Dues and Membership in Scientific Societies

Current statistics for societies reveal distinct differences among the various disciplines.

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For over one hundred years the scientific societies of the United States have provided the principal means of communication among American scientists. In the late 1800's the first of the newly formed societies brought small groups of specialists together, usually on a local basis, for the exchange of research ideas and results. The fashion for letter writing doubtless kept individual members in touch between meetings. As membership increased and became national and even international, the society journals appeared as the logical communications media. Regular annual meetings for the oral presentation of research results were soon established and quickly became traditional. This pattern of society activity has persisted over the years and has served the scientific community well.

Recently, however, pressures have developed that have forced professional societies to reconsider their role and their methods of providing scientists with avenues of communication. One of these pressures has been the increasing number of research papers offered to society journals for publication. This increase is due in large part to the greater number of scientists at work in all fields and to the mounting financial support of research by both federal and private sources. The rising cost of printing has contributed its share, as well, to the problem.

The Office of Science Information Service of the National Science Foundation, both by its basic legislation (*1*) and by recent directives (*2*), is authorized to encourage and facilitate the dissemination of scientific information. In line with these directives the primary research journal has been receiving the attention and support of the Foundation for some time. Because the majority of the country's scientific journals are published or sponsored by professional societies, a preliminary study of these societies seemed in order. In particular, "yardstick" data on dues, membership, and journal subscription rates were needed. Consequently, in July 1959 the Foundation sent a brief questionnaire to the secretaries of 215 professional scientific societies. This is the report of that survey.

The societies included were national in scope and membership, with members who were primarily professional scientists actively engaged in research or teaching. Societies in clinical medicine and applied technology were excluded, as were Greek-letter and honorary societies and regional and state organizations. Of the 215 questionnaires mailed, 15 of those returned were ultimately rejected as inappropriate, 22 were not returned, one arrived too late for inclusion, and 177, or 82 percent, were used in the study.

Membership

For analytical purposes, societies were grouped into seven major disciplines plus a "miscellaneous" category that contained a variety of disciplines, none numerous enough to be considered separately (*3*) (Table 1).

It must be kept in mind, in considering total membership figures, that they do not take into account the multiple memberships that exist in certain fields (for example, biology) and between certain disciplines. These figures, however, do offer rough indications of the numbers of scientists in each discipline. Individual society membership ranged from less than 100 to more than 87,000.

Average membership figures clearly pointed up a well-established pattern in the field of biology—that of "splintered" interests and specialization resulting in a large number of societies (67) with relatively low average membership (1489). The social science societies showed signs of a similar situation, although not to the same degree as biology. Engineering displayed another condition—a large number of societies (35) with extremely high average membership (14,822).

Most societies offer scientists a choice of membership. Commonly, this includes senior or active membership, junior or student membership, and institutional (corporate, contributing, or sustaining) membership. Requirements for membership vary widely both between individual societies and between disciplines. Thirty-three percent of all societies surveyed required an academic degree for senior membership. Engineering was the most liberal with respect to the degree requirement—only 6 percent of the engineering societies required a degree. Chemistry, on the other hand, was most conservative—80 percent of the societies in this field required a degree for senior membership.

Age of Societies

The oldest society in the study (Table 2) was 160 years old; the youngest, one year old. Of the 176 societies (*4*) analyzed for age, 60 percent were less than 60 years old. The eight oldest societies (*5*), founded before 1860, did not include any societies in the fields of chemistry, physics, or earth science.

All disciplines were represented in the 49 societies formed since 1941. It

Table 1. Society membership by major discipline. The number of societies included in each discipline is given in parentheses.

Discipline	Membership		
	Total	Average	Median
Engineering (35)	518,781	14,822	8,807
Chemistry (10)	107,448	10,744	1,625
Biology (67)	99,774	1,489	788
Social science (22)	65,287	2,967	1,601
Physics (12)	41,168	3,430	1,120
Earth science (12)	39,246	3,270	1,201
Miscellaneous (11)	31,689	2,880	1,537
Mathematics (8)	29,839	3,729	2,634

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Table 2. Number of societies included in the study, by age.

