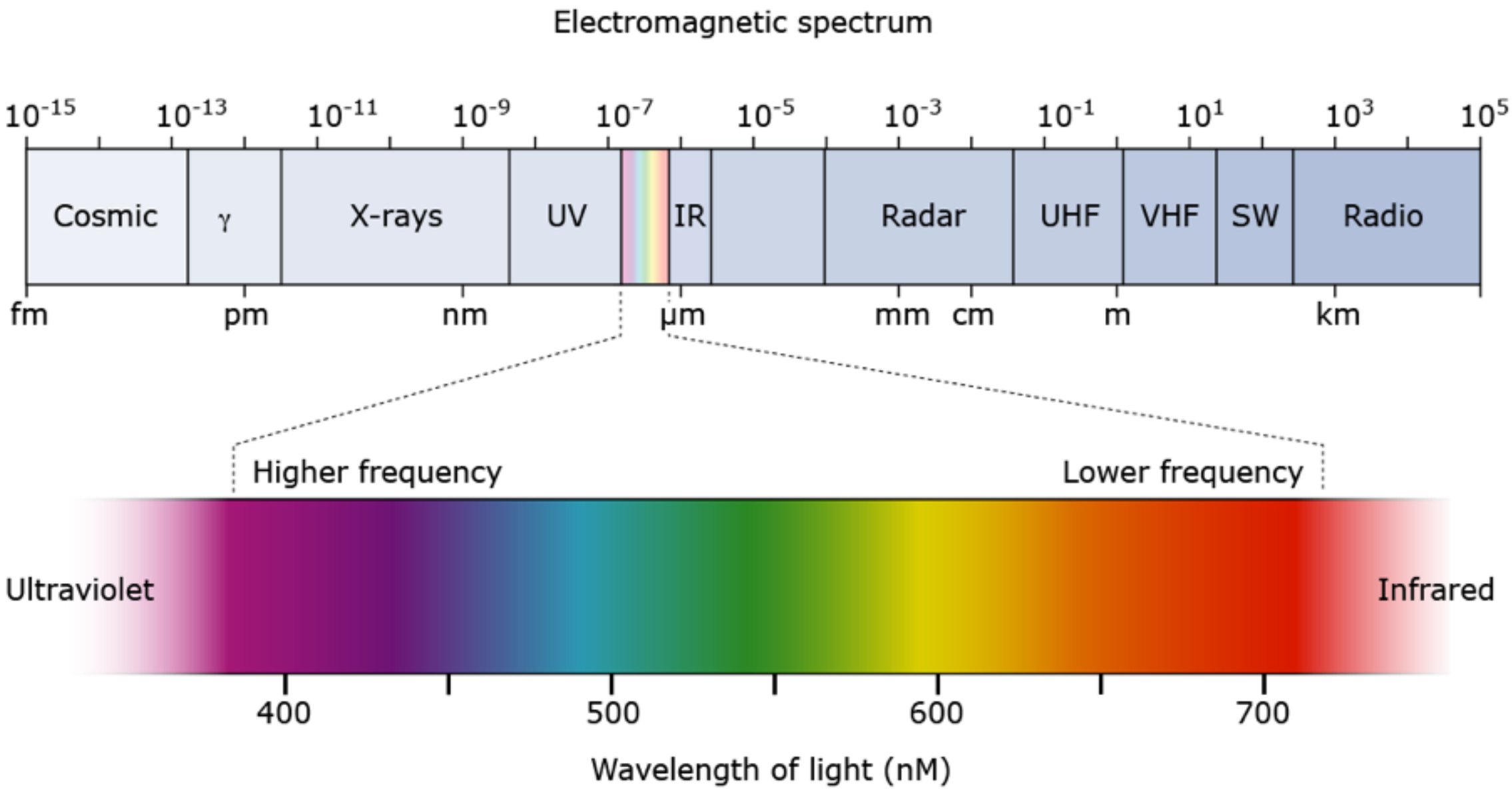
Module # 1—Background

Visual Perception and the Brain

