Thiessen
Rawlings

1958 Report from the Sub-Committee on the Encouragement of Research Midwestern Association of Chemistry Teachers in Liberal Arts Colleges

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Over the past five years this sub-committee has sent out annual questionnaires to the members of MACTLAC having for their purpose the development of information on the amount of money available for research, the extent of research, the extent of publication, and possible blocks to research at the MACTLAC colleges. Last year the committee presented a five-year summary report covering the general situation.

This year we decided to eliminate the questionnaire and take advantage of the new report which has come from the National Research Council, entitled Doctorate Production in United States Universities, 1936-1956 with Baccalaureate Origins of Doctorates in Sciences, Arts and Humanities, Publication 582, compiled by the Office of Scientific Personnel. This publication lists over a 21-year period the number of Ph.D.'s having their baccalaureate origins in various undergraduate schools in some thirty disciplines together with summations for physical sciences, natural sciences, social sciences, arts and humanities, and finally education. The total number of institutions responding to the questionnaire of the Office of Scientific Personnel number 1177. The number of what might be called private liberal arts colleges in that group I estimate to be around 650 based upon a personal count and an evaluation of the individual colleges. Hence there is bound to be some confusion with regard to the borderline schools, but I think it can be said that in no case has a real liberal arts college been included in any other classification than this. For those of you who have not had occasion to see this report, I have included in Table I a listing of all the MACTLAC colleges in the last MACTLAC list. The table includes the number of Ph.D.'s in chemistry and

biochemistry, the number of Ph.D.'s in physical sciences, the number of Ph.D.'s in natural sciences, the number of Ph.D.'s in humanities, arts and social sciences, and the total number of Ph.D.'s.

The total number of Ph.D.'s in chemistry and biochemistry comes to 16,682. The total number of Ph.D.'s in these fields on the part of the MACTLAC colleges comes to 1353 or 9.2% of the total. There are 91 MACTLAC colleges; these make up 15% of the total number of colleges and 7.7% of the total number of institutions. Although MACTLAC colleges make up only 15% of the colleges, they have produced 32% of the college chemistry Ph.D.'s or twice the expectation based on the number of institutions. MACTLAC colleges have produced on the average of 15 Ph.D.'s per college in 21 years. The number per institution for all institutions is 14.3.* MACTLAC colleges, therefore, have produced better than the average for all colleges and universities. As a matter of interest, all colleges have been responsible for 25% of all chemistry Ph.D.'s; while the rest are largely university derived, there are also quite a number from technical schools and teachers colleges.

When we review the figures in natural science we find that MACTLAC colleges have averaged 29.2 Ph.D.'s in natural sciences for the period, while all institutions have averaged 40.8. When we consider all Ph.D.'s, the MACTLAC institutions have produced 64.4 per institution, all institutions 82.6. From these three sets of figures we might deduce that MACTLAC colleges are producing chemistry Ph.D.'s at a rate which is in excess of the rate in natural sciences and in all Ph.D.'s. Our chemistry departments apparently are more active than all departments or all those in the natural science category. While we produce more than the average in chemistry we produce only 74% of the average in natural sciences and 78% in all Ph.D. categories.

*If we leave out of consideration the MACTLAC women's colleges, then the average chemistry Ph.D. production per college rises to the figure of 17.4.

I have gone over all the college figures in Publication 582 and have listed those colleges which have produced 15 or more over the 21-year period. These are listed in Table II in alphabetical order together with the number of Ph.D.'s. Of these colleges, 28 of the 76, or 37%, are MACTLAC colleges. Remember that MACTLAC colleges make up only 15% of all of the colleges. More MACTLAC colleges are therefore more productive than would be predicted from their numbers.

Next have been listed as the most productive those colleges which are responsible for 30 or more Ph.D.'s in the period. These will be seen in Table III together with the number of Ph.D.'s. These 29 colleges are quantitatively the most productive in the country. Such a measurement of productivity does an injustice to the very small schools.

