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## Iowa's Contribution to American Men of Science, Seventh Edition

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## IOWA'S CONTRIBUTION TO AMERICAN MEN OF SCIENCE, SEVENTH EDITION

H. E. ZABEL

The latest directory has appeared during the war when many fields of science are marking time and when we have adopted a policy of interrupting the production of scientists. It thus becomes a landmark and an analysis of the data it presents has special significance.

In this directory Iowa has not only maintained her position among the leading states in production of scientists but has slightly improved this relative standing.

### NATIVE SCIENTISTS

Iowa has 258 new native son scientists but has lost 76—56 by death. This makes a net gain of 182 for a total of 1292. In the previous edition, six states had more native scientists than Iowa, Indiana surpassing Iowa by a margin of 4. Now Iowa has surpassed Indiana for sixth position by the same margin.

We may follow a method suggested by Dr. E. L. Thorndike (Science July 1940) for computing the number of scientists per million of population. We then use the 1900 census and find Iowa has 580. Only three states outrank Iowa: Utah 1065, Colorado 657, Vermont 589. On this basis, from 1938 to 1944, Iowa has increased her number of scientists per million of population from 538 to 580. She has passed Connecticut and Massachusetts since the appearance of the 6th edition.

The total number of names in the present edition is 34,114, an increase of 23.2%. Iowa's increase over her very high previous total is 16.4%.

### ALUMNI

A better showing is made by the increase of alumni of Iowa colleges, where the total stands at 1064, an increase of 208. This is an increase of 24.3%, slightly above the rate for the entire United States: 23.5%. Only seven states have a larger increase of alumni: Illinois 491, Ohio 460, California 451, Pennsylvania 434, New York 386, Massachusetts 332, and Wisconsin 219.

In figure 2, we have the states arranged according to the totals of their alumni scientists. The entire graph for each state indicates these totals. The shaded part of each graph indicates the amount of the increase since 1938. The rate of increase of Iowa is slightly above the average. Especially large rates of increase will be noted for Illinois, Ohio, California, Minnesota, Texas, and Washington.

Iowa is in ninth position in the total number of alumni scientists

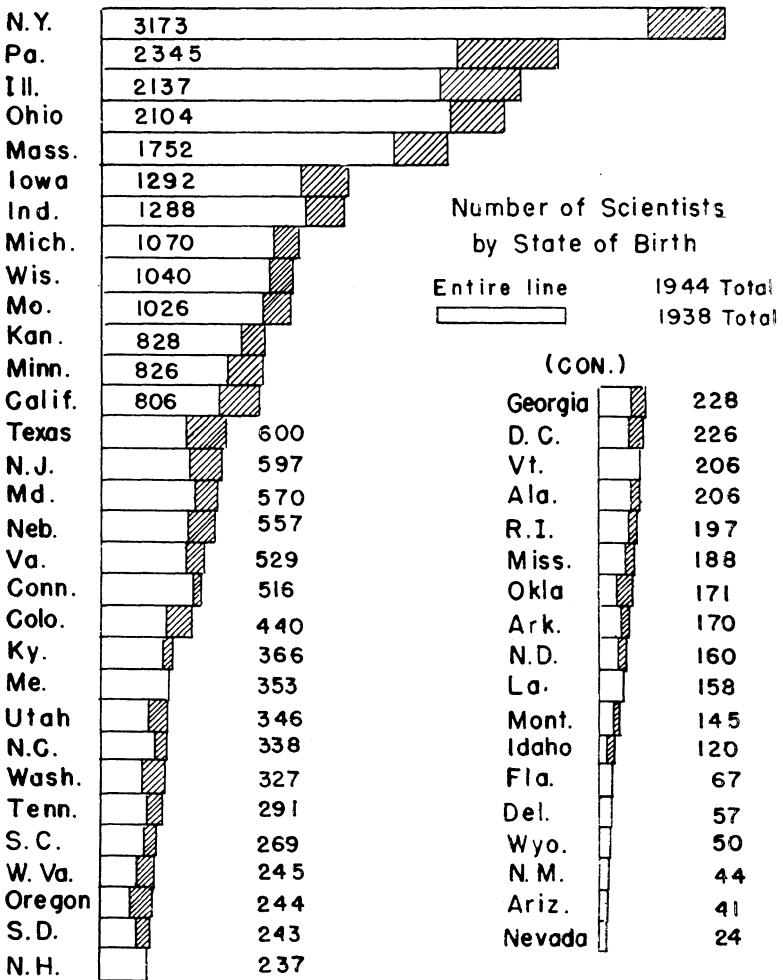
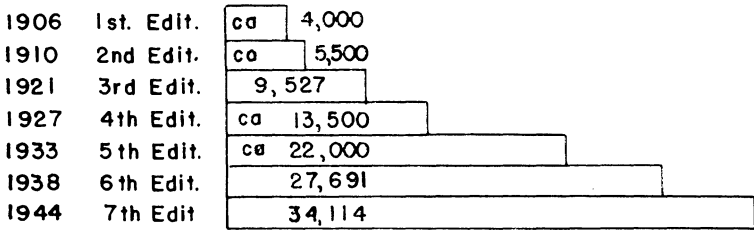