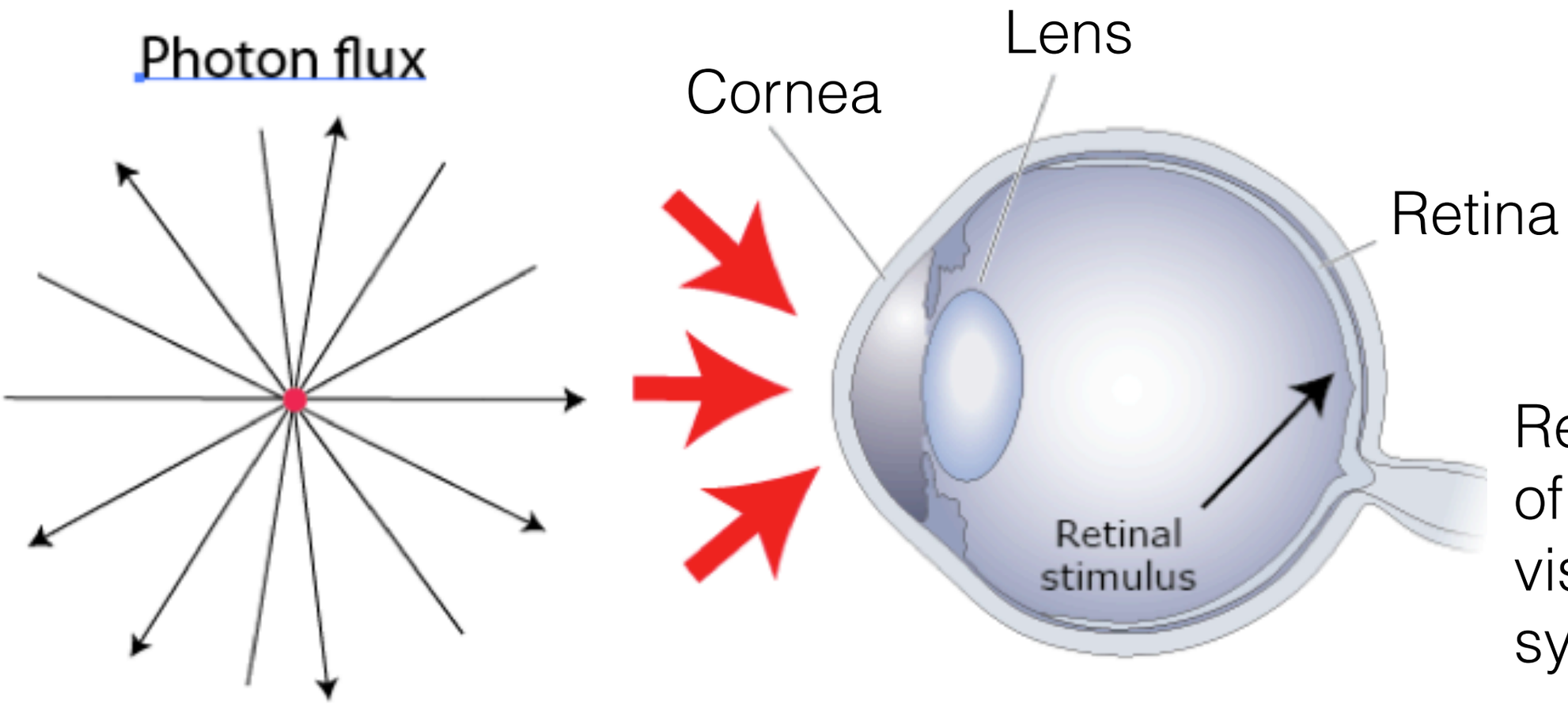
DUKE INSTITUTE *for* BRAIN SCIENCES

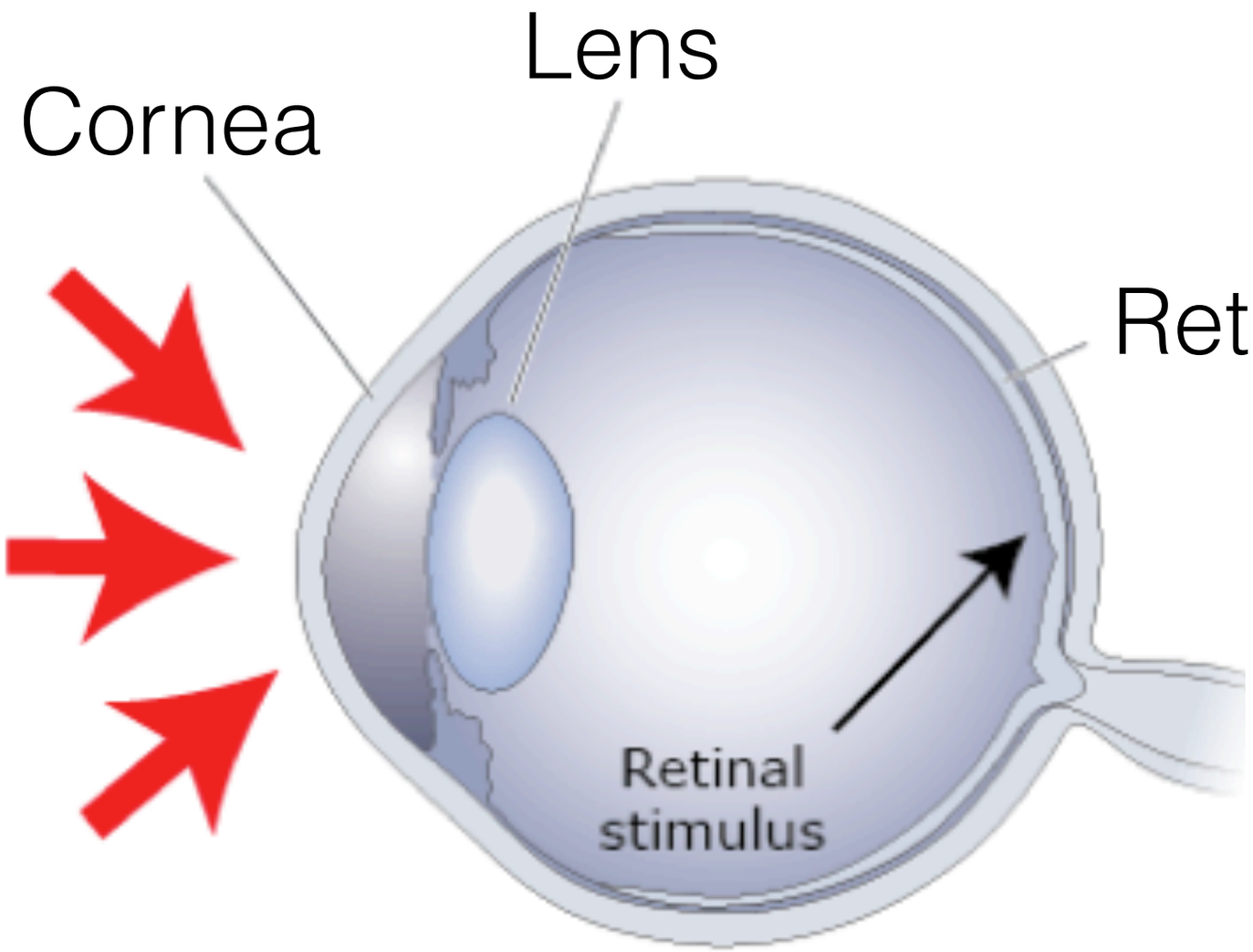