In order to get some kind of a qualitative index of productivity for the colleges producing 15 or more (Table II), I have carried through still another set of calculations. These involve the determination of the product of the total number of chemistry Ph.D.'s in the 21 years divided by the number of men who graduated from the particular school in the year 1957. (See Earned Degrees Conferred by Higher Educational Institutions, 1956-57, Circular 527 of the Office of Education.) To give significance to the figure, I should have obtained the actual number of men graduating from the school in the full 21-year period but this was impossible to do in a short time. As I check to see whether the 1957 figure was out of line, I also got the figure for 1952, as listed in Circular 360 of the same agency. As an illustration of the method for obtaining this relative number, and I should stress that this figure does not represent a per cent or anything else, let us consider Monmouth College. Monmouth College is given credit for 47 Ph.D.'s in chemistry

and biochemistry in Publication 582. In 1957 there were 83 men listed graduating. Forty-seven over 83 equals 56.6. This is the number which I have used in placing Monmouth College. This scheme is not quanitative, of course, but it does represent one means of giving credit where credit is due to the small colleges. I have then arranged in order all those colleges which have produced 15 Ph.D.'s or more and have relative productivity numbers of 15 or more arranged in descending order. This arrangement will be found in Table IV which also includes MACTLAC colleges producing less than 15 Ph.D.'s but with a productivity number over 15.* The first column following the name of the school represents the Numerical Rating developed as I have described. Then comes a figure representing the number of men graduating from the institution in 1957; the last column represents the number graduating in 1952. If the figures on these last two columns are relatively close together, I think it may be assumed that my Number Rating may not be too far out of line.

There are 77 colleges listed in Table IV; of these 77 colleges there are 38 MACTLAC colleges or 49% of the total number. This really shows the quality of MACTLAC chemistry. In all probability the relative standing of Park, Sterling and Illinois colleges are colored somewhat by variability and the very small numbers of men graduating. For with very small classes a difference of 21, as in the case of Park College, between 1957 and 1952 means a great difference in numerical rating. Nevertheless, I have left them in their order for they do show that all three colleges have done outstandingly good work in spite of very small registrations.

For those of you who are interested in comparing the quantitative production of your chemistry departments with your physics (and astronomy), and mathematics departments Table V and VI list the most productive colleges in these two fields. I have taken as a break point in the case of physics the figure of 5 and in the

* Since preparing this test, I have calculated all colleges having a productivity number of 15 or more so Table IV is now fairly significant on a country wide basis.

case of mathematics a figure or 3 for the productive colleges, and for the most productive colleges break points of 10 and 5 respectively. These are based upon the relative numbers of Ph.D.'s in chemistry and biochemistry, physics and astronomy, and mathematics. If we look at the most productive colleges in each one of these three categories we will see that in chemistry 48% of the colleges are MACTLAC colleges, in physics 32%, and in mathematics 29.4%. In going over the physics list you will note that Park College has 9 Ph.D.'s in physics. In view of the limited enrollment at Park College I would rather guess that qualitatively this has been one of the most productive colleges in physics in the country over the last 21 years. Earlier studies have also rated it high.

I have left Mount Holyoke out of all these calculations and discussions. This all women's college has done a fantastic job of training women Ph.D.'s in chemistry. Its numerical rating is 12.5, or it has done about as well in turning out women Ph.D.'s as Williams College has in turning out men Ph.D.'s and exceeds in rating Dartmouth College which stands so high on the numerical lists. At the Wesleyan Conference this summer we had the pleasure of visiting Mount Holyoke College and saw its beautiful new chemistry building. Any of you who are interested in building chemistry buildings and are in the east by all means should visit this institution.

Let me close by saying that next year we will attempt a biannual report on research grants and research activities. I think we have reached the point in MACTLAC where there is not enough change from year to year to warrant continuing annual studies.