Fig. 1

and has been gaining slightly on Indiana and Michigan, the two states immediately ahead of her.

A supplementary graph on figure 2, compares the number of native scientists with the number of alumni scientists. The horizontal shading indicates the extent to which the alumni exceed the native scientists. The vertical shading for a state indicates the excess of native scientists.

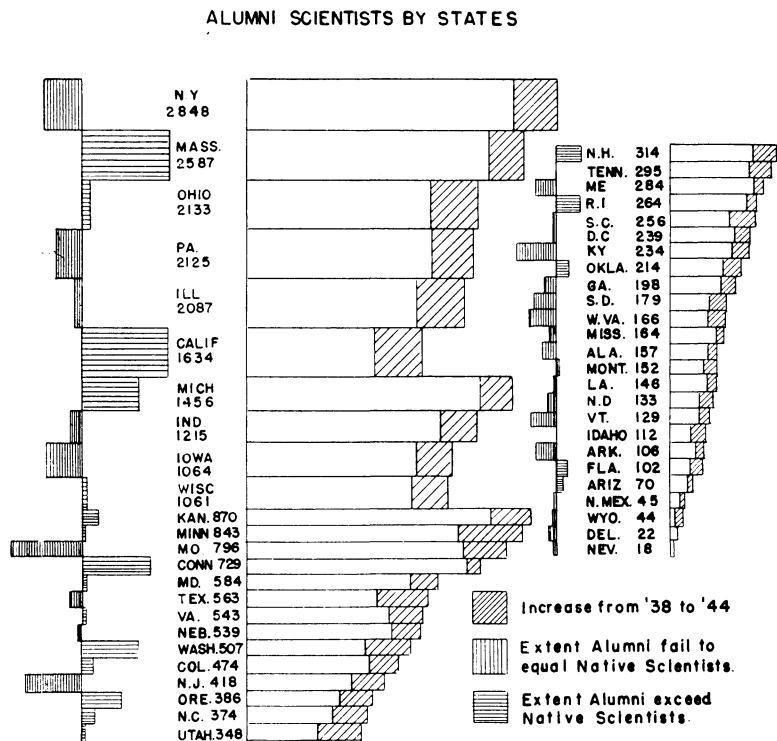


Fig. 2

The vertical shading thus indicates the extent by which the colleges of a state were unequal to the requirements of its native scientists for undergraduate training. The horizontal shading indicates the extent to which the colleges of a state furnished undergraduate training to scientists in excess of the requirements of its native scientists.

