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Reading in two colours at the same time

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The Nobel prize-winning physicist Richard Feynman once wrote in his autobiographical book (*What do you care what other people think?*): "When I see equations, I see letters in colors - I don't know why [...] And I wonder what the hell it must look like to the students."

This neurological phenomenon is known to psychologists as synaesthesia and Feynman's experience of "seeing" the letters in colour was a specific form known today as "grapheme-colour" synaesthesia. What is perhaps most puzzling about this condition is that people actually claim to see two colours simultaneously when reading letters or numbers: the real colour of the ink (e.g. black) and an additional – synaesthetic – color.

Now a new study, published in the March 2011 issue of Elsevier's *Cortex*, has revealed the patterns of brain activity that allow some people to experience the sensation of "seeing" two colours at the same time.

A group of researchers in Norway used functional magnetic resonance imaging (fMRI) to investigate the brain activity patterns of two grapheme-colour synaesthetes, as they looked at letters written in different colours, presented on a screen while inside an MRI scanner. The participants had previously been asked to indicate the synaesthetic colours that they associated with given letters and were then presented with single letters whose physical colour sometimes corresponded to the synaesthetic colour and other times was clearly different.

Prof. Bruno Laeng from the University of Oslo, along with colleagues Kenneth Hugdahl and Karsten Specht from the University of Bergen,

had reasoned that increasing the similarity between the physical and synaesthetic colours should affect the level of activity seen in areas of the brain known to be important for colour processing, and their results confirmed this expectation, revealing that the strength of the observed brain activity was correlated with the similarity of the colours.

The authors concluded that the same brain areas that support the conscious experience of colour also support the experience of synaesthetic colours, allowing the two to be "seen" at the same time. This supports the view that the phenomenon of colour synaesthesia is perceptual in nature.

More information: The article is "The neural correlate of colour distances revealed with competing synaesthetic and real colours" by Bruno Laeng, Kenneth Hugdahl, Karsten Specht, and appears in *Cortex*, Volume 47, Issue 3 (March 2011).
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