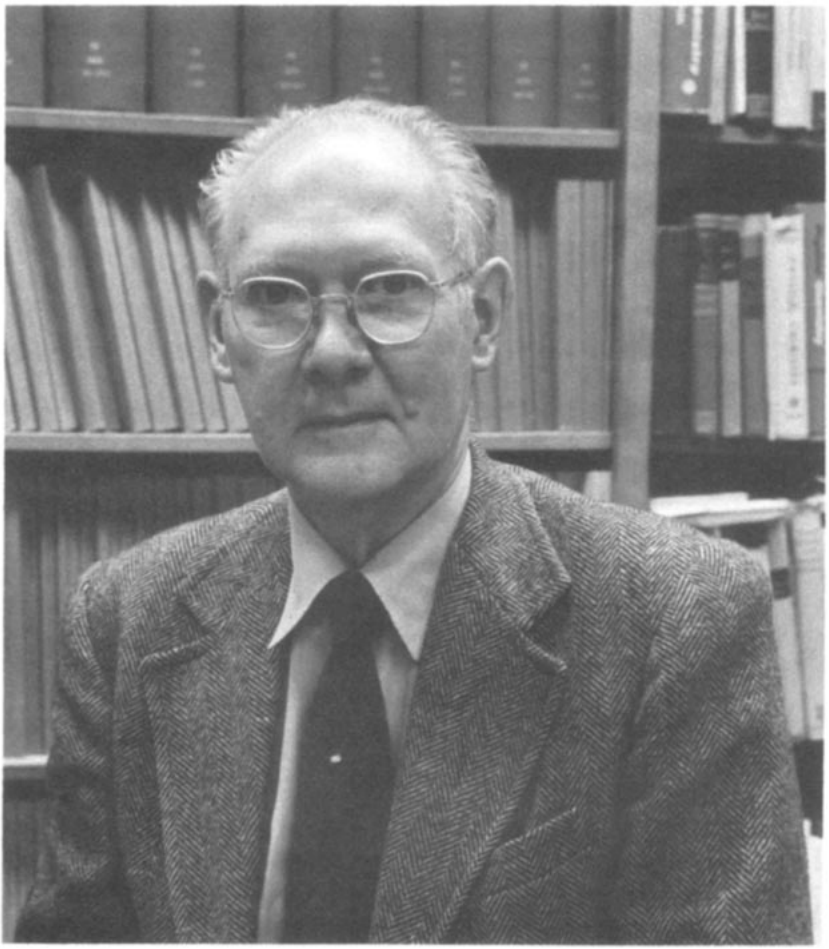

J. W. Stout

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THE JOURNAL OF CHEMICAL PHYSICS: The First 50 Years

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INTRODUCTION

The Journal of Chemical Physics was founded in 1933 by Harold C. Urey, then an associate professor of chemistry at Columbia University in New York. In an editorial (1) on the first page of Volume 1, Number 1 of the *Journal*, dated January 1933, Urey wrote:

> The Journal of Chemical Physics which makes its appearance with this issue, is a natural result of the recent development of the chemical and physical sciences. At present the boundary between the sciences of physics and chemistry has been completely bridged. Men who must be classified as physicists on the basis of training and of relations to departments or institutes of physics are working on the traditional problems of chemistry; and others who must be regarded as chemists on similar grounds are working in fields which must be regarded as physics. These men, regardless of training and affiliations, have a broad knowledge of both sciences and their work is admired and respected by their co-workers in both sciences. The methods of investigation used are, to a large extent, not those of classical chemistry and the field is not of primary interest to the main body of physicists, nor is it the traditional field of physics. It seems proper that a journal devoted to this borderline field should be available to this group.

The 1920s and 1930s were years of extraordinary ferment in the physical sciences. In nuclear physics great discoveries followed one another in rapid sequence, and the revolution in thinking caused by the newly formulated quantum mechanics had profound implications for chemistry as well as physics. The time was auspicious for the launching of a journal devoted to the new field christened "chemical physics." Urey was an active leader in this field and had written, with Arthur E. Ruark, a book (2) which was the bible of those who, like myself, then a graduate student at Berkeley, wished to learn about the new physics and chemistry. It is a tribute to Harold Urey's extraordinary energy and enthusiasm that he devoted effort

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to the founding of the new journal at the time he was actively engaged in the research that led to his receiving the Nobel prize in 1934 for the discovery of deuterium.

According to anecdotal history Urey approached both the American Chemical Society and the American Physical Society in an effort to obtain a society sponsorship for a journal devoted to chemical physics but was turned down by both. The founding institution and publisher of *The Journal of Chemical Physics* was the American Institute of Physics, and the AIP remains the owner and publisher of the *Journal* to this day. The AIP had been organized in 1931 and 1932 by the American Physical Society, the Optical Society of America, the Acoustical Society of America, the Society of Rheology, and the American Association of Physics Teachers. As the first chairman of the governing board of the AIP, Karl Compton, wrote (3):

> In one sense the American Institute of Physics is the child of the five parent national societies which have cooperated in forming it. In another sense, however, it has followed the more usual course of being born of two parents, the one financial distress and the other organizational disintegration.

The Chemical Foundation, a corporation which was given certain German patents after the 1914–1918 World War, had money available that was to be used for the advancement of chemistry and allied sciences. When the American Physical Society approached this foundation seeking financial support for its publications it was told that support could be provided for an association that represented all American physicists. The AIP met this requirement. The AIP undertook the task of the printing and publishing of the journals of its member societies. In addition, beginning in 1933, it assumed the primary responsibility for the *Review of Scientific Instruments* and launched *The Journal of Chemical Physics.*

It is the practice in starting a new scientific journal to assemble a list of distinguished names to adorn the masthead. The *JCP* was no exception. Listed in the first issue as an advisory editorial board were R. T. Birge, A. H. Compton, Irving Langmuir, Gilbert N. Lewis, A. A. Noyes, and John T. Tate. Harold C. Urey was called Managing Editor and the names of 22 well-known physicists and physical chemists of the time appeared as Associate Editors.