We see that the North Atlantic region of New York, New Jersey and Pennsylvania depends on other regions for the undergraduate training of an appreciable portion of its native scientists.

Quite conspicuous among the remaining states by the extent to which they depend upon other states for the undergraduate training

of their native scientists are Iowa, Missouri and Kentucky. The large increase of Iowa alumni that we have noted above is now reducing this excess. It may be considered both a challenge and an opportunity for Iowa undergraduate work.

UNIVERSITIES AND COLLEGES

Figure 3 arranges the most productive universities and colleges of the United States according to their number of alumni scientists. This is done on the basis of the BA degree or its equivalent and duplicate degrees are not considered.

Iowa State College alumni scientists were increased by 57 and those of the State University of Iowa by 56. This is an increase relative to that of other productive universities. Iowa State has passed Indiana, Missouri and Kansas and advanced from 20th to 17th place

TOTAL ALUMNI SCIENTISTS OF UNIVERSITIES

CORNELL	866	PRINCETON	237	OHIO WES	119	W.RESERVE	81
MICH	849	OSBERLIN	233	MT HOLYOKE	118	COLO. ST.	80
GALIF	767	SYRACUSE	227	MIAMI (O)	115	RENSELAER	80
UCLA	67	MASS. ST.	226	ROCHESTER	111	FRANKL MARSH	79
WISC	832	BROWN	216	CLEMSON	116	OHIO U.	79
HARVARD	822	TEXAS	213	LEHIGH	107	So. DAK. ST.	78
ILLINOIS	786	DARTMOUTH	211	IDAHO	105	MONT. ST.	77
CHICAGO	661	NORTHWEST	186	WILLIAMS	101	HAVERFORD	76
OHIO ST	640	COLO	185	N. HAMP	98	WOOSTER	75
MINN	613	OREGON ST.	180	OREGON	98	VA. P. I.	75
MIT	597	VIRGINIA	178	TUFTS	97	DENNISON	75
COLUMBIA	515	GEO. WASH.	173	WABASH	95	CASE SCH.	75
YALE	497	PITTSBURGH	168	MISS. ST.	93	ARK.	74
STANFORD	410	N. Y. U.	159	DENVER	89	COLO. COL.	74
PENN ST	391	WESLEYAN	151	LAFAYETTE	89	BOSTON U.	74
PENN	384	WASH. (MD)	147	POMONA	88	BATES	73
NEBR	364	MD.	146	VERMONT	86	ALA. P. I.	72
IOWA ST	348	CAL TECH	144	CLARK	84	EARLHAM	71
KANSAS	345	RUTGERS	142	VANDERBILT	84	SWARTHM.	71
MO	334	De PAUW	138	WORSTER P. I.	84	EMORY	70
IND.	331	KY	138	CARLETON	83	ARIZ	70
WASH (Seattle)	329	CINCINNATI	133	BRIG YOUNG	83	ST. OLAF	69
J. HOPKINS	307	N C	130	TEXAS A & M	83	ALLEGHENY	69
C.C of N Y	306	ST. COL WASH.	129	OKLA. A. & M.	83	CARN. TECH.	68
IOWA	273	AMHERST	127	SMITH	83	COLGATE	67
PURDUE	253	UTAH	127	FLA.	83	BUFFALO	66
KANSAS ST	250	W. VIRG.	120	WELLSLEY	83	BOWDOIN	66
MICH ST.	241	ME.	119	VASSAR	82	TULANE	66

Fig. 3

among the large universities. The State University moved from 25th to 24th place ahead of Michigan State.

We stop to note some other changes: Michigan has faltered and Cornell now leads all the universities. California and Wisconsin have

passed Harvard. Penn State has passed the University of Pennsylvania and four of her midwest competitors. The North Central states still retain their 15 representatives among the 27 leading institutions.

