

Optical illusions related to binocular vision

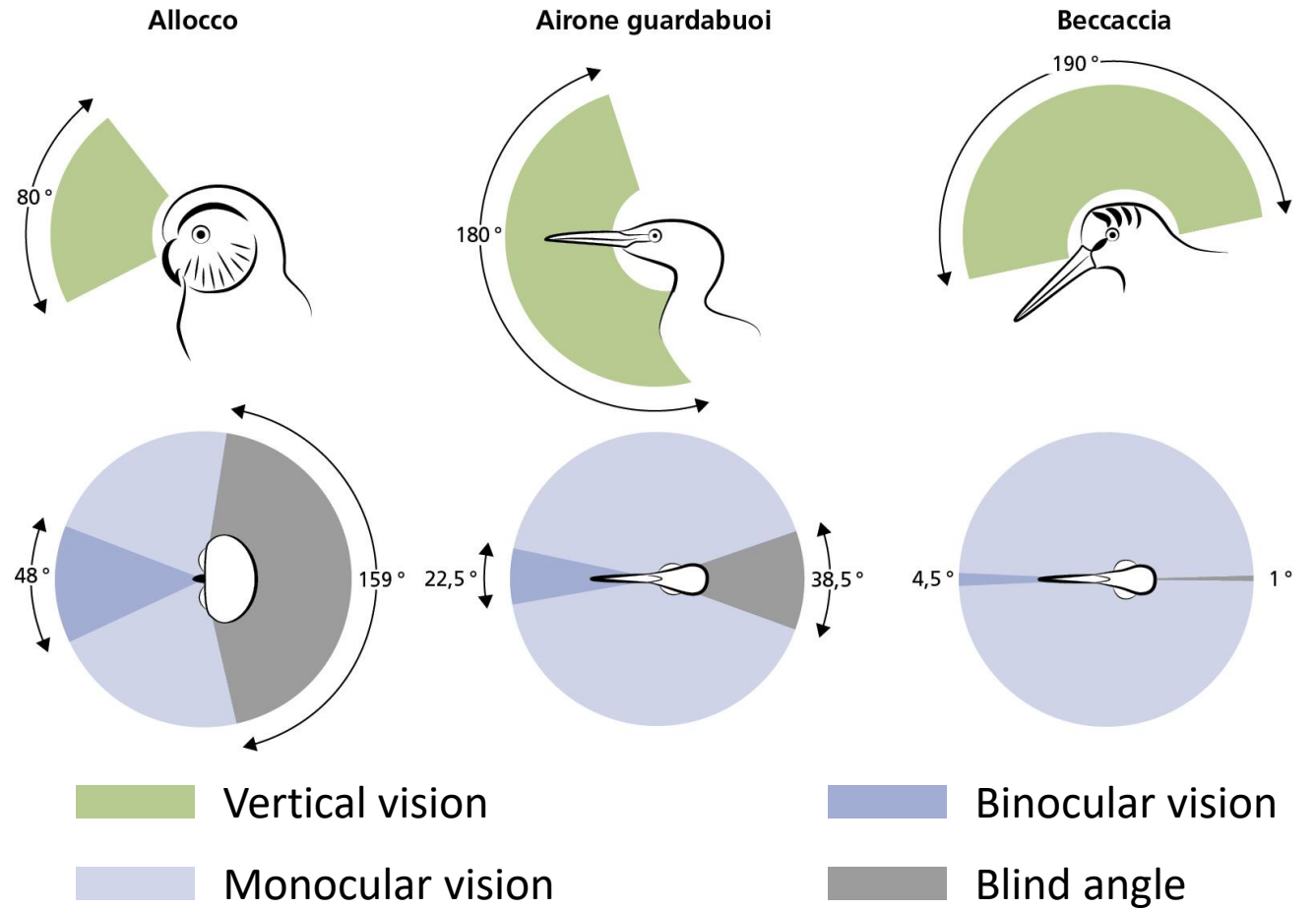
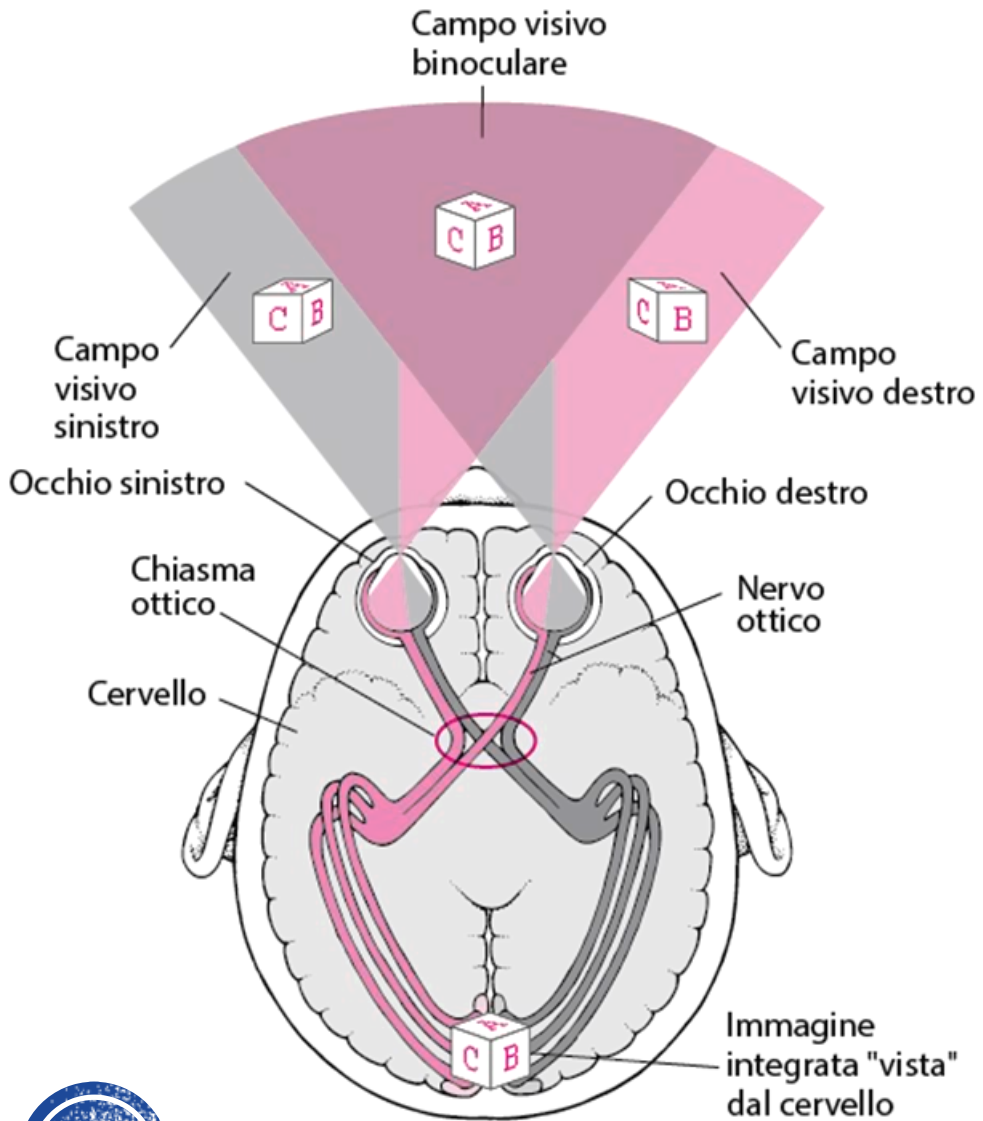
Andrea Ristori