TABLE I

MACTLAC Colleges as Baccalaureate Origins of Ph.D.'s

College	Men Graduates in 1957	Relative * Productivity No.	Ph.D.'s Chemistry & Biochemistry	Ph.D.'s Physical Science	Ph.D.'s Natural Science	Ph.D.'s Art, Humanities & Social Sciences	Total Ph.D.'s
Albion	113	4.4	5	14	29	49	78
Alma	70	22.8	16	16	29	16	45
Anderson**		--	--	--	1	15	16
Augustana	118	19.5	23	39	48	39	87
Aurora	21	14.2	3	3	8	11	19
Barat**		--	1	1	2	10	12
Beloit	106	24.5	26	29	44	45	89
Bethel (Kansas)	39	18	7	12	14	26	40
Blackburn	34	8.9	3	1	3	--	3
Bradley	339	6.2	21	23	28	34	62
Briar Cliff**		--	--	--	--	--	0
Calvin	182	15.3	28	33	41	58	99
Carleton	103	41.7	43	58	84	80	164
Carroll	73	9.6	7	5	15	22	37
Carthage	64	21.9	14	14	19	17	36
Central (Iowa)	51	17.6	9	11	15	18	33
Central (Missouri)	67	54.2	37	43	53	36	89
Clarke**		--	1	1	1	12	13
Coe	88	19.3	17	23	36	52	88
Cornell	69	34.8	24	35	47	73	120
Culver-Stockton	31	22.5	7	8	9	11	20
Denison	137	7.3	10	38	48	71	119
De Pauw	199	38.7	77	107	181	189	370
Drake	365	2.2	8	11	29	78	107
Drury	60	13.3	8	16	22	35	57
Dubuque	70	5.7	3	4	6	20	26
Earlham	75	8	6	12	32	39	71
Eureka	18	11	2	2	3	12	15
Evansville	140	8.6	12	14	16	22	38
Franklin	71	9.9	7	10	12	24	36
Greenville	74	10.8	8	10	20	37	57
Goshen	69	8.7	6	7	17	20	37
Grinnell	99	31.1	31	36	46	72	118

TABLE I (continued)

College	Men Graduates in 1957	Relative* Productivity No.	Ph.D.'s Chemistry & Biochemistry	Ph.D.'s Physical Science	Ph.D.'s Natural Science	Ph.D.'s Art, Humanities & Social Sciences	Total Ph.D.'s
Hamline	76	21.1	16	16	23	52	75
Hiram	57	38.7	22	27	36	41	77
Hope	127	45.6	58	57	80	40	120
Illinois	35	40.0	14	22	28	28	57
Indiana Central	41	2.5	1	1	4	20	24
Iowa Wesleyan	60	20	12	13	24	9	33
Kalamazoo	44	97.8	43	54	78	25	103
Kenyon	95	15.8	15	23	31	31	62
Knox	101	27.1	27	35	44	54	98
Lake Forest	91	3.3	3	5	9	17	26
Lawrence	87	21.8	19	21	34	72	106
Loras	156	7.1	11	13	15	30	45
Luther	119	8.4	10	20	35	36	71
MacMurray**		--	--	--	--	5	5
McKendree	45	6.6	3	5	11	5	16
Manchester	90	21	29	33	40	52	92
Milliken	112	17	19	19	26	24	50
Milton	36	3	1	1	5	4	9
Milwaukee-Downer**		--	5	3	7	3	10
Monmouth	83	56.6	47	50	61	25	86
Mundelin**		--	1	1	4	8	12
Muskingum	68	19.2	13	18	25	58	83
Nazareth (Michigan)**		--	1	1	1	2	3
Nebraska Wesleyan	77	15.6	12	17	34	63	97
North Central	64	25	16	19	37	42	79
Northland	31	6.5	2	2	6	5	11
Oberlin	244	50	122	205	287	378	665
Ohio Wesleyan	234	11.9	28	41	59	139	198
Olivet	39	17.7	7	10	14	13	27
Olivet Nazarene	58	1.9	1	3	3	5	8
Omaha	309	2.9	9	15	21	22	43
Park	10	110	11	21	31	56	87
Parsons	45	4.2	2	2	6	13	19

TABLE I (continued)

