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Feedback Control of Journal Manuscript Receipts

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The rate of receipt of manuscripts by *Accounts of Chemical Research* correlates inversely with the number of "Articles Accepted for Publication in Future Issues" as listed on the inside back cover. A feedback mechanism regulating manuscript flow is shown to operate. Feedback is delayed, and in consequence manuscript receipts and the backlog of unpublished articles are cyclic in character.

Without really intending to do so, the journal *Accounts of Chemical Research* has during the past eight years conducted an experiment relevant to factors that influence the number of manuscripts submitted for publication in a scientific journal.

THE JOURNAL AND ITS PRACTICES

Accounts of Chemical Research (hereafter abbreviated *Accounts*) is a journal of short reviews, usually of developments at or near the research frontier in a limited area of special interest to the author. Articles in *Accounts* are often concerned in large part with developments in the author's own laboratory. Critical analyses of problems currently in a state of flux are also welcomed.

Accounts is published by the American Chemical Society. A substantial fraction (about 75%) of the manuscripts published stem from invitations extended by the editor. Of the others, most are proposed by the author to the editor in preliminary correspondence, and then encouraged by the editor, but some come in "over the transom" without any prior contact. All manuscripts are sent to at least two reviewers for criticism, and not infrequently authors are asked to revise manuscripts as suggested by the reviewers or editor.[1]

The intended, ideal space allocation is six journal pages per article, and overlength manuscripts are returned to authors for shortening. Actual practice falls long of the ideal, for the average length of articles published through 1975 is 7.2 pages.

An honorarium of $250 is paid per manuscript upon publication. In case of coauthorship, it is divided equally among the coauthors. No page charge is levied, but reprints must be purchased at usual rates.

CONDITIONS OF THE "EXPERIMENT"

Three features of *Accounts* have served the purpose of what we may regard retrospectively as an experiment. One is that the annual number of text pages (exclusive of covers, title page, and indexes) has been virtually fixed: 380 pages in 1968, 379 in 1969, 421 in 1972, and 427 pages in other years through 1975. The second is that articles, by virtue of editorial enforcement of the length restriction, are nearly constant in length (65% of those published in Volumes, 1–8, inclusive, were 6, 7, or 8 pages long). The third is that articles accepted for publication and to appear in future issues have, since June 1968, been listed by author(s) and title on the inside back cover.[2] The number so listed has varied from a low of 6 to a high of 30.

Finally records have been kept of manuscript receipts, month-by-month,[3] and of invitations issued by the editor to prospective authors.

The principal question on which the accumulated data are now brought to bear is whether or how the number of manuscripts received in a month is related to the number of articles accepted for publication as listed on the inside back cover. An associated question is whether or how manuscript receipts are related to the number of invitations extended by the editor in the recent past.

RESULTS

Our data concerning manuscript receipts and the number of articles listed on the inside back cover are plotted month-by-month on a chronological basis in Figure 1. Fluctuations are evident, long-term swells and troughs in the number of articles listed, and short-term fluttering in monthly manuscript receipts. Nevertheless some trends in the latter seem apparent: a surge of manuscript receipts in late 1970 and early 1971, another in 1972–73, and a third in 1974–75, with "dry seasons" especially in 1971–72 and the latter parts of 1973 and 1975.

These "dry seasons" of low manuscript receipts happen to coincide with swells in the number of articles listed, in late 1971, 1973, and 1975. This suggests a correlation.

Accordingly the data for December 1968 through December 1975 were subjected to linear regression analysis, correlation being attempted between manuscript receipts and articles listed the same month, the previous month, and so forth back to the fifth month before. Correlations were also attempted with

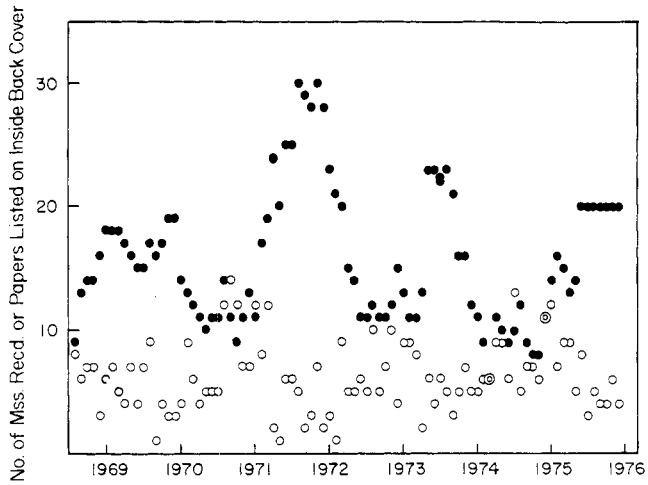

Figure 1. Monthly manuscript receipts (open circles) and numbers of "Articles Accepted for Publication in Future Issues" as listed on inside back cover (filled circles). Bull's-eyes represent both these quantities in cases where they happen to be equal. On the horizontal scale, year markings appear at January.

