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Chapter 8

Learned Societies Adapt to New Publishing Realities

A Review of the Role Played by U.S. Societies

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The dramatic development of radar and the atomic bomb during World War II was the direct result of a massive basic and applied research effort by the scientific and engineering community. This set the stage for future substantial increases in financial support of research programs by industry and the U.S. government.

Scientists and scientific societies have always recognized the prime importance of publishing the results of scientific research. The basic principle is that research is not complete until the results are peer-reviewed and published. Each research project builds on the published results in the archive. This also avoids the delays and added expense of "reinventing the wheel".

However, learned societies have always been concerned about the cost of publishing a large and growing amount of research results for a relatively small audience in each of the scientific disciplines. The proposed solution to this problem was the invention and introduction of the publication charge system. In essence, this system called for the payment of a publication charge by the organization conducting the research. This payment, on behalf of the author, was designed to cover the cost of the producing the first copy of each article. It was charged as a set amount per page for a given journal and varied with the length of each article. This payment covered the cost of editorial management (including peer-review), editorial mechanics (including copy editing) and composition of text, illustrations and tables. The remaining cost of printing, paper and distribution would come from individuals and libraries who subscribe to each journal. The publication charge rate was only $2.00 a page when the plan was first introduced in 1930 by the American Physical Society. In later years many of these rates reached levels well in excess of $100 per page.

Increased funding of research and development led to the graduation and

employment of increasing numbers of Ph.D. scientists who then joined scientific societies operating in their chosen fields of research. It also resulted in the formation of many new societies covering specialized areas that were not adequately covered by the established learned societies. These developments produced a tremendous increase in the size and scope of all society programs including employment services, scientific meetings and conferences, publishing research journals, magazines and books and even providing information about the benefits of research to the general public.

All of these developments posed a wide variety of challenges for society publishing programs. Society members expected prompt publication of their papers, low subscription rates, wide circulation of the research results and low cost membership dues.

Exponential growth in the number of submitted research papers led to long publication delays. In addition, income from publication charges and subscriptions failed to keep pace with rapidly escalating publication costs. Subsequent increases in the level of publication charges persuaded many authors to publish with commercial publishers who did not levy page charges. Even though publication charges were paid by the authors organization, the expense was normally charged to the authors research budget. Without this expense the author had funds for other research purposes. However, without page charge income the subscription prices for commercial journals had to be much higher than society journals with page charge support. This increased each organization's expense for library subscriptions. With decreased levels of page charge income support, society subscription rates also had to increase. All of these increases led to regular annual declines in the number of journal subscriptions bought by libraries.

During this period most society publication programs were running at substantial losses. The shortfall in income had to be made up by increasing membership dues and attendance fees for society conferences and meetings. In the early 1970's some societies recognized that they needed professional management for their publishing programs to take full advantage of new technology, streamline their operation and regularly produce a substantial net income. It was recognized that additional income was needed to carry out the long term goals of the society without substantially increasing membership dues. At this point in time most society publishing programs were managed by scientists who were very familiar with the scientific content, and at the same time handicapped by their limited publishing experience and expertise.

At the American Institute of Physics, with new publishing management in place, the first challenge was to reduce publication time by streamlining the pro-

duction process and increasing the page budget so that accepted papers would not be delayed because of page budget limitations. There was a substantial saving in time and cost by eliminating the author galley step. Each author only received page proofs of the complete article with all illustrations and tables in place. Authors that had the habit of rewriting their papers when they received galleys were quick to see that they should only change errors of fact and interpretation. This change dramatically reduced production time as well as the composition cost incurred for authors alterations.

The most expensive step in production was monotype composition. The monotype process was required to accommodate type setting the wide range of special characters needed for scientific text and to compose complex mathematical equations. Composition cost during this time period was in the range of $45 to $50 per page.

To decrease cost and shorten production time, *Physical Review Letters*, published weekly, pioneered the use of electric typewriters for in-house composition. A set of some 200 special typewriter keys, for individual manual insertion in the typewriter, made it possible to compose unjustified scientific text containing special characters and complex mathematical equations. The typewriters were operated by typists with no special composition skills compared to the highly skilled monotype operators at printing plants. The cost of typewriter composition was about $18 per page including authors alterations.

