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Kosslyn S M & Pomerantz J R. Imagery, propositions, and the form of internal representations. *Cognitive Psychol.* 9:52-76, 1977.  
[Johns Hopkins University, Baltimore, MD]

What is the nature of the internal representations that underlie the experience of 'mental imagery'? In the first part of this paper we summarize Pylyshyn's<sup>1</sup> arguments that image representations are not qualitatively distinct from 'propositional' representations (e.g., as are used in storing the meaning of sentences). In the second part we criticize these arguments and present arguments supporting the plausibility of imagery's being a distinct form of representation. Finally, in the third part we review classes of imagery findings, and compare and contrast imagery and propositional accounts for the results. [The *Social Sciences Citation Index*® (SSCI)® indicates that this paper has been cited in over 150 publications since 1977.]

Stephen M. Kosslyn  
Department of Psychology  
and Social Relations  
Harvard University  
Cambridge, MA 02138

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"If you are asked to describe the shape of a beagle's ears, to decide whether a mouse is larger than a hamster, or to report the number of windows in your living room, you probably will experience 'seeing' the object or objects 'in your mind's eye' when answering. The introspection that you can 'see' with a mind's eye was contrary to the theoretical biases of the early computer-oriented psychologists, who believed that all information is stored using 'mental descriptions.' Images convey information by *resembling* what they stand for, whereas descriptions are strings of symbols whose meaning is arbitrarily assigned. It is most straightforward to program a computer to store information using descriptions, and many researchers assumed that the mind is like that too. In 1973, Zenon Pylyshyn wrote a paper entitled 'What the mind's eye tells the mind's brain: a critique of mental imagery,'<sup>1</sup> in which he claimed that the experience of imagery really says nothing about the way the information is stored, and argued that all information in the mind is stored in terms of descriptions—including the information underlying

mental imagery. This was music to the ears of many computer-inspired cognitive psychologists at the time.

"However, upon reflection, it seemed clear to us that there were holes in Pylyshyn's arguments. In particular, it was clear that a 'mental picture' need not be a real picture (which would require eyes to view, and would probably be rather uncomfortable up there in the head); for example, in computers one can store pictures as configurations of points in an array.

"Thus, Pylyshyn's *in principle* objections to mental images provided the motivation for the paper James Pomerantz and I wrote. When I arrived at Johns Hopkins University in 1974, I met Jim and discovered that we shared similar biases with regard to mental imagery. I had written a very rough draft of some of the paper when I was still a graduate student, and showed it to him. He immediately suggested excellent improvements and I suggested a collaboration.

"The paper was 'completed' at the beginning of 1975. It was subsequently submitted to the *Psychological Bulletin*, where it was rejected, and then to the *Psychological Review*, where it was also rejected. Then we tried the journal *Cognitive Psychology*, which went easier on us—asking us to make numerous changes and finally deciding to accept it.

"The paper has been widely cited for three reasons, I believe. First, the summary of arguments and counterarguments helps to define a basic issue in the study of the mind. Second, it summarizes data that bear on that issue, and provides concrete examples of how data can be interpreted from two very different points of view—demonstrating that the problem of studying mental representation is more difficult than many of us had initially believed. Third, the issue seems central to computational models of mental representation, and this topic currently is fashionable—in part because it is a point of contact between psychology and artificial intelligence.

"The paper formed the foundation of chapter two of *Image and Mind*,<sup>2</sup> which further developed the arguments in light of the debate that continued after the paper was published. A consideration of the issues in the paper led to research that in turn led to my receiving the 1983 Award for Initiatives in Research from the National Academy of Sciences."

1. Pylyshyn Z W. What the mind's eye tells the mind's brain: a critique of mental imagery. *Psychol. Bull.* 80:1-24, 1973. [Citation Classic. *Current Contents/Social & Behavioral Sciences* 14(42):22, 18 October 1982.]
2. Kosslyn S M. *Image and mind*. Cambridge, MA: Harvard University Press, 1980. 500 p.