of differences between terminals and the exorbitant memory it would require) it will not be feasible to store the journal as a high-resolution raster image. The natural form of storage will be a source file for TEX or some similar typesetting program, or perhaps as the DVI output file of such a program.

Finally, there is a use to which TEX or some system growing out of TEX could be put which is in the nature of a spinoff. There is rapidly coming into existence a large number of on-line bibliographic data bases. These data bases must of necessity be stored in a linear character-by-character manner. For ordinary text this poses little problem. But when there are mathematical formulas involved there are enormous problems caused by the lack of any standard linearized method to describe what is often really two-dimensional text. Of course, if TEX gains sufficient acceptance it could become a *de facto* standard for linearized mathematics. Indeed, it is possible that ultimately the complete $\mathcal{AMS}$-TEX version of the Mathematical Reviews input files will be available on-line in commercial data base retrieval systems.

The Role of TUG

A look at the TUG roster will show that a surprisingly large number of people have written in expressing an interest in TEX and asking to belong to TUG. What is the appropriate role for us to play? It was clear from the discussion at the organizational meeting that there was anything but unanimous agreement on this point. It would seem appropriate to me that we should wait about a year after the Pascal version of TEX is actually "in the field" and then have a second face-to-face meeting to discuss our experiences, problems, and needs. In the meantime, TUG will function as a clearing-house for information concerning TEX. Initially the main problems will involve getting Pascal TEX installed on various architectures and operating systems. Here it will be particularly important to avoid many different groups reinventing the wheel. Once the basic installation problems are settled, there will be a certain amount of elementary question-answering needed from TUG until expertise builds up in the field. Eventually this function of TUG should evolve into one of providing names of experts for TEX consulting and trouble-shooting, and TUG will no doubt gradually assume other functions such as a clearing-house for the exchange of documented TEX macro packages. Ultimately TUG will become exactly what we its members make it. And that is what we can look forward to discussing at our next meeting. Until then,

Happy TEX-ing
Richard S. Palais

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PUBLISHING & TEX

Ellen E. Swanson

A published book or journal originates as an idea in the mind of the author, is put into manuscript form, and sent to an editor for review. Upon acceptance for publication it is copy edited, set into type, proofread, corrected, paged, and finally assembled and sent for printing and binding. Many hours and dollars are spent on each page and chapter of every published book or journal. If the material is scientific, or mathematical, the copy editing and composition is generally more expensive than for ordinary text. New technology utilised over the past few years has reduced the expensive composition costs. Tight budgets have resulted in some economies being implemented in the editorial aspects, for instance by eliminating a proofreading check. The purpose of this article is to acquaint the author with the main steps of the publication process and then to indicate how TEX may help eliminate some of the publication costs.

Current systems using computer-assisted composition have reduced the cost of composition dramatically, but not for editorial functions such as copy editing or proofreading. Curiously enough the cost of composing a page of mathematics at the American Mathematical Society is about the same in 1980 as it was in 1969; new technology has negated the inflation factor. On the other hand, the hours spent in copy editing, proofreading and other editorial tasks have not been reduced significantly, with the result that these costs per page have more than doubled.

The use of TEX could provide savings for the publisher in both composition and editorial functions. To understand more fully how this saving can be accomplished there follows a list of the steps involved in publishing and an indication of the time and/or dollars that are spent. Then it will be pointed out where TEX can produce savings. For the sake of simplicity in this paper it will be assumed that an article is being written for publication in a journal, and that the journal is a scientific one containing some mathematics. Essentially the same process is used for publication of a book. Obviously, if the publication does not contain mathematics, some of

the steps will be simpler and any references to mathematics can be ignored.

THE MANUSCRIPT. The first step in the publication process is that the author conceives an idea, and puts it on paper by handwriting or typing. The original manuscript is doubtless revised once, twice or even more times before the author is happy with the result. Then it must be sent to an editor, who may in turn send it to another one or two persons (often called referees) for their recommendation. Let us assume it is accepted for publication.

ACCEPTANCE TO PRINTED COPY. The editor usually sends a manuscript to the editorial office of the journal for processing. This office is usually involved in all of the steps from the time the manuscript arrives to when pages are sent to the printer ready for negatives to be made for offset printing.

Logging in. The manuscript has to be acknowledged and other procedures instituted such as setting up files, and obtaining copyright permissions.

Copy editing. A manuscript should be read line by line to be sure that it is legible, that the grammar and spelling are correct, and that the author has maintained a consistent style that conforms to that of the journal in which the article is being published. For a scientific paper editors also check that notation is available and clear, and in mathematics papers that the displays are in a form suitable for keyboarding and printing. Artwork must be in a form required for printing and reduction factors determined, if they are needed. Time spent copy editing is important; it saves money in the long run because it cuts down on the number of changes and corrections required on the proof.

Composition. The kind of composition used today is almost as varied as the number of publishers. Whatever the method, the manuscript must be keyboarded and then camera copy produced with the use of some kind of hardware. There is usually a check for errors and corrections must be keyboarded; proof must be produced and then sent to the editorial office and to the author.

Proofreading. This proof must be read carefully, whether by an editorial assistant or by the author; a more accurate publication is produced if it is proofread by both. If mathematics is involved, bad breaks at the end of lines, or poorly set up displays, need to be marked for rearrangement.