From its beginning the *JCP* attracted as authors the leading people in its field. Among the authors of papers in Volume 1 one finds the names of J. D. Bernal, J. B. Conant, P. Debye, Immanuel Estermann, Henry Eyring, R. H. Fowler, William D. Harkins, Herbert S. Harned, G. Herzberg, J. H. Hildebrand, John G. Kirkwood, G. B. Kistiakowsky, Victor K. La Mer, Irving Langmuir, W. M. Latimer, Gilbert N. Lewis, W. F. Libby,

Joseph E. Mayer, Robert S. Mulliken, Linus Pauling, Oscar K. Rice, J. C. Slater, Charles P. Smyth, F. H. Spedding, Hugh S. Taylor, Harold C. Urey, J. H. Van Vleck, E. Bright Wilson, Jr., and W. H. Zachariasen.

GROWTH OF THE JOURNAL

In its first year, 1933, the *JCP* appeared as 12 monthly issues, numbers 1–12 of Volume 1. The total page count was 896. There were 121 articles and 17 letters published in Volume 1, a total of 887 textual pages, and there were nine pages of subject and author indexes. In its fiftieth year, 1982, the *Journal* was published bimonthly, appearing on the first and the fifteenth of each month. There were two volumes, 76 and 77, each with 12 numbers. The total numbered pages was 13,001. In 1982, 1527 articles and 266 letters were published, making a total of 12,797 pages of textual material. Author and subject indexes appeared at the end of each volume, in the issues of 15 June and 15 December, and occupied 204 pages.

The growth of the *JCP* over the years 1933 through 1984 is displayed in Table 1. During its first eight years, 1933–1940, the *Journal* grew slowly, averaging about 3% a year. World War II began in Europe in 1939 and the efforts of many *JCP* authors were gradually diverted from research in pure science to work of military importance. The *Journal* grew thin, reaching in 1944 and 1945 a minimum size less than half that predicted from an extrapolation of the 1933–1940 trend. With the end of the war a rapid growth in scientific publication began. The *JCP* was in the forefront of the pack. In the years 1945–1965 the average yearly increase in the number of textual pages and the number of articles published was 12%. Had this exponential growth continued unabated, the 1985 *JCP* would have had 90,265 textual pages and 13,660 articles. Fortunately exponential growth curves do turn over, and in the years 1966–1984 the growth in material published in the *JCP* fluctuated around a mean of about 1% per year.

In its first five years, 1933–1937, the *JCP* published 707 articles occupying 4291 pages, an average of 6.07 pages per article. In the five years 1978–1982, 7580 articles occupied 59,345 pages, so the mean article length had increased to 7.83 pages. However, like the dollar, a journal page is a nonconstant measure of value. In the early days the printed pages of the *JCP* were beautifully set by monotype operators and were uncrowded with wide margins. Beginning in March 1949 about 12% more material was squeezed into each page, still retaining monotype composition. In 1974 the page size itself was increased in area by about 12%. The 1978–1982 pages were set by typewriter composition, nonjustified on the right. I estimate that a 1978–1982 page contained approximately 25% more

Table 1 Quantity of material published in *The Journal of Chemical Physics*, 1933–1984

Year	Volume	Number of textual pages	Articles	Letters
1933	1	887	121	17
1934	2	891	143	53
1935	3	834	151	42
1936	4	804	140	43
1937	5	994	152	41
1938	6	908	146	53
1939	7	1115	170	60
1940	8	998	158	47
1941	9	880	131	42
1942	10	761	103	39
1943	11	562	81	19
1944	12	522	69	22
1945	13	586	67	25
1946	14	743	97	54
1947	15	886	106	80
1948	16	1176	166	109
1949	17	1358	203	180
1950	18	1687	291	224
1951	19	1615	284	268
1952	20	1983	340	317
1953	21	2247	363	378
1954	22	2099	362	330
1955	23	2469	417	406
1956	24–25	2585	404	419
1957	26–27	3220	538	285
1958	28–29	2695	418	282
1959	30–31	3330	504	307
1960	32–33	3784	602	306
1961	34–35	4482	644	305
1962	36–37	6527	977	350
1963	38–39	6581	936	332
1964	40–41	7763	1111	419
1965	42–43	9132	1305	449
1966	44–45	9412	1323	416
1967	46–47	10,460	1414	448
1968	48–49	11,292	1528	457
1969	50–51	11,164	1451	438
1970	52–53	11,180	1484	442
1971	54–55	11,292	1482	415
1972	56–57	11,895	1595	375
1973	58–59	12,536	1519	346
1974	60–61	10,618	1390	333
1975	62–63	10,472	1366	322
1976	64–65	10,861	1384	318

Table 1 (*continued*)

Year	Volume	Number of textual pages	Articles	Letters
1977	66–67	11,817	1543	304
1978	68–69	11,234	1421	283
1979	70–71	11,315	1413	278
1980	72–73	13,172	1625	311
1981	74–75	12,966	1594	293
1982	76–77	12,797	1527	266
1983	78–79	13,937	1679	262
1984	80–81	12,746	1593	216

characters than a 1933–1937 page. With this correction the mean length per article in 1978–1982 was 1.6 times that in 1933–1937 and the volume of material published was increased by a factor of 17. By what factor has our human ability to read and assimilate increased?

THE EDITING OF THE *JCP*

Harold Urey served as editor of the *JCP* from its inception in 1933 through 1940. In 1939 and 1940 Joseph E. Mayer was listed as assistant editor and in 1941 Mayer succeeded Urey as editor. When Joe Mayer moved from Columbia to The University of Chicago in 1945 he brought the *Journal* with him. Beginning in January 1953, Clyde A. Hutchison Jr. assumed the editorial reins. Hutchison served as editor through 1959, at which time he resigned the editorship to take the chairmanship of the Department of Chemistry at Chicago. In those days the finding of someone to succeed a retiring editor was a very informal procedure, without search committees and with little involvement by the administration of the American Institute of Physics. I remember Joe and Clyde coming into my office early in 1959 and, after a bit of softsoaping listing my sterling qualities, proposed that I become the *JCP* editor. After a few days of debating with myself I agreed to be considered and Clyde wrote Elmer Hutchisson, then director of the AIP, proposing my name. After a formal approval by the executive committee of the Governing Board of the AIP I became the *JCP* editor and served until my retirement at the end of calendar year 1982. The procedure for finding my successor was much more elaborate. The Division of Chemical Physics of the American Physical Society regards the *JCP* as the primary medium for the publication of the scientific work of its members and considers the *Journal* its own. On several occasions representatives of the Division had written me inquiring about plans for the *Journal* after

my retirement. In the spring of 1982, H. W. Koch, director of the AIP, appointed a search committee to recommend a successor. The committee was chaired by Bill Klemperer of Harvard University and included the chairman of the Division and the AIP director of publications. The committee unanimously recommended John C. Light as the succeeding editor and, with the proviso that Donald H. Levy be appointed associate editor, Light accepted the editorship. Light and Levy are both at The University of Chicago, so the *Journal* offices and secretarial staff remained unchanged, greatly facilitating the smooth transfer of editorial responsibility.

