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Directory Listings of Minnesota Scientists

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DIRECTORY LISTINGS OF MINNESOTA SCIENTISTS

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The new directory of scientists, the 10th edition of *American Men of Science*, enables us to ascertain in what fields and with what organizations scientists are working in Minnesota. It also makes possible a comparison with other organizations and with the rest of the United States.

Of the five volumes, that are to include biographies of 120,000 scientists, only the first three (Physical and Biological Sciences, names A to R inclusive) have appeared to date.

The following table totals all scientists giving Minnesota addresses for the three volumes. In the later tables or where comparisons are made with other institutions and states the data are limited to two volumes.

EDUCATION. The University of Minnesota ranks fifth among the schools of the United States in the listing of her staff in volumes one and three. The leaders are:

University of Calif. (six universities)	754
University of Illinois	520
University of Michigan	446
Cornell University	432
University of Minnesota	416
Columbia	400
Harvard	385
Wisconsin	376
Pennsylvania	314
New York University	314

The steady increase in the listing of the staffs of the Minnesota small colleges reflects the strengthening of their science faculties.

INDUSTRY. A generation ago industrial scientists were limited almost exclusively to the Mid-Atlantic region of the United States. Scientific research laboratories spread first into the East North Central States and in southern New England. Pharmaceutical and chemical houses developed in the midwest. The aircraft, oil and missile industries spread laboratories to the Pacific and Gulf states, California now rivals the leaders—New York and New Jersey. Ohio has established herself among the top five. Illinois, Texas and Michigan

TABLE 1. Scientists in Minnesota

Educational			Industrial		
Listed Alumni		Listed Staff	Staff Members Listed		
Vols. 1 & 2,					
882	Univ. of Minnesota	616	Minn. M & M	119	
	Duluth	22	General Mills	60	
3	Augsburg	3	Honeywell Regulator	44	
86	Carleton	18	Archer Daniel Midland	14	
15	Concordia	10	Remington Rand (Univac)	8	
21	Gustavus Adolphus	6	Pillsbury Co.	6	
22	Hamline	7	Pillsbury Mills, Inc.	3	
26	Macalester	9	Minn. & Ont. Paper Co.	6	
	State Colleges		Cargill, Inc.	4	
7	not specified		Econ. Labs., Inc.	4	
3	Bemidji	4	Int. Milling Co.	3	
6	Mankato	15	Durkee Atwood Co.	2	
2	Moorhead	1	Gould Natl. Batteries	2	
6	St. Cloud	7	Green Giant Co.	2	
2	Winona	3	Lithium Corp.	2	
1	St. Benedict	3	McLaughlin Gormley King	2	
2	St. Catherine	5	Pichard Matthews Co.	2	
18	St. John's	6	U.S. Steel (Oliver)	2	
16	St. Mary's	5	Wood Conservation Co.	2	
74	St. Olaf	16	35 firms, one each	35	
—	St. Scholastica	2		—	
—	St. Teresa	2			321
30	St. Thomas	9	Minn. State Depts.	14	
	Bethel	2	Federal Depts.	30	
	Morris	1		—	
	Ely Jr. College	1			44
			Miscellaneous	27	
1222		773			27
			Total in the State		1165

have similarly succeeded in the top ten. At present, Indiana, Missouri and Minnesota are among the top fifteen states. Of the fifty firms with the largest listings one half are primarily in aircraft (9), oil (8), or pharmaceuticals (8), Minnesota has not been favored in these fields.

In the sixth edition of 1938, Minnesota Industries were represented by 39 names (53 in the seventh edition of 1944). When the present edition is completed, we may expect Minnesota firms to be represented by 500 scientists. M. & M. stands 30th among American firms in the number of her listed scientists.

The leaders in volumes one and three are:

Dupont	1219	R.C.A.	226
General Electric	590	Westinghouse Electric	221
Union Carbide	336	Esso	220
American Cyanamid	323	Eastman Kodak	208
Shell Oil	316	Olin Mathiesen	171
Dow Chemical	274	I.B.M.	170
Bell Telephone	268	Battelle Memorial	170
Monsanto	233	Standard Oil, Calif.	131

Merck Sharpe & Dohme.	130	Upjohn	100
Standard Oil, Ind.	120	Rand Corp.	100
Philips Petrol.	115	Socony	94
U.S. Steel	112	C. Pfizer	94
Allied Chemical	109	Eli Lilly	90
Stanford Research Inst. .	107	General Dynamics	88
Rohm & Haas	102	Minnesota M & M	87

The lines of demarcation of the sciences are being erased. To get a survey of the fields we may combine the hundred sciences into a dozen disciplines. Let, for instance, biochemistry include physiological chemistry, pharmaceuticals and drugs; medicine include surgery, pathology, public health, therapeutics, etc.; botany include bacteriology, microbiology, forestry. Miscellaneous includes astronomy, geography, anthropology, psychology, mineralogy.

The institutional connections of scientists are: (1) Educational, (2) Industrial, (3) Public (A) Federal (B) Local, (4) Miscellaneous: museums, foundations, consulting, private and retired.

The following table summarizes the institutional and discipline affiliations of the 48,273 Scientists in the United States as listed in volumes one and three: The totals of scientists in Minnesota are repeated separately for easy comparison.

STATISTICAL ANALYSIS. (Of the listing of the Younger Native Minnesotans in American Men of Science.)

