

# Perception: Psychophysics and Modeling

## 01d | Introduction

Felix Wichmann



Neural Information Processing Group  
Eberhard Karls Universität Tübingen

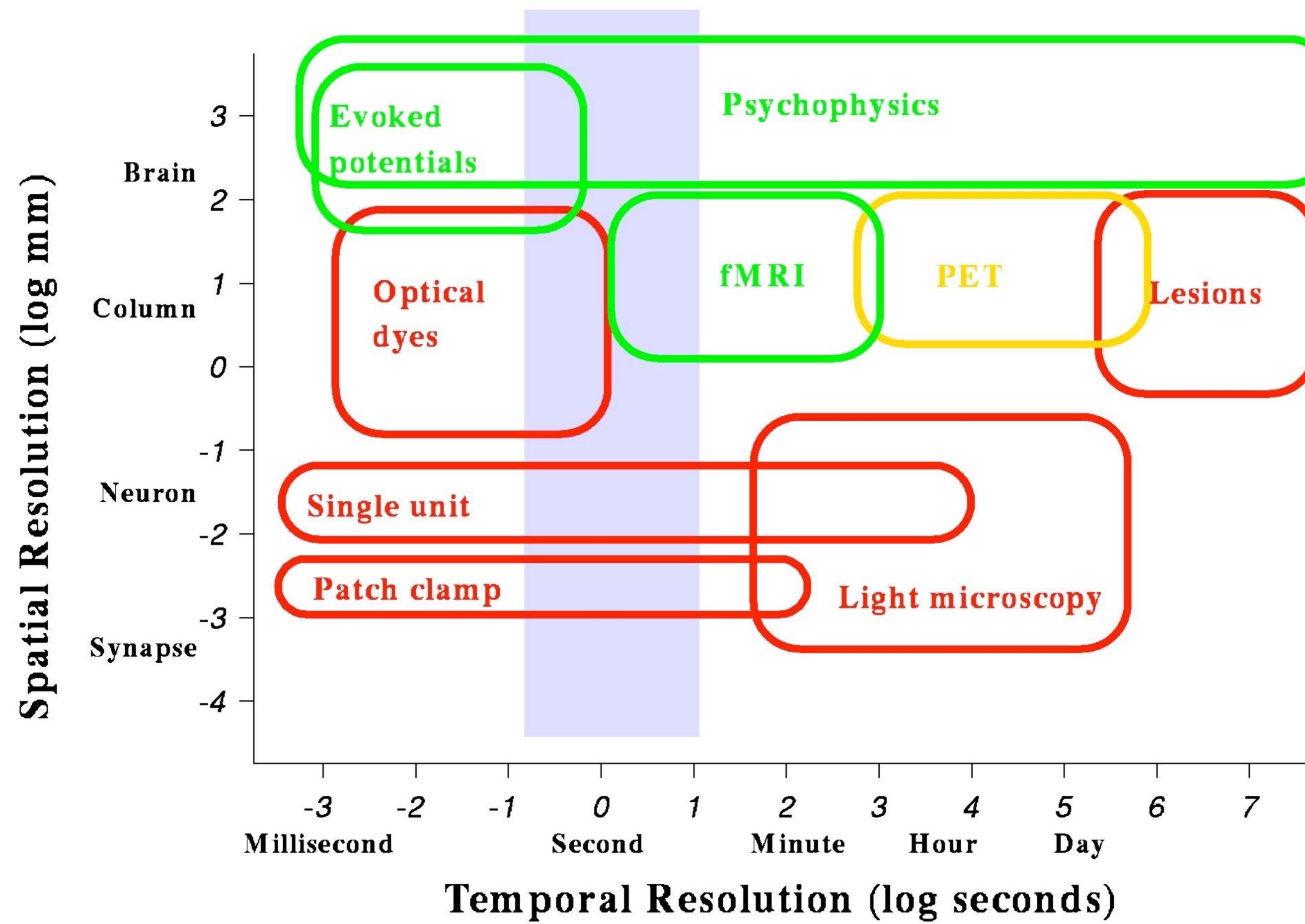
# Visual perception

Behaviour  
Experimental Psychology



Neurobiology  
Physiology

Computer Science  
Algorithms

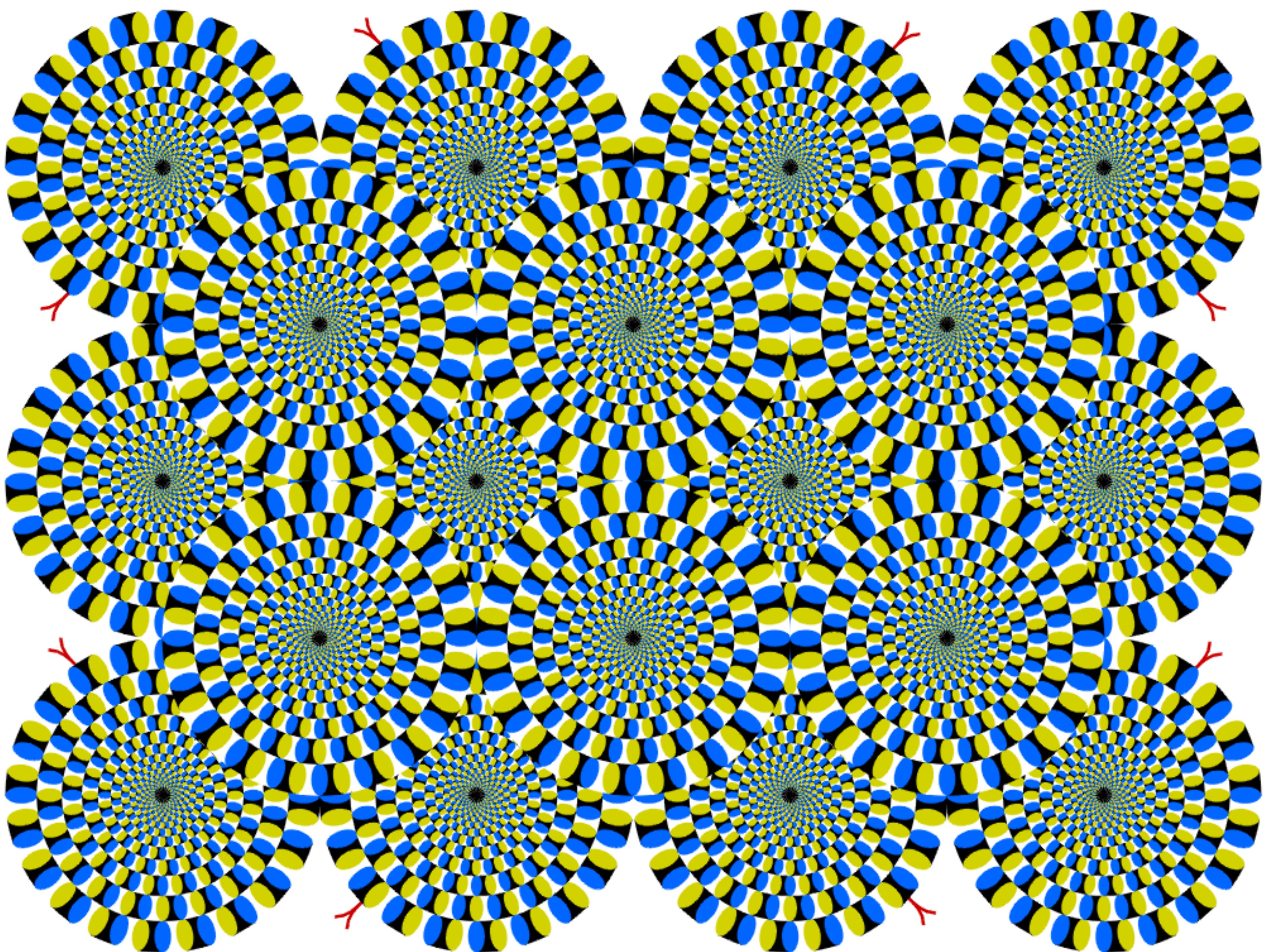


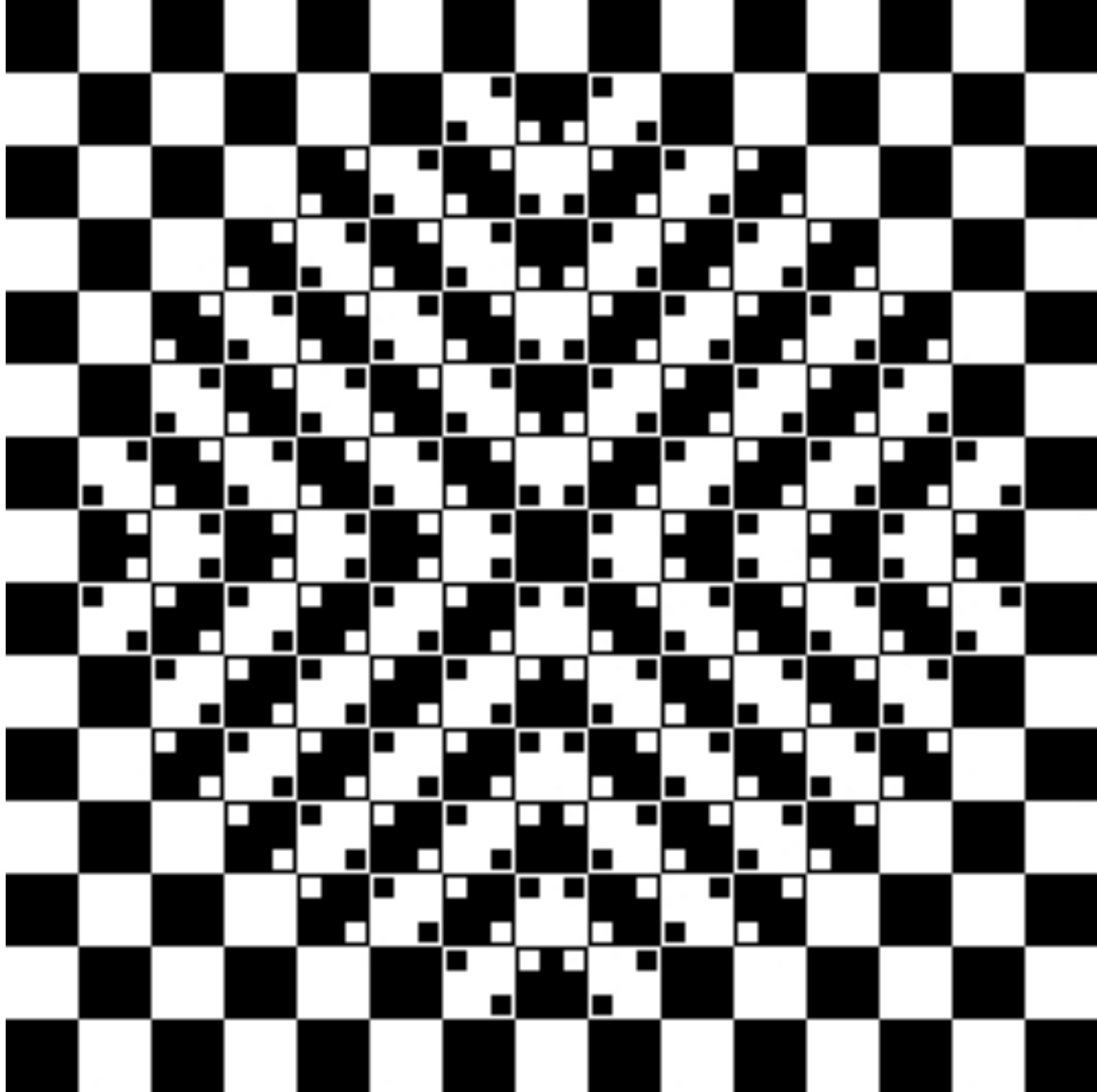
# Visual perception

Most people believe that the world “is like this, we see it”—e. g. colours, sizes, brightnesses.

Important metaphors of the mind come from visual perception:  
“see solutions”, “brilliant ideas”, “bright minds”, “cloudy prospects”,  
“new point of view”, “what a dull lecture” ...

... not only true in English but, e.g., also auf Deutsch:  