Topic 2.Visual Stimuli

Lesson 1. Light and the Electromagnetic Spectrum

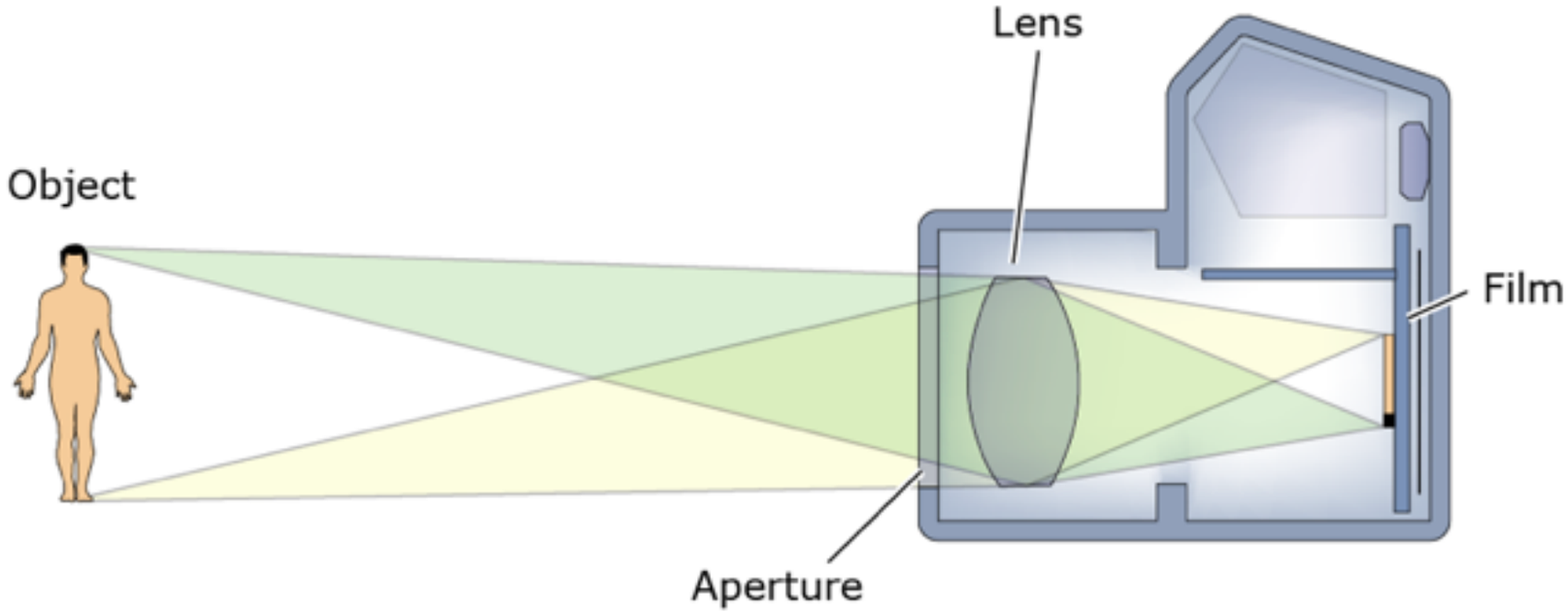


Lesson 2. Making an Image

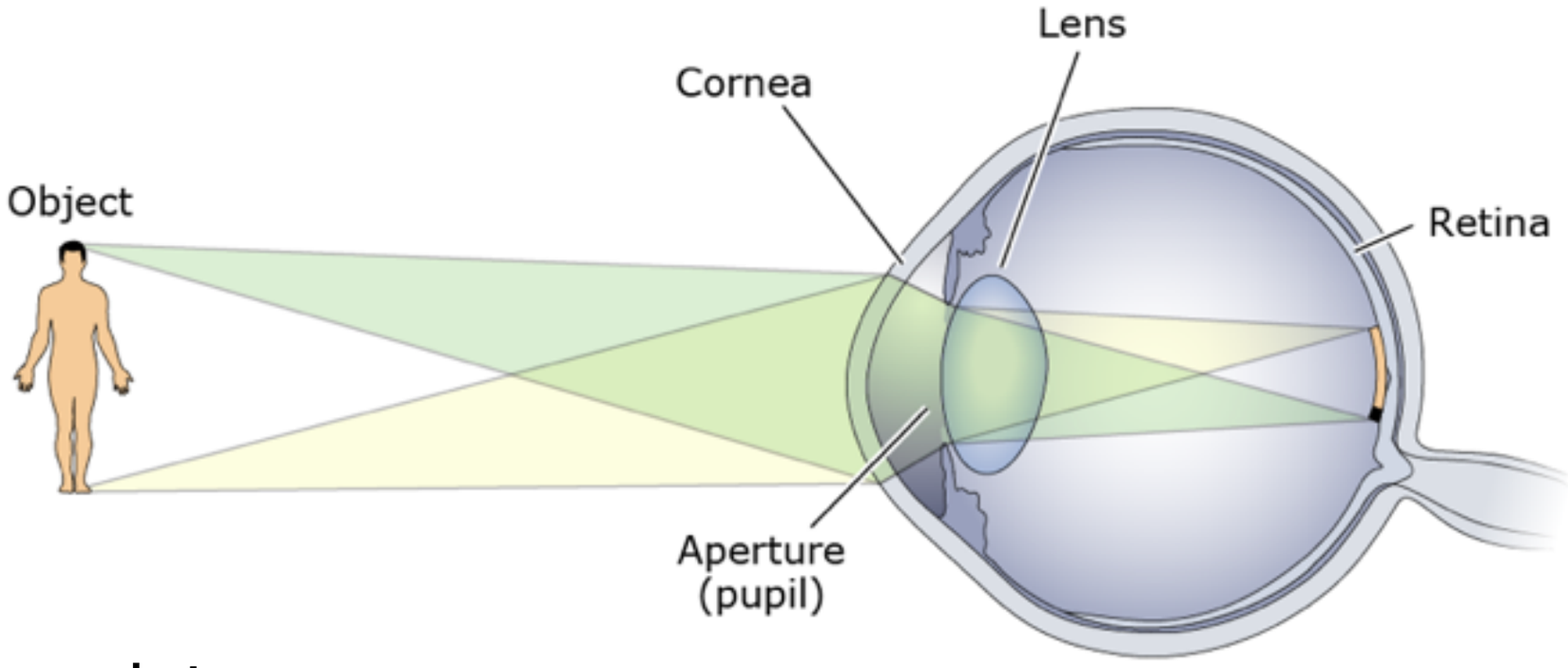