Period of founding	Societies (No.)
1799–1860	8
1861–1880	8
1881–1900	26
1901–1920	46
1921–1940	39
1941–1959	49

was interesting to note that six, or 50 percent, of the physics societies were founded between 1941 and 1959.

An attempt was made to compare ages of societies with their total membership, but no significant correlation was found. Nor did there appear to be any correlation between the age of a society and the annual dues paid by senior members.

Annual Dues

Society dues (Table 3) varied with membership; junior or student membership, when offered, carried considerably lower dues than senior or active membership. Life membership, offered by 37 societies, usually cost between $100 and $200. Emeritus and honorary members were seldom required to pay dues. For purposes of this study, only senior membership dues figures were used in the calculations.

Comparison of Median Annual Dues and Median Annual Salaries

Since median annual salary figures for scientists in all disciplines were available from the National Register of Scientific and Technical Personnel (*6*), a comparison was made between these and median annual dues (see Fig. 1). When median salary levels were ranked by discipline, biology was lowest, with $6789, while engineering was highest, with $9065 per year. The same disciplines also had the lowest and highest dues rates, biologists paying median dues of $6 and engineers dues of $15 per year.

Income from Dues

As might be expected, senior members contributed the highest percentage of total income from annual dues (Table 4). This percentage ranged from 69 percent in chemistry to 91 percent in biology. Institutional members also provided a substantial proportion of the income from dues, and all disciplines, but not all societies, had this category of membership. The average income from this source for all disciplines was 17 percent. Of interest was the fact that social science derived the highest percentage (22 percent) of dues income from institutional membership. Engineering followed with 20 percent, and chemistry was third with 18 percent. Earth science societies ranked lowest (10 percent) in income from this source.

Table 3. Society dues, by discipline.

Discipline	Annual dues ($)	
	Range	Median
Biology	1–20	6
Mathematics	5–14	7.50
Earth science	2–15	8
Physics	2–25	8.75
Social science	1–25	9.50
Chemistry	2–15	10
Miscellaneous	2–20	10
Engineering	1.50–25	15

The average total income that each society derived from annual dues (all categories) ranged from $12,800 per society in biology to $234,200 in engineering.

Sixty societies, or about 33 percent of the total number in the survey, reported that their sole source of income was from dues. More than half of this number were in biology.

Income from Other Sources

At least 66 percent of all societies had sources of income other than dues; percentages ranged from 50 percent for physics societies to 86 percent for the societies in social science. Other sources of income included contributions, endowments, sale of lists, books, reprints, annual meeting registration fees and exhibit space rental, investments, and advertising.

Society Journals

More than 86 percent of the societies polled in this study published at least one scientific journal as part of their service to members. A scientific journal was defined as a publication appearing at least twice a year and containing the results of original research. This definition excluded newsletters, memoirs, and annual proceedings.

Sixty-seven percent of the societies indicated that their members received at least one journal free of charge with the payment of dues. About 19 percent of the societies had more than one scientific publication, and members might be charged for all or none. Fifty percent of the chemistry societies, for example, charged their members for at least one journal.