Table I. Summary of Correlations, Monthly Manuscript Receipts with Number of Papers Listed on Inside Back Cover

	r^a	Slope	Intercept	$\sigma_{sl}{}^b$	$\sigma_y{}^c$
With no. listed same month	−0.417**	−0.22	9.6	0.05	2.7
With no. listed previous month	−0.487**	−0.26	10.2	0.05	2.6
With no. listed 2 months before	−0.472**	−0.25	10.1	0.05	2.6
With no. listed 3 months before	−0.429**	−0.23	9.7	0.05	2.6
With no. listed 4 months before	−0.431**	−0.23	9.7	0.05	2.6
With no. listed 5 months before	−0.338	−0.18	8.9	0.05	2.7
With sum of listings, 1st and 2nd months before	−0.494**	−0.13	10.4	0.03	2.5
With sum of listings, 2nd and 3rd months before	−0.464**	−0.13	10.1	0.03	2.6
With sum of listings, 3rd and 4th months before	−0.443*	−0.12	9.9	0.03	2.6

[a] Correlation coefficient; two asterisks indicate correlation significant at the 0.01 level ($p < 0.01$), and one asterisk at the 0.05 level ($p < 0.05$). [b] Standard deviation of slope. [c] Standard deviation of points from the line in vertical direction.

certain two-month sums of listings. The results of these correlation efforts are set forth in Table I. The number of points (months) for every correlation in Table I is 85.

In all cases there is a statistically significant correlation. The computed correlation coefficients (r) are remarkably high. From scrutiny of the slope parameter and its standard deviation (σ_{sl}), one judges the probability that such correlations could result from random chance to be less than 1 in 100 000.[4] (The significance level p is less than 1×10^{-5}.)

The strongest correlation is with the number of papers listed on the inside back cover the previous month. The correlation is negative: the more papers listed as accepted for publication in the previous issue, the fewer are received in any month. However, the correlation is nearly as good with the number of papers listed two months before and only somewhat less satisfactory with listings three or four months previously. It is poorer with listings in the same month, and much poorer with listings five months previously.

Conceivably the number of manuscripts received in any time period might be related to the number of invitations issued by the editor somewhat earlier. By way of considering this possibility, we attempted correlation of *quarterly* manuscript receipts with the number of invitations issued the same quarter, the previous quarter, and the quarter before that. While working with quarterly figures, we also tried correlation of manuscript receipts with the total of inside back cover article listings for the same and for the previous quarter. All the "quarterly" correlation efforts are summarized in Table II. The number of points (quarters) for every correlation in Table II is 29.

Table II. Summary of Correlations, Quarterly Manuscript Receipts with Quarterly Sums of Invitations Issued or Listings of Accepted Papers on Inside Back Cover

	r^a	Slope	Intercept	$\sigma_{sl}{}^a$	$\sigma_y{}^a$
A. Of Unadjusted Manuscript Receipts					
With sum of listings, same quarter	−0.617*	−0.24	30.2	0.06	5.0
With sum of listings, previous quarter	−0.614*	−0.24	29.8	0.06	5.0
With sum of invitations, same quarter	−0.190	−0.08	20.2	0.08	6.3
With sum of invitations, previous quarter	0.033	0.01	18.3	0.08	6.4
With sum of invitations, 2nd quarter before	0.179	0.08	16.9	0.08	6.3
With sum of invitations, same + previous quarters	−0.115	−0.04	20.0	0.06	6.3
With sum of invitations, 1st and 2nd quarters before	0.153	0.05	16.6	0.06	6.3
B. Of Adjusted Manuscript Receipts[b]					
With sum of invitations, same quarter	−0.184	−0.08	19.3	0.08	5.8
With sum of invitations, previous quarter	−0.041	−0.02	18.2	0.08	5.9
With sum of invitations, 2nd quarter before	0.175	0.07	16.4	0.08	5.8
With sum of invitations, same + previous quarters	−0.165	−0.05	19.8	0.06	5.8
With sum of invitations, 1st and 2nd quarters before	0.097	0.03	16.7	0.06	5.9

[a] See footnotes, Table I. [b] The adjustment was as follows: from the sum of manuscript receipts in a quarter, the number of manuscripts submitted in response to the "second round" invitations of April 1970 was subtracted.