iLight: Light Sciences meet Optical Illusions



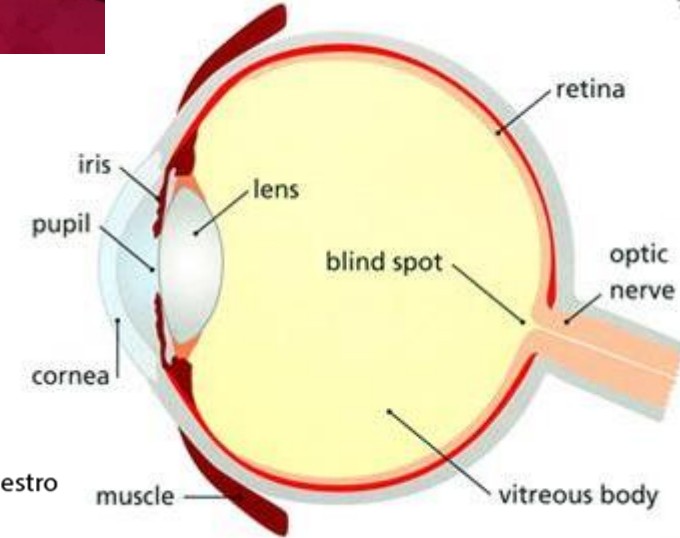
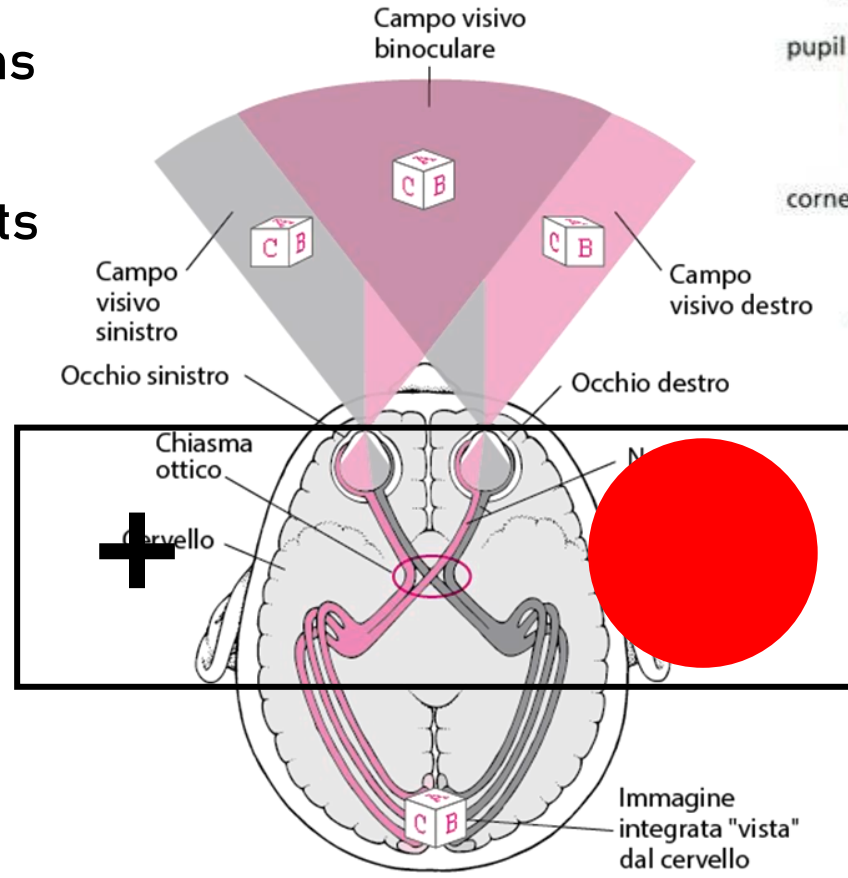
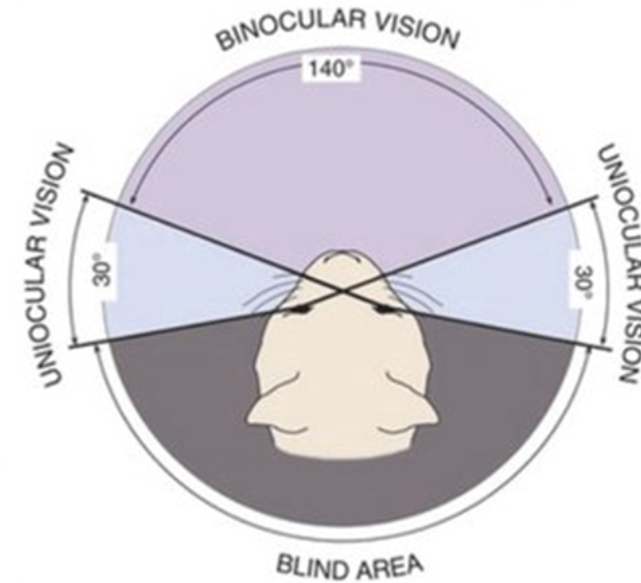
European Laboratory for
Non-Linear Spectroscopy

Binocular vision



Binocular vision - Advantages

- "Spare eye"
- Avoid the blind spot
- Low light situations
- See-around objects
- Stereopsis



First optical illusion

Materials:

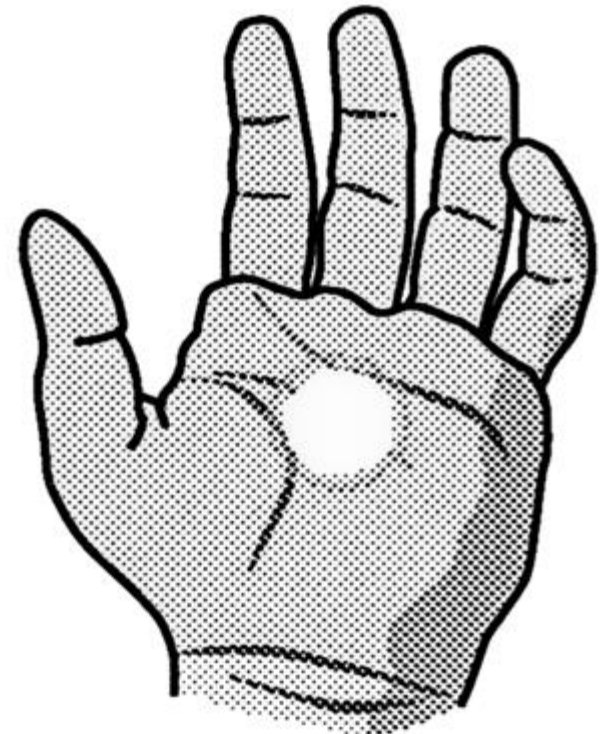
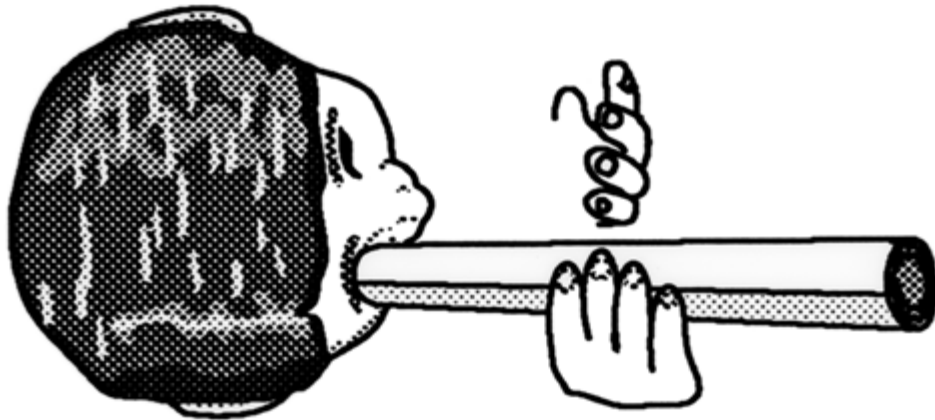
- A sheet of paper

Instructions:

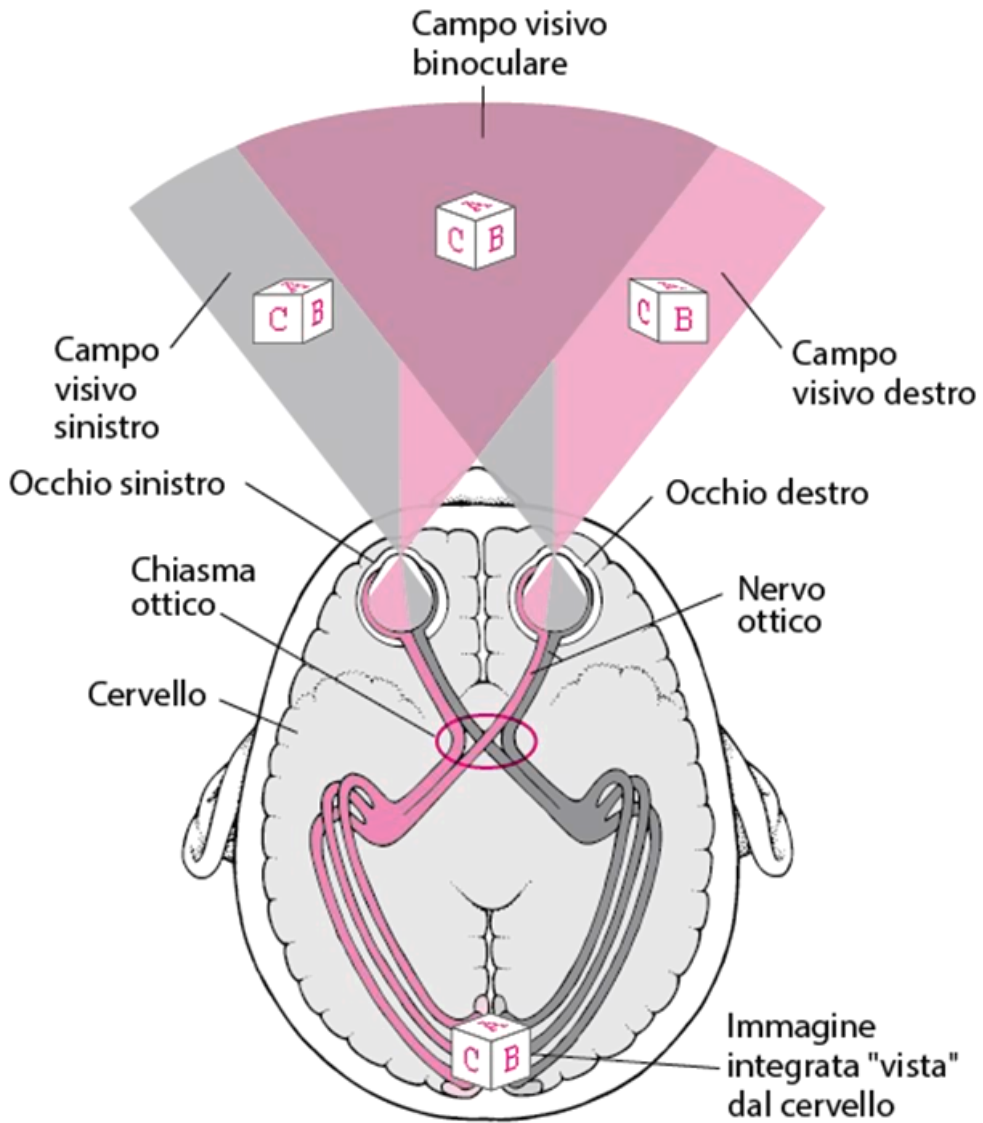
- Fold the sheet of paper into a tube
- Place the tube in front of your right eye
- Hold your left hand near the tube about halfway down (as in the figure)
- With both eyes opened focus on the image inside the tube

Result:

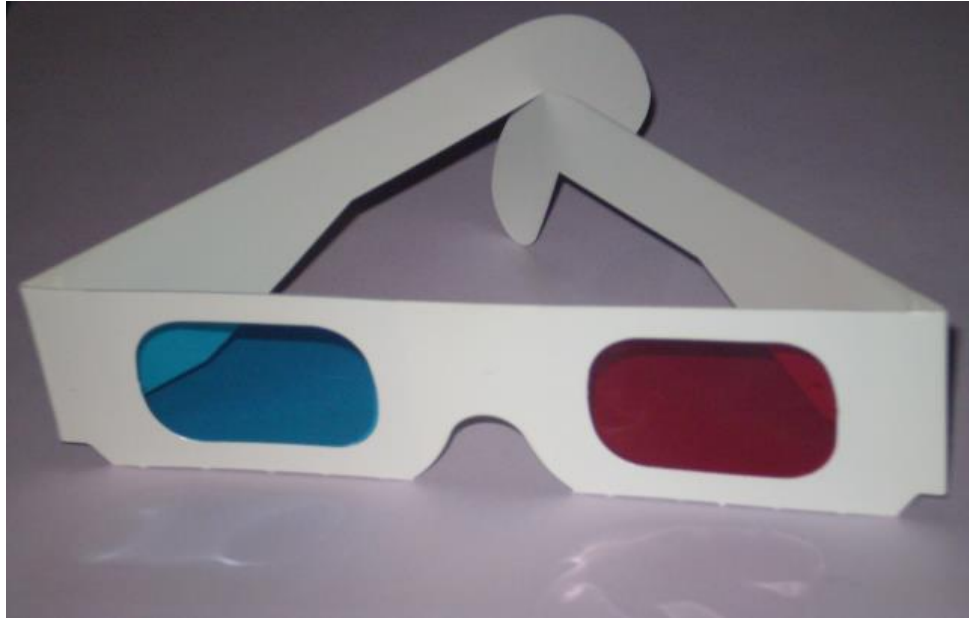
- Your hands appears to have a hole in it!