Typewriter composition was rapidly introduced on practically all of the physics journals published by the American Institute of Physics. A fan mechanism developed for the electric typewriter contained practically all the special character keys needed for composition. This device increased the output efficiency of each typist. They also became very adept at composing complex mathematics with the special keys and adroit use of the typewriter roller to accurately position the various component parts of each mathematical equation.

The next improvement was the introduction of computer photocomposition for the "heads" and "tails" of articles using Datapoint terminals. Each article heading contained bibliographic information including title, abstract, authors and indexing and classification terms. The tails included complete references to articles cited. This computer software was still unable to compose the complete scientific text and mathematics so typewriter composition continued to be used for the main text of each paper. The computer tape from the heads and tails system efficiently produced annual subject and author indexes for each journal. It also provided income from the sale of this information to secondary service publishers as input for their abstract journals and bibliographic data bases.

Computerized photocomposition of the main text became a reality with the introduction of the Atex system at the American Institute of Physics in the early 1980's. The electric typewriter and Datapoint terminals were replaced by computer keyboards and video screens that quickly and accurately composed complex scientific text and built up mathematics. In addition, the appearance of each page dramatically improved and the information content of each page increased.

The next advance came from Kurzweil equipment that scanned each author manuscript and sent the captured keystrokes directly to the Atex system. This reduced keyboarding time and expense. All keyboard operators had to do was correct any scanning errors and add mathematics at appropriate locations. One major drawback of the Atex system was its inability to compose complete pages with illustrations in place. It produced galleys which had to be manually pasted up into complete pages for plate making and printing.

The Xyvision composition system, currently used by both the American Institute of Physics and the American Chemical Society, produces complete digitized pages with illustrations and tables in position, for mounting on the internet and production of the printed publication. In addition, digitized text from the author can be input directly into the computer system, copy edited on line, and then sent directly into the Xyvision system. This development speeds up production and greatly reduces costs.

The 1990's have been characterized by learned societies growing use of strategic planning with the primary goal of developing successful publishing programs that produce a net income to help support overall society activities. Another important goal is achieving a completely digitized publishing program to meet the demands of members for fast, low-cost, world-wide access to scientific information on the internet.

Publication time and cost has been further reduced by efficient computerized editorial management systems for manuscript receipt, peer review and acceptance. Improved communication between authors, editors and editorial staff is a time saving byproduct benefit of these new systems.

Secondary service data base products are almost completely electronic although there are still some die-hard paper subscribers. Many data base producers are using direct computer tape input from primary publishers. Electronic full text of more and more journals is available on the internet with links to abstract data bases and the full text of other computerized journals. Simplified, easy to learn interfaces are being developed so that individual scientists can directly access data bases and the full text of electronic journals without using an expert intermediary.

All societies are now facing up to the challenge of setting realistic value based

prices for magazines, journals and books. Scientific journal publication charges and subscription prices have traditionally been set to support publication of the complete peer-reviewed archive. The subscription system allocates the considerable cost of publishing the complete archive among all subscribers to the journal. The sale of individual articles that happen to be of current interest to scientists and other users will not provide the income needed to replace the current subscription system. In fact, it will lead to much higher subscription prices for the others who continue to subscribe. The single article sales approach also doesn't recognize the value received when a search of the complete archive does not locate any published research in the area of interest.

The successful research journal is one that attracts papers from the best authors and quickly publishes all submitted articles that pass the test of peer-review and belong in the editorial scope of the journal. Scientific papers and articles are not and should not be evaluated and accepted for publication on the basis of their potential single article sales or readership. This approach stands in sharp contrast to book publishing where editors do not publish all peer-reviewed, high- quality science submitted. In addition to scientific quality books are evaluated on their potential sales to individuals, libraries and educational institutions. The same philosophy applies to magazine publishing.

Currently, with some exceptions, there is greatly reduced reliance on publication charge income. Page charges have either been greatly reduced or eliminated for most existing and new journals. Additional income is needed to keep abreast of new technology and cover the growth of traditional and other rapidly expanding niche areas of science in existing and new publications. Today's competitive climate also calls for substantial financial resources to support comprehensive marketing and promotion programs for existing journals and for the introduction of an increasing variety of new niche publications.