Before commenting on the correlations of quarterly data, we wish to point out an advantage in working with quarterly rather than monthly data. We also wish to point out a special classification problem, and to describe how we have chosen to deal with it.

Invitations to prospective authors were often issued in batches, and the number issued per month varied from a low of 0 to a high of 39. These fluctuations are damped somewhat by considering totals for 3-month quarters. Nevertheless the quarterly invitation totals varied considerably, there being fewer than 7 in five quarters and more than 40 in three quarters. Manuscript receipts, which vary from month to month in part because of the random fluctuation of small numbers, are also smoothed somewhat by considering quarterly totals.

The special classification problem stems from the fact that in April 1970 we sent a special "second round" invitation letter to a number of scientists who had already published in *Accounts*. Because that invitation differed, both in its wording and in the context in which it was issued, from the usual invitations, we adjusted the manuscript receipt data for some of the correlations with numbers of invitations issued. The adjustment was to subtract from quarterly manuscript receipts any that could be considered to result from the special "second round" invitations.

All the computed correlations with the numbers of invitations issued in the recent past (in respect to the time of

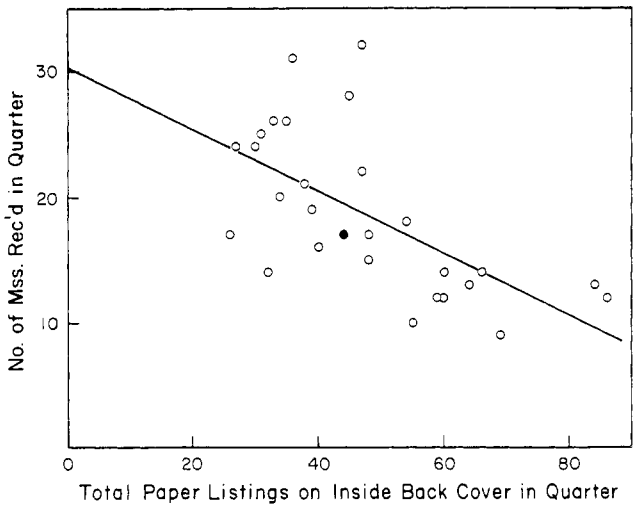

Figure 2. Quarterly manuscript receipts plotted against the sum of listings of "Articles Accepted for Publication in Future Issues" on the inside back covers of the three issues of the same quarter. The filled circle represents two quarters for which data are identical. The linear regression line is drawn.

manuscript receipt) are weak. They are almost equally weak regardless of whether adjusted or unadjusted manuscript receipt data are used. There is an actual *negative* correlation with invitations issued in the same quarter, on which we comment below. Of the rest, the best correlation is with invitations issued two quarters previously, but the standard deviation of the slope (σ_{s1}) is equal to or greater than the slope, and thus there is one chance in three that the apparent correlation stems from random variation. Thus evidence for correlation of manuscript receipts with the number of invitations recently issued is marginal at best.

On the other hand, there is strong (negative) correlation of quarterly manuscript receipts with the total of article listings in the same or the previous quarter. Quarterly manuscript receipts are plotted in Figure 2 against the total of article listings for the same quarter.

In Figure 2, the greatest departures from the approximately linear relationship established by the other points represent extraordinarily high (>30) manuscript receipts in the third quarter of 1970 and the first quarter of 1971, and abnormally low receipts (10 or 9) in the fourth quarter of 1969 and the second quarter of 1971. Those four somewhat deviant points all represent experience during the first four years of the journal.

DISCUSSION

Our data show that manuscript receipts by *Accounts* are strongly correlated with the number of manuscripts listed as accepted for publication on the inside back cover of recent monthly issues. The best correlation (Figure 2) is of quarterly manuscript receipts with the total of article listings in the three issues of the same quarter. Manuscript receipts are only weakly related to the number of invitations issued by the editor to prospective authors in the recent past.