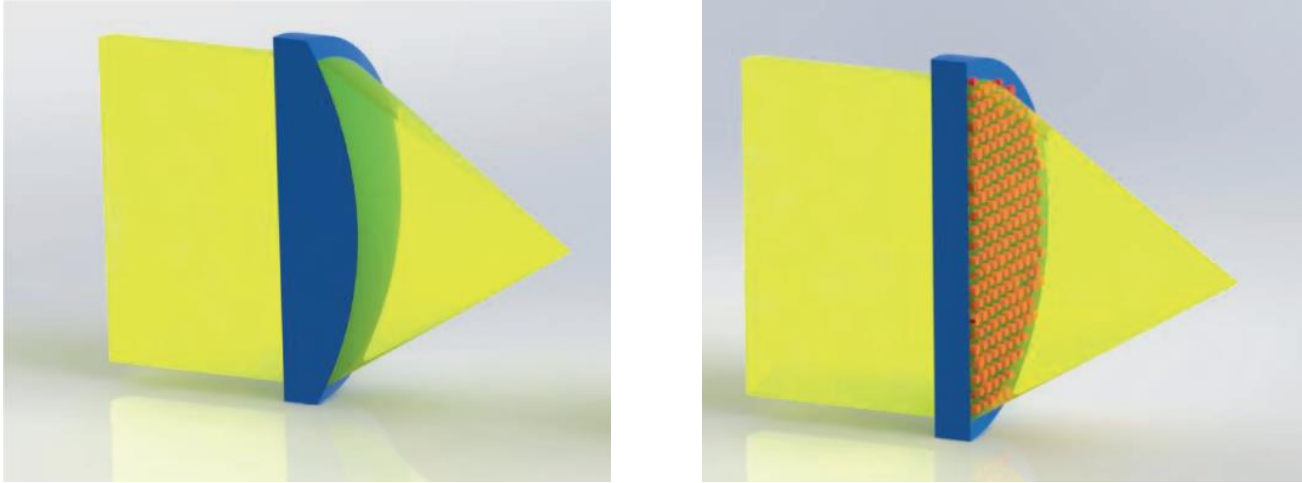
Stereopsis and stereoscopes



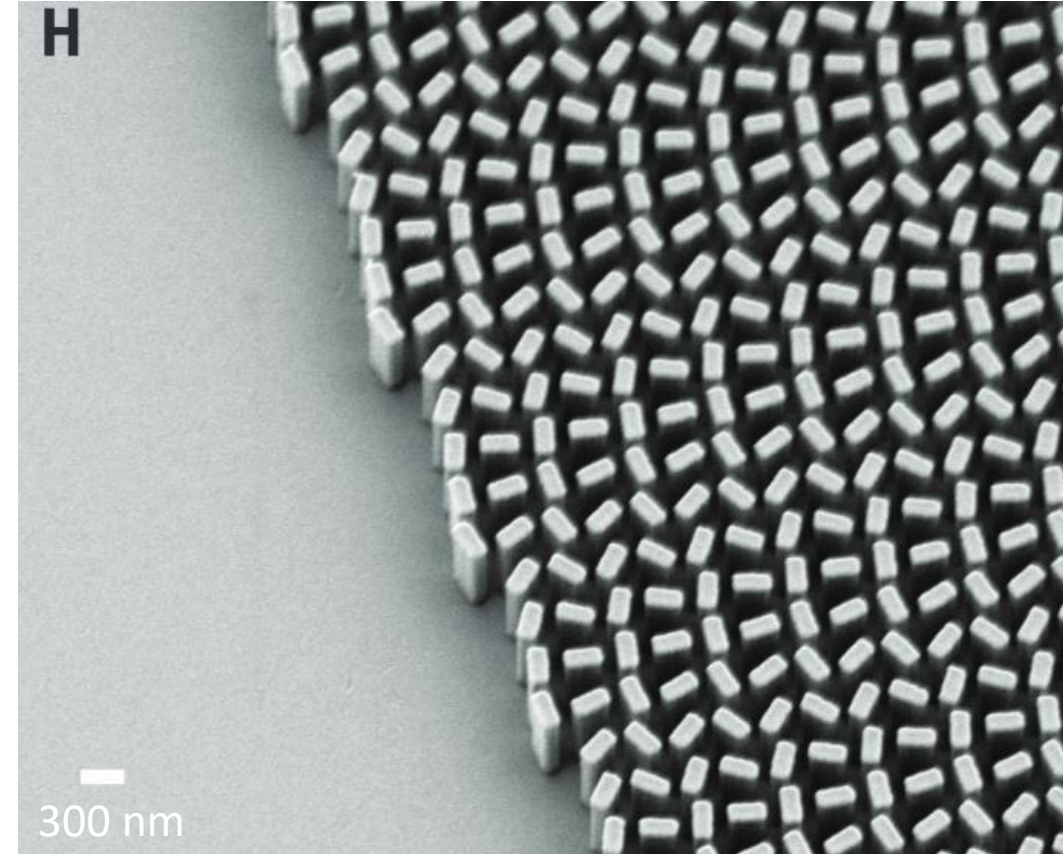
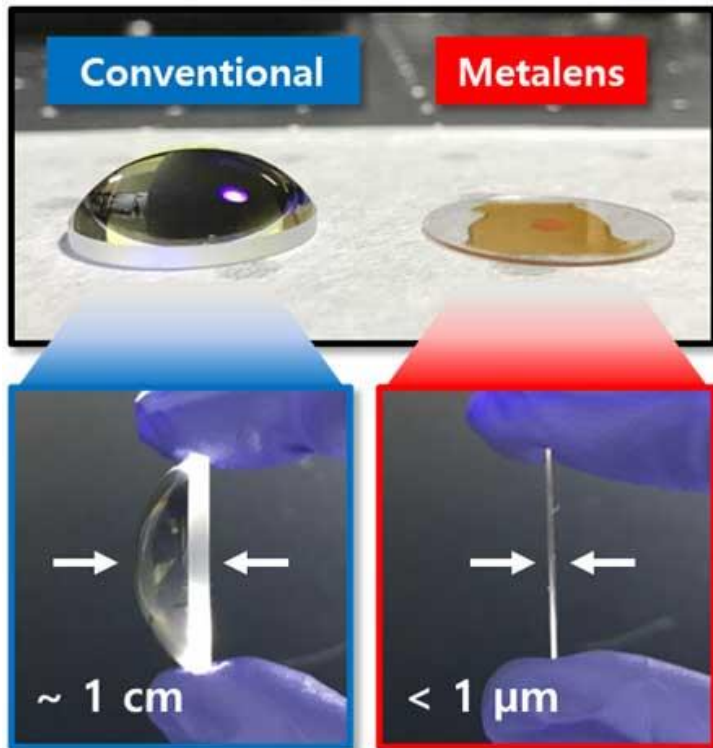
Stereopsis and stereoscopes