Twenty-nine societies published no

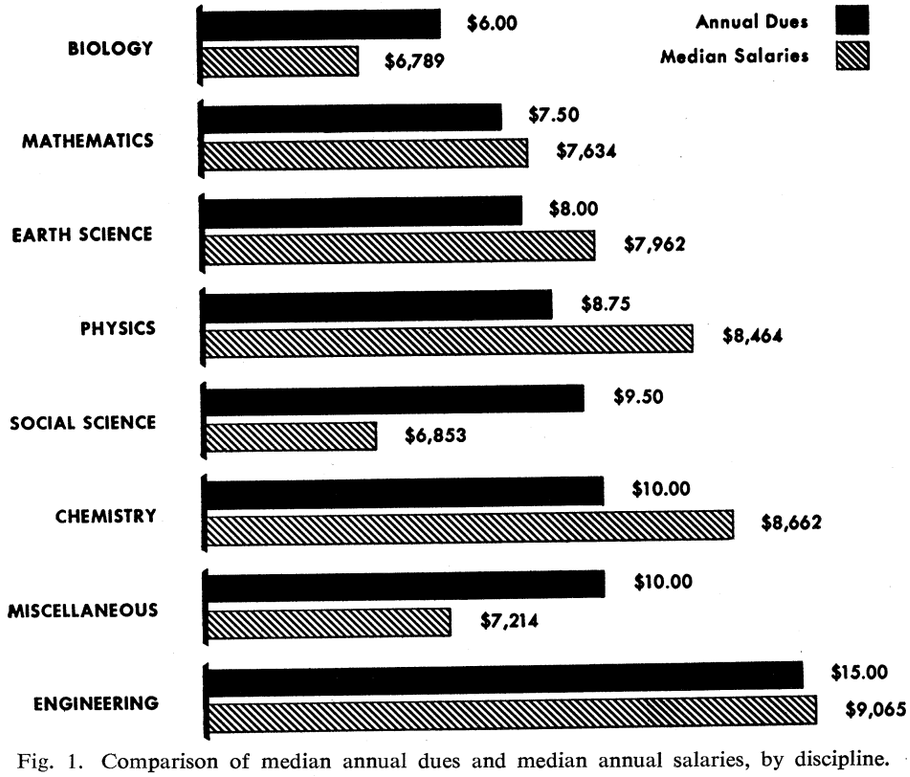

Fig. 1. Comparison of median annual dues and median annual salaries, by discipline.

research journal. Most of these were small societies; approximately half had less than 500 members. About one-third of these societies, however, did publish some form of annual proceedings. Biology, with the highest number of individual societies and almost 100,000 members, published only 0.9 of a journal per society. Mathematics, conversely, with the least number of societies and approximately 30,000 members, published almost 1.9 journals per society.

Individual journal circulation figures revealed a low of 250 and a high of 85,000. Average circulation followed a disciplinary ranking similar to that for median annual dues, with biology lowest (2635) and engineering highest (13,074) (Table 5).

A comparison of total membership and total circulation figures, by discipline, provided some interesting bases for speculation. In the fields of mathematics, physics, chemistry, and social science, the total circulation of society journals was approximately twice the total membership of the societies that produced the journals. This would appear to indicate an extensive readership outside the societies themselves and might mean either a large audience in allied fields or wide foreign distribution. It might also mean that scientists in these fields regularly receive—or read—more than one journal.

Biology fell somewhere in middle ground in this comparison, but earth science and engineering showed total membership and total circulation figures that were very nearly the same (circulation was always somewhat higher). This could be interpreted to mean that these societies include in their membership most of their journal readers. It might also mean that in these disciplines society members read fewer journals.

Table 4. Relation of membership dues and institutional dues to total annual dues, by discipline, and number of societies whose total income is from dues. The number of societies included in each discipline is given in parentheses.

Discipline	Societies with senior members		Societies with institutional members			Societies receiving income only from dues (all categories) (No.)
	No.	Av. % of dues paid by senior members	No.	Av. % of dues paid by institutional members	Range (%)	
Chemistry (10)	9	69	4	18	10–31	2
Engineering (35)	35	73	15	20	2–57	9
Social science (22)	22	70	7	22	3–32	3
Biology (67)	67	91	21	15	1–46	31
Mathematics (8)	8	85	5	16	9–30	3
Earth science (12)	12	85	3	10	2–23	3
Physics (12)	12	88	6	15	1–33	6
Miscellaneous (11)	11	76	8	21	4–45	3

Table 5. Membership, numbers of journals, and journal circulation, by discipline.

Discipline	Societies (No.)	Total membership	Journals (No.)	Circulation	
				Total	Av.
Biology	67	99,774	60	158,141	2,635
Social science	22	65,287	31	130,437	4,207
Earth science	12	39,246	11	48,619	4,419
Mathematics	8	29,838	15	68,410	4,560
Physics	12	41,168	14	93,092	6,649
Miscellaneous	11	31,689	14	137,560*	9,925
Chemistry	10	107,448	15	187,860	12,524
Engineering	35	518,781	43	562,199	13,074

* Includes the 85,000 circulation of *American Scientist*, of which Sigma Xi, a society not included in this survey, is one of the publishers.