In discussing these data, we must bear in mind that there exist publication opportunities alternative to *Accounts* (other review journals, serial publications that appear as annual volumes, symposium proceedings, etc.) that serve a somewhat similar function in the perception of authors. Whether the alternative publications serve the interests of readers equally well is a valid question but beyond the scope of this discussion.

The strong negative correlation with listings in recent issues is easy to rationalize. A scientist intending to write a manuscript for *Accounts* or to submit a completed manuscript to *Accounts* might reconsider if he saw a long list of articles awaiting publication on the inside back cover of the issue(s) he consulted. Figuring that about five articles appear per issue, he could quickly reckon the number of months that would be required to work off the obvious backlog. He could also expect that additional manuscripts would join the list while his own was going through the editorial process. Adding it all up, he might decide to wait until a more auspicious time to compose his intended manuscript or, forsaking the advantages of publishing in *Accounts*, to send a completed manuscript somewhere else where (he hoped) it would be published sooner.

Inasmuch as issues of *Accounts* do not emerge from the printer's plant until about the middle of the stated month and do not reach subscribers until some days later, it seems nearly impossible that listings on the inside back cover could affect manuscript receipts for the same month.

Let us consider why manuscript receipts in any month correlate rather well with listings on the inside back cover, not only a month or two previously, but also in the two months before that, as well as in the current month's issue. Part of the answer lies in the fact that the number of papers listed in any issue tends to correlate rather well with the number listed a month or two earlier or later. There are few sharp rises or falls in Figure 1 for papers listed. With the practices that have prevailed in the editing of *Accounts*, big backlogs are slow to accumulate and slow to dissipate.

Suggested above are two types of decision by a scientist that will affect whether or not a manuscript is submitted to *Accounts*. One is a decision whether to undertake the *composition* of a manuscript intended for *Accounts*, a decision which may in some cases be carried right through to submission of the manuscript without being influenced by listings on the inside back cover of issues that appear in the meanwhile. For many scientists, the time lapse between the decision to start writing and the actual submission of the completed manuscript is about three or four months.

The other type of decision suggested above is whether to send a completed manuscript to *Accounts* or somewhere else. This seems most likely to be influenced by listings in the issue for the previous month. However, the scientist's impression of the size of the backlog may be based on recollections from perusal of the issue for the month before that. Also, if he consciously consults a recent issue to see how long the backlog is, the issue he gets his hands on may be that for two months ago because the most recent issue was left at home, loaned to a colleague, or had been checked out of the library by someone else.

The fact that correlation is best with listings in the previous month suggests that listings have more effect on decisions as to where to send a completed manuscript than they do on decisions as to whether to undertake composition of a manuscript for *Accounts*.

The number of papers listed on the inside back cover was, according to practices followed in 1970–1975, mildly susceptible to control by the editor. Actual issues during this period comprised either 32 or 40 text pages, in equal numbers, but the scheduling of 32- or 40-page issues within the year was subject to editorial decision. There was a tendency to publish 40-page issues preferentially when the backlog was high, and 32-page issues when it was low. Also, in some cases fewer papers were listed than were eligible, in order to avoid crowding the inside back cover. However, inasmuch as the number of papers listed is treated in this study as an independent variable, factors determining it are inconsequential.

The very weak correlation of manuscript receipts with recent invitations to prospective authors is noteworthy. It does not follow, however, that invitations to prospective authors are pointless. For some scientists a personal invitation may be a

necessary but not sufficient condition for publication in *Accounts*.

Even within the first year of publication of *Accounts* it became obvious that fewer than half of the scientists who had been invited to contribute, and who had responded affirmatively, actually submitted manuscripts within a year of the date of invitation. Thus there exists a substantial list of invitees who have not yet contributed, and from time to time many of them are sent reminders of *Accounts*' continuing interest. A significant number of manuscript receipts is traceable, usually through statements in the author's letter of transmittal, to invitations issued years previously.

The apparently negative correlation of manuscript receipts with invitations issued in the same quarter has an obvious explanation. When manuscript receipts are low, the editor is motivated to send out more invitations, but the effect, such as it is, is not felt until subsequent quarters.

There are some other obvious factors that influence manuscript flow to any scientific journal. They include the general level of scholarly activity in the field served by the journal, the existence of alternative publication options for authors, and the general desirability of publication in a given journal as perceived by the author. The latter factor is influenced by such factors as journal prestige, journal operating procedures, costs or rewards associated with publication in the journal, and whether the journal is read by a particular audience the author seeks to address. Whether authors are substantially influenced by the number of subscribers to the journal is an interesting question. There are indications that some authors care more to be read by ten peers in their research area than by ten thousand other scientists.