The age and place of birth as given in the directory of scientists

TABLE 2.

	Chemistry	Organic	Biochemistry	Physics	Engineering	Medicine	Botany	Zoology	Agriculture	Geology	Mathematics	Miscellaneous	Total
EDUCATION:													
U.S.	1883	736	1968	2153	2416	4735	2315	2631	1307	643	1929	694	22810
Minn.	42*	24*	26	38	49	159*	60*	55	47*	8	39	15*	562*
INDUSTRY:													
U.S.	3964	2892	1037	2059	3429	202	555	241	133	344	401	533	15790
Minn.	55	55*	8	35	43	1	7	2	5*	2	6	8	227
Public, Federal U.S.			5691										
Minnesota			24										
Public, Local			525										
Minnesota			11										
Miscellaneous U.S.			3457										
Minnesota			21										
Total U.S.			48,273										
Total Minn.			845			Minnesota expected on the basis of population 890.							

* Asterisks note numbers that indicate relative prominence for Minnesota. (Almost one half of U.S. scientists are with educational institutions, almost one third with firms and almost one eighth with the federal government. In Minnesota the educational group is relatively numerous while the other groups are relatively fewer.)

lets us investigate where the younger scientists are coming from. If the influences that have been effective and those that are limiting can be ascertained, a great increase of scientists is possible. At the appearance of volume one of *American Men of Science* 10th edition, the age of those giving the United States as their place of birth was:

870 under 30 years
6679 in their thirties
6231 in their forties
3925 in their fifties
3264 sixty years or over.

Ages of native Minnesotans in Vols. 1 & 2

39 under 30 years
315 in their thirties
412 in their forties
233 in their fifties
174 sixty years or over.

The median age was approximately 44 years (almost two years younger than the median age of those listed in the 7th edition, 1944). Accordingly we may use the census of 1920 to tell us how many listed scientists were furnished by each city, state or region per million of the population, and the census of 1930 will give a similar comparison for the younger scientists, those under 40 years of age.

The following table gives this information for the regions used in the census report. The percentage for each region of the United States is given for easy comparison.

TABLE 3.

	Total Native Scientists Vols. 1 & 2	Per Million 1920 Census	Percentage of U.S.	Scientists Under 40 Years	Per Million 1930 Census	Percentage of U.S.
New England	3,658	494	8.7%	1294	159	8.4%
Mid-Atlantic	10,671	479	25.4	4357	166	28.2
East North Central	9,715	406	23.1	3289	130	21.2
West North Central	5,988	576	14.2	1798	135	11.6
South Atlantic	3,505	256	8.3	1397	88	8.8
East South Central	1,595	179	3.8	585	58	3.8
West South Central	2,276	222	5.3	941	78	6.1
Rocky Mountain	1,976	490	4.7	711	192	4.5
Pacific	2,547	461	6.1	1059	129	6.8
Outlying	95	...	.22	89	91	.25

The great changes in the rate of production are the increase in the Mid-Atlantic region and the drop in the west North Central States. Minor relative increases in the west South Central, the Pa-

	Total Native Scientists	Rate per Million 1920 Census	Younger Scientists Under 40 Years	Nat. Per Million 1930 Census
Minnesota	1173	491	354	138
Utah	532	1093	191	376

cific and the South Atlantic are offset by minor decreases in the east North Central and New England States.

Minnesota figures, thanks to her large cities, are well above the average but far below the top state, Utah.

The most striking development however is the increase of scientists from cities with a population of over 100,000. In the sixth edition of 1938 many large cities lagged behind the rest of their states in the number of native scientists. Philadelphia and Pittsburgh with 473 scientists (235 per million) rest of state, 253 per million New York City and Buffalo with 1172 scientists (225 per million) rest of the state, 445 per million, Chicago with 355 scientists (167 per million) rest of the state, 397 per million.

The Twin Cities already had surpassed the rest of Minnesota. Twin Cities 182 (355 per million) rest of Minnesota, 297 per million.

A remarkable change has taken place. Of the 15,452 native United States scientists under 40 years of age as listed in Volumes one and two, 6906 are from cities with a population over 100,000, 193 per million, 1930 census, 8,546 from the rest of the United States 99 per million for the 1930 census. Larger cities are furnishing scientists at twice the rate of the rest of the U. S.

In Minnesota the contrast is even greater than this average. 183 scientists for the three cities, rate 219 per million, rest of the state, 171 or 99 per million.

The rate for the rest of the state 99 per million compares with the corresponding rate in:

Wis.	121 per million	Kansas	154 per million
Iowa	122 per million	Nebr.	140 per million
Ill.	129 per million	So. Dak.	166 per million
		No. Dak.	100 per million

Minnesota's non-big-city rate is barely above the corresponding rate of the entire United States, the rate of many sections of which is handicapped by the large number of colored and other relatively unproductive groups. 5% more scientists are alumni of Minnesota Colleges than are native of the state.

The directory does not give any easy answers to the disturbing problems that it raises. What are the large cities doing that the rest of the country has neglected?

It has been claimed that the heavy increase of scientists in some of the larger cities is due in part to the students being nearer the research centers. Science has become more honorable and is better rewarded than formerly. Many of the so-called "bright lads" that formerly would have gone into the practice of medicine, into law, business and industry are now going into research. The absence of this tendency can hardly account for the relatively poor showing of Minnesota outside of the large cities.