Table 6. Total and average membership in scientific societies, by discipline. The number of societies included in each discipline is given in parentheses.

Discipline	Membership					
	1937		1948		1959	
	Total	Av.	Total	Av.	Total	Av.
Engineering (11)	62,337	5,667	74,251	6,750	228,651	20,786
Biology (28)	22,800	814	35,265	1,259	61,245	2,187
Chemistry (4)	22,198	5,549	54,529	13,632	93,505	23,376
Earth science (8)	11,870	1,483	32,007	4,000	65,738	8,217
Mathematics (3)	5,990	1,997	10,385	3,461	21,513	7,171
Physics (4)	3,899	974	9,514	2,378	22,381	5,575
Social science (5)	2,904	580	4,276	855	13,933	2,786
Psychology (2)	2,180	1,090	5,134	2,567	17,528	8,764

Table 7. Average dues of senior members in scientific societies, by discipline. Figures in parentheses represent number of societies.

Discipline	Dues ($)		
	1937	1948	1959
Engineering (17)	13.46 (14)	13.41	17.32
Chemistry (9)	7.07 (7)	8.87	11.83
Physics (7)	6.30 (3)	7.36	11.07
Social science (12)	6.08 (6)	6.80	9.12
Earth science (11)	5.70 (10)	5.36	8.68
Mathematics (4)	5.66	6.50	9.25
Psychology (2)	5.50	5.50	13.00
Biology (41)	3.62 (37)	4.68	9.12

Annual Meetings

Ninety-four percent of all societies sponsored annual meetings at which original research papers were presented. Approximately 70 percent indicated that at least some of these papers were subsequently published either in the society journal or in some other appropriate publication. No society supplied figures on the exact number of papers ultimately published. Some information is available, however, from other sources (*7*), on the percentage of meeting and conference papers that eventually appear in print.

Trends in Society Membership

It seemed highly desirable to measure, if possible, the recent growth of professional societies. To obtain information about past dues, total membership figures, and journal subscriptions, the third (1937) and the fifth (1948) editions of the *Handbook of Scientific and Technical Societies and Institutions of the United States and Canada* (*8*) were searched. Not all 177 societies that responded to the National Science Foundation questionnaire appeared in these early National Academy of Sciences–National Research Council volumes, and in many cases information was incomplete in certain categories. Sixty-five societies did appear, however, in both the 1937 and 1948 volumes.

Figures collected from these sources showed that during the period 1937–

Table 8. Summary of average journal costs in 1937, 1948, and 1959 and percentage increases, in nine disciplines. The number of journals included in each category is given in parentheses. Blank spaces indicate that no data were available.

Discipline	Av. cost of journal to members ($)			Increase (%)			Av. cost of journal to nonmembers ($)			Increase (%)		
	1937	1948	1959	1937–48	1948–59	1937–59	1937	1948	1959	1937–48	1948–59	1937–59
Physics (8)		8.19	20.81		154			8.00	18.06		125	
Chemistry (7)*	10.90	10.80	17.78	−1	63	64	7.20	6.90	16.14	−4	133	124
Mathematics (5)		10.30	17.40		69			9.40	20.60		119	
Meteorology (2)		10.00	19.00		90			4.75	12.00		152	
Earth science (5)*	5.40	5.80	9.60	7	66	77	6.14	7.40	12.60	20	70	105
Psychology (9)*	5.20	5.94	23.72	14	299	356	4.60	5.94	9.77	29	64	112
Social science (7)		7.07	11.07		56			4.85	8.70		79	
Engineering (7)†	13.50	13.85	21.64	2	56	60	7.50	8.25	10.57	10	28	41
Biology (27)‡	5.10	5.60	10.40	10	86	104	5.30	5.90	12.50	11	112	135

* Data for 1937 were based on five journals. † Data for 1937 were based on four journals. ‡ Data for 1937 were based on 18 journals.