Corrections. All corrections have to be coordinated and returned to composition for keyboarding. Corrected proof is then returned to the editorial office for checking. If the luck is bad, there will be additional errors and the correction process will have to be repeated.

Page makeup. Fully corrected proof is ready for its final paging. If it is in galleys, they must be cut into page lengths. All pages must be checked for proper length and for bad breaks between pages. Then any changes in paging must be both executed and checked. Running heads and page numbers must be inserted.

Makeup of an issue. Once the pages are ready the book must be *carefully* put together. Covers, title pages, information pages, prefaces, contents, and indexes must be coordinated; articles or chapters have to be ordered, and running heads and page numbers checked.

To the printer. Checks must be made that the pages are correctly ordered, that the instructions to the printer are clear, both on the proof and in the accompanying letter. Binding instructions must also be included.

COSTS OF PUBLICATION. It is rather difficult to put costs into dollars because of differences in salary and in the overhead rate for various publishers. Some of the cost items below are, therefore, given in hours rather than in dollars. It should be remembered, however, that, if you know the salary of a keyboarder or copy editor is $6.00 an hour, it cannot be assumed that the cost of a half hour of work is just $3.00. In addition to salary there are benefits, rent, and other types of overhead. The actual "rate" is apt to be two or three times the hourly wage. I remember a young woman, who was working for me as an editorial assistant, becoming very irate when she saw the budget of the project on which she was working—it seemed we were not paying *her* the amount of money that was budgeted for the work she was doing. Here is a list of the various steps with comments regarding time and costs. These figures assume a page has a printing area of about $5'' \times 8''$ and 6 lines of 10 point type per inch.

1. *The manuscript.* Only an author can know the time and effort that is entailed in the writing and an editor the hours involved in reviewing the paper.

2. *Logging in and other clerical functions.* 30 minutes to 2 hours per paper.

3. *Copy editing.* 10 to 15 minutes per page. It depends greatly on the condition of the manuscript, whether or not rewrite is necessary, and the type of material being published.

4. *Composition.* 30 to 60 minutes per page. Depends greatly on the content, that is whether it is strictly words or if there is scientific notation involved. Computer or other hardware charges are involved in addition to personnel.

5. *Proofreading.* 6 to 20 minutes per page.

6. *Keyboarding corrections.* 3 to 10 minutes per page.

7. *Checking corrections.* 3 to 6 minutes per page.

8. *Page makeup.* 3 to 12 minutes per page. Depends a great deal on whether it is straight text or whether displays, figures or tables make page breaks difficult.

9. *Makeup of an issue.* 1 to 3 minutes per page.

In all, these minutes add up to anywhere from 1¼ to nearly 3 hours per page. In general, one can assume that editorial functions (Steps 2, 3, 5, 7, 9) take about an hour a page, while keyboarding, page makeup and other composition related functions (Steps 4, 6, 8) tend to take about one hour and a half of personnel time.

At the American Mathematical Society we do all our own editorial work and we do our own composition by a computer-assisted system, but use an outside phototypesetter. The editorial functions take approximately one hour. Composition costs at the present time are $18.00 to $24.00 per page, including both department and Society overhead; composition takes about 1½ hours of personnel time plus computer and outside service charges of about $4.00.

Role of TEX. TEX can be useful to both the author and the publisher. If an author learns the TEX codes, or has a secretary who knows them, a manuscript can be keyboarded by use of TEX and revisions can be made while sitting at a terminal—only the lines being revised need to be rekeyboarded.

For the publisher there are two main ways in which TEX can cut costs.

(a) If a paper were submitted in the traditional manner some saving would result from using TEX for composition. The manuscript would be copy edited, keyboarded and all the other steps outlined above executed. However, page makeup would be streamlined because TEX not only can automatically divide a manuscript into pages, but has a built-in mechanism for lengthening or shortening pages to correct lengths. If page breaks between lines are not acceptable, they can be changed by a keyboarding direction rather than by hand stripping. These shortcuts could easily save a dollar or more per page.

(b) If an author were to produce the manuscript on the TEX system and submit a magnetic tape to a publisher who has facilities for converting the tape to typeset copy, the savings would be much more dramatic. Personnel for copy editing, composition, proofreading, and keyboarding of corrections (Steps 3, 4, 5, 6) would be almost entirely eliminated. If copy editing changes were needed to conform to house style, these could be made directly on the computer terminal and would thus be minimal. Proof would be submitted to authors in pages set automatically by TEX. However, if the author makes changes or corrections, the cost would increase because it would result in extra keyboarding and checking; in addition the whole paper would need to be set in type again, or patches set and stripped onto the original pages by hand.

A saving of 80% of both composition and editorial costs could easily result if a paper were submitted on a TEX magnetic tape. If the TEX tape needs copy editing and/or corrections, the saving would likely still be 50% to 75% because copy editing, keyboarding and proofreading would be cut drastically.

It is unrealistic to assume that all articles in a publication will be submitted in TEX. Not all authors have the temperament or desire to learn the TEX codes and not all university departments will have a TEX expert. However, there would still be a considerable saving in the cost of publication if only part of the papers for a book or journal were submitted by authors on magnetic tape produced by the TEX system.

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