Figure 4 diagrams the part that each of the Iowa Colleges and Universities had in producing the 1064 Iowa alumni scientists and also shows the recent increase. Very large gains were made by Iowa Wesleyan, Coe and Luther Colleges. Relatively good gains were made by Cornell, Grinnell, Morningside, Simpson and St. Ambrose. The score on the increase stands 117 to 91 in favor of the state institutions over the private colleges.

FIELDS OF SCIENCE

Figure 5 gives a table of the various groups of Iowa scientists tabulated according to sciences. There is some variation in terminology used by the scientists in naming their specialty. A few generalizations were made to reduce them to these classifications. Where a scientists claims several fields, the first given was used.

The first column classifies native scientists, the second alumni, the

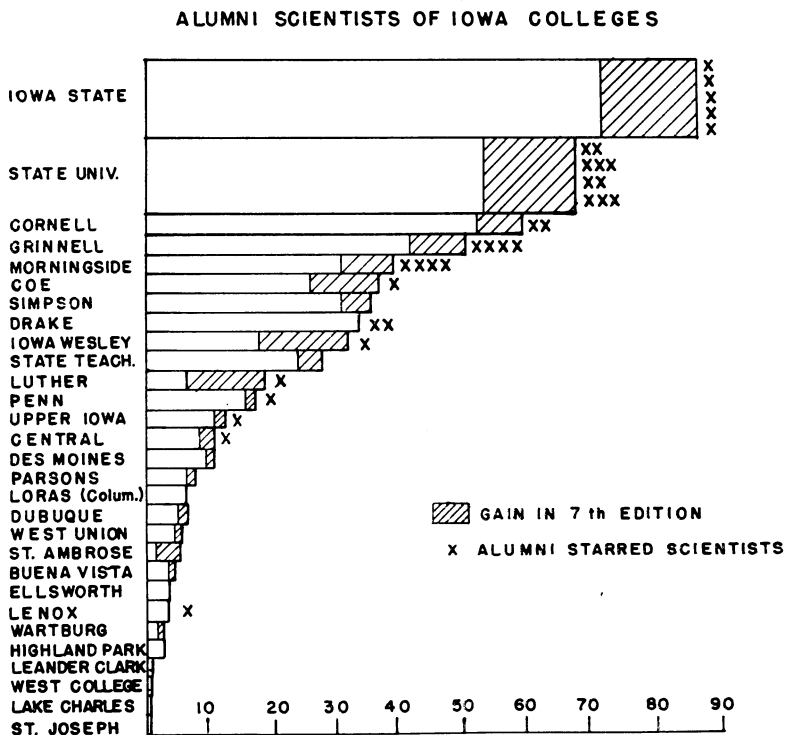


Fig. 4

third gives the scientists who claim an Iowa Ph.D., the fourth column totals other scientists who got their main final advanced degree in Iowa. No scientist is listed more than once in columns 3 and 4, but otherwise some are listed in two or more columns.

The data given in this table invite a dramatization of their story. The first column represents the material our colleges and universities had to work with. As we have seen, it is of the best, the finest in the country. The second column shows how well our undergradu-