College	Men Graduates in 1957	Relative* Productivity No.	Ph.D.'s Chemistry & Biochemistry	Ph.D.'s Physical Science	Ph.D.'s Natural Science	Ph.D.'s Art Humanities & Social Sciences	Total Ph.D.'s
Principia	42	--	--	4	9	8	17
Ripon	64	20.3	13	19	25	18	43
Rockford**		--	1	1	6	15	21
St. Ambrose	126	12.7	16	18	28	19	47
St. Catherine**		--	1	2	2	16	18
St. Francis**		--	--	--	--	2	2
St. Francis Xavier							
St. Mary (Michigan)			1	1	1	2	3
St. Mary (Minnesota)	106	11.3	12	12	21	9	30
St. Mary-of-the-Woods**		--	1	--	1	6	7
St. Norbert	129	1.5	2	2	9	8	17
St. Olaf	160	31.8	51	57	86	72	158
St. Scholastica**		--	--	--	1	6	7
St. Teresa			1	3	4	14	18
St. Thomas	198	19.2	37	42	58	20	78
Shurtleff	125						
Sienna Heights**		--	3	3	3	10	13
Tarkio	22	31.8	7	7	11	13	24
Valparaiso	223	5.2	11	11	18	26	44
Wabash	121	30.6	37	43	66	47	113
Wartburg	70	10	7	8	9	12	21
Westmar	54	3.8	2	2	2	9	11
Westminister (Mo.)	81	7.4	6	10	23	28	51
Wheaton	241	13.6	33	42	60	82	142
William Jewell	99	14.0	14	22	25	46	71
Wooster	114	41.5	47	79	106	120	226
Total = 91 Colleges			1353		2649		5880

* See page 3

* Women's colleges not calculated for productivity index

TABLE II

Colleges Providing for 15 or more Ph.D.'s
in Chemistry -- 1936-1956

College	Number of Ph.D.'s	College	Number of Ph.D.'s
Albright	18	Knox	27
Allegheny	33	Lafayette	29
Alma	16	Lawrence	19
Amherst	37	Lebanon Valley	30
Antioch	45	Manchester	29
Augustana	23	Marietta	17
Bates	28	Middlebury	30
Beloit	26	Mississippi	21
Berea	17	Monmouth	47
Birmingham-Southern	19	Mt. Holyoke	31
Bowdoin	25	Milliken	19
Bradley	21	Mt. Union	27
Bucknell	21	Muhlenberg	15
Butler	15	Oberlin	122
Calvin	28	Ohio Wesleyan	28
Canisius	22	Pomona	24
Carleton	45	Reed	68
Centenary	17	Richmond	26
Central (Mo.)	37	St. Ambrose	16
Coe	17	St. Johns (Minn.)	16
Colgate	21	St. Olaf	51
Cornell (Iowa)	24	St. Thomas	37
Dartmouth	62	St. Vincent	15
Davidson	20	Scranton	20
DePauw	77	Southern Methodist	20
Dickinson	15	Sterling	15
Drew	18	Swarthmore	51
Franklin-Marshall	62	Trinity (Conn.)	23
Furman	15	Union	53
Gettysburg	19	Ursinus	16
Grinnell	31	Villanova	20
Grove City	17	Wabash	37
Hamilton	20	W. and J.	18
Hamline	16	W. and L.	18
Haverford	44	Wellesley	17
Hiram	22	Wesleyan	44
Hobart	17	Wheaton (Ill.)	33
Holy Cross	25	Whitman	16
Hope	58	Willamette	19
Howard College	16	Williams	30
Juniata	46	Wittenberg	17
Kalamazoo	43	Wooster	47
Kenyon	15	Xavier (Ohio)	16

TABLE III

Most Productive Colleges with 30 or more Ph.D.'s in Chemistry--1936-1956

College	Number of Ph.D.'s
Alleghany	33
Amherst	37
Antioch	45
Carleton	45
Central (Mo.)	37
Dartmouth	62
DePauw	77
F. & M.	62
Grinnell	31
Haverford	44
Hope	58
Juniata	46
Kalamazoo	43
Lebanon Valley	30
Middlebury	30
Monmouth	47
Mt. Holyoke	31
Oberlin	122
Pomona	24
Reed	68
St. Olaf	51
St. Thomas	37
Swarthmore	51
Union	53
Wabash	37
Wesleyan	44
Wheaton (Ill.)	33
Williams	30
Wooster	47

TABLE IV

Tentative Arrangement of Productive College by Relative Productivity Number $\frac{\text{Ph.D.'s chemistry x 100}}{\text{men graduates 1957}}$