Editorial Policies

The broad editorial policy of the *JCP* has not changed from the beginning. It is to select and promptly publish the best papers in the field. All papers published must contain new results of original research and must not have been published or submitted for publication elsewhere. No review articles are accepted.

Nearly all papers submitted are sent to referees for review. The only exceptions are those few cases where it is apparent to the editor that a paper is scientific nonsense or well outside the scope of the *Journal.* I always kept in mind that a revolutionary new idea might at first reading seem crackpot to a member of the establishment and would usually send a paper to a referee whom I knew to be fair and open minded even though I was 99% sure that it did not belong in the *Journal.* If, as almost always happened, the referee replied with a strong recommendation against publication I would send this to the author, together with my own evaluation, and decline to accept the paper.

Aside from these few exceptional cases a negative recommendation from a single referee was not sufficient reason for the rejection of a paper by the editor. The author would be sent a form letter enclosing the comments of the referee who had recommended against publication. If the author disagreed he would be asked to write a detailed answer listing his reasons, and additional referees would be consulted if the paper were returned. As a rule second and subsequent referees were sent anonymous copies of earlier referees' comments and the authors' reply. Frequently second referees would say that they had first read the paper themselves and formed an independent opinion before reading the earlier history of the paper. Some authors, returning a paper that had received harsh criticism, would ask that the first referee's comments not be sent to subsequent reviewers. The editor would honor this request if on reviewing the file it appeared to him that the first referee's remarks were unsubstantial and that he should have immediately sent it to someone else. Otherwise it is a question of editorial judgment as to whether it is fairer and wiser to obtain a completely

independent evaluation or to make subsequent referees aware of all points in dispute. To avoid the possibility of later referees missing a substantial defect in a paper the second alternative was usually selected.

Some 80% of the articles submitted to the *JCP* are accepted, although many of these undergo substantial revision before reaching final form. The rather low rejection rate reflects, I think, an awareness on the part of authors of the standards of various journals and a preselection by them of the most appropriate journal before submission.

In the *JCP* the editor is the final arbiter of the acceptance or rejection of papers. Unlike some Society journals there is no mechanism for appeal to higher authority. Only once during my tenure as editor did I ever receive a letter from an AIP official asking about a decision I had made, and there was no suggestion that my decision be overruled. An author who feels that his paper has been wrongly rejected by the *JCP* editor could ask one of the associate editors to intervene. I encouraged this. If an associate editor inquired about a particular paper that had been rejected I would send him copies of our complete file, with a warning to keep all referees' names confidential, and welcomed the associate editor's opinion. In all cases that I can recall the associate editors agreed that the original decision had been correct.

The task of referees and editor is to evaluate the suitability of the particular paper under consideration for publication in the *JCP*. Unlike the assessment of a grant proposal we are dealing with the evaluation of finished work, and the past performance or scientific eminence or institutional connection of the authors is irrelevant. Among the authors of rejected papers are the names of several Nobel laureates. Belonging to the faculty of The University of Chicago is not a guarantee that one's papers will obtain a favorable reception by the *JCP*.

Nearly all authors accepted adverse editorial decisions with good grace, but there are always a few who return their rejected papers with strong remarks as to the incompetence and bias of the referees and a demand for reconsideration. Several years may elapse before the folders on these papers reach their final resting place. The associate editors were particularly helpful in such cases, since I asked them to make an independent editorial judgment based on the complete file with all names disclosed and could obtain their opinions as to the suitability of the particular referees that had been previously consulted as well as to comment on the substance of the paper itself.

After two reviewers had recommended rejection of the paper I would reread the complete file and look at the paper itself. The result would usually be rejection but occasionally a paper would strike me as unorthodox but intriguing and worthy of evaluation in the open literature. I

would solicit additional opinions and a few such papers were eventually published.

The scope of the *JCP* is loosely stated as being "to bridge a gap between journals of physics and journals of chemistry." A bridge must have substantial foundations at either end and there is inevitably overlap between the area covered by the *JCP* and that belonging to physics or chemistry journals. Perhaps the best definition is one that paraphrases a remark by G. N. Lewis: Chemical Physics is whatever chemical physicists are doing.

An examination of the contents of Volume 1 of the *JCP* reveals that many of the broad areas engaging the attention of chemical physicists in 1933 continue to be active areas of research in the field. There were papers on molecular spectroscopy and molecular structures, both theoretical and experimental, on the quantum mechanical treatment of the electronic structure of molecules and crystals and chemical binding, on understanding the kinetics of chemical reaction from basic physical principles, on the thermodynamic properties of substances and the calculation of these by statistical mechanical methods, on the structure of crystals, and on phenomena at surfaces.

The editors of the *JCP* have avoided setting precise limits on the scope of the *Journal*, relying instead on the opinions of referees and on their own sense of what constituted important chemical physics at a particular time. When Joe Mayer was editor, colloid and surface chemistry was a contentious area with little hard science, and papers in that area were returned to authors without review as lying outside the scope of the *JCP*. By the 1950s modern methods and techniques for investigating surfaces had emerged and as the science hardened the *JCP* publication in surface phenomena increased. In the early days of the *Journal* papers calculating thermodynamic properties of gases from molecular and spectroscopic data were new and important, but as the years went by computation became easy and it was a trivial task to look up in the literature the moments of inertia and vibrational frequencies of some molecule, input the information to a computer program, and produce a paper with impressive tables of thermodynamic properties to add to one's publication list. Shortly after I became editor I noticed several such papers coming to the *Journal* and soon adopted a policy of excluding them unless they formed a small part of a larger paper presenting the primary data. In the beginning there was nothing that could be called biology published in the *JCP*. More recently some chemical physicists have turned their attention to complex problems of biological significance and began to submit their papers to the *JCP*. I tried to draw a line between papers containing new methods or discoveries that would be of interest to the general community of chemical physics

and those which used the techniques of chemical physics to obtain results that were of only biological interest.

