

MATHEMATICAL TYPOGRAPHY

BY DONALD E. KNUTH

Dedicated to George Pólya on his 90th birthday

ABSTRACT. Mathematics books and journals do not look as beautiful as they used to. It is not that their mathematical content is unsatisfactory, rather that the old and well-developed traditions of typesetting have become too expensive. Fortunately, it now appears that mathematics itself can be used to solve this problem.

A first step in the solution is to devise a method for unambiguously specifying mathematical manuscripts in such a way that they can easily be manipulated by machines. Such languages, when properly designed, can be learned quickly by authors and their typists, yet manuscripts in this form will lead directly to high quality plates for the printer with little or no human intervention.

A second step in the solution makes use of classical mathematics to design the shapes of the letters and symbols themselves. It is possible to give a rigorous definition of the exact shape of the letter "a", for example, in such a way that infinitely many styles (bold, extended, sans-serif, italic, etc.) are obtained from a single definition by changing only a few parameters. When the same is done for the other letters and symbols, we obtain a mathematical definition of type fonts, a definition that can be used on all machines both now and in the future. The main significance of this approach is that new symbols can readily be added in such a way that they are automatically consistent with the old ones.

Of course it is necessary that the mathematically-defined letters be beautiful according to traditional notions of aesthetics. Given a sequence of points in the plane, what is the most pleasing curve that connects them? This question leads to interesting mathematics, and one solution based on a novel family of spline curves has produced excellent fonts of type in the author's preliminary experiments. We may conclude that a mathematical approach to the design of alphabets does not eliminate the artists who have been doing the job for so many years; on the contrary, it gives them an exciting new medium to work with.

I will be speaking today about work in progress, instead of completed research; this was not my original intention when I chose the subject of this lecture, but the fact is I couldn't get my computer programs working in time. Fortunately it is just as well that I don't have a finished product to describe to you today, because research in mathematics is generally much more interesting while you're doing it than after it's all done. I will try therefore to convey

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