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10/84

THE AUTHOR COMMENTS: Because only MacAdam's third comment directly relates to the theme of my article, I will confine myself to it. My concern was not in the first place with Newton's color theory, but rather with the historical development of his method and his first attempt to mathematize an entire area of physics. Because Newton attempted to mathematize the science of color by means of spectroscopy and dispersion theory, they were obviously fundamental for him and not at all incidental. The main point, however, is not what is essential or fundamental now, but Newton's bold and imaginative attempt to create a new branch of mathematical physics before the *Principia*, his willingness to recognize his lack of success, and his ability to recast his initial work into an experimental form.

I am aware of the significance of Newton's color circle and have described¹ it elsewhere. Newton, however, did not recognize its true significance as described by MacAdam. It was to take another 150 years before Hermann Grassmann recognized² that it could serve as the foundation of colorimetry. MacAdam's account of Newton's color circle is misleading, for it conflates what we today deduce from his color circle with what Newton deduced. To illustrate this I will consider his comments on Newton's Experiment 13. MacAdam states that this experiment proved that three primary colors were sufficient to compound white, and also that a wide variety of pairs of colors (complementaries) could also produce white. However, in Experiment 13 Newton himself says³ that "rays of every sort," not just three sorts (or colors), were mixed to produce white. Moreover, in describing his color circle Newton explicitly denies⁴ that there exists even a single pair of complementaries, let alone a wide variety: "I could never yet by mixing only two primary Colours produce a perfect white."

As late as 1852, Hermann von Helmholtz, with his vastly more sophisticated experimental apparatus, was able to discover⁵ only one pair of complementaries. It was only after Grassmann finally recognized the true significance of Newton's color circle and pointed out

to Helmholtz that it implied that there must be many complementaries, that Helmholtz succeeded in locating⁶ a wide variety. By attributing such a complete understanding of his color circle and its experimental implications to Newton, MacAdam in effect eliminates 150 years of very exciting history. The difference of emphasis between MacAdam and me, of course, depends on our different principal interests, his being colorimetry and mine history.

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2/85

Word-processed manuscripts

When I was managing editor of the *Proceedings of the National Academy of Sciences*, I found that many of the manuscripts created by modern word-processing methods have serious defects. Fortunately, these defects are the result of lack of attention rather than flaws inherent in the methods. I am writing this letter to call attention to the problem areas in the hope of decreasing the disadvantages without affecting the advantages.

To set the stage, first I will state the important physical requirements of a manuscript, which derive from the things that happen to the manuscript in the course of its conversion from typescript to printed page. It must be on relatively sturdy paper, because it will be handled by 6 to 12 people. It must be easily readable at high speed, because several workers not familiar with the subject matter or the vocabulary, such as keyboarders and proofreaders, must process it. It must have generous margins and interline spaces, because editors need room for their instructions to the production personnel.

Paper quality is mainly a question of what the paper should not do. It should not wrinkle or tear easily. It should not be so shiny that glare makes reading difficult. It should not be so porous that ink spreads, or so heavily coated that finger pressure deletes editorial

continued on page 102



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letters

continued from page 15

markings or type. It should not be so slick that it is difficult to stack, or so flimsy that it is completely limp. I suspect that in many instances the paper for a word-processor output device is chosen for its price and its ability to accept the imprint of the output device. However, for manuscript work, durability and ability to accept pencil and pen markings must also be considered.

One now sees a wide range of typeface styles in manuscripts. Quite a few are hard to read and therefore are unsatisfactory. In fact, we have returned manuscripts to authors for re-typing in a clearer typeface. There are two styles that are especially poor. In one of these, the "lines" that make up the letters actually are series of dots. In the straight strokes of letters, such as the verticals of the letter "m," the dots are close enough together to create a line. However, in the sharply curved portions, the dots are well separated and sometimes the "line" disappears. The other poor style is a typeface in which the lowercase letters have no descenders. At first glance the typed page looks lovely. On closer inspection, as in reading, "g" looks like "s," and other letters are hard to identify. This typeface may be machine-readable but it is not person-readable.

Another factor is related to ease of reading but is independent of typeface. This factor is the damage done to create a justified right edge. Again, the product looks lovely at first glance. Or at least both edges of the text are straight, uniform and crisp. The type-covered portion of the page, where the reader has to read, is shot full of randomly distributed spaces of different sizes. In other words, the price for a straight right edge is a jumbled interior. The gain is not worth the price. The variation in interword spacing in this type of text is much greater than one finds in "real" printed text (probably because computer control of photocomposition is much more elaborate). I find the marked variation of spacing in this kind of typescript very distracting, which makes the page difficult to read; also, we find that our size calculations have greater error factors.

I suspect that, with the development of word-processor equipment, many institutions have created centralized word-processor services. I also suspect that authors send to these services their tapes, cassettes, disks, and such to be converted to hard copy without mentioning the spacing requirements stipulated by the journal of their choice. We have seen a sharp increase in manuscripts with less-than-adequate margins or interline spacing.

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letters

How sad that the product of such elegant technologic achievements is useless because of inattention to simple but important details. We concluded that attempts to redact manuscripts with inadequate space results in an increase in typographic errors. Therefore, at the National Academy, we sent all such manuscripts back to the authors. We required side, top and bottom margins to be no less than 4 cm and interline white space to be 6 mm or greater. Our editors could write smaller than this, but the keyboarders could not read such writing.

Which leads to the bottom line of this sermon. The typescript must be easily readable by a busy editor. And the marked-up transcript must be easily readable by a keyboarder. Editing time, keyboarding time and proofreading time are too expensive to warrant working on manuscripts that are not in good form physically.

BERNARD K. FORSCHER

Mayo Clinic and Mayo Foundation

1/85

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These remarks first appeared in the Newsletter of the Society for Scholarly Publishing 6, issue 5 (1984).

AN APS EDITOR COMMENTS: Although Bernard Forscher's comments are directed toward manuscripts produced by word processors, much of what he says is applicable to all kinds of manuscripts.

The journals of The American Physical Society have never been as rigid in their requirements as Forscher's letter indicates the National Academy to be. Nevertheless, we do make certain demands, and it would probably be helpful if authors understood the reasons for them. In addition, some things that we are not particular about may still influence a referee's attitude about a paper, so that authors can do themselves a favor by paying attention not only to the content but also to the preparation of their manuscripts.

GEORGE L. TRIGG

3/85

Physical Review Letters

Fellow-travelers

In the worst years of Stalin's terror, there was a category of educated Westerners, who not only loudly applauded Stalin, but from time to time visited the Soviet Union and saw there what they wanted to see, not what was really there. Denizens of the Communist paradise would read their reports wondering what it was on the part of those foreigners: unbelievable short-sightedness and stupidity or a cynical pursuit of their own goals?