

## Contributions to the Periodical Literature of Chemistry From United States Universities In 1955-1960

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The 1955, 1957, and 1959 Editions of the American Chemical Society "Directory of Graduate Research" contain an almost complete list of papers published in chemical journals by the academic staff of the departments of chemistry in United States Universities for the period January 1, 1955, to September 30, 1959. This paper will present some statistics relating to the number of publications authored by individual staff members, and by the members of various departments.

The reader who would undertake a critical perusal of a representative group of these papers will almost certainly conclude that they differ widely in the nature and in the amount of scientific findings reported, and even more widely with respect to their significance. The last quality is at once the most important and the most difficult to determine. Any contemporary judgement is necessarily imperfect, since the influence of a contribution upon subsequent developments is what determines its ultimate importance, and this can be justly evaluated only in the light of historical perspective. It follows, and it may be well to state explicitly, that *the data to be reported do not measure the contribution made by individuals or groups to the developments of the science*. They should not be so interpreted.

Figure 1 represents the numbers of papers published by individual staff members in the 4.75-year period from January 1, 1955, to September 30, 1959. The data refer only to the individuals listed in the Departments-of-Chemistry section of the 1959 "Directory" although previous editions were consulted as necessary to find all the papers published by these individuals since 1955; a few cases not covered by the "Directories" were excluded. Each co-author of a paper published jointly by more than one individual was credited with the paper; in the majority of cases, only one of the authors was covered by this survey, *i.e.*, was a staff member in a department of chemistry, but some papers were counted more than once. Occasional comparison with the indices of "Chemical Abstracts" and other sources of information, as well as critical examination of the entries themselves, indicate that the information reported in the "Directories" is not completely accurate; however, it was considered sufficiently accurate for the purposes of this survey, which does not aspire to attain results of exact quantitative significance. Some of the contributions listed in the "Directories" had not appeared in scientific journals, and their status as publications might be questioned. However, it would be difficult to establish and apply a more stringent

criterion of acceptability, and the number of such cases is comparatively small; accordingly, all the items listed in the "Directories" were counted, except papers said to be "in press."

It can be seen that the median value is about five papers, *i.e.*, one paper per year on the average; somewhat more than half of the staff members surveyed published five papers or fewer, somewhat less than half published more. About 17% of the staff members published no papers during this period. At the other extreme (not shown in the figure) are the staff members who published more than twenty-five papers during this period; they number about 60, less than 4% of the total.

Next, it seemed of interest to compute the number of papers published by the members of each department. Doing this raises some problems, among them the proper way to count the contribution of individuals who were not in a department during the entire period under study.

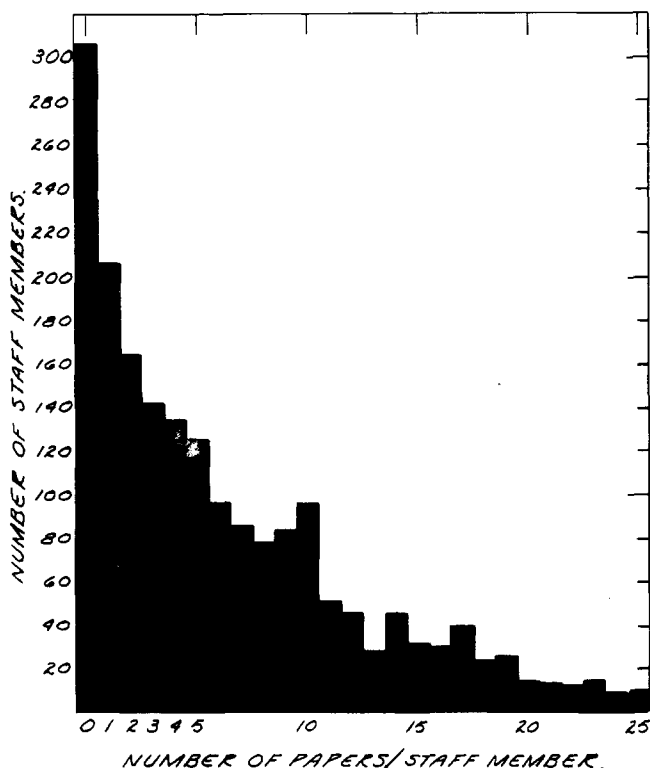


Fig. 1. Bar Graph representing number of staff members who authored 0-25 papers in 1955-1959