„sehen Lösungen“, womöglich „glänzende Ideen“, „helle Köpfe“, „trübe Aussichten“, „neuer  
Gesichtspunkt“ ...







Remember  
ings are in  
store for you  
dearful surprise  
wait you.

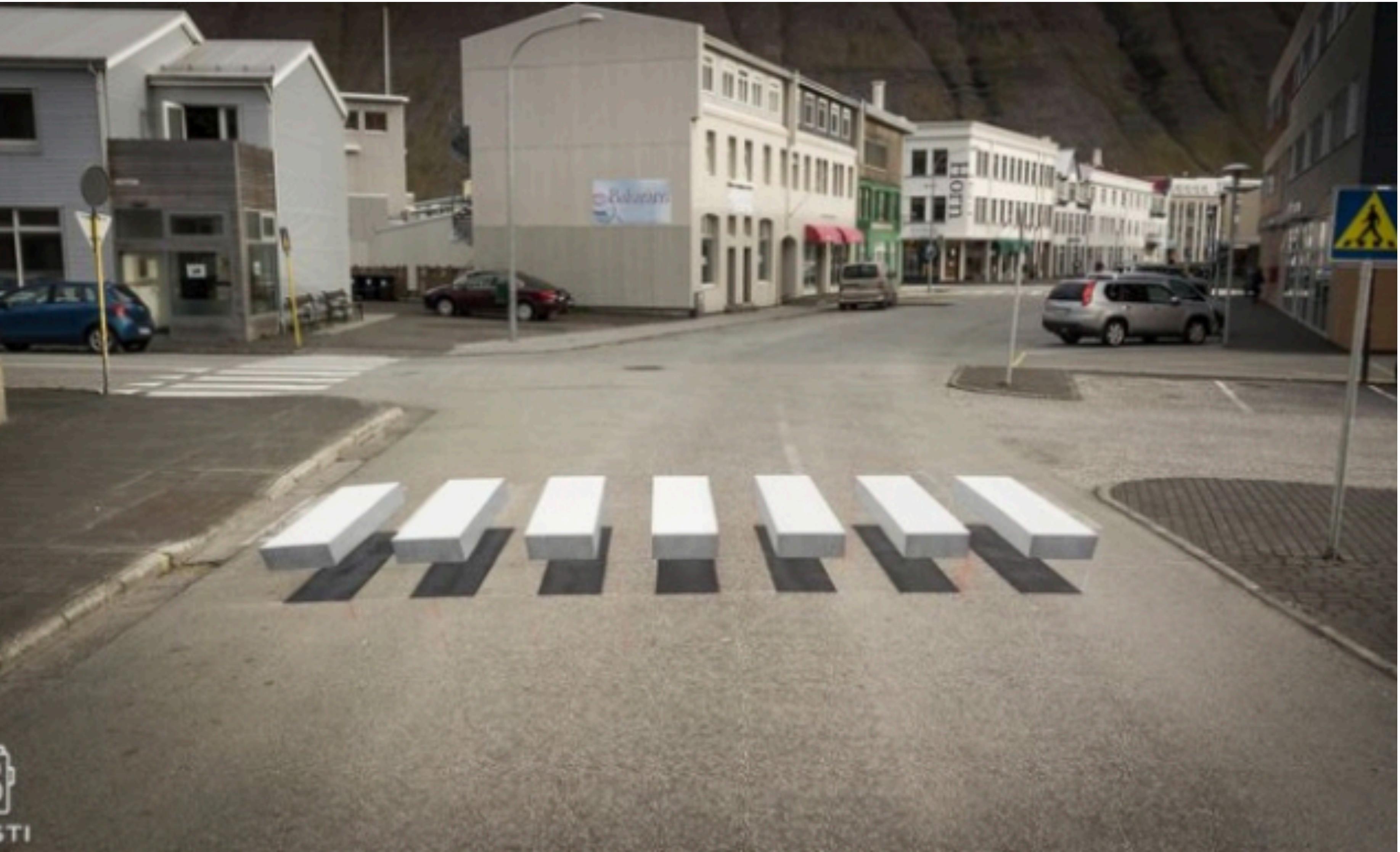
ROALD DAHL

M16



have a lovely  
bakery  
will go to  
the best  
place

imagination  
is the only weapon  
in the war against  
reality









## More on visual illusions...

For more on visual illusions, take a look at Michael Bach's website:

<http://www.michaelbach.de/ot/>

... or simply search for *visual illusions* or *optical illusions* on YouTube.

But, please, do not take the “explanations” offered in the videos seriously; most so-called optical illusions on YouTube have nothing to do with optics, most explanations are plainly wrong or at least inadequate ...

... but the illusions are still fun to watch!