Metasurfaces

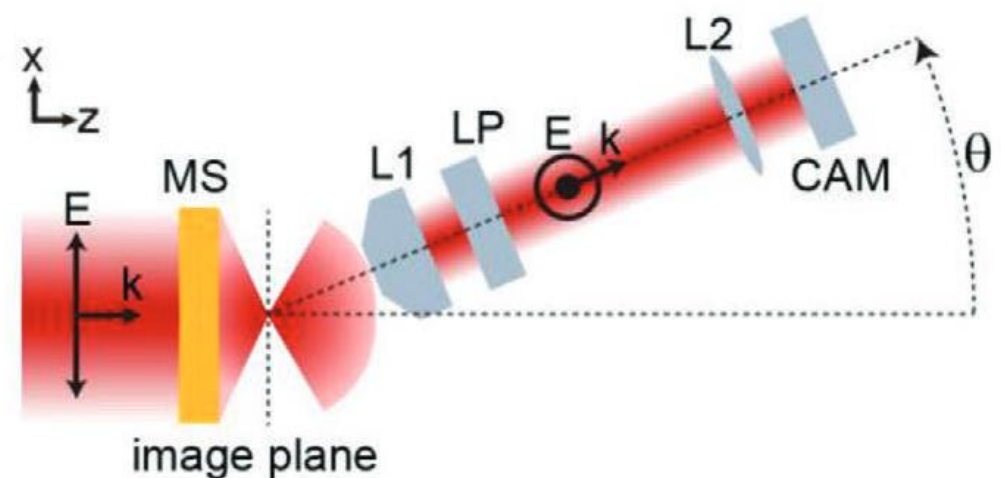
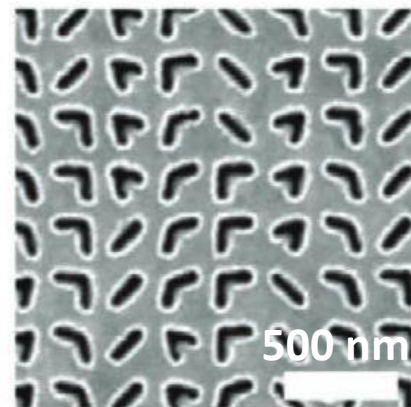
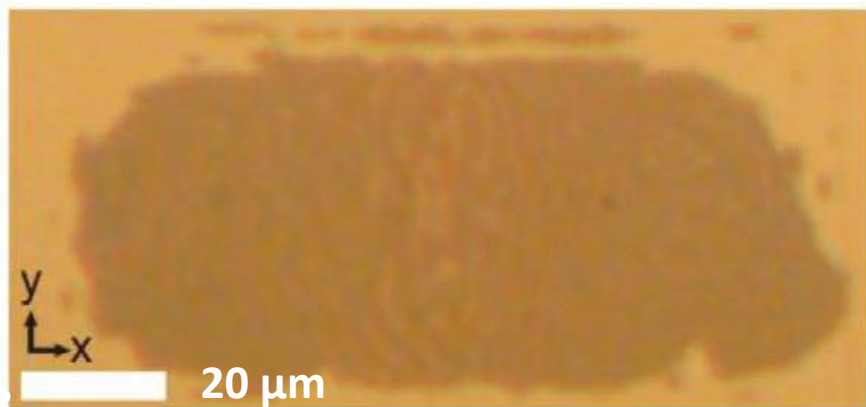
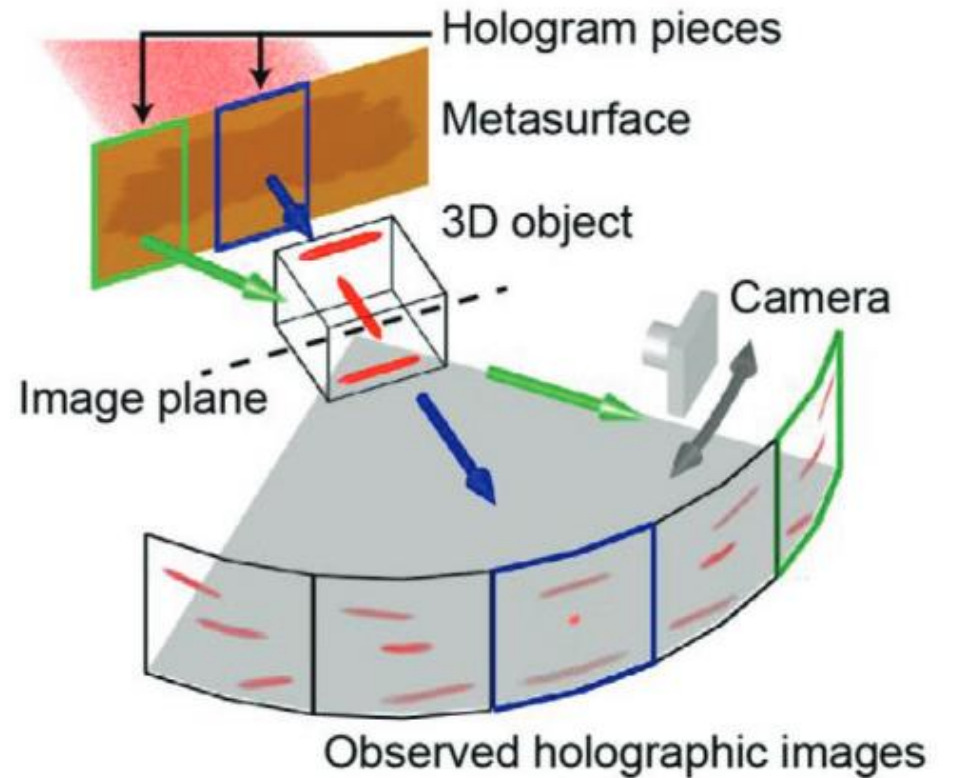
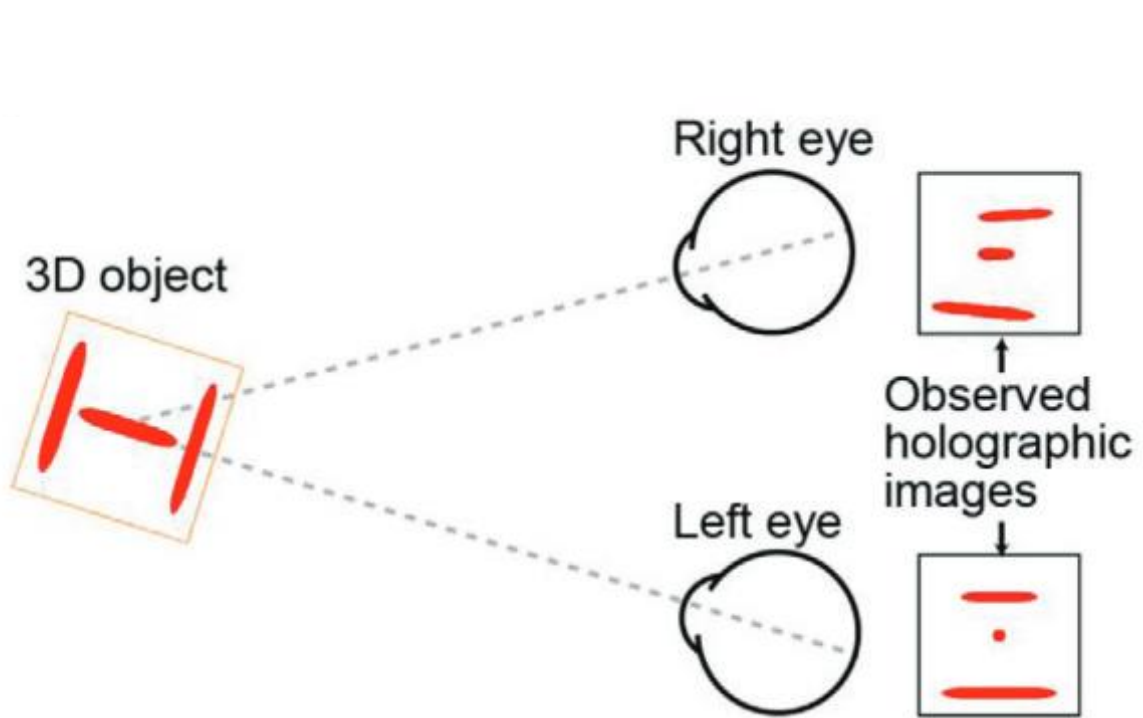