College	No. Chemistry Ph.D.'s	Relative Productivity No.	Number of Men Graduates in 1957	Number of Men Graduates in 1952
Park	11	110	10	31
Kalamazoo	43	97.8	44	54
Reed	68	86	79	67
Juniata	46	79.5	58	58
Sterling	15	57.7	26	23
Monmouth	47	56.6	83	73
Central (Mo.)	37	54.2	67	75
Antioch	45	53	85	98
Oberlin	122	50	244	234
Swarthmore	51	47	109	105
Hope	58	45.6	127	123
Lebanon Valley	30	43	70	86
Carleton	43	41.7	103	116
Wooster	47	41.5	114	142
Haverford	44	40	110	107
Illinois	14	40	35	58
DePauw	77	38.7	199	210
Hiram	22	38.7	57	68
Bates	28	35.4	79	96
Cornell	24	34.8	69	109
Jamestown	11	32.4	34	35
Manchester	29	32.2	90	98
St. Olaf	51	31.8	160	163
Tarkio	7	31.8	22	23
Grinnell	31	31.1	99	73
Wabash	37	30.6	101	87
Bluffton	7	29.1	24	24
Allegheny	33	29	121	147
Knox	27	27.1	101	97
Wesleyan	44	26	169	165
Mt. Union	27	26	104	111
Washington	13	25.5	51	69
North Central	16	25	64	100
Maryville (Tenn.)	14	25	56	86
Beloit	26	24.5	106	125
Franklin & Marshall	62	24.4	254	252
Erskine	9	23.1	52	41
Alma	16	22.8	70	63
Hampden-Sydney	13	22.8	57	78
College of Idaho	13	22.8	57	61
Culver-Stockton	7	22.5	31	43
Whitman	16	22.2	72	79
Carthage	14	21.9	64	56
Missouri Valley	10	21.8	46	61
Lawrence	19	21.8	87	92

TABLE IV (continued)

	No. Chemistry Ph.D.'s	Relative Productivity No.	Number of Men Graduates in 1957	Number of Men Graduates in 1952
Linfield	12	21.4	56	67
Southwestern	12	21.3	59	55
Hamline	16	21.1	76	120
Centenary	17	21.1	81	102
Ripon	13	20.3	64	56
Albright	18	20.3	88	101
Iowa Wesleyan	12	20	60	74
Middlebury	30	20	149	134
Bethany (W. Virginia)	13	19.8	66	48
Augustana	23	19.5	118	163
Coe	17	19.3	88	94
Muskingum	13	19.2	68	79
St. Thomas	37	19.2	198	261
Hanover	12	19.0	63	72
Ursinus	16	18.8	85	117
Pomona	24	18.6	129	123
Birmingham-Southern	19	18.4	104	88
Bethel (Kansas)	3	18	39	44
Olivet	7	17.7	39	21
Central (Iowa)	9	17.6	51	47
Emmanuel Missionary	9	17.3	52	84
Milliken	19	17	112	165
Marietta	17	16.9	102	121
W. Virginia Wesleyan	14	16.5	85	104
Randolph Macon	11	16.2	68	81
Kenyon	15	15.8	95	107
Nebraska Wesleyan	12	15.6	77	91
Berea	17	15.6	109	81
Willamette	19	15.4	123	152
St. Benedict's (Kansas)	10	15.4	65	84
Calvin	28	15.3	182	126
Rollins	11	15.1	73	73

****

These five colleges were in the very productive group (Table III) but their relative number falls below 15.

Amherst	14.4	257	248
Union	13.7	387	203
Wheaton	13.6	241	207
Williams	13	232	234
Dartmouth	8.1	765	587

