution to science.

Any list is, of course, only as good as the system that helps create it. Many of you are well aware of quirks in authorship attribution that permit some scientist-administrators to put their names on hundreds of papers as coauthors. Some of these scientist-administrators will show up on the accompanying list. This follows the old European tradition and quite often it has been followed at certain American institutions. The list may also include certain academicians who have not otherwise achieved great distinction but have coauthored dozens of papers with graduate students. We should not be quick to criticize such authors since there is no agreed-upon, published set of rules for establishing authorship. In some instances the other authors may have been only too happy to have the prestigious name included. It often helps the young research worker to be joined by a famous scientist as coauthor. There is as yet no agreed-upon method for assigning credit to each coauthor, although Derek Price has recently suggested a method to fairly attribute citations on multi-authored papers.⁶ When we do the institutional study of these authors,

this particular problem will be eliminated since citations to each paper can be credited to the department involved.

We realized long ago that a few people may appear on such lists because they had written one super-cited paper. When I discussed this with John deCani, department of statistics, University of Pennsylvania, he suggested that we might "censor" the data by excluding citations to the most-cited paper for each of the 1,000 authors.⁷

We did so and found that 90 percent of the time the most-cited paper accounted for fewer than 22 percent of the citations. In other words, the vast majority of the authors on this list would still remain among the most-cited if their most-cited paper were removed. The average number of citations to each author's most-cited item was 453. A study now under way will tell us how many papers in this time period have been cited this many times. Nevertheless, there are some instances where one or two papers account for most citations. The fact is that scientists *of Nobel class* not only publish one or more superstar papers, they also publish more often and their papers achieve higher impact. We observed this phenomenon over 15 years ago in a study of Nobel prizewinners.⁸ (p. 63-4)

The world of science is very large. Over one million scientists publish from time to time. Of these, however, a small percentage publish a large percentage of all papers. That is one kind of productivity measure. Of those, however, there is an even smaller number who have a significant impact, which is largely reflected in citations. Since it is generally agreed that there is no significance to a particular citation count, one may usefully think in terms of percentiles—much as we do with IQs or aptitude tests. It would be absurd to choose one doctoral candidate over another because an individual had one point higher on an aptitude test. It

would be equally absurd to judge anyone on the difference of a few papers or citations. Indeed, it is absurd to use citations, publications, or any other *single* factor alone in evaluations. However, to narrow down one million names to 10,000 or less and then to categorize these names by specialties does provide a useful *beginning* in identifying, in an objective, non-obtrusive manner, those who are making the greatest impact.

Future parts of this series of essays will present a discussion of the 1,000 authors by discipline, provide detailed citation data and publication counts for each author, identify academy memberships and other forms of recognition, and examine the institutions where highly cited research is being conducted.

It is obvious to me that we must extend these initial studies in the future to include at least another 1,000 or 2,000 scientists. I say this if only because the memberships of the world's academies of science exceed this number, and the number of important scientists exceeds that number. But in order to do this in a

far more efficient and systematic manner, ISI is developing a statistical data base derived from *SCI* and *Social Sciences Citation Index*[®] (*SSCI*[®]) that will facilitate large-scale studies for a variety of scientometric purposes. As we make progress with this system, I'll be reporting the outcome here and in the professional journals. And as the size of the study population increases, we shall identify more people in the smaller or less published fields.

We'd like to thank all those who cooperated with us during this study. In spite of their own publishing deadlines, grant application complications, and other research demands, hundreds of scientists took the time to provide us with information, even though some of these scientists were not included in the study.

* * * * *

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