J. Engelberg
and U. Levy,
Nat Commun
(2020)

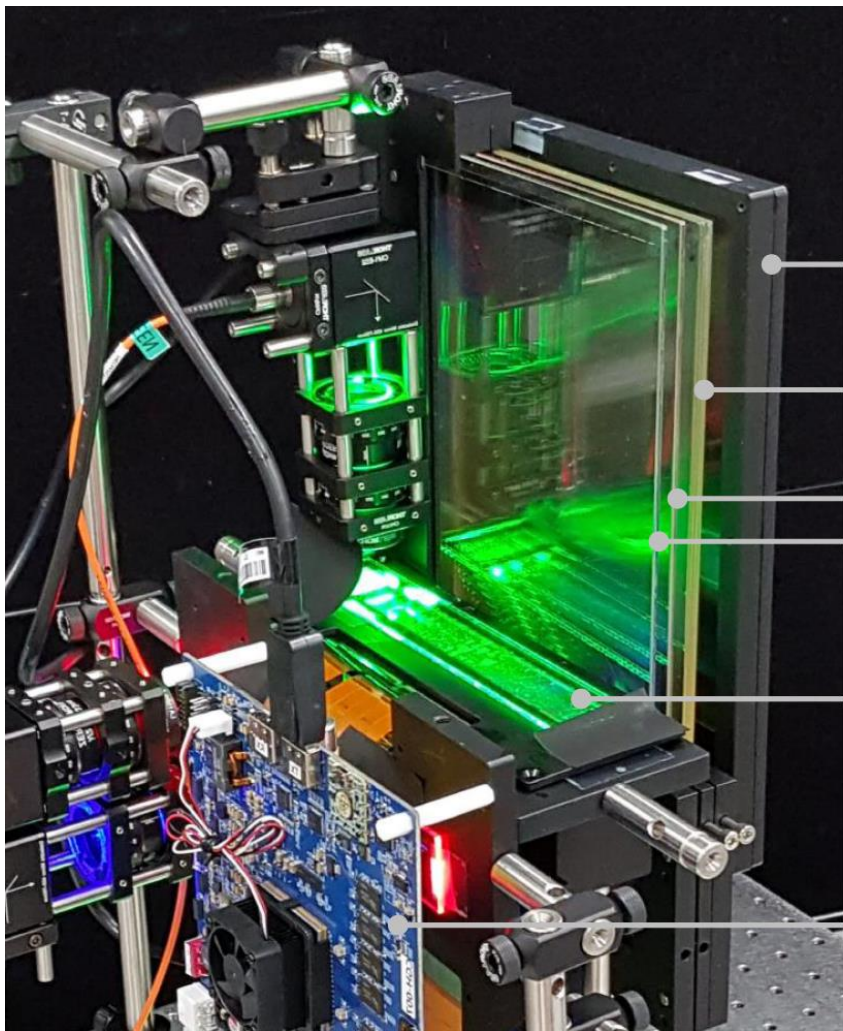


M. Khorasaninejad et al., *Science* (2016)

Stereopsis with metasurfaces



3D hologram display



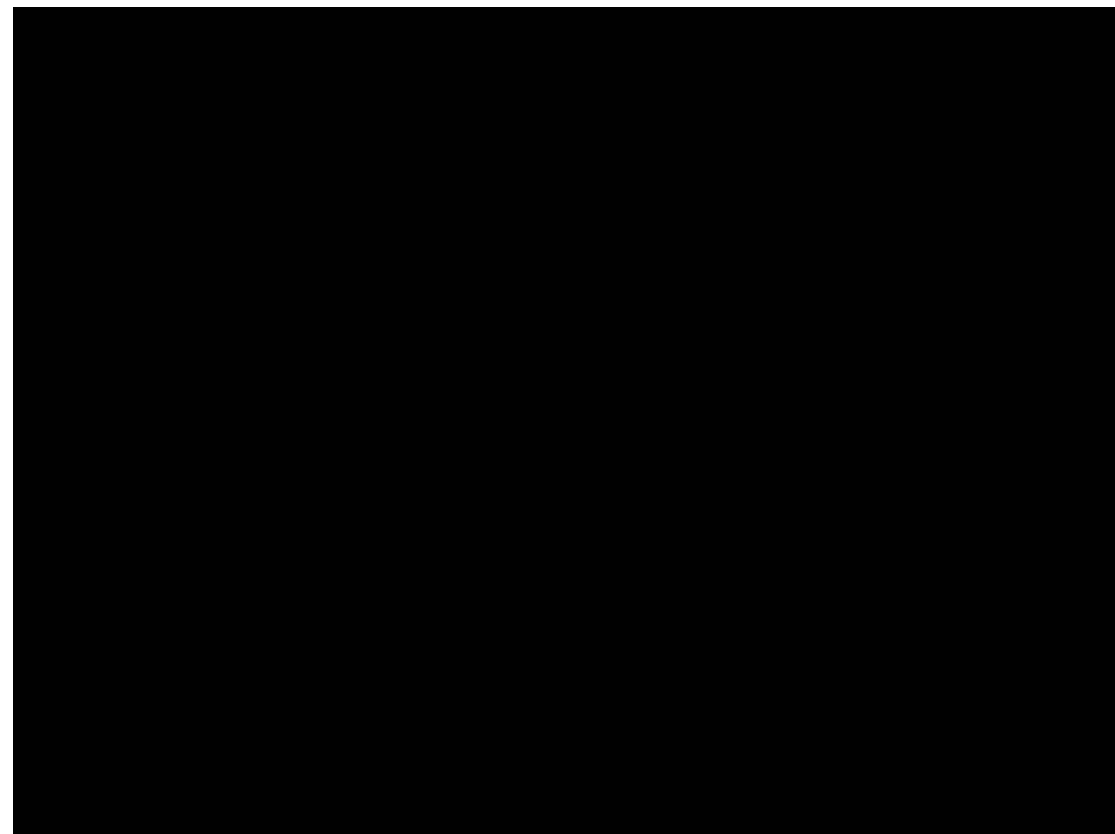
Spatial light modulator

Geometric phase lens