	NATIVE	A. B. ALUMNI	PH. D.	OTHER ADVANCED DEGREES	NOW IN IOWA
<b>CHEMISTRY</b>	199	164	169	22	48
<b>PHYSICAL</b>	36	37	40	-	11
<b>ORGANIC</b>	52	45	95	-	8
<b>BIOCHEMISTRY</b>	14	11	31	1	7
<b>PHYSIOLOGICAL</b>	8	7	10	1	2
<b>METALLURGICAL</b>	8	3	3	-	-
<b>PHYSIOLOGY</b>	28	20	26	2	16
<b>AGRICULTURE</b> ( Misc'l)	58	69	58	39	69
<b>PHYSICS</b>	93	83	67	7	30
<b>MATH.</b>	57	50	35	12	40
<b>GEOLOGY</b>	42	34	42	6	11
<b>PSYCHOLOGY</b>	76	57	84	1	32
<b>SPEECH</b>	2	2	6	-	3
<b>ZOOLOGY</b>	55	48	36	4	28
<b>ENTOMOLOGY</b>	28	24	47	9	13
<b>PARASITOLOGY</b>	6	4	1	-	2
<b>ECOLOGY</b>	7	6	3	1	3
<b>BOTANY</b>	44	34	30	8	25
<b>PLANT PHYSIOL.</b>	11	8	10	3	2
<b>PLANT PATHOL.</b>	13	14	22	5	8
<b>HORTICULTURE</b>	14	8	9	16	12
<b>FORESTRY</b>	21	13	2	10	3
<b>ANATOMY</b>	21	18	6	2	5
<b>PHARMACOLOGY</b>	12	7	6	1	7
<b>PATHOLOGY</b>	28	12	1	7	9
<b>BACTERIOLOGY</b>	21	19	41	1	13
<b>MEDICAL ( Misc'l)</b>	54	26	8	12	20
<b>VET. ( Misc'l)</b>	2	9	2	8	8
<b>GENETICS</b>	12	19	20	1	5
<b>SOILS</b>	10	9	27	3	6
<b>NUTRITION</b>	7	5	13	-	7
<b>HOME ECON.</b>	4	3	2	-	2
<b>EDUCATION</b>	3	6	2	1	-
<b>ASTRONOMY</b>	7	7	-	3	4
<b>METEOROLOGY</b>	2	2	-	1	1
<b>GEOGRAPHY</b>	6	4	1	-	2
<b>STATISTICS</b>	7	6	4	1	3
<b>ANTHROP.</b>	7	2	1	1	1
<b>AGRI. ECON.</b>	10	9	-	5	1
<b>BIOLOGY</b>	31	22	16	4	6
<b>ENGINEERING</b>	133	108	51	78	81
<b>PALEONTOLOGY</b>	10	2	2	1	3
			1029	277	537

Fig. 5

ate colleges have succeeded with this material in the development of scientists. The results are given for each branch of science.

Iowa produced 76 Psychologists, but Iowa undergraduate colleges can claim credit for only 59. Other states have given 19 Iowa students inspiration and undergraduate guidance in becoming psychologists.

The third and fourth columns give a corresponding record of the graduate work. In Psychology Iowa graduate schools have been 50% more productive than the schools are in the undergraduate work. They have trained Psychologists not only to make up for the deficiency in the undergraduate results but added 10% more.

As most of the scientists in Iowa now are connected with schools, the last column represents those to whom specific credit or blame for the result accrues. There is, however, one exception. If the 33 present Psychologists listed in the fifth column are so disposed they may say that the 48 Psychologists, the temporary Iowa scientists, who had their jobs before them were to blame.

Geology, Physiology, Botany and Entomology tell a very similar story with some variations.

The graduate schools we find, were especially productive in developing scientists in Organic Chemistry, Agriculture, Psychology, Entomology, Plant Pathology, Horticulture, Bacteriology, Nutrition, Genetics and Soils. This means that many have come from other states to become scientists in these fields.

The graduate work has been comparatively less productive in General Chemistry, Physics, Zoology, Anatomy, Pathology, miscellaneous Medical Sciences, Astronomy, Geography, Anthropology and Agricultural Economics.

A total of 1274 scientists, approximately 4% of the North American scientists, have gotten their final advanced degree in Iowa. This is about two and a half times the number of scientists now in the state.

The graduate schools have been more productive than the undergraduate schools or than the native population.

#### STARRED SCIENTISTS

Iowa has always had a consistently good representation among the starred scientists, even though the applied sciences in which Iowa is especially strong are not considered for starring. Since the previous edition appeared, Iowa has lost six native starred scientists. Six native Iowa scientists were starred in the present edition. She thus maintains her previous total of 60.

The accompanying table shows the distribution of these (Fig. 6).