TABLE V

Colleges Providing for 5 or more Ph.D.'s
in Physics (and astronomy)--1936-1956

College	Number of Ph.D.'s	College	Number of Ph.D.'s	********** Most Productive 10 or more **********
Albion	6	Manhattan	5	Alleghany
Alleghany	14	Middlebury	6	Amherst
Amherst	22	Mississippi	6	Antioch
Antioch	10	Muhlenberg	7	Bowdoin
Bates	5	Nebraska Wesleyan	6	Carleton
Beloit	6	North Central	10	Dartmouth
Berea	5	Oberlin	59	Davison
Birmingham-Southern	5	Ohio Wesleyan	6	Denison
Bowdoin	13	Park	9	DePauw
Canisius	8	Pomona	19	F. & M.
Carleton	13	Puget Sound	7	Haverford
Central (Mo.)	5	Randolph-Macon	7	Kalamazoo
Citadel	7	Redlands	7	Oberlin
Colgate	8	Reed	28	Pomona
Colorado	9	Richmond	8	Reed
Concordia (Minn.)	5	Ripon	11	Ripon
Dartmouth	19	St. Olaf	11	St. Olaf
Davidson	16	Scranton	11	Scranton
Denison	11	Southern Methodist	9	Swarthmore
DePauw	19	Univ. of the South	7	Union
Drew	6	Southwestern	7	W. & J.
Franklin-Marshall	12	Swarthmore	42	Wesleyan
Friends	8	Texas Christian	9	William & Mary
Furman	6	Trinity (Conn.)	6	Williams
Geneva	5	Union	33	Wooster
Gettysburg	5	Wake Forest	6	
Hampden-Sydney	9	Washington & Jefferson	13	
Hastings	8	Wellesley	6	
Haverford	14	Wesleyan	17	
Hiram	6	Whitman	10	
Hobart	5	Willamette	7	
Kalamazoo	16	William & Mary	18	
Knox	5	William Jewell	5	
Lafayette	9	Williams	16	
Linfield	5	Wooster	13	
Luther	5			

TABLE VI

Colleges Providing for 3 or more Ph.D.'s
in Mathematics--1936-1956

	Number of Ph.D.'s		Number of Ph.D.'s
Amherst	4	Lafayette	7
Antioch	4	Lenoir Rhyne	4
Barnard	3	Louisiana	3
Bates	4	Luther	4
Birmingham-Southern	7	Marietta	3
Bowdoin	4	Middlebury	3
Bucknell	7	Millsaps	4
Bridgewater	3	Missouri Valley	3
Butler	3	Oberlin	19
Carroll (Montana)	3	Occidental	3
Central (Missouri)	3	Park	3
Colgate	3	Pomona	7
Concordia	3	Puget Sound	3
Cornell	6	Randolph-Macon	3
Creighton	3	Reed	16
Dartmouth	4	St. Olaf	4
Dayton	6	St. Thomas	6
Denison	8	Smith	3
DePauw	5	Southern Methodist	5
Drake	4	Southwestern (Memphis)	3
F. & M.	3	Stetson	6
Georgetown (Ky.)	4	Texas Christian	3
Gonzaga	3	Wabash	3
Grinnell	4	Washburn	3
Grove City	4	W. & J.	9
Hamilton	9	Wellesley	4
Haverford	7	Westminister (Mo.)	4
Holy Cross	3	Willamette	4
Hope	3	Williams	4
Illinois	4	Wofford	7
Kenyon	4	Wittenberg	3
Knox	3	Wooster	6

****
Very Productive
5 or more
****

Birmingham-Southern	7
Bucknell	7
Cornell (Iowa)	6
Dayton	6
Denison	8
DePauw	5
Hamilton	9
Haverford	7
Lafayette	7
Oberlin	19
Pomona	7
Reed	16
St. Thomas	6
Southern Methodist	5
Stetson	6
W. & J.	9
Wofford	7

APPENDIX I

You may have missed noticing that General Electric Company has started a DuPont type of a program for colleges and last year they gave 20 such grants. Of the 20, 7 went to institutions in the MACTLAC area.

TABLE VII

Allegheny College, Pennsylvania
Bates College, Maine
Beloit College, Wisconsin
Colorado College, Colorado
Concordia College, Minnesota
DePauw University, Indiana
Eureka College, Illinois
Kalamazoo College, Michigan
LeMoyne College, Tennessee
Linfield College, Oregon
Middlebury College, Vermont
Mount Holyoke College, Massachusetts
Pomona College, California
Reed College, Oregon
Roanoke College, Virginia
Rollins College, Florida
St. Olaf College, Minnesota
Union College, New York
Whitman College, Washington
College of Wooster, Ohio