We are personally too close to *Accounts* to hold objectively valid opinions as to the influence of these other factors. It does seem clear, however, that *Accounts* is at least sufficiently attractive to authors to assure an adequate manuscript flow.

The Feedback Phenomenon. Listing all manuscripts accepted for publication in future issues is shown by this study to have a significant effect on manuscript flow to *Accounts*. It acts as a feedback mechanism, tending (with something of a time lag) to diminish manuscript flow when the backlog is high and to remove restraints or even attract manuscripts when it is low.

The feedback mechanism has a delayed response owing in part to the time required for editorial processing of manuscripts. Time is required for criticism by reviewers, for work on a manuscript at various stages by the editorial staff, and for revision or shortening of it by author. (Nearly all manuscripts are returned to authors at least for consideration of reviewers' comments or minor revision, but sometimes for major revision.) The time that elapses between receipt of a manuscript and acceptance for publication varies from a month or two to a year or more. (Although there is some problem with slowness of response by reviewers, delays of six months or more are usually traceable to the time that the author takes for revision.) Although we have not sought systematically to study the time lapse *between receipt and acceptance* as a function of article listings on the inside back cover, our impression is that there is little relationship.

A further factor delaying the feedback response is that authors appear to respond not only to listings in the recent month, but also to those in the three months previous to the recent month.

If the feedback mechanism operated instantaneously it would ensure a uniform manuscript flow, except for a certain amount of random variation. Because of the one-to-four month delay in author response and the time lapse between manuscript receipt and acceptance, it causes a cyclic character to manuscript receipts and article listings. Thus listings in Figure 1 peak approximately in the later months of 1969, 1971, 1973, and 1975. It is a two-year cycle. One can easily argue in detail why both surges and sags occur.

Implications. Is this feedback mechanism desirable or not? It would appear to assist both authors and the editor to some extent, though whether truly to their advantage might be debated. Authors are enabled to avoid a long wait for publication of manuscripts, and the editor is relieved of having to placate authors irate over a long delay in publication. However, authors may give excessive weight to the factor of calculated delay in publication in *Accounts* and choose alternatives ultimately less beneficial to them. The editor may suffer loss of some superb manuscripts.

How about the reader? As long as the page budget for annual volumes remains relatively low, the *quantity* of reading material furnished will be unaffected by existence of the feedback mechanism. As to its *quality*, it does seem clear that the feedback mechanism operates to make articles fresher, more up to date at the time they are published. But the factor of timeliness is less significant for the truly great papers, and what influence the feedback mechanism may have on their appearance in *Accounts* is hard to say.

ACKNOWLEDGMENT

Data correlations were performed by courtesy of Professor W. Todd Wipke on a Stanford University computer with use of the program STAT PACK V4 (Western Michigan University). We thank Dr. Marshall Sylvan for advice on the statistical treatment.

REFERENCES AND NOTES

(1) Since *Accounts* began in 1968, J. F. Bunnett has been Editor and H. Koivisto has served as Editorial Assistant. Editorial duties were shared with Eva L. Menger as Assistant Editor from July 1969 through December 1974, and since January 1, 1975, they have been shared with Associate Editors Bruce H. Mahan and John E. McMurry. Regardless of which editor handles a manuscript, it is examined and criticized also by one other editor as well as by the two reviewers. In the present article, "the editor" refers to the member of the editorial staff delegated editorial responsibility in a particular case.

(2) The list on the inside back cover is compiled by the American Chemical Society Editorial Department (Charles R. Bertsch, Head) in Easton, Pa., on the basis of manuscripts forwarded by the editor after being accepted for publication. The listing lags a few days behind action in the editor's office owing to the time required for transcontinental mailing and other processing. Also, at times (especially in late 1975) fewer articles were actually listed than were eligible for listing, so as not to crowd the inside back cover.

(3) The number of manuscripts received, as defined for the purposes of this study, is somewhat less than reported to the Books and Journals Division of the American Chemical Society. The difference stems from the practice of counting manuscripts long since returned to authors for revision as "withdrawn" and then, when a manuscript long-delayed in revision is finally returned to the editor, counting it as a new manuscript receipt. In the present study, resubmission of a manuscript long delayed in revision is not counted as a manuscript receipt.

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