## Inverse Problem

The 2D retinal image is determined by the laws of physics

The human visual system is able to infer some properties of the 3D scene from this 2D image

Researchers believing that the visual system really tries to invert this process call this theory “inverse optics”

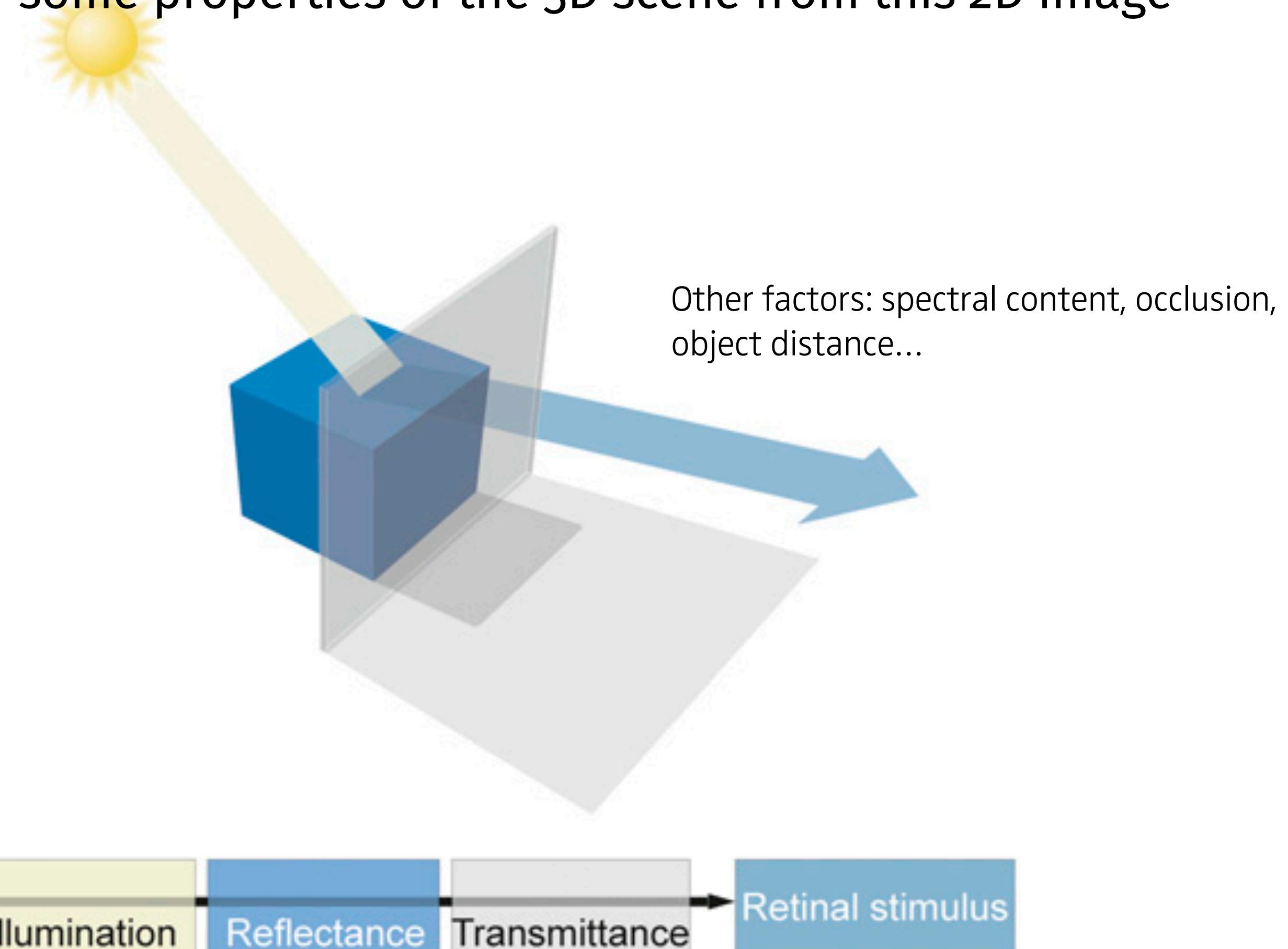
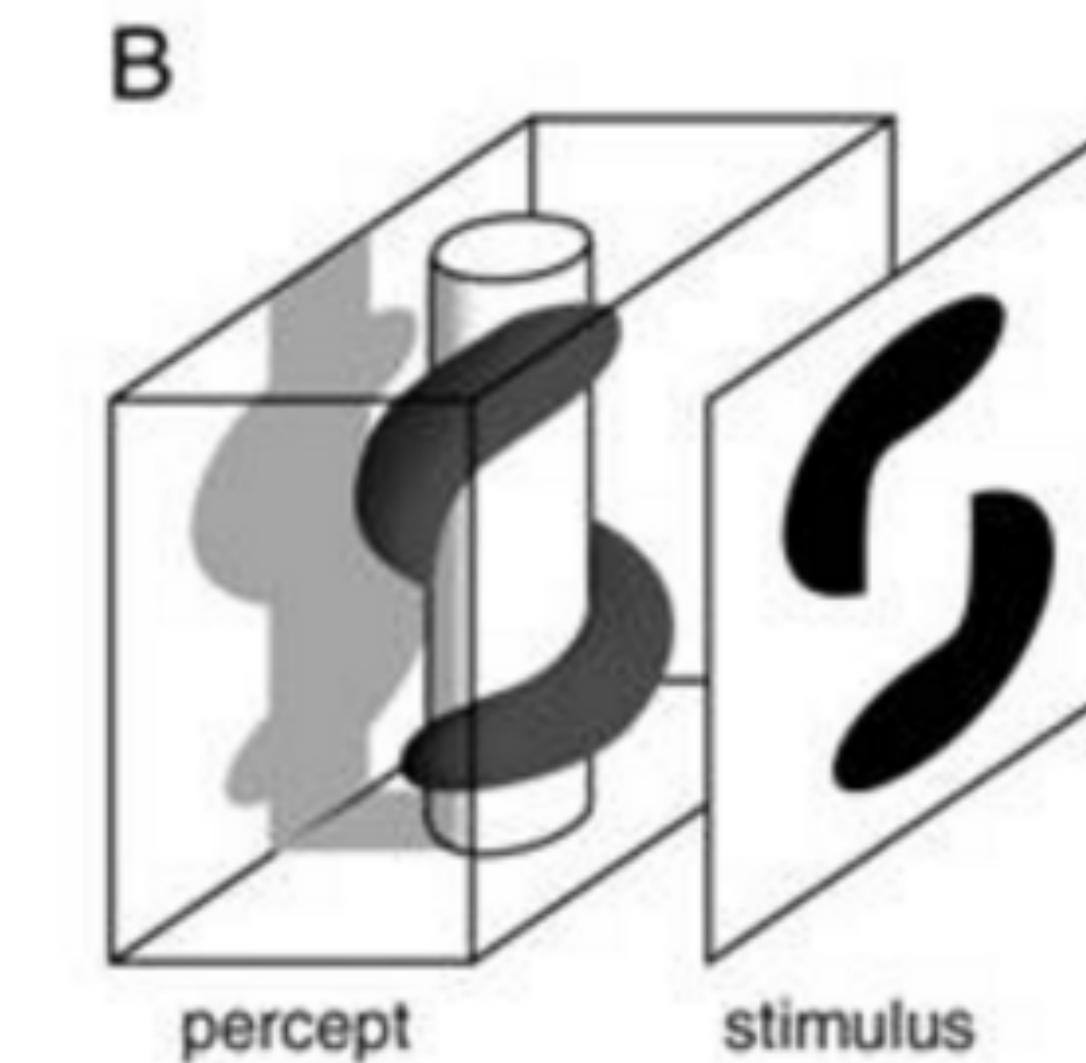
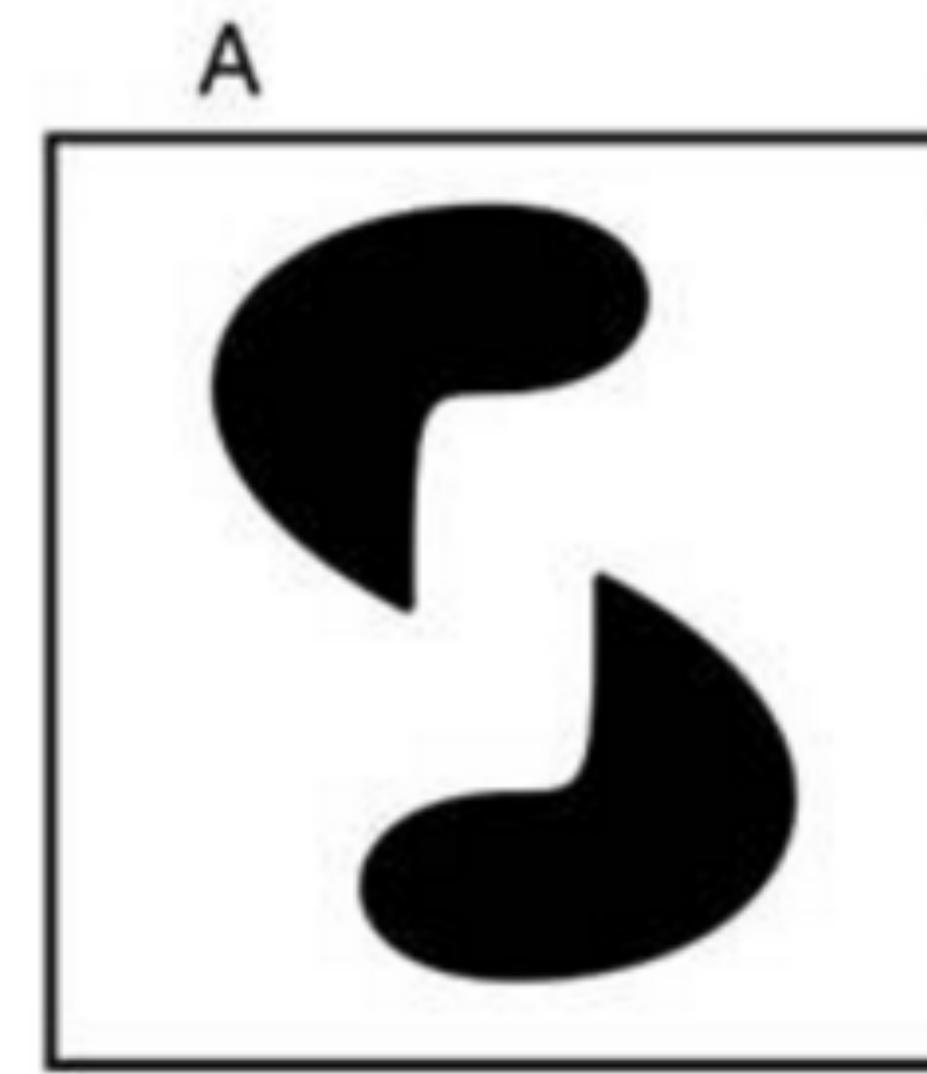
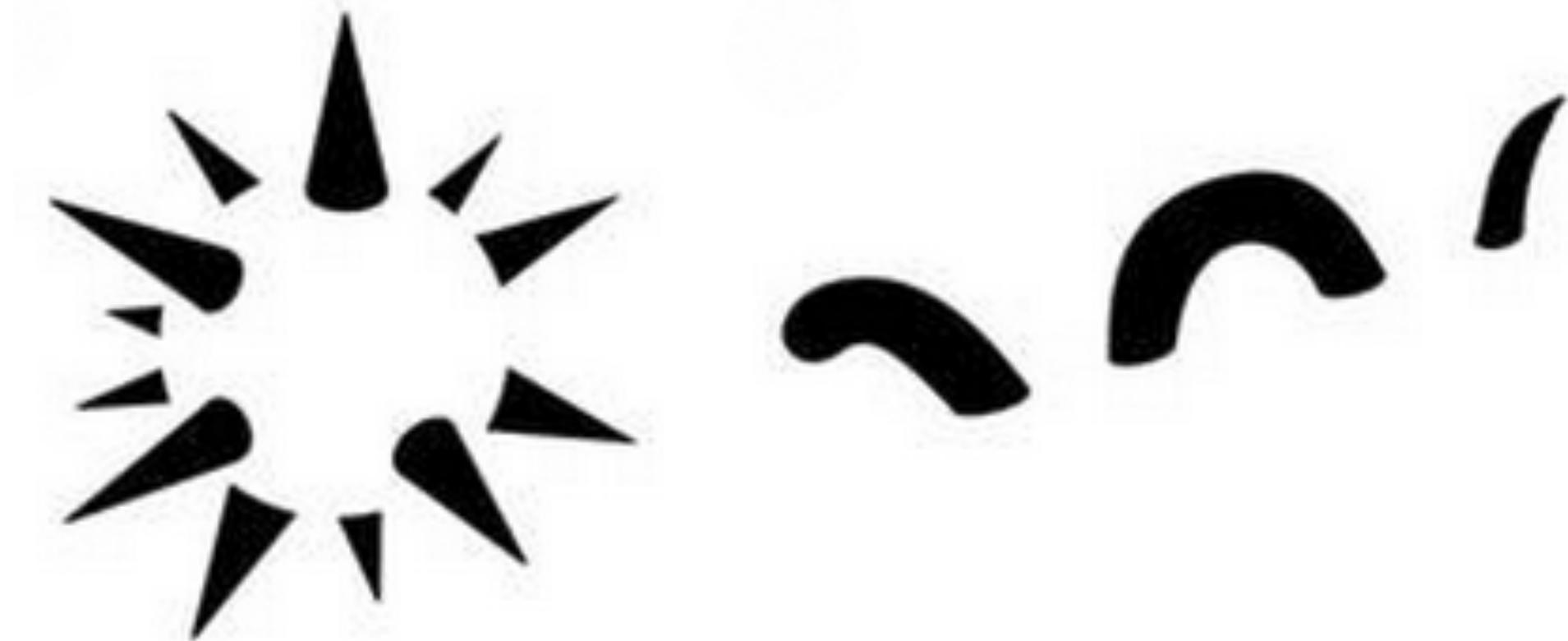