Letters

The Letters to the Editor section of the *JCP* first appeared in the issue of April 1933. Letters were to be "terse and contain few figures" and were published in a reduced type size at the end of each monthly issue. An explicit length limit of 600 words for Letters was introduced with the April 1939 issue, although an examination of Letters in the 1940s and 1950s shows that this limit was not always rigorously enforced. In the early 1950s the number of Letters began a dramatic increase (see Table 1). When Clyde Hutchison became editor he was concerned with the chaotic growth of the Letters section and proceeded to reorganize it in a systematic fashion. A "Revised Announcement" in the May 1967 *JCP* divided the Letters section into three parts: Communications, Comments and Errata, and Notes. The maximum word count of a Letter was increased to 950 and explicit instructions were included for the count of figures, equations, and tables. The categorization of Letters introduced by Hutchison still remains, with minor modification, in the *JCP*, and a similar categorization, with various names for the categories, has been adopted by other scientific journals. In 1965 I separated the Errata from Comments and in 1974, in response to popular demand, the word limit was increased to 1200.

Communications in the *JCP* are reports of preliminary results of "current and extreme interest to relatively large numbers of workers in the field." It is expected that a fuller description of the work described in a Communication will later be published as a regular article. The only justification for such preliminary publication is that the rapid dissemination of the new results would be of great importance to workers in the field and that the delay in waiting for a complete regular article would substantially impede progress. Speed is of the essence with Communications. They are published in the issue two months following the day that they are forwarded from the editorial offices to the publisher. This tight schedule allows little time for the reading of proof by authors that is normal with regular articles. Publication managers at the AIP have urged that no proof be sent to authors of Communications, and this practice prevailed from time to time. I have always felt that it is essential that an author have an opportunity to read, and correct if necessary, material to be published over his name. Proof is now sent to authors of Communications and they are asked to telephone with any corrections.

Communications were also given expeditous handling in the editorial office. They were sent to experts in the field, usually two in number, with a letter explaining the nature of a Communication and asking for a prompt

response. Frequently the experts who had not responded by a Communication date, the first and fifteenth of each month, were telephoned by the editor. During my tenure as editor I read the text of all proposed Communications myself, with an eye as to the reason that this particular manuscript deserved rapid preliminary publication. The criteria for the acceptance of a Communication were both more subjective and more stringent than those for regular articles and some 60% of the papers submitted as a Communication were not accepted as such. The publication of a *JCP* Communication was regarded by some as a mark of unusual scientific distinction, and I have frequently read letters of recommendation of prospective faculty members making this point.

Notes are intended as the final publication of results that can be completely described within the length limitation of a Letter. They are reviewed in the same fashion as regular articles. Errata correct errors in papers published in the *JCP*. If they make sense after a brief scrutiny by the editor they are accepted without review.

Comments are discussion of material previously published in the *JCP*, an essential restriction. A Comment was ordinarily sent to an author of the work commented on who was asked to criticize it and, if he felt it necessary, to prepare a Comment in reply. This often led to an acrimonious exchange of letters through the editor's office and could be a protracted process. A woman scorned hath no fury like a scientist whose work is questioned. Frequently an independent, anonymous referee would be consulted by the editor. If the Comment and Reply contained significant material of scientific importance and were reasonably free of pejorative personal invective, they were eventually published together. Although Comments occupied a very small fraction of the space in the *Journal* they took a considerable amount of the editor's time and judgment.

Sam Goudsmit once said that he suspected that the ratio of readers to authors of *Physical Review* articles was less than unity, since it was evident that some authors had not read their articles before submitting them. I sometimes wondered, as the increasingly thick issues of the *JCP* overflowed the bookshelves in my office, how much of the voluminous material we published was actually read. The Comments we received helped to lay my fears to rest. Two incidents in which a paper in the *JCP* provoked a flood of Comments that, after prolonged correspondence and exchange of views, resulted in the publication of a single clarifying Comment remain vividly in my memory.

In 1965 Ernest Davidson published (4) a brief Note "On Derivations of the Uncertainty Principle," in which he pointed out an apparent paradox in the usual textbook derivation of this principle and proposed a resolution. This is essentially a mathematical question on the foundations of quantum

mechanics. Now although most readers of the *JCP* are not professional mathematicians we all love mathematical puzzles. We received six Comments, involving eight authors, on the Davidson Note. I encouraged correspondence among the various authors and attempted, without success, to have them combine their efforts into a single brief Comment that would be the final *JCP* publication on the matter. A total of four independent referees were involved in a correspondence that extended over nine months. The upshot was the publication of a single Comment (5), which in the opinion of reviewers best resolved the question for readers of the *JCP* and which carried a footnote mentioning the other authors.

In 1971 a Note (6) was published proposing an atomic orbital that combined the usual analytical hydrogen atom orbital with a Gaussian. The author had tested this orbital on the hydrogen atom itself, and his computer program, using the variation method, arrived at a ground state energy slightly above the well-known exact value and a ground state function with a nonzero Gaussian admixture. Everyone who has taught an introductory course in quantum mechanics is aware that the variation method applied to a function that contains the exact function as a component will result in the exact function and its corresponding energy value. It was apparent that neither the referee, an eminent expert in molecular orbital calculations, nor the editor had read the Note. At the lunch table in the faculty club I received sarcastic remarks on the decline of the *JCP* and the Comments began to come in. In this case I was successful in persuading the critics to prepare a single joint Comment with five authors, which was published (7) in the 15 January 1972 issue.

The Referees

The selection of reviewers for each paper is the most important function performed by an editor. The referees should be experts in the particular subject matter of a paper, know the relevant literature, and be both highly competent and fair. Nearly all published papers are improved by revisions resulting from a critical reading by a reviewer. Although we hear much of disputes between referees and authors the fact is that such cases, although memorable, are the exception rather than the rule. In most cases authors are very grateful for the advice proffered by referees and would often ask me to convey their thanks to an anonymous referee for pointing out an error or calling attention to an overlooked literature reference.