Of the 255 scientists recently honored, only 197 were born in the United States 102 of these are natives of the North Central States, more than are native of all the rest of the states combined.

Of the starred scientists still living of the 3rd, 4th and 5th groups,



the North Central States have furnished nearly one-half (Fig. 6).

Starred Scientists 7th edit. by State of Birth

	1	2	3	4	5	6	7	Totals
MAINE	4	5	3	1	2	2	1	18
N. H.	3	1	3	2	-	-	3	12
VERM'T	3	1	3	2	2	-	1	12
MASS.	26	13	22	16	17	13	11	119
R. I.	1	3	-	1	1	-	-	6
CONN.	10	4	6	4	4	4	3	34
N. Eng.	47	27	37	26	26	19	19	201
N. Y.	36	16	26	20	29	17	16	160
N. J.	9	1	4	3	3	7	2	29
PA.	13	8	16	16	11	21	14	99
N. Atl.	58	25	46	39	43	45	32	288
OHIO	25	11	25	12	14	13	16	116
MICH.	9	10	6	4	4	8	8	49
IND.	11	9	12	4	9	5	11	61
ILL.	16	6	14	18	21	11	23	109
WIS.	16	7	10	13	5	2	4	57
E. N. Cent.	77	43	67	51	53	39	62	392
MINN.	1	2	6	6	7	5	7	34
IOWA	9	8	18	6	7	6	6	60
MO.	8	4	9	10	9	9	5	54
N. D.-S. D.	-	-	1	1-2	- 2	- 2	2-2	3-9
NEB.	2	-	4	2	5	2	7	22
KANS.	2	1	3	5	8	3	10	32
W. N. Cent.	22	15	41	32	38	27	39	214
S. Atl.	16	12	17	18	9	15	12	99
E. S. Cent.	4	3	5	5	3	5	4	29
W. S. C.	2	2	2	1	3	3	4	17
Mts.	1	-	1	5	7	6	5	25
Coast	6	4	8	1	9	14	16	58
U. S. A.	233	131	224	178	191	173	193	1323
N. Cent.	99	58	108	83	91	66	101	606

Fig. 6

- 1921 North Central States, 108 out of 224
- 1927 North Central States, 83 out of 178
- 1933 North Central States, 91 out of 191
- 1944 North Central States, 102 out of 197

The North Central States are definitely leading the nation in supplying our outstanding scientists.

Four of the State University of Iowa professors were honored by being starred in this edition: H. W. Beams, Zoology; Walter F. Loehwing, Botany; George W. Martin, Botany; and Henry A. Mattill, Physiology. Seven native Iowans were similarly honored: Professors Harry Goldblatt, Pathology, Western Reserve; P. J. Hanzlik, Physi-

ology, Stanford; J. C. Hinsey, Anatomy, Cornell; D. Reno H. Sales, Geology, Anaconda Mining Co.; A. L. Tatum, Physiology, Wisconsin; Fred L. Whipple, Astronomy, Harvard.

Iowa alumni honored are Professors M. R. Irwin, Zoology of Wisconsin, B.S. Iowa State; G. M. Kay, Geology of Columbia, A. B. of University of Iowa; Philip B. King of the U.S. Geological Survey, A.B. University of Iowa; A. L. Tatum, Physiology of Wisconsin, B.S. Penn College.

The State University of Iowa Ph.D's honored are: Professors D. Montgomery, Mathematics of Smith College, Ph.D. Iowa '33; M. R. Irwin, Zoology of Wisconsin, Ph.D. Iowa State '28 and Samuel S. Wilks, Mathematics of Princeton, Ph.D. Iowa '31.