1959 all disciplines experienced a substantial increase in society membership. In 1937, engineering (5667) and chemistry (5549) had the highest average society membership; social science (580) and biology (814) had the lowest. By 1959, both chemistry (23,376) and engineering (20,786) had quadrupled their average membership. Social science (2786) and biology (2187) were still lowest (see Table 6) but had made substantial gains.

Trends in Society Dues

The dues paid by senior members increased in all disciplines during the period 1937–1959 (see Table 7). Between 1937 and 1948 a relatively small increase occurred; the average rise was about 16 percent. During the next 11-year period the increase was more pronounced: the average, except for psychology, was about 56 percent. The average dues for psychology were somewhat out of line because of a very large increase in dues in one society between 1948 and 1959.

The range of average dues for senior members extended from $3.62 in biology to $13.46 in engineering in 1937. By 1959 the range was somewhat shorter and extended from $8.68 for earth science to $17.32 for engineering.

Trends in Costs of Journals to Members and Nonmembers

From the same sources of data for 1937 and 1948 (*8*), the costs, to members and nonmembers, of 75 journals were obtained. Table 8 summarizes the average journal costs in 1937, 1948, and 1959 and the percentage increases for nine disciplines. Costs to members were based on senior member dues plus the additional amount (if any) that members were required to pay for a subscription. This base line for comparison was chosen as the only possible one, although it was realized that some unknown proportion of member dues was allocated to general society services. The figures for cost of journals to members are, therefore, somewhat on the high side. With one exception the average dollar cost of journals to members followed a pattern similar to that of dues—a slight rise during the 1937–1948 period and an abrupt rise from 1948 to 1959. The only discipline at variance was chemistry, which actually dropped from $10.90 to $10.80 during the period 1937–1948. The increase in average journal costs to members from 1948 to 1959 ranged from $3.80 in earth science to almost $18 in psychology.

Journal costs to nonmembers followed a similar trend—a slight rise from 1937 to 1948 and an abrupt one from 1948 to 1959. Again, the one exception was chemistry for the 1937–1948 period. The actual average dollar increase for nonmembers was less than for members, ranging from $2.32 for engineering to more than $11 for mathematics during the period 1948–1959.

These data, interesting as they are, offer only a limited picture of the national journal situation. The National Science Foundation intentionally asked few questions about journals in its society questionnaire because a separate, comprehensive survey of research journals was being planned. This journal study is now well underway, and a report can be expected in early 1961. Both studies form part of a general fact-finding program that the Office of Science Information Service of the Foundation is undertaking. Studies in progress or planned include the publication "climate" in industry (being made jointly with the Office of Special Studies; report expected in 1960); publication of symposia and conference proceedings; the role of monographs in communications; and the status of commercially published research journals.

References and Notes

1. National Science Foundation Act, 1950, as amended.
2. Title IX of the National Defense Education Act (1958), sect. 10. Executive Order 10521, 17 March 1954, added by Executive Order 10807, 13 March 1959.
3. Societies included in the "miscellaneous" category were as follows: American Nuclear Society, American Academy of Arts and Sciences, American Meteorological Society, American Astronomical Society, Astronomical Society of the Pacific, Human Factors Society, American Ceramic Society, Arctic Institute, American Documentation Institute, Institute of Navigation, and Scientific Research Society of America.
4. The age of one society could not be determined.
5. The eight oldest societies were as follows: American Academy of Arts and Sciences, founded 1780; American Physiological Society, founded 1799; American Statistical Association, founded 1839; American Ethnological Society, founded 1842; American Pomological Society, founded 1848; American Society of Civil Engineers, founded 1852; American Geographical Society, founded 1852; and American Entomological Society, founded 1859.
6. National Science Foundation, *Scientific Manpower Bull. No. 7* (1956).
7. *Am. Inst. Phys. Document. Newsletter* **1**, No. 2 (Aug. 1959); F. Liebesny, *Lost Information: Unpublished Conference Papers* (1958) (reprinted from *Proc. Intern. Conf. Sci. Inform.*, area 2, pp. 161–165).
8. *Handbook of Scientific and Technical Societies and Institutions of the United States and Canada* (National Academy of Sciences–National Research Council, Washington, D.C., ed. 3, 1937; ed. 5, 1948).