Coherent backlight unit

Beam deflector

Holographic video processor



An J. et al., *Nat Commun* (2020)

An J. et al., *Nat Commun* (2020)

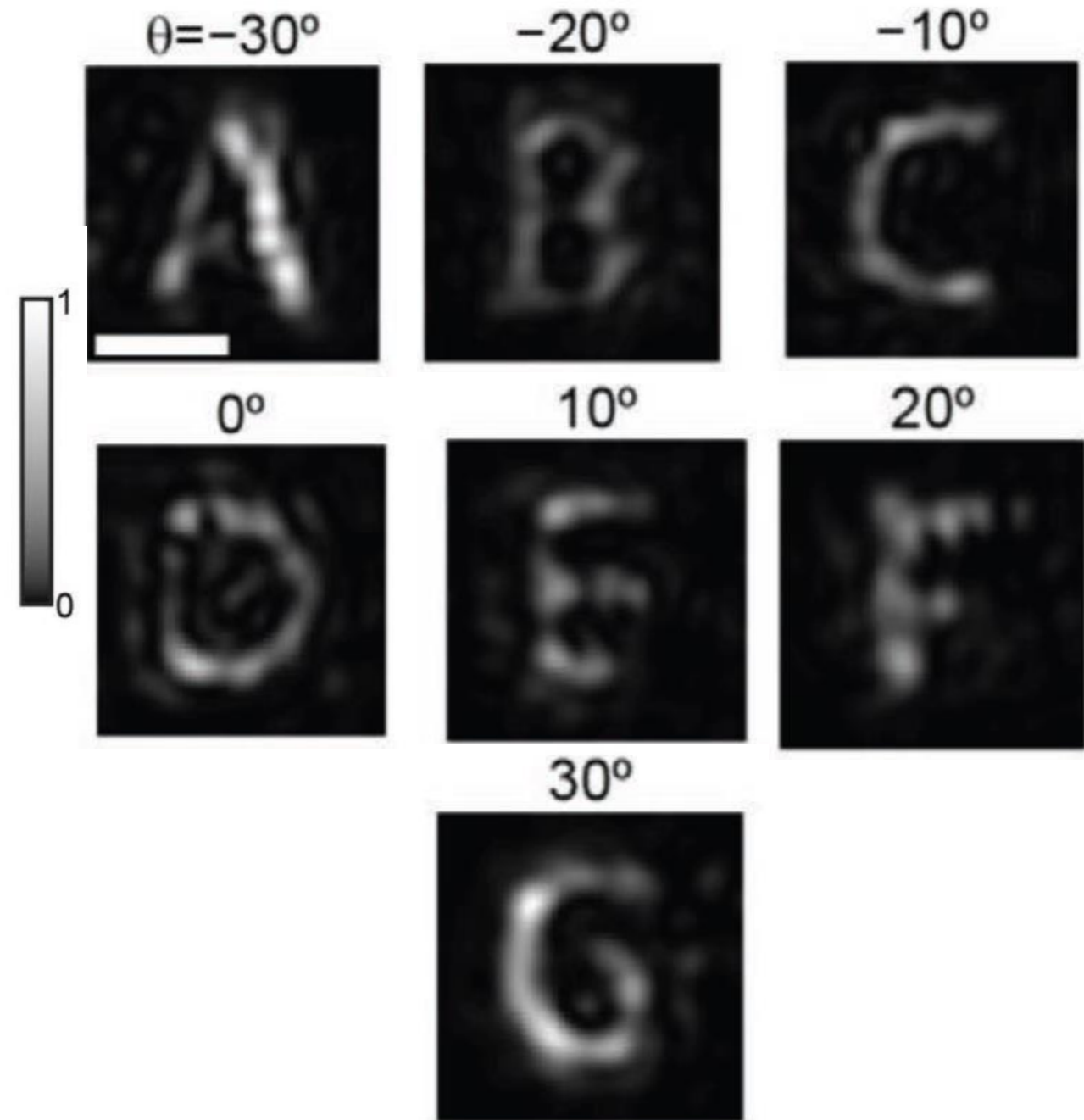
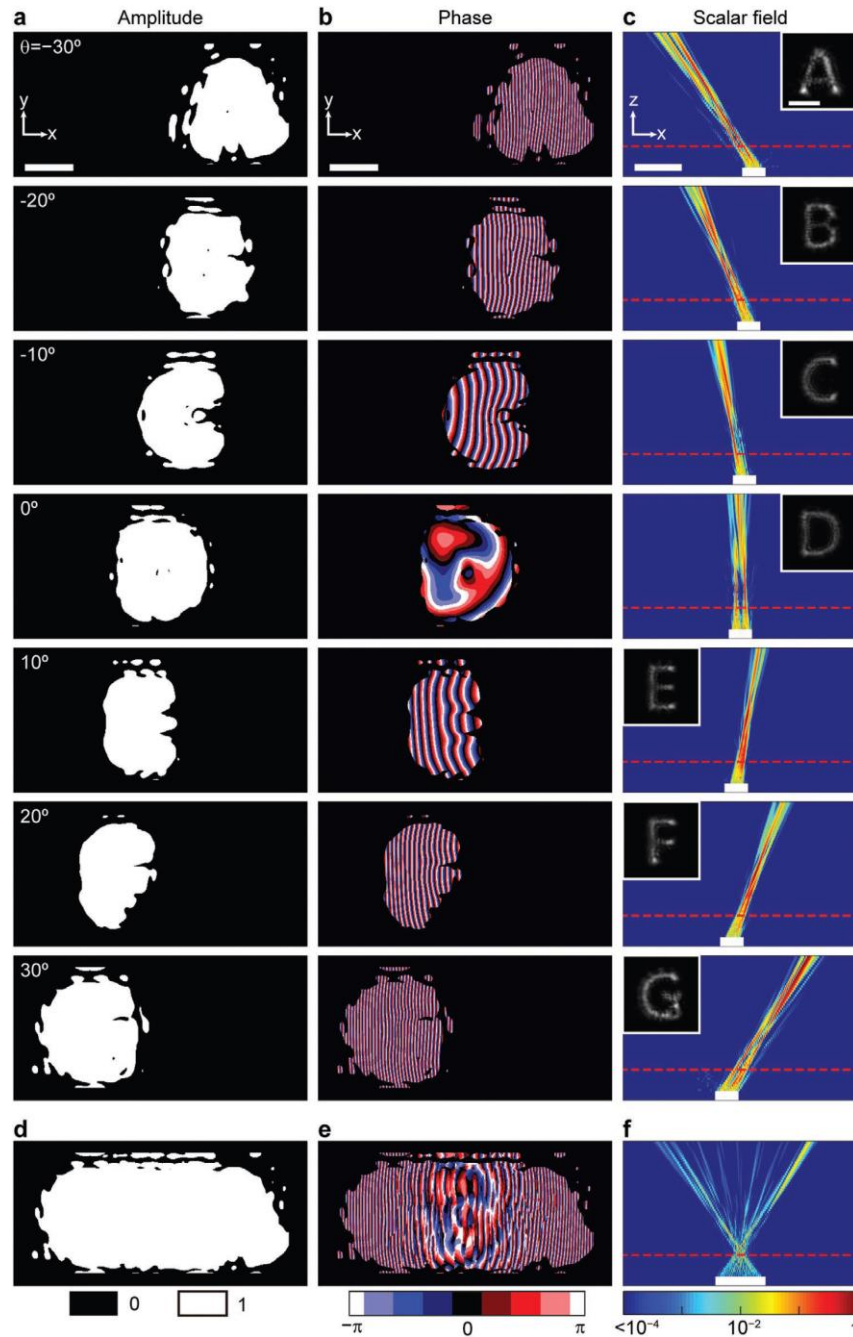
Thank you for the attention!