Unless a referee specifically requests that his name be disclosed to the author his identity is kept confidential by the editor and an anonymous copy of his report is sent to the author. Great care was taken in the *Journal* office to remove identifying marks from copies of reports mailed to authors, but embarrassing mistakes sometimes occurred. We once had a

copying machine that made visible the watermark on the paper on which a report had been written; thus we learned to include almost invisible watermarks among the items to delete from material sent to authors. On more than one occasion a paper was mailed for review to a referee whose name appeared among a long list of authors of a paper and we filed the ensuing tongue-in-cheek and glowing report with a red face before sending the paper to an uninvolved reviewer.

The referee file of the *JCP* contained some two thousand names, mostly in Canada or the United States, but with a generous sprinkling of experts residing in other countries. The referees were classified by areas of expertise using a scheme similar to the one employed by the old subject index. The subject file was most useful to me in recovering names that I could not at the moment recall, since much of the information about referees is stored in an editor's head. The referee files of the *JCP* have now been largely transferred to a computer and their subjects of expertise are categorized by key words provided by the referees themselves. The referee files were continuously updated, both to keep track of changing addresses and institutional affiliations and to remove and add names. I have found that the most careful reviews are frequently provided by young people who have not published enough to be well known but who have an expert knowledge of their fields. I often wrote more prominent and busy people asking for such names to add to our referee file and would pick names of likely referees from authors of papers published in the *JCP*. A report that merely says "Publish" makes an editor wonder if the paper has really been read.

A persistent and unsolved problem of refereed journals is the late return of reports of reviewers. If a busy reviewer does not get around to reading a paper in the first week after he receives it the paper may get buried in a pile of unfinished business on his desk and a nudge from the editorial office is required. The *JCP* has a procedure involving a sequence of three letters, of increasing stridency, followed by telephone calls from an editorial assistant, for recovering papers from dilatory reviewers. The date on which a paper was mailed for review is prominently noted on the file of each paper and the tardy referee letters start a month later. The dates when a paper is sent to and received back from a referee are entered in the referee file and the use of chronically tardy referees is soon discontinued. Authors are with justification irritated by delays in reviewing and frequently telephone. The *JCP* has always strived to secure the prompt publication of acceptable papers. I recently looked through the 1 January and 15 January 1982 issues as an example to see how we had done. The dates of receipt and acceptance are listed in the published papers, and I made a histogram of the time between these dates. This time reflects not only the time wasted by tardy

referees but includes also the time while a paper is in the author's hands for revision as well as the time lost when the first referee has been sent a paper that for some reason has been promptly returned without review. For the 144 papers published in the two issues sampled, the time from receipt to acceptance ranged from one day to 587 days. The distribution was very non-Gaussian, with a median time of 66 days and a mean of 82 days. Although we usually were able to mail papers out for review on the day of their receipt, one day seemed too short and I checked the file. It turned out that the paper had been sent to a referee whose office is in our building. He had previously read it as a preprint and returned his review to our office the day after he received the paper from us. The minimum review time for papers that had gone through the mails was eight days.

Every year six new associate editors were appointed for three-year terms and the six who had served three years were retired. In choosing associate editors consideration was given to having among the panel of 18 on the editorial board someone expert in each area covered by the *Journal*, but the principal weight was given to finding people who had written excellent papers for the *Journal* and who had in the past served in an exemplary fashion as referees. I continued to use associate editors as referees, taking care not to increase their load, and as mentioned above sometimes asked them for editorial judgments in difficult cases.

Indexes

The *JCP* has always published author and subject indexes at the end of each volume. Beginning in 1956, two volumes a year have been published. In the years 1966–1973 various problems led to delays in the composition of the index and they were mailed to subscribers bound separately, sometimes arriving six months after the scheduled date. Originally the subject index contained an alphabetically ordered list of subject headings that had been chosen by various editors, without systematic analysis, to reflect categories under which a reader might hope to find listed articles published in the *Journal*. There was a typed list numbering these subject index categories and the editor assigned index numbers to each paper when it was forwarded for publication. An index secretary at the AIP transferred this information to typed cards used to prepare the copy for the indexes. A single person at the AIP handled this index preparation. She was intelligent and efficient and the indexes were prepared in timely fashion. However, an automatic sorting operation such as the preparation of indexes seemed well suited for rapid processing by a digital computer, so the preparation of indexes was one of the first operations to be computerized at the AIP. The AIP has created an Information Division, which, in addition to its broader

responsibilities involving the general problem of the dissemination of information from the physics literature, assumed the responsibility for the *JCP* indexes. Unlike a good secretary a computer does not recognize when it is outputting garbage and the early computer-produced indexes required extensive correction in proof and were consequently late.

One of the principal tasks of the Information Division was to devise a method of indexing the physics literature by subject, in a logical fashion that would be unambiguous and could be used efficiently by a scientist searching the literature for information on a particular subject. I recall reading lengthy reports by members of this division outlining projected schemes involving mathematical methods such as Boolean algebra to keep the logic straight or statistical techniques to maximize the probability of successful search. The task is difficult since the meaning of words used by physicists to label their work often depends on the context. The upshot of these endeavors was the Physics and Astronomy Classification Scheme (PACS), which to my eye appears a descendant of the scheme formerly used by *Physics Abstracts*. Beginning in 1974 the subject indexes of the *JCP* used the PACS classification. PACS was widely publicized and authors were encouraged to include PACS numbers on their papers. The responsibility for the preparation of indexes was transferred from the editorial office to the AIP indexers. The PACS index is now widely used throughout the international physics literature. The computer programs have been debugged and the subject classification is used for many purposes beyond the preparation of journal subject indexes.

The arrangement of authors' names in alphabetical order for an author index would be a straightforward procedure if there were a one to one mapping of names and identities. When I wrote my first scientific paper, my mentor, W. F. Giauque, strongly advised me to choose a single form for my name and stick to it throughout my scientific career. Not all *JCP* authors followed this advice: one would find separate author index headings for Blow, J. P.; Blow, Joe; Blow, Joseph P.; Blow, Joseph Patrick; and Blow, Joseph Patrick, Jr. even though the same Joe had written all papers. The consolidation of different forms of a name used by a single person and the separation of individuals whose names are the same requires human intervention. For the recent cumulative index covering volumes 72–81 of the *JCP* I was assigned this task. In addition to the indexes at the end of each volume, an author index for each issues was added to the *JCP* beginning with the 1 July 1966 issue. In 1974 the author index appearing in each issue was changed to a cumulative one including all papers in previous issues of the volume. Many readers have remarked that they find the cumulative author index particularly valuable.