Image from Purves, D., Wojtach, W. T., & Lotto, R. B. (2011). Understanding vision in wholly empirical terms. *Proceedings of the National Academy of Sciences*, 108(Supplement\_3), 15588–15595. <https://doi.org/10.1073/pnas.1012178108>

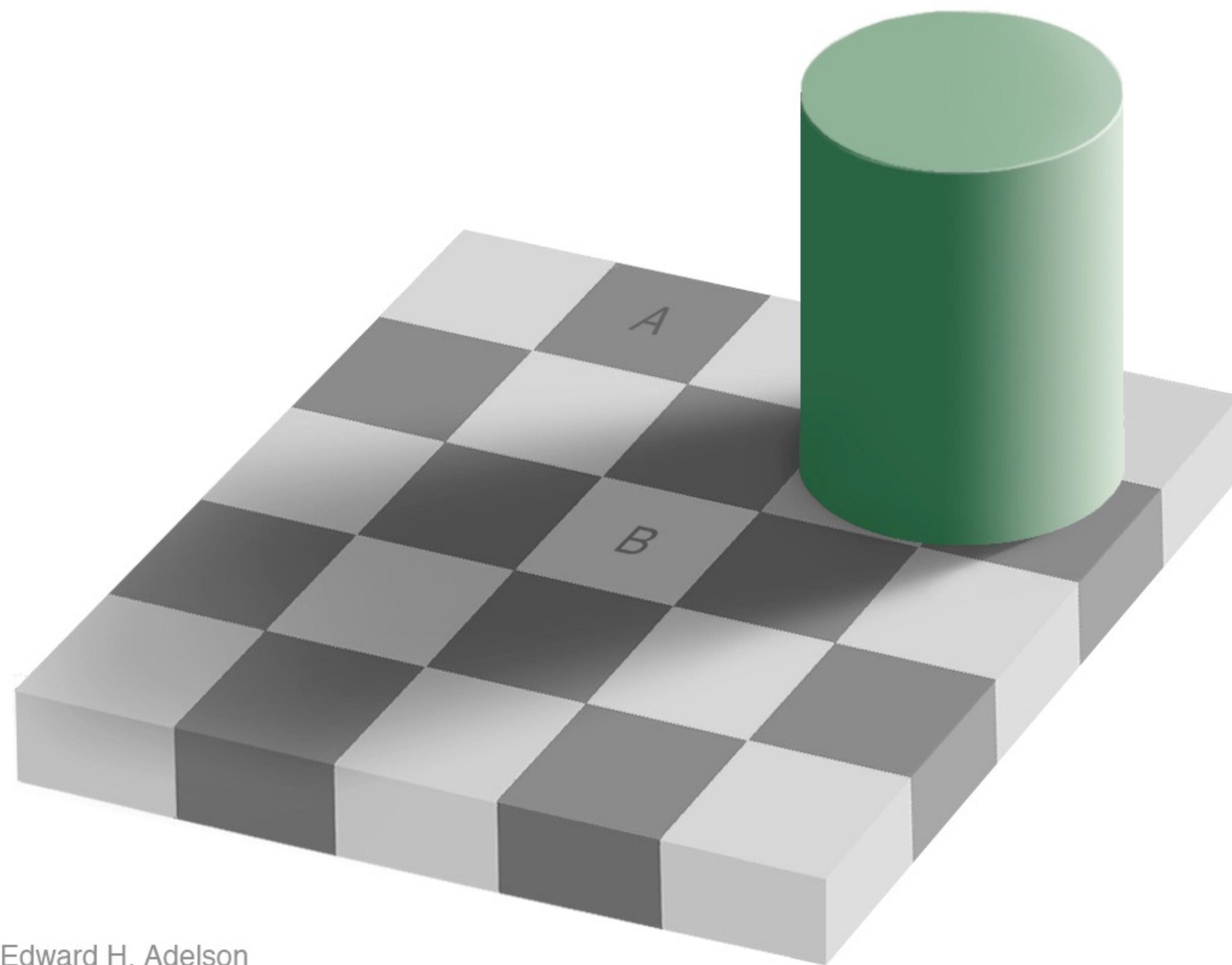
# Inferring 3D volume from 2D images



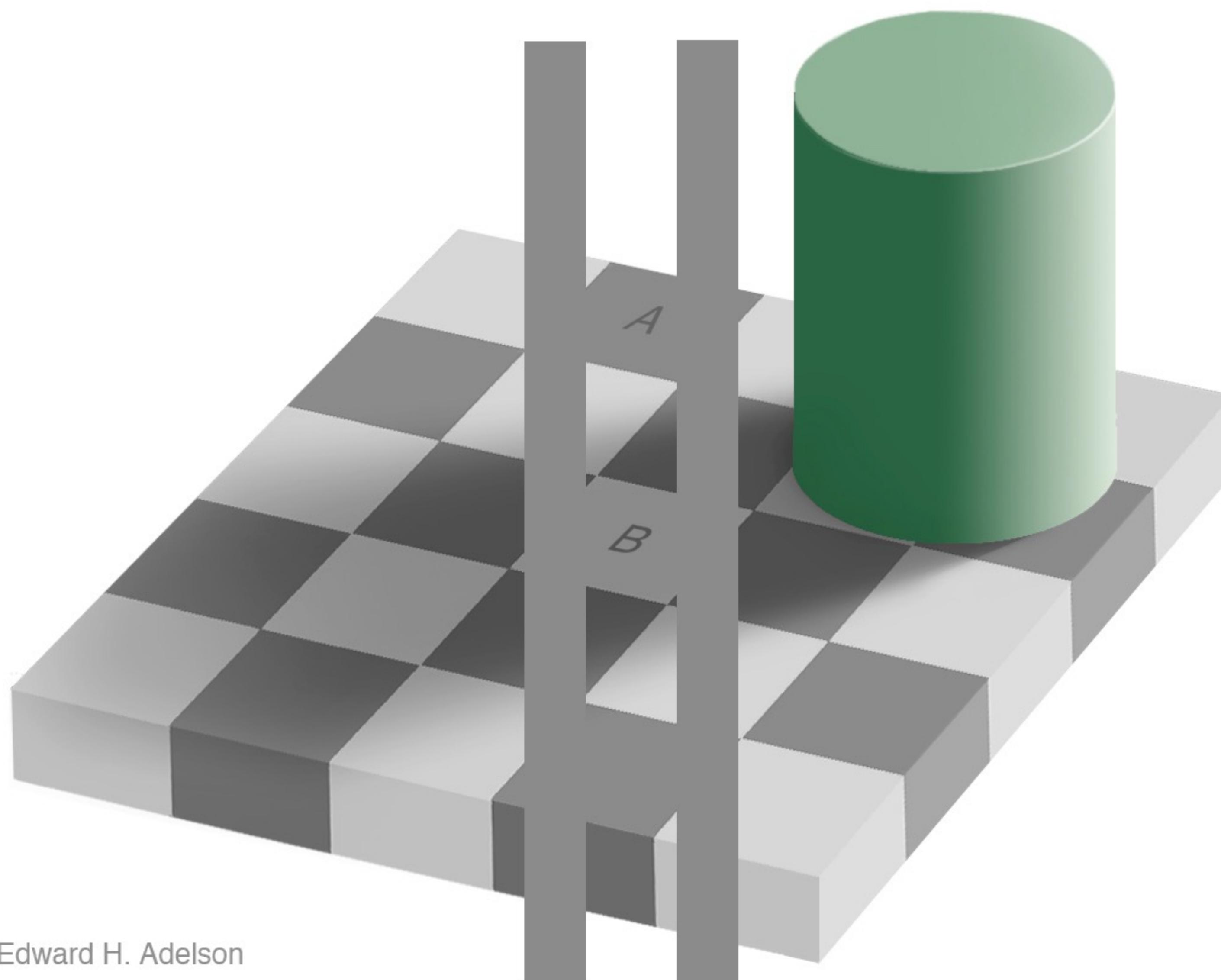
Images from <https://slehar.wordpress.com/2014/09/12/the-inverse-optics-problem/>