Backup slides



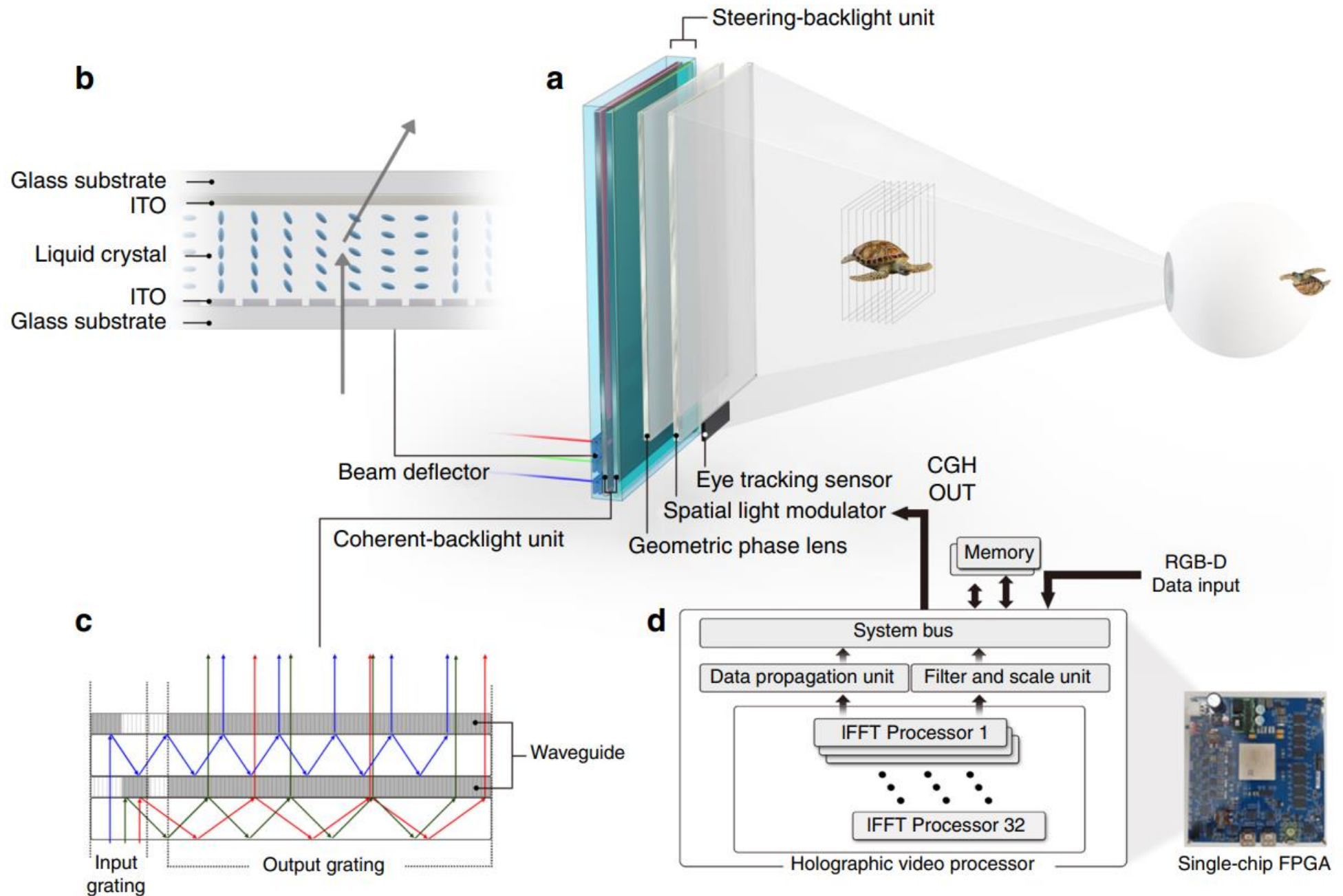
Metasurface design



Y.-S. Choi et al., *Adv. Optical Mater.* (2020)



Hologram video display design



An J. et al., *Nat Commun* (2020)



Single-chip FPGA