

$\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX

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1. \TeX

Donald E. Knuth's multi-volume epic: *The Art of Computer Programming* [3] (written in the sixties and seventies) caused a great deal of frustration to the author. It seemed very difficult to keep the various volumes typographically uniform. Out of this frustration, the \TeX mathematical typesetting language was born, see [4]–[8].

\TeX takes care of millions of little details that are so important in mathematical typesetting: it properly spaces the formulas; breaks up the text into pleasing lines and paragraphs—hyphenates words as necessary; provides the hundreds of symbols and fonts without which you cannot do mathematics. \TeX does this on most any computer: IBM compatible, Macintosh, Atari, Amiga, workstations, minicomputers, and mainframes. You can typeset your work on an IBM compatible, and email it to your coworker who will do the corrections on a Macintosh; the final result goes to your publisher who probably uses a minicomputer to print the result on a Linotype printer.

To produce a typeset article, you need a style designer—a specialist, who decides what fonts to use, how large an interline gap you need (before and) after a theorem, and specifies the million and one other parameters that go into a style. \TeX was designed to work with a “stylesheet,” so **you** do not have to worry about style design problems.

Knuth also realized that it requires knowledgeable users to typeset with \TeX an article of any complexity. So \TeX was designed as a “platform” on which *convenient work environments*—so called “macro packages”—can be built.

2. $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX AND \LaTeX

It is somewhat unfortunate that **two** such macro packages, $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX and \LaTeX , were made available to the mathematical community in the early eighties.

$\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX was written by M. D. Spivak for the $\mathcal{A}\mathcal{M}\mathcal{S}$, while \LaTeX was developed by L. Lamport. Both systems were first-rate and both came with excellent user manuals (M. D. Spivak [11] and L. Lamport [9]). So it is not surprising that both became popular, causing a split in the mathematical community.

The strengths of the two systems are somewhat complementary. $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX (now in its version 2.1) provides many features, necessary for mathematical papers, including:

- Excellent formatting of multiline formulas; especially, aligned multicolumn formulas.
- Flexible bibliographic references.

- Papers written in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ can be submitted for publication in a growing number of journals.

$\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ also provides many features that are very convenient for authors, including:

- Automatic numbering and cross-referencing.
- Bibliographic databases.

3. WHY $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$?

About five years ago, a joint paper of mine with E. Fried [1] was accepted by the Proceedings of the $\mathcal{A}\mathcal{M}\mathcal{S}$; along with the acceptance came a letter that offered to publish the paper in 20 weeks if it was submitted in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$. I borrowed a friend's copy of Spivak's *The Joy of $\mathcal{T}\mathcal{E}\mathcal{X}$* [11], and rewrote the short paper in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$. It was most satisfying to receive the proofs with no errors introduced by the typesetter.

Since then, I wrote a number of papers in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$. Some were published in journals accepting submissions in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$; even those that were typeset in a printing shop showed much superior result: the typesetter did not have to guess at my intentions since I submitted the manuscript typeset.

Early in 1990, I wrote a survey article with A. Kisielewicz [2]; the survey contained about 70 sections and subsections, 60 problems and theorems, and about 180 references. And it all had to be set up so that when the paper is reorganized so that Section 3.2 becomes Section 2.8, the cross-references have to adjust themselves. This was difficult to do in $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$. I was told that a paper of this type should be written in $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$; however, papers written in $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ were not accepted by the $\mathcal{A}\mathcal{M}\mathcal{S}$.

In the summer of 1990, the $\mathcal{A}\mathcal{M}\mathcal{S}$ released a $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ option: $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$, which emulates in $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ the functionalities of $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$; papers written with the $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ option in $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ are now accepted by the $\mathcal{A}\mathcal{M}\mathcal{S}$ for publication. So I can have my cake and eat it too: I can have the convenience of numbering and cross-referencing of $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$, the elegant multiline formula structures of $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$, and the possibility of publishing my results without anybody touching my manuscript.

F. Mittelbach and R. Schöpf undertook some years ago to write a new version of $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$: Version 3.0. In conjunction with this, they collaborated with the $\mathcal{A}\mathcal{M}\mathcal{S}$, in particular with R. Kumar and M. Downes, in developing $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ as a $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ option. The Mittelbach–Schöpf project is not expected to be completed before 1994; however, many parts of $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 3 are done. Some of these parts, together with the $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ option for $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$, form $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$. Once the $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ 3 project is complete, $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ —probably, as a stylesheet option—will become an official part of $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$.

4. LEARNING THE SYSTEM

Unfortunately, learning $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ is not easy. It inherited from $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ and $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ a cumbersome error reporting system and a steep learning curve. In addition, the only documentation available is M. Downes' *User's Guide* [10]. This manual suggests to learn $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ from [9], to become acquainted with $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$ by reading [11], and resolve what applies to $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ by reading [10].

In fact, a novice can start using $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ in one day. In my book on $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ (Birkhäuser Boston, Spring, 1993), I present a *Short course* which can get

you up and running in one working day. This is achieved by supplying templates for articles and various constructs so the mathematician can start using the system without having to learn the rules.

5. TO \TeX OR NOT TO \TeX

The debate whether to use \TeX or some of its derivatives ($\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX , \LaTeX , $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX) will forever rage in the mathematical community. WYSIWYG word processors (such as Microsoft Word) are becoming more and more powerful and ever so much easier to use. However, the $\mathcal{A}\mathcal{M}\mathcal{S}$ invested a lot of money in \TeX so that now they can accept submissions in $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX and $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX ; moreover, since they put the complete Mathematical Reviews database in \TeX , there is little doubt that mathematicians will not have a different system anytime soon.

So the question is not whether we should use \TeX for writing mathematical papers but which form should we use. And there is little doubt that the answer to this question is: $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX .

There are two important arguments against the use of $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX . Firstly, there are many more mathematicians using $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX than $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX ; why join the minority? In my view, in the long run, as $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX will become part of the mainstream \LaTeX , it is inevitable that $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX will get the upper hand. Presently, the main obstacle appears to be a lack of books on $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX . I trust that my book will make $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX easily accessible.

Secondly, $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX uses the \LaTeX bibliographic system: \BIBTeX . This is rather cumbersome compared to the elegant and flexible bibliographic system of $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX .

Unfortunately, $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX did not implement the $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX bibliographic system. At the time $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX was planned, most \TeX implementations were restricted to 3,000 macros. $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX requires very close to that number. Adding the macros to implement the $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX bibliographic system would have pushed the number of macros closer to 3,500, making it impossible to use $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX on most personal computers. However, presently, all implementations of \TeX allow at least 5,000 macros, so the $\mathcal{A}\mathcal{M}\mathcal{S}$ - \TeX bibliographic system could be added to $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX . Once this is done—and hopefully soon—one can use in $\mathcal{A}\mathcal{M}\mathcal{S}$ - \LaTeX the awesome database from the Mathematical Reviews directly.

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