In this survey, the procedure followed for individuals listed in the 1959 but not in the 1957 "Directory" was to count the papers dated from 1958 onward (this does not apply to members of the departments which were listed in the 1959 "Directory" for the first time; in these cases, all the papers from January 1, 1955, were counted). With staff members listed in the 1957 "Directory" the papers counted were from January 1, 1955, to September 30, 1957, the terminal date for that edition. The contributions of staff members listed only in the 1955 "Directory" were not counted. Remarkably few staff members changed from one department to another between 1957 and 1959; in these few cases, the papers listed in the 1957 "Directory" were credited to the former affiliation and subsequent ones to the latter. Papers co-authored by two or more members of the same department were counted only once.

Another difficulty is caused by the fact that the institutions surveyed differ in organization with respect to the fields of biochemistry and chemical engineering; in most institutions, the staff members specializing in these fields are organized in separate departments, but some departments of chemistry comprise either or both. The situation is complex—for example, many institutions have biochemists in the chemistry department as well as a separate biochemistry department, and some have even more numerous subdivisions; furthermore, the biochemistry division of the department of chemistry in one institution may be as autonomous as the separate department of biochemistry in another institution. For the purpose of this survey, no attempt was made to resolve this matter; as has already been stated, the count was restricted to the Department-of-Chemistry section, and the staff members listed in that section were counted regardless of the field of specialization. This gives higher total counts to the departments which comprise biochemistry and/or chemical engineering, and should be considered when comparisons are made.

After the count had been completed for the 121 institutions listed in the 1959 "Directory," the departments were ranked in decreasing order. Table I reports the number of papers which corresponds to certain ordinal ranks, selected at appropriate intervals. This method of reporting the data was preferred to the more straightforward one of listing each institution and the corresponding number of publications in order to save space, and also because it was felt that the identity of the institutions was not material to the purpose of this survey. The rank of any particular department can be estimated by counting the papers for that department and comparing the results with Table I; the possible error in interpolation will be within the accuracy of the data. It may be well to repeat at this point that the data reported in Table I are based entirely on the information contained in the "Directory of Graduate Research," which is not completely accurate.

The next question of interest is the ratio between the number of papers and the number of staff members; column three of Table I reports selected values, in the same manner as column two. It should be made clear

Table I. Papers, Papers/Staff Ratio, and Ordinal Rank

Rank	Total papers	Papers/staff
1st	570	20
5th	400	13
10th	300	12
15th	240	11
20th	210	9.7
30th	170	8.9
40th	120	7.2
50th	110	6.4
60th	82	5.7
80th	48	4.2
100th	33	2.9
120th	7	0.9

that the data in the two columns do *not* refer to the same institutions, *i.e.*, the institution that ranks fifth in total number of papers is not the same as that which ranks fifth with respect to papers/staff ratio. The data on papers/staff ratio refer to the staff members listed in the 1959 "Directory," and to papers authored and co-authored by those staff members during the period 1955–1959, regardless of whether or not they had been in the department for the entire time.

Some factors that tend to distort the value of the papers/staff ratio should be mentioned. First of all, it must be realized that the publications appearing in the period under consideration usually describe work done one or more years earlier, because of the delay involved in publication. Departments that comprise young persons, newly starting upon an academic career, who do not have a back-log of work to describe, will get an unduly low ratio as a result. Another common cause of low values is the inclusion of persons who are not part of the effective, permanent staff, such as some instructors, lecturers, curators, deans, etc. When one compares the lists from different departments, it becomes clear that they may not be strictly comparable, and some adjustment should be made when considering the data for specific institutions. It should be kept in mind, too, that such adjustments, when applied generally, will raise the over-all level of the data. If one excludes from the count (a) holders of Ph.D. degrees awarded in 1956 or thereafter, (b) administrative officials holding positions outside the department, and (c) instructors and holders of unusual titles, the values of the papers/staff ratio is raised by about one unit.

Although the significance of the data given above is limited, they indicate the current level of scientific publication by University staff members, and may serve as a basis for extrapolations to the future. Also, they reflect, at least to some extent, the volume, if not the quality, of the research activity recently prevailing in the departments of chemistry of various institutions.

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