In these groups the Zoologists, Physiologists and Geologists have three each, Botany and Mathematics two, Pathology, Anatomy and Astronomy one each. Previously starred scientists now in Iowa are Professors Bartow, Chemistry; Bodine, Zoology; Chittenden, Mathematics; Ellett, Physics; Glockler, Chemistry; Houser, Zoology; Patrick, Emeritus, Psychology; Rietz, Mathematics; Seashore, Psychology; Stewart, Physics; Trowbridge, Geology; Witschi, Zoology; Wyllie, Botany at the State University of Iowa.

Also starred are Professors Gilman, Chemistry; Gowen, Zoology; Lindstrom, Genetics; Melhus, Botany at Iowa State.

Figure 6 shows the distribution of Iowa's native starred scientists. While the table shows many fluctuations, Iowa's distribution is remarkable even with the exception of the very large number contributed by the '21 edition. The competition for the honor is much keener. In the 1906 edition, one out of four listed scientists was starred. In 1944, one out of 22 listed scientists is starred. Under this keener competition, Iowa has kept up her good listing.

#### INSTITUTIONAL CONNECTIONS

This table gives the distribution of the 3303 Iowa scientists by institutional connections, omitting all duplications.

The overall list has been increased by 680 names. Most of these are accounted for by those who have come to Iowa for advanced degrees. There is also an increasing number who have held teaching positions in the state.

The number now within the state is increased by 71 to a total of 537, an increase of 15%. These are largely accounted for by an increased listing in Agriculture and Engineering (Column 6, Fig. 7).

The traditional field of education still leads but not as predominantly as formerly. (Column 2, Fig. 7). It now accounts for only 65.5% of our scientists.

It could be broken down into many interesting groups. We have, e.g., the presidents of the Universities of Michigan, Washington, Arizona, British Columbia, of Massachusetts State College and On-

tario Agricultural College, the emeriti presidents of Iowa State and of the University of Wyoming.

	INDUSTRY	COLLEGE, UNIV.	GOVERN'T	FOUNDAT'S ETC.	PRIVATE MUSEUMS RESEARCH, CONSULT'G	RETIRED, MISCEL.
CHEMISTRY	195	197	35	12	7	9
PHYSICAL	42	36	6	1	1	1
ORGANIC	98	45	11	-	-	-
BIOCHEM.	17	42	7	4	2	-
PHYSIOLOGICAL	6	16	1	-	1	-
METALLURGY	4	5	2	1	-	-
PHYSIOLOGY	4	55	3	2	1	1
AGRICULTURE	10	145	31	1	1	2
PHYSICS	41	144	17	7	3	1
GEOLOGY	22	60	24	1	12	1
PSYCHOLOGY	6	174	13	4	10	1
SPEECH		12				
ZOOLOGY	1	124	16	7	2	2
ENTOMOLOGY	5	57	37	2	2	3
PARASITOLOGY	-	8	2			
ECOLOGY	2	11	2			
BOTANY	3	97	7	4	4	4
PLANT PHYSIOL.	2	21	2			
PLANT PATHOL.	3	41	15	1	1	
HORTICULTURE	1	45	9			
FORESTRY	1	21	19		1	
ANATOMY		45				
PHARMACY	6	19		1		1
PATHOLOGY	5	25	2	2	2	2
BACTERIOLOGY	17	51	12	1	1	
MED. MISCEL	10	78	7	2	13	
VET. MISCEL	1	30				
GENETICS	3	28	12	3	3	
SOILS	1	27	13			
NUTRITION	6	23		1		
HOME ECON.		6				
EDUCATION	1	14	1			1
SOCIOL. & ARCHEOL.			2			
ASTRONOMY		10	1	1	2	1
METEOROLOGY			2			1
GEOGRAPHY		13	1		1	
STATISTICS	1	8	2			
ANTHROPOLOGY		3	2	2	1	
AGRI. ECON.	3	6	11			
BIOLOGY		41	9	4		1
MATH		154	8	2		1
ENGINEERING	46	190	53	5	15	6
TOTAL	564	2131	398	74	90	40

Fig. 7

The figures are impersonal. Their significance is only realized when they are related to the work and influence of the scientists in question. As an illustration, the 45 former Iowa anatomists are teaching anatomy in exactly one-third of the medical schools of the United States and are found in all parts of the country. We mention Harvard, Yale, Dartmouth, Cornell, Columbia, George Washington, Duke, Georgia, Louisiana, St. Louis, Indiana, Wayne, Illinois, Chicago, Loyola, Minnesota, Nebraska, Creighton, Kansas, Colorado, Stanford, Medical Evangelists, etc.

