Short and Sweet

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Stacking Chairs: Local Sense and Global Nonsense

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Abstract
We report a confusing stimulus which demonstrates the power of local interpretation of three-dimensional structure to disrupt a coherent global perception.

Keywords
3D perception, depth, perception, illusion

Figure 1 shows a photograph of nine stackable chairs, leaning back at an angle against a wall. For all observers (n = 40+, recruited *ad hoc* via Facebook, where the stimulus was displayed), this image elicits confusion. If the number of chairs is reduced below four, the effect disappears.

Figure 2(a) is an annotated version of Figure 1. The local interpretation of three-dimensional structure – at each 'corner', *i.e.* AD, BC and EF – is generally unambiguous (apart from AD, which flips in depth in a Necker-cube-like manner for some observers). But the repetition of the stacked elements along the virtual contours AD, BC and, to a lesser extent, EF suggests a change in depth along those lines which does not actually exist. Figure 2(b) makes this explicit: an abstracted version of the image reveals an alternative interpretation, which fails to correspond to reality – the repetitive structure now looks more like a stack of quadrilaterals rising from the ground plane.

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Figure 1. The stacking chairs.

The stimulus superficially calls to mind the Penrose triangle (Penrose & Penrose, 1958), the critical difference between the two being that the latter has no real-world interpretation (it is a paradoxical figure, and geometrically impossible), whereas the former does: A, B, C, D, E and F all being in roughly in the same vertical plane. But the misleading local three-dimensional

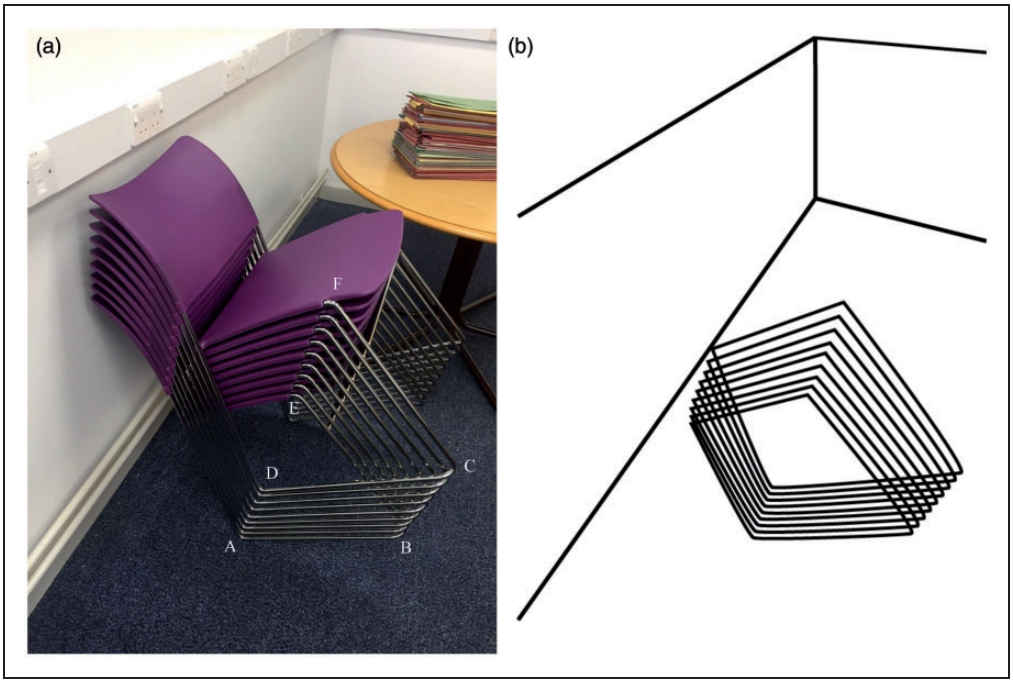

Figure 2. An annotated (a) and an abstracted (b) version.

form at each corner is so compelling that we see an incoherent Gestalt instead, with the parallel planes ABCD and BCFE not appearing to be such. There is local sense, but global nonsense.

Online Video 1 reveals the true three-dimensional form of the stimulus. Nick Scott-Samuel (in whose office the illusion was observed) reports that it obtains in real life as well as in images, even when sober.

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Supplementary material

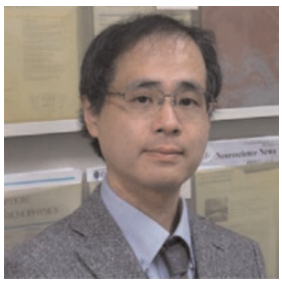
Supplementary material for this article is available online

Reference

Penrose, L. S., & Penrose, R. (1958). Impossible objects: A special type of visual illusion. *British Journal of Psychology*, *49*, 31–33. doi: 10.1111/j.2044-8295.1958.tb00634.x

Author Biographies

Nicholas E. Scott-Samuel has a BA in Philosophy (University of Bristol) and an MSc in Cognitive Science (University of Birmingham). His PhD on human visual motion processing was supervised by Mark Georgeson (University of Birmingham), and was followed by postdocs with Andy Smith (Royal Holloway, University of London) and Robert Hess (McGill University). He is currently a Reader at the University of Bristol.



Hiroshi Ashida received his PhD in psychology from Kyoto University, Japan. He has been working at Kyoto University since 2001 and became a Professor in 2015. His main research interest is in visual processing of motion and visual illusion in general, studied with psychophysics and MRI.

P. George Lovell has a BSc in Psychology (Cardiff University) and an MSc in Computational Neuroscience (University of Stirling). His PhD on human contour integration was supervised by Roger Watt (University of Stirling), and was followed by postdocs with Alan Wing (University of Birmingham), Tom Troscianko (Bristol University) and Julie Harris (University of St Andrews). He is currently a Lecturer at Abertay University. His favourite colour is dark green (0,100,0) and his favourite dinosaur is the Stegosaurus.

Tim S. Meese worked as a telecommunications engineer for five years before studying Psychology and Computer Science at the University of Newcastle-Upon-Tyne where he graduated in 1989. He did his PhD at the University of Bristol and is now Professor of Vision Science at Aston University. His main research interests are in binocular and spatial vision and depth perception; he is currently developing new interests in social vision and virtual reality. He has been on the executive committee of the Applied Vision Association for more than twenty years and is now one of the chief editors of Perception and i-Perception.

D. Samuel Schwarzkopf did his PhD in neuroscience at Cardiff University. His research seeks to understand the variability and commonalities between what different people perceive. For this he employs both functional brain imaging and psychophysical experiments. From 2008-2017 he worked at University College London and is now an Associate Professor at the University of Auckland, New Zealand.