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PURPOSIVE NAMING IN MATHEMATICS

The names, symbols, and pictures used by mathematicians have tended to be confusing to laymen and to other mathematicians. Part of the reason for this is that the mathematician is all too often unaware of this tendency; on the other hand, part of the reason is that those who tend to become confused very often fail to recognize or appreciate the purpose of the mathematician in naming, symbolizing, and picturing as he does.

We owe a debt to Wittgenstein for making us aware of the dangers and pitfalls inherent in the language of mathematics. A recent discussion of the psychological aspects of this issue can be found in [1]. Work by J. Hadamard [2] and G. Birkhoff [3] on the psychological aspects of mathematics encourages a fresh examination of Wittgenstein's contribution.

The question therefore arises: For what purposes do Mathematicians name, symbolize, and picture as they do? The seven answers below are intended to indicate a wide range of possible purposes without being either exhaustive or mutually exclusive.

1. One of the mathematician's primary is to communicate or report his results in an effective way to the reader. If the reader is faced by a mathematician who regards his names, symbols, and pictures as an essential and integral aspect of reporting his results in an effective way, then the reader may absorb these with a minimum of caution and wonder. If, on the other hand, the reader is faced by a mathematician who is concerned only with the results themselves and only that his results get stated, then inevitably names, symbols and pictures will crop up which have distracting associations and misleading connections. The reader has no way to determine whether or not he should attach special significance to the mathematician's labels.

2. There are mathematicians who name, symbolize or picture in order to reveal their philosophical or psychological motivations, and there are other mathematicians who deliberately avoid such revelations. In either case, the reader can rely only on guesswork to determine the connection between the mathematician's labels and his philosophical or psychological motivations.
3. The mathematician may name, symbolize, or picture as he does in order to enlist and maintain the support of other professionals. The reader who is unaware of this purpose may well become confused or misled by the persuasive motives behind the mathematician's labels.
4. The mathematician may name, symbolize, or picture as he does in order to bolster his own ego. It is confusing for the reader to find details obscured with important sounding names, symbols, and pictures whose unintentional purpose is to strengthen the mathematician's image of himself.
5. A mathematician may try to label in a way which is consonant with existing names, symbols, and pictures, thus avoiding unsound changes in that which is already familiar. The resulting labels are confusing if they are not suited to the present situation or problems under attack.
6. A mathematician may name, symbolize, or picture in a way which requires changes in existing labels. The reader may find himself in conflict as a result of new labels for old ideas, especially if these new labels already have other meanings not known to the mathematician.
7. Finally, a mathematician may attach the name of an outstanding individual, group, or culture to a part or whole of the mathematical subject matter at hand. The purpose here is to bestow laudatory recognition, but there need not be a connection between the individual, group, or culture, and the subject matter so named.

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At a deeper level, each mathematician himself bears a name and lives in a world of pictures and symbols, when both awake and dreaming. At this deeper level, the mathematician's purposes in naming, symbolizing and picturing as he does are intimately linked with the reasons which led him to become a mathematician in the first place. We know as little about these reasons as we do about the reasons which lead others into an aversion

for mathematics.

References

- [1] S. M. Engel, *Wittgenstein's 'Foundations' and its Reception*, **American Philosophical Quarterly**, Vol. 4, No. 4, October 1967.
- [2] J. Hadamard, **The Psychology of Invention in the Mathematical Field**, Princeton University Press, Princeton, 1954.
- [3] G. Birkhoff, *Mathematics and Psychology*, **SIAM Review**, Vol. 2, No. 4, October 1969.

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