Sectioning

As the *Journal* grew in size there were from time to time proposals that it be split into two or more journals, each devoted to a part of the scientific area spanned by the present *JCP*. Virtually all of the readers of and contributors to the *Journal* who expressed opinions were opposed to the splitting of the *Journal*, as was the editor. There is a perceived unity in the papers published, often on apparently disparate subjects, which would be lost if separate journals were established. The Division of Chemical Physics of the American Physical Society has several times strongly recommended against splitting the *JCP*. A committee chaired by Robert G. Parr that reviewed the operations of the *Journal* in 1979 opposed splitting and wrote, "A distinguished broad-scope *Journal of Chemical Physics* should continue indefinitely."

The review committee did, however, urge the editor to try some system of classification of papers by subject matter in the Table of Contents and in the grouping of articles in the body of the *Journal*. Beginning with the 1 July 1980 issue I separated the Table of Contents into five sections: Spectroscopy and Light Scattering; Molecular Interactions and Reactions, Scattering, Photochemistry; Quantum Chemistry, Theoretical Electronic and Molecular Structure; Statistical Mechanics and Thermodynamics; Polymers, Surfaces, and General Chemical Physics. Several people complained that the sectioning was a mistake and in order to find the sentiments among a wider readership I conducted a poll of all present and former associate editors of the *Journal*. The response was amazing, 95 replies in all, almost evenly divided pro and con, with a small majority favoring the continuation of sectioning. Those opposed to sectioning felt that the strength of chemical physics lay in its unity and breadth and that sectioning would weaken this unity and encourage the overspecialization they saw in modern science. All respondents, pro and con, felt that the *Journal* should not be split into separate publications, and all said that sectioning or not, they would continue to read all titles since they often found papers of interest in subfields other than their own. The argument for sectioning was that it makes the Table of Contents page less overwhelming and easier to scan, even when one reads the titles in all sections. As one man remarked, there is a "glazed eye effect." The number of items missed in a long list increases more than linearly with the length of the list.

The assignment of articles to sections is made by the editor, who, of course, welcomes advice from the authors of papers. In assigning a section I often found that a paper could equally well be put in any of several sections and that my choice was very arbitrary. Sectioning should be

viewed as a cosmetic device that improves the appearance of the Contents pages and not as a guarantee that related papers will not appear in different sections or as a first step toward the division of the *Journal* into separate publications.

Special Issues

Since 1959 three special issues of the *JCP* have appeared, honoring John G. Kirkwood, Robert S. Mulliken, and Willis H. Flygare, respectively. Other than a picture and a brief introduction or biography, I tried to make sure that papers published in special issues met the usual standards for *JCP* articles and were not reviews of published work.

The November 1960 issue of the *Journal* contained 32 papers honoring Kirkwood. Joe Hirschfelder headed a committee soliciting papers for this issue. All papers were submitted to the *JCP* office and reviewed in the normal fashion. The Kirkwood issue also contained ten regular articles not tied to the Kirkwood memorial and Letters.

The Mulliken issue was published on 15 November 1965 as a supplementary Part 2 of the issue of that date. It was separately bound and paginated. The 50 papers in the supplementary issue had been presented at a symposium at Sanibel Island. Per-Olov Löwdin organized the symposium and served as chairman of a committee that reviewed many of the *JCP* papers. Brief discussions of the papers were included in the supplement.

The Flygare memorial issue was Part 2 of the 15 March 1983 *JCP*. The 116 articles occupying 966 pages of text in the Flygare issue spanned the broad field of chemical physics. George Flynn acted as editor for this issue and succeeded admirably in selecting articles of *JCP*-quality.

The Darker Side

To the casual reader of *Science* it may appear that fraud and deceit in scientific publication is a common result of the pressure to publish. Actually the number of fraudulent papers is very few and the publicity given to them reflects the overwhelming concern of the scientific community that integrity be maintained. During my 23 years as editor there were only three instances of cheating. A perceptive reader wrote me that several sentences in the introductory paragraph of a Note published in the *Journal* were identical to those in an earlier paper by Leo Brewer. When I consulted the file I found that Brewer had been the referee of the Note. In reply to my letter he remarked that he had found the introductory paragraph unusually well written but had not recognized the words as his own. The data and interpretation in the Note were new and had originated with its author. Although a technical plagiarism had occurred I did not think a

published correction was necessary and contented myself with a strong admonitory letter to the author.

A more serious breach of scientific ethics was the publication, in a paper primarily concerned with crystal spectra, of magnetic susceptibility data taken from the unpublished thesis of a student at another institution. The original *JCP* paper had presented these data as originating in the laboratory of one of the authors of that paper. An appropriate correction (8) was published. A second Erratum (9) corrected some misleading statements in another paper.

There was one case in which a paper submitted to the *JCP* was an outright copy of published work. A paper on a Monte Carlo study of a polymer chain had been published in Russian in an obscure journal, and the paper that came to the *JCP* was a poor translation of the Soviet publication. Luckily the referee to whom I sent the paper was thoroughly familiar with the Russian literature. The submitted paper was rejected with a harsh letter to the author. The author claimed that, for reasons that security prevented him from disclosing, the paper had been submitted for the purpose of obtaining a referee's opinion and would have been immediately withdrawn had it been accepted. In his last letter he remarked that he had chosen a future path in life other than physics.

There is a file in the *Journal* office labeled "Authors to Watch." Its contents are principally correspondence from former collaborators who have had a falling out and are concerned about the publication of their joint work, or letters concerning authors who have resubmitted papers previously rejected by the *Journal* without alerting the editor, or have submitted a paper simultaneously to two journals.

Potpourri

As the reputation of the *JCP* grew, articles were attracted from authors throughout the world. In the five-year period 1978–1982, 64% of the articles published were by authors whose institutional by-line was in the United States, 6% were from Canada, and the remaining 30% came from a wide assortment of other countries.