Illusions from left to right from Kaniza, Tse, Idesawa and Tse

The human visual system  
is not a spectral camera



Edward H. Adelson



Edward H. Adelson

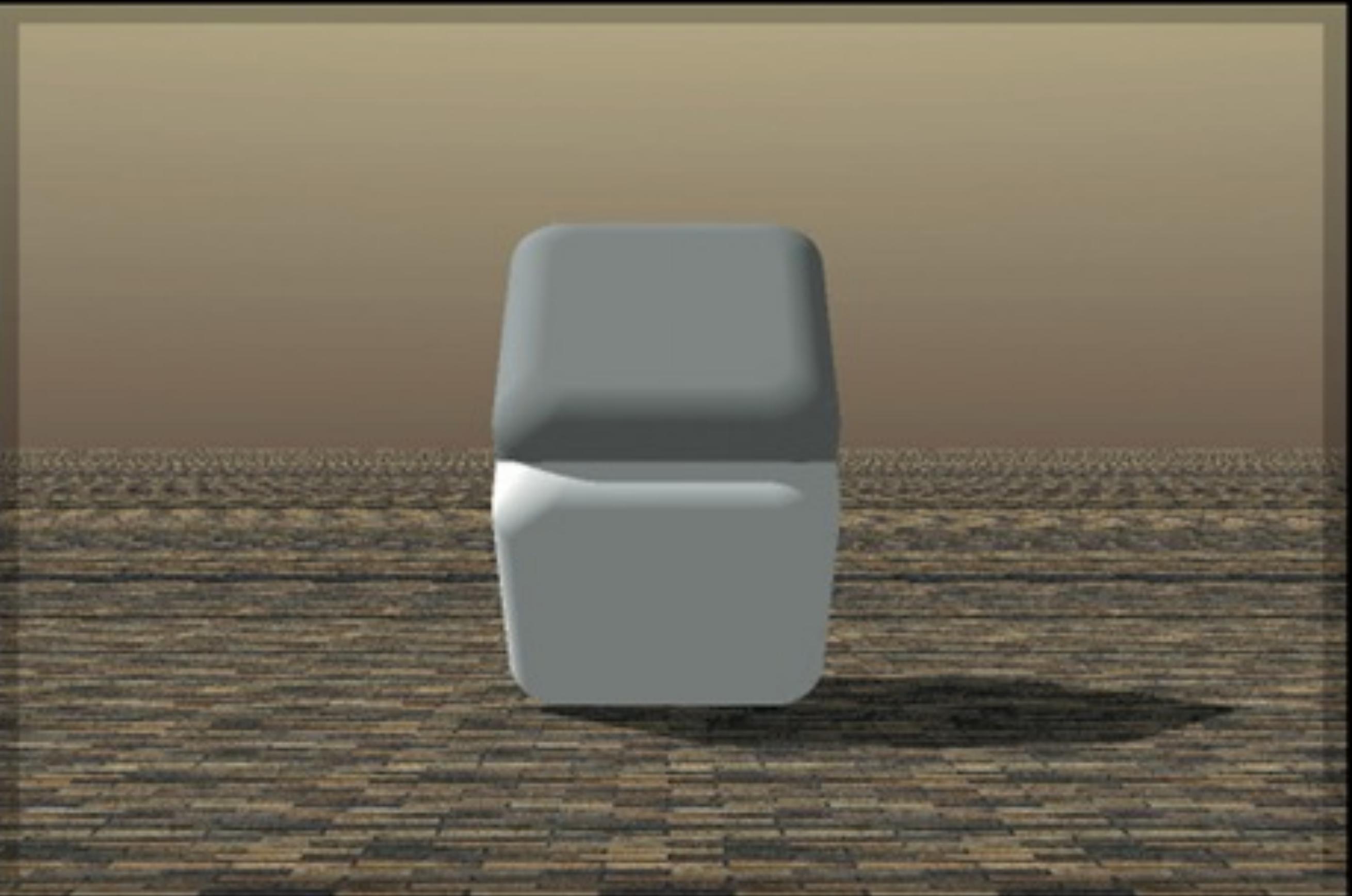


Image by R. Beau Lotto

