# False perception - visual illusions in colour attribute blending

**Analysing multiple seismic attributes simultaneously in a single volume is an increasingly important tool for revealing underlying geological features. Increasing computational power means that the quality of colour visualisations have improved significantly, but the use of colour to represent data also has its pitfalls.**

remarkably good at distinguishing colours and a trained human eye can distinguish about ten million colours, as compared to a mere 500 shades of grey" said Barbara Froner, who researched the subject for a poster presented at EAGE 2012. "However, we perceive colour in a non-linear fashion as our visual system adopts a number of compensating mechanisms in order to adapt to different stimuli and visual scenes, resulting in a number of somewhat unexpected visual effects."

The non-linearity of the human visual system leads to the possibility of interpretations being based not on features that are actually in the data but on illusions created by false perception (see Figure 5).

The human eye is more sensitive to some colours than others and this leads to a false perception of boundaries when none are present. "The effects of using hue variation to visualise attribute data is clear, as a number of false contours are now apparent on the radial profile, most prominently around the yellow and cyan hues," said Ms. Froner. "This effect becomes more dangerous when the structure of the data is not known in advance as we risk interpreting these false contours as actual data features."

Our eyes are also very sensitive to the context of what we are seeing. The perception of brightness and colour of an object is affected by what lies around that object. This 'simultaneous contrast' effect can also cause significant problems when attempting to visually compare seismic attribute responses in different parts of a large seismic section or extracted map; those responses may in fact be the same, even though they appear to be different because of the colour of the surrounding data.

"Colour plays a primary role in seismic interpretation.," concluded Ms. Froner. "Improvements in colour visualisation have contributed greatly to simultaneous interpretation of seismic attributes."

"[...] current interpretation or visualisation software does little to acknowledge or compensate for these effects. Practically, maintaining an awareness of these effects during interpretation is currently the best an interpreter can do towards compensating for any bias they introduce."

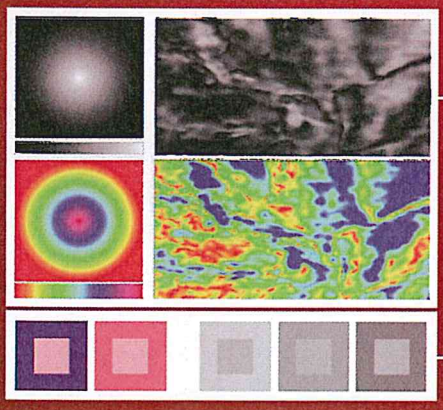

*Figure 5 – Visual illusions*
*The two images have been generated using the same dataset, i.e. a radial pattern decreasing linearly with distance from the centre. When displayed in grey scale the smooth radial variation is clear, in the colour image a number of steps appear.*

*The two pink central squares are exactly the same colour but appear to be different due to the surrounding colours. Similarly, the grey inner squares in the right part of the figure are of the same grey shade despite the fact that they appear to be different: the darker the surround the lighter the square.*