The characteristic blue color and austere typographical layout of the cover of the *JCP* have from the beginning uniquely identified it in a pile of journals on a desk. Around 1973 the AIP jazzed up the covers of some of its journals and I was shown a proposed "new look" for the *JCP* cover. I reacted as if it were proposed to paint a moustache on the Mona Lisa and the old-fashioned but well-loved cover remained. Formerly the Table of Contents page was printed on the back cover, running backwards into the Journal if its length required. Several institutions engaged in the business of photocopying contents pages complained of difficulties with

the *JCP* and Robert Mulliken once told me at lunch that he would find the contents much easier to read if it were printed on white paper. In 1974 the Table of Contents was moved inside on white pages at the front of each issue.

We have brushed twice with the lunatic fringe. I was once visited by a man, a PhD from the university where I taught, whose paper had been rejected by the *Journal.* After a few minutes of trying to discuss with him the science in his paper I realized that one or the other of us was crazy. Fortunately he had no gun and was not very big. Subsequently I received a stream of telephone calls from this man, and university administrators were bombarded with letters insisting I be fired. It is amusing to note that the paper in question, which still makes no sense to me, was later published in a reputable journal. In 1977 we received a letter signed THETA, PhD Physics, which claimed to represent a colony of disgruntled authors who had gravitated to Salinas, California and had determined to reform scientific publication so that it would allow "creative scientific thought." A "wave weapon" had been developed, which in a test near King City had instantly killed a ten-year old horse a mile away. I happened to mention the letter in a telephone call to the AIP about another matter, and their lawyer got a copy of the letter, which was given to the FBI. We were visited by a delegation of FBI men, whose demeanor reminded me of a television program with that name. A few months later we were assured that the writer of the letter was harmless and we need not fear that the *Journal* personnel would suffer the fate of the horse.

Editors of scientific journals eschew involvement in the struggles for power among nations, at least in times when outright hostilities have not broken out. Nonetheless an occasional wavelet breaks at the door of editorial offices. I was once approached by a gentleman who gave an implausible name and flashed a card identifying him with a national intelligence agency. He proposed to intercept upon arrival and photocopy all manuscripts received by the *JCP* from "behind the iron curtain." I told him of the firm policy of the *JCP* to treat all unpublished papers as confidential information disclosed only to the editor and to reviewers and suggested his agency instead buy a subscription to the *Journal.*

We received in 1974 from a number of sources, all insisting that their identity remain secret, a paper on a generalized Ising model for polymer thermodynamics. At the time the author was writing from a private address in Moscow (USSR not Idaho), and direct correspondence with him involved difficulties. Referees to whom I sent the paper reported that it contained important original ideas and should be published but that problems with English and notation required that it be rewritten. The referee and a colleague, both expert in the subject matter of the paper,

performed this task anonymously and it proved possible for the author to see and approve the revised and retyped paper (10) before its publication in May 1975.

PRODUCING THE JOURNAL

A large effort is required to bring the typed papers received from authors into the final printed journal that goes to readers. This function has been performed by the editorial mechanics office of the AIP, originally located in various buildings in downtown Manhattan and now transferred to Woodbury, Long Island.

Copymarking and Printing

Before a paper is sent to the compositor it must be marked to indicate type styles to be used and to put abbreviations in references and for units in standard form. The copymarking should also correct errors in spelling and grammar, which the author would have done had he noted them. Many copymarkers were English majors and in a few cases their impulse to creative rewriting changed the meaning and converted sense into nonsense. In 1963 I wrote some suggestions for copymarkers asking them not to act as rewrite men and to avoid rearranging sentences or altering words. In the main these were followed in *JCP* copymarking.

There is a firm rule that authors must approve proof before a paper is transferred to pages. On the very rare occasions when someone violated this rule and made changes after proof had been approved, the editor was sure to receive an irate letter from the author and an "AIP-paid" Erratum would be published.

When I first became editor the composition of the *JCP* was done by Mono of Maryland using Monotype machines. The resulting pages were beautiful and there were very few errors in the proof sent to authors. For economic reasons a change to typewriter composition, by outside contractors, was made in 1973. The appearance was a bit more ragged but acceptable, and there were few complaints from readers. In the same year the AIP began using a computer for in-house composition of the "heads and tails" of papers: the titles, authors' names, abstract, and references. The early efforts at computerized composition often produced bizarre results in proof mailed to authors. The corrections required resulted in substantial delays in the printing of the *Journal*, and in the latter part of 1973 issues were received by subscribers more than two months after the dates printed on the covers. In Volume 58 a bewildering array of type styles is found for the titles and authors' names. In time the bugs in the computer-controlled composition were ironed out. By 1983 it was possible

to compose the entire *Journal*, in-house, by computer with an improvement in both appearance and cost.

Financing the Journal

In some respects scholarly publication resembles the vanity press. The drive for publication comes from authors who submit papers. The authors are not directly compensated for their efforts but are rewarded by the professional recognition and personal satisfaction that result from the publication of their work. When the *JCP* commenced publication most scientific journals were financed by professional societies and, the income from subscriptions being insufficient to cover the costs, were partly supported by dues from society members. Initially the cost of producing the *JCP*, beyond the income from subscriptions, was assumed by the AIP, using resources obtained from a small fraction of the dues paid to its member societies as well as from granting institutions such as the Chemical Foundation.

As the *Journal* grew, costs increased and financial crises caused a continuing examination of the role of the *JCP* and its relation to both the American Physical Society and the American Chemical Society. The problems became particularly acute in the early 1950s, and the editors at that time were much involved. The governing board of the AIP had for some time questioned whether an appropriate function for the Institute was the publication of archival journals such as the *JCP*, and various committees had considered the general question of physics publication. A committee of the APS was appointed to investigate the possibility of joint sponsorship of the *JCP* by the APS and the relatively affluent ACS. This committee found that joint sponsorship was "impractical" and recommended that responsibility for the *JCP* be transferred to the APS. In 1955 another joint AIP-APS committee proposed that the APS assume responsibility for the *JCP*, that the name be changed to the "Journal of Solid State and Chemical Physics," and that the *Journal* become more a physicist's and less a chemist's journal. This last proposal received little support from either the solid state physics or chemical physics communities. In the end the AIP continued as owner and publisher of the *JCP*.