The group next in size is found in industry. (Column 1, Fig. 7). Almost two-thirds of these are chemists but nearly every branch of science is represented. Most of the Organic Chemists have gone into industry and half of those who specify their field as Physical Chemistry are in industry. Only slightly less than half of the Chemists, specific field not given, are with commercial firms. The Biochemists and Physiological Chemists, on the other hand, are largely connected with universities. Engineers, Physicists, Geologists and Bacteriologists are going into industry in appreciable numbers.

Our 564 scientists in industry are connected with 335 commercial firms. The listing of even a few of the leading of these will show how widely they reach into our industrial life:

DuPont .....	40	B. F. Goodrich Co. ....	5
Eastman Kodak .....	15	Commercial Solvents Corp.....	5
Standard Oil Cos. ....	14	Firestone Tire & Rubber .....	4
American Cyanamid Co. ....	13	American Maize Products .....	4
General Electric .....	9	Hercules Powder Co. ....	4
UpJohn Co. ....	7	Dow Chemical Co. ....	4
Allied Chemical & Dye Corp.....	7	Parke, Davis Co. ....	4
General Aniline & Film .....	7	National Carbon Co. ....	4
U. S. Rubber Co. ....	7	Western Electric Co. ....	4
R.C.A. Mfg. Co. ....	7	Shell Development Co. ....	4
Bell Telephone Labs. ....	6	Sperry Gyroscope Co. ....	3
Bakelite Corp. ....	6	Henry Ford Hospital .....	3
Armour & Co. ....	6	Metropolitan Life Ins. ....	3
General Mills, Inc. ....	3	Bausch & Lomb Optical Co.....	3
General Motors Corp. ....	3	Abbott Labs. ....	3

Iowa has sent a very large number of scientists into Government Service, on the prewar basis, almost equalling the total number of scientists now in the state (Column 3, Fig. 7). These include nearly every branch of science with the numbers distributed more evenly than in the two above groups. Chemistry, Engineering, and miscellaneous Agriculture account for a large number. Especially noteworthy are also Entomology 37, Geology 24, Forestry 19, Physics 17, Zoology 16, Plant Pathology 15, Soils 13, Psychology 13. Most of Iowa's Agricultural Economists have gone into government service. All of these latter were grabbed before they took the traditional Ph.D. degree. Iowa may not be accountable for New Deal "planned economy" but she has contributed appreciable strength to the central government.

There is an appreciable number of individualists, that also carries on in most fields but especially as consulting specialists in Engineering, Geology, Psychology, and Chemistry. (Column 4, Fig. 8).

An able group of scientists is connected with Research Foundations, Institutes and Museums—74 in number.

All together these groups total 3303—10% of the entire listed number of North American scientists.

#### OBSERVATIONS

Many of our early scientists who have helped attain a leading place for American scientists are leaving the field of activity. Several of the states that were among the early leaders in the production of scientists are now doing little more than replacing their losses. In the face of much keener competition they have not been able to maintain their number of outstanding scientists.

An increasing number of our scientists are coming from the homes of scientific people. Most of the Iowa alumni scientists are leaving the state. Their offspring scientists will be credited to other states, rather than to Iowa.

We have interrupted the specific training of our future scientists as other warring nations have not done.

It will take liberal support of our colleges and universities, of our science departments and of our scientists, to maintain our fine record and especially to improve it.

CHICAGO, ILLINOIS