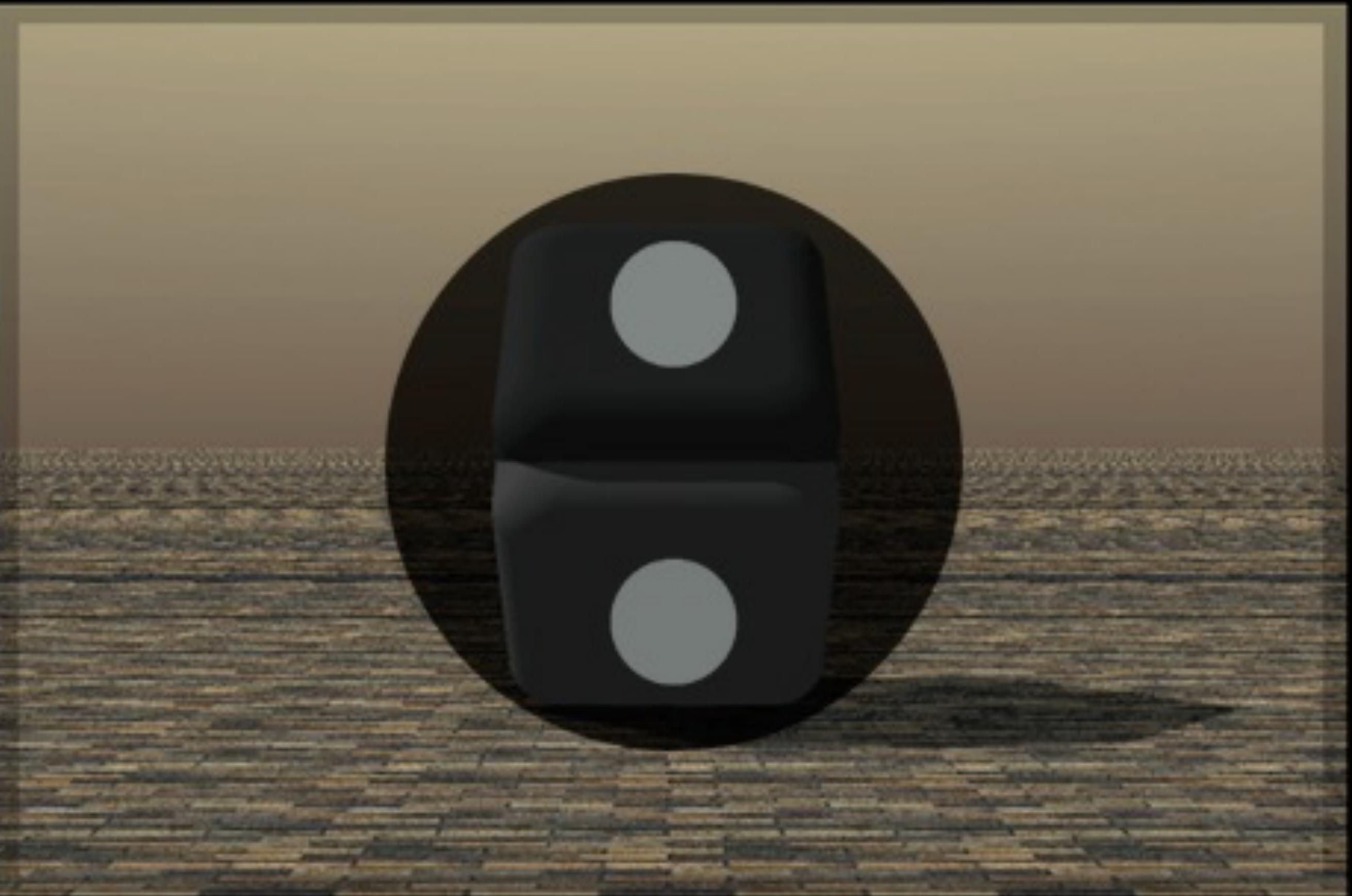


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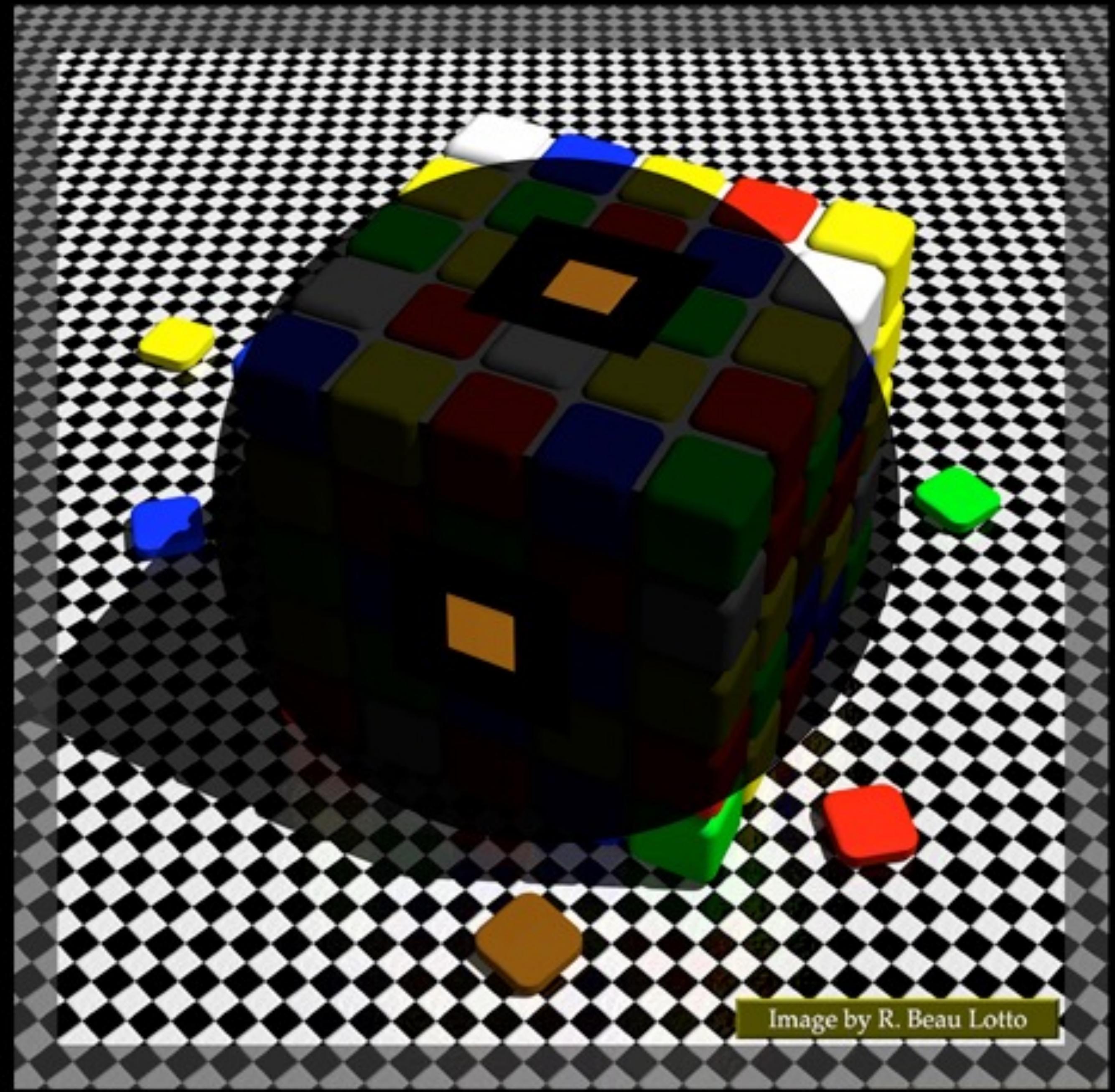
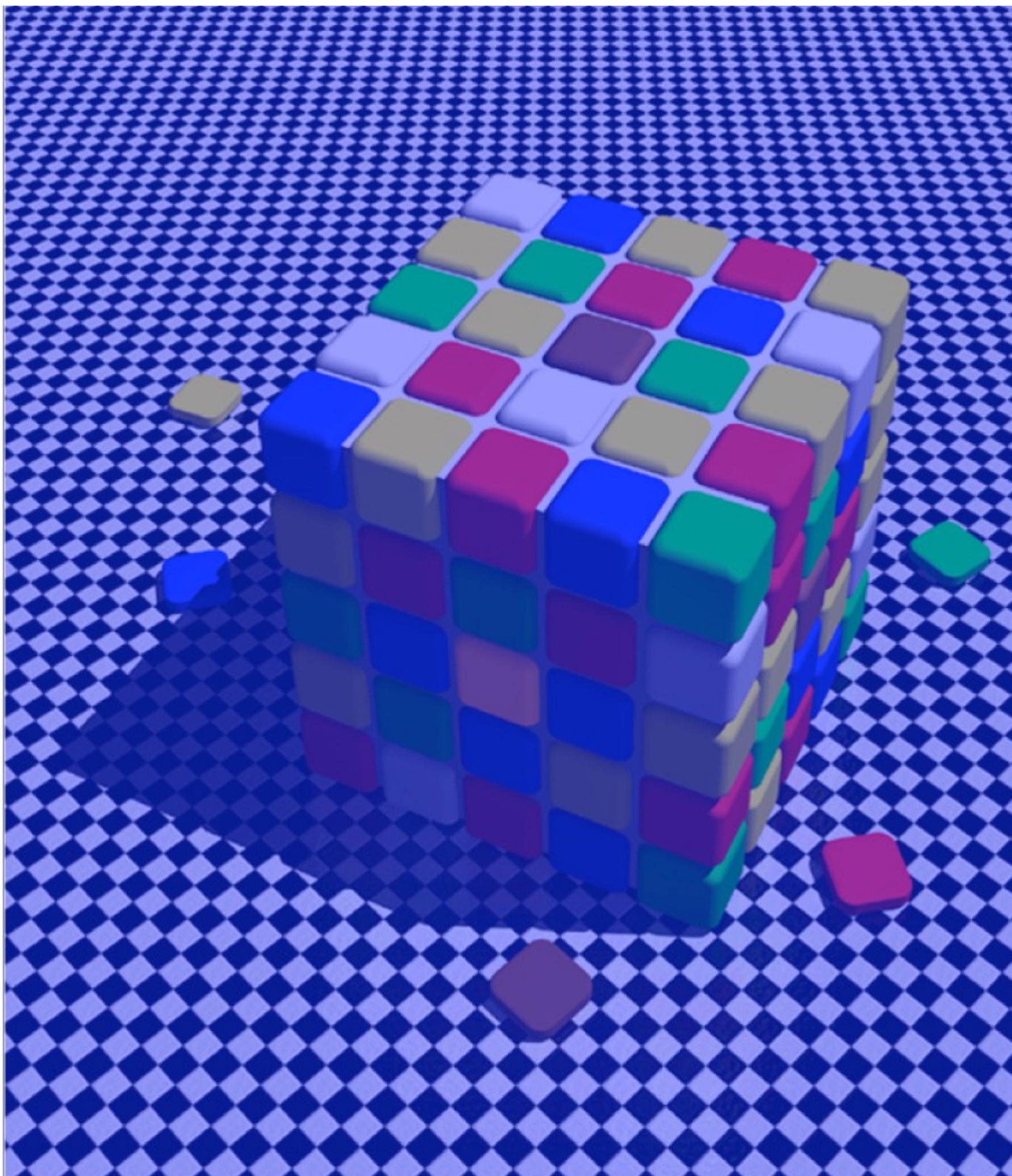
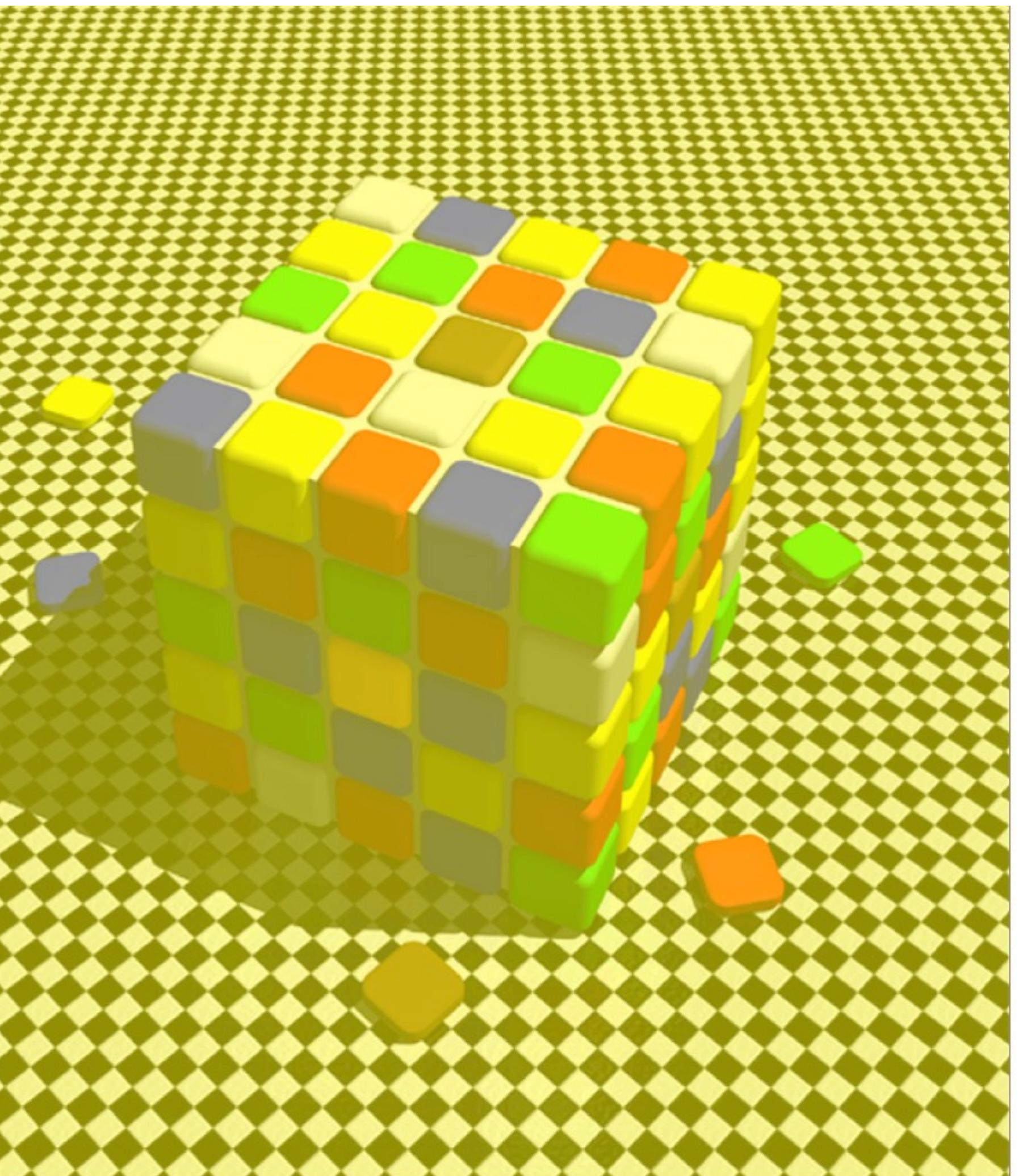
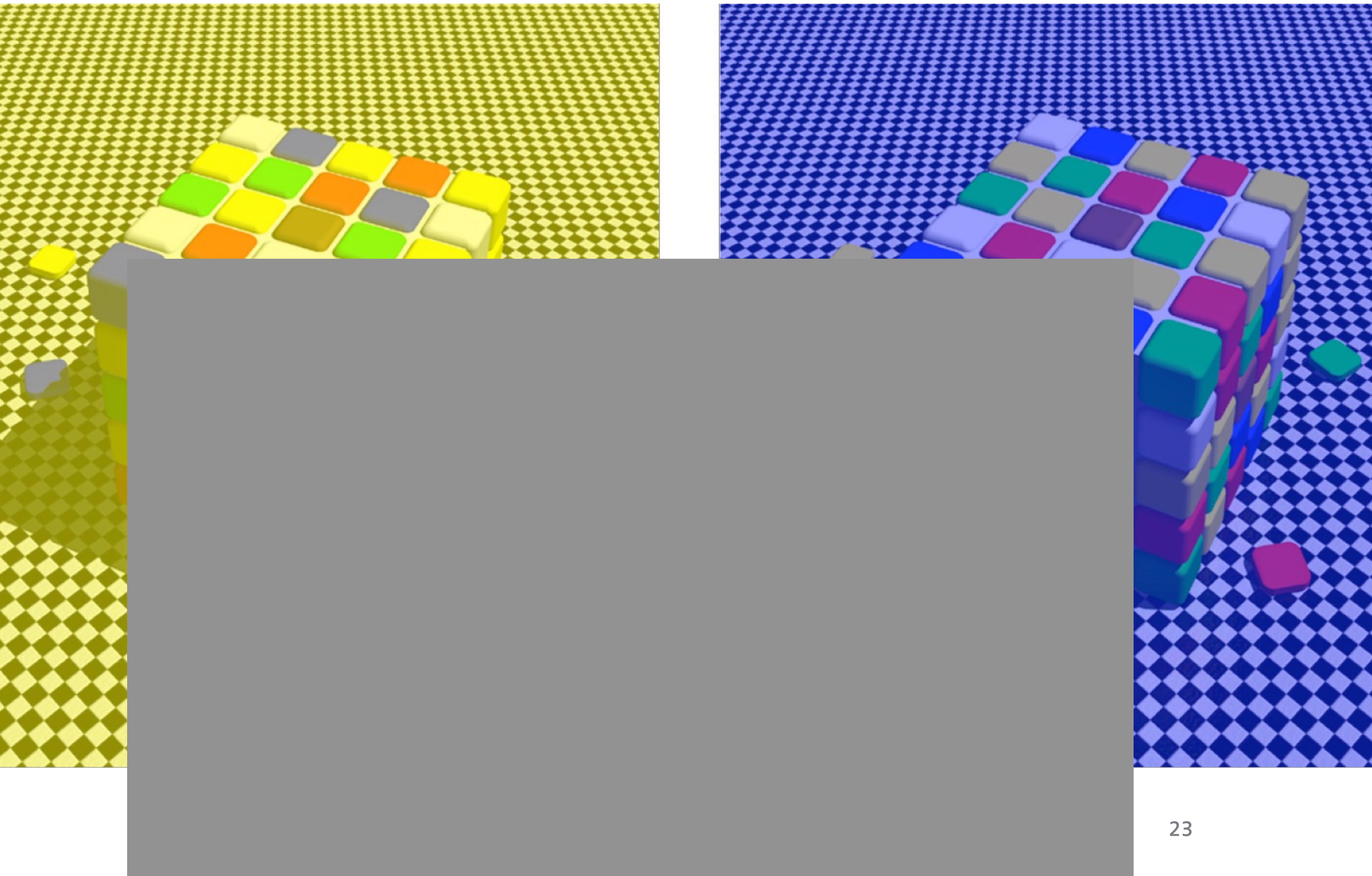
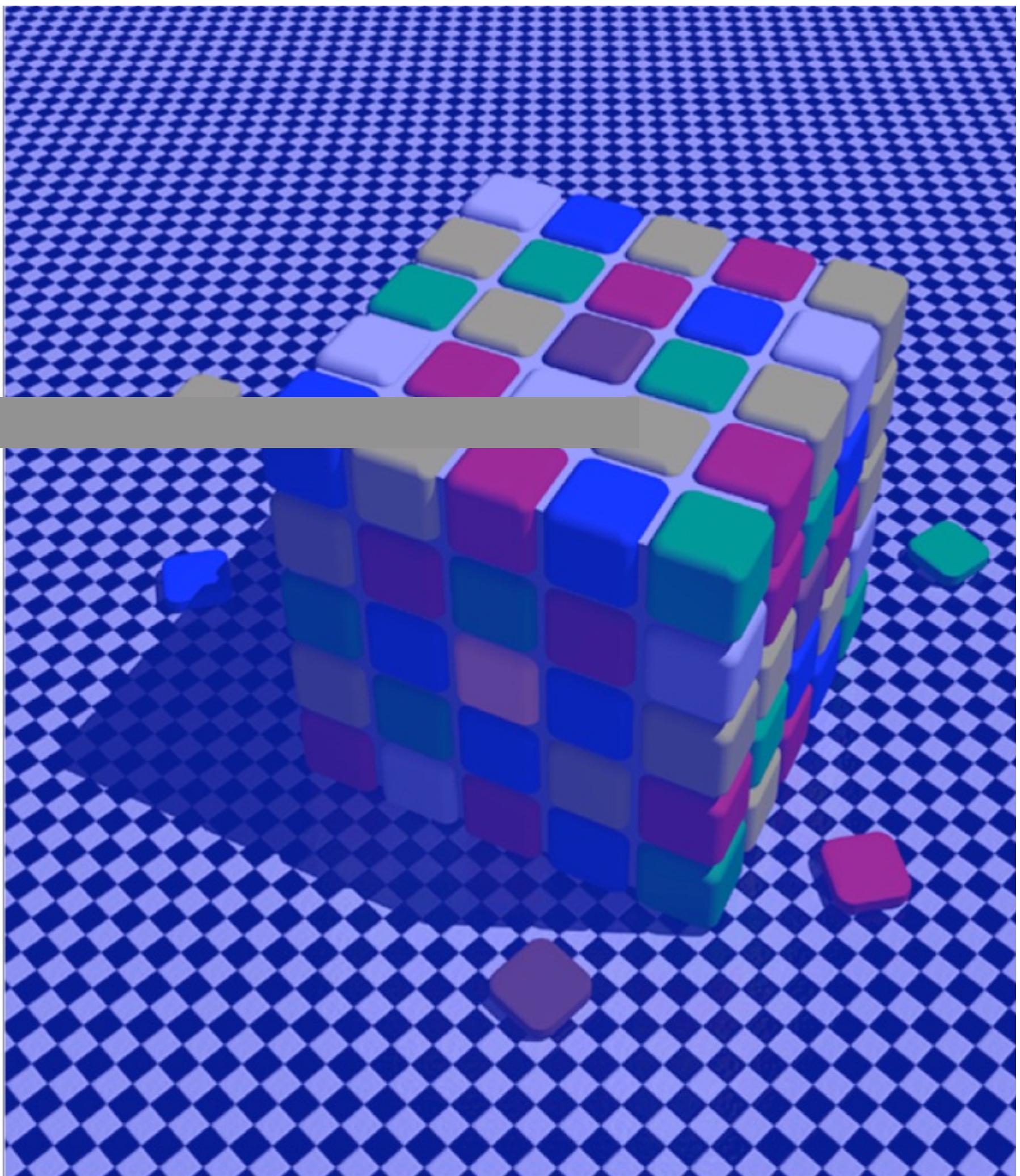
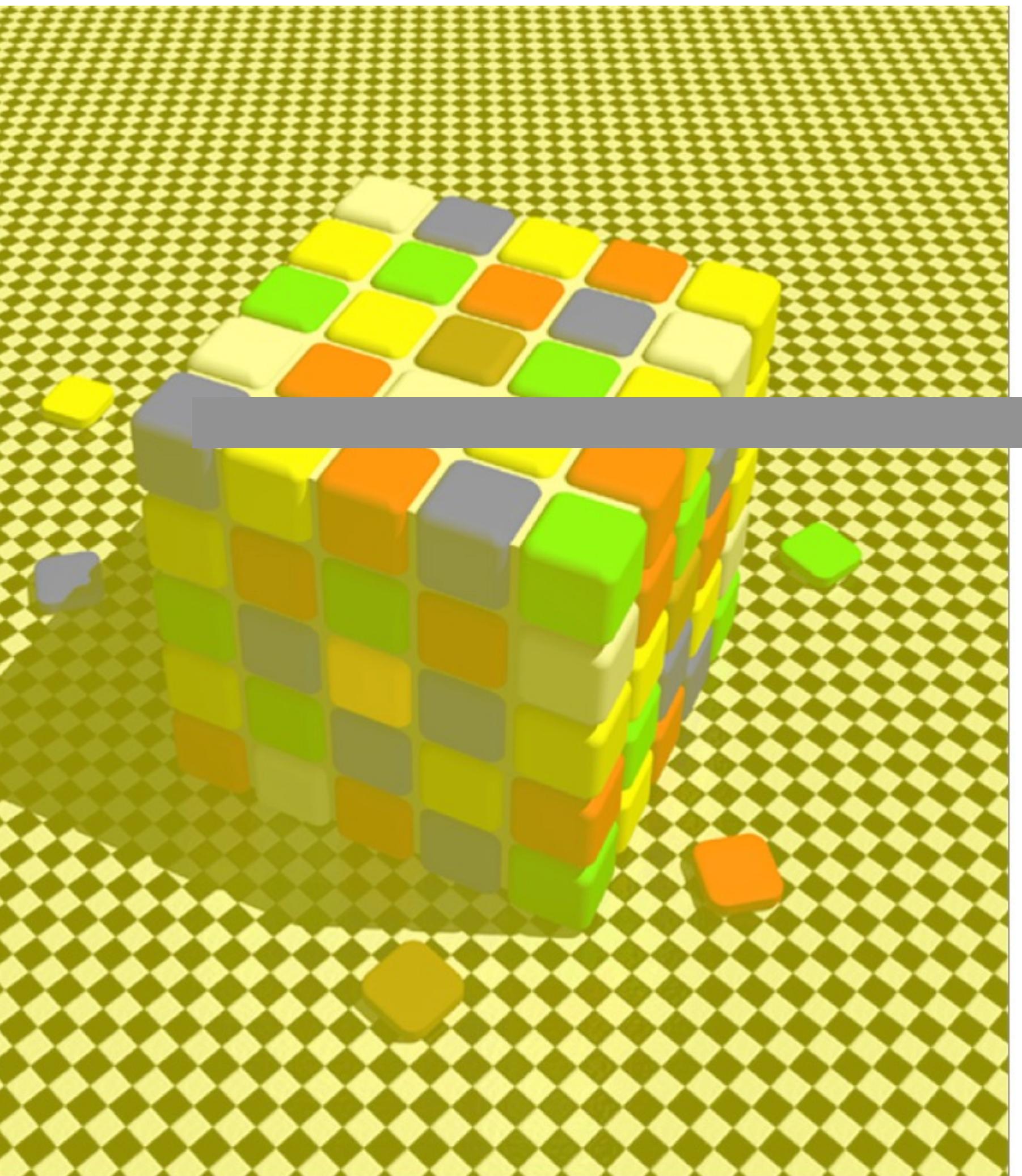


Image by R. Beau Lotto







# Thank you.

**Felix Wichmann**



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