It appears that from the beginning the AIP requested from authors' institutions the payment of page charges to help defray publication costs, although the first public announcement of a "publication charge of $4.00 per page" appeared in the issue of April 1949. The payment of the page charge was not a requirement for the publication of a paper accepted by the editor, and no consideration of whether or not page charges would be honored ever influenced editorial decisions as to the acceptability of papers. With time and inflated costs the dollars per page increased, reaching a

maximum of $80 in 1980. The honoring of page charges was accepted by industrial laboratories and after some initial bureaucratic confusion by government laboratories, but the response from academic institutions, particularly departments of chemistry, was poor. As editor, Joe Mayer wrote letters to some department chairmen urging the honoring of page charges, and a later campaign was conducted in 1959 by the Division of Chemical Physics of the APS through the then secretary of the division, Arthur Frost. It is with some nostalgia that one notes that in 1958 money for page charges came from departmental budgets rather than from grants.

In 1969 the AIP instituted a policy that resulted in a delay of publication of some papers on which the page charge had not been honored by an author's institution. At the insistence of the editor the policy was not applied to Communications in the Letters section of the *JCP* but it was applied to other Letters and to all articles. Fifteen percent of the pages published were available for nonhonored papers. If the number of such papers exceeded this quota the papers were delayed until a later issue and appeared, in the order of their originally scheduled publication dates, as nonhonored space became available. During the years 1969 through 1972 the delay for publication of nonhonored papers ranged from zero to a high of 14 months. The handling of publication charges and the imposition of the delays were functions of the publication office at the AIP. Nevertheless the editor became deeply involved both in answering letters from angry authors and in concern for the deleterious effect on the *Journal* caused by the delaying of nonhonored papers. There is no doubt that the delay caused the diversion to other journals of excellent papers that would otherwise have come to the *JCP*. There were cases in which accepted papers were withdrawn by authors after a delay had been imposed. In my annual reports and letters to the publishers I complained *ad nauseum*. The 1979 report of the *JCP* Review Committee listed as its two primary recommendations that page charges be reduced and the delay for nonhonored papers be eliminated. Some of the delayed papers bore acknowledgment of support by the National Science Foundation. In 1980 I wrote to acquaintances at the NSF proposing that publication charges for work supported by the NSF automatically be assumed by that agency at the time a paper is accepted rather than be included as an item in a grant budget. I thought that the costs to the NSF would not be increased much and the delay problem for the *JCP* would be substantially ameliorated. The proposal was seriously considered by the National Science Board but it apparently involved broad questions of government policy and, in the absence of strong support from scientific publishers, nothing happened. The decisions of the AIP governing board in 1983 and 1984 to

lower the publication charge and cut the delay time are very welcome. By 1985 the publication charge was reduced to $45 per page and the delay time to two months.

When I first subscribed to the *JCP* in January 1944 the price was $10 per year. In 1948 this was still the price for members of AIP societies but $12 was asked of "others." In the following years the subscription price for people belonging to member societies of the AIP remained relatively low and an increasingly higher subscription rate was asked of nonmembers and institutions. In 1985 a year's subscription cost $100 for members and $760 for nonmembers, with an added mailing charge for those living beyond the borders of the United States. If the 1985 price is adjusted for the inflation of the dollar, members then got more articles or pages for their money than they did in 1944. The price to libraries remains a bargain when compared to that asked by privately published journals.

There were 1619 paid subscriptions to the *JCP* in 1946. The number of subscribers increased as the reputation of the *Journal* grew, reaching a peak of 6488 in 1969. Since then the number of subscriptions has declined slowly. It was 4524 in 1980. Some 69% of the *JCP* subscriptions are by nonmembers, principally libraries. Almost half of the *JCP* subscriptions are mailed to addresses outside of the United States.

CONCLUSION

On 1 January 1986 *The Journal of Chemical Physics* celebrated its fifty-third birthday. It has grown in size and in status and in my admittedly biased judgment is now the leading journal in the world in its field. There is some supporting evidence. The Review Committee in 1979 wrote, "The Journal of Chemical Physics has been the preeminent research journal in the field of chemical physics. It remains so." King & Roderer (11) quote a survey of physicists, which found the *JCP* to be among their five "most important or frequently used" journals. Emsley (12) puts the *JCP* second on a list of journals that are essential to retain in research libraries in times of financial stringency. In the *Journal Citation Reports* of *Science Citations Index* the *JCP* has consistently been in the top six journals in physical and biological sciences, ordered in terms of the total number of literature references to published papers, and in "impact value," a measure of the number of citations per article, the *JCP* ranks high among journals of physics and chemistry.

The community of chemical physicists has grown with the *Journal*. The Division of Chemical Physics is prominent among the divisions of the APS, and the *JCP* is a major publication output for members of that division as well as for those who belong to the Division of Physical

Chemistry of the *American Chemical Society*. With the advent of solid state electronics, digital computers, and lasers the techniques and instrumentation used by chemical physicists have changed tremendously over the years. We no longer find Type K potentiometers with batteries and a galvanometer in the laboratory, and glass blowing is becoming a lost art among graduate students. Elaborate computer-controlled instruments acquire data at a rate beyond human comprehension; one resorts to a computer to reduce the information to something we can understand. The basic problems attacked by chemical physics remain, however, the same, and are solved with ever increasing refinement and accuracy.

From the beginning theoretical papers were prominent in the *JCP*, and the interplay between theory and experiment has always been strong in papers in the *Journal*. The distinction between theoretic ans and experimentalists in chemical physics is less sharp than in some other parts of physics, and we find many chemical physicists who make important contributions to theory related to experiments they also conduct. People perform "computer experiments" with Monte Carlo or Molecular Dynamics methods to solve theoretical problems where the basic theory is understood but the mathematical complexity of analytical solutions is beyond our capabilities.

One reads much of authors' problems with referees and of arbitrary and unfair editorial decisions. One might think the life of an editor is a contentious one, "full of sound and fury, signifying nothing." I am not quite sure about the significance, but in fact an editor presides over an operation whose purpose is to improve the quality of published papers with the cooperation of both authors and reviewers. Instances of acrimonious dispute are atypical, although they stir the blood and remain in the memory. Even rarer are instances of chicanery on the part of authors or referees. The overwhelming impression I retain from 23 years of editing the *JCP* is one of probity and love for the integrity of their science by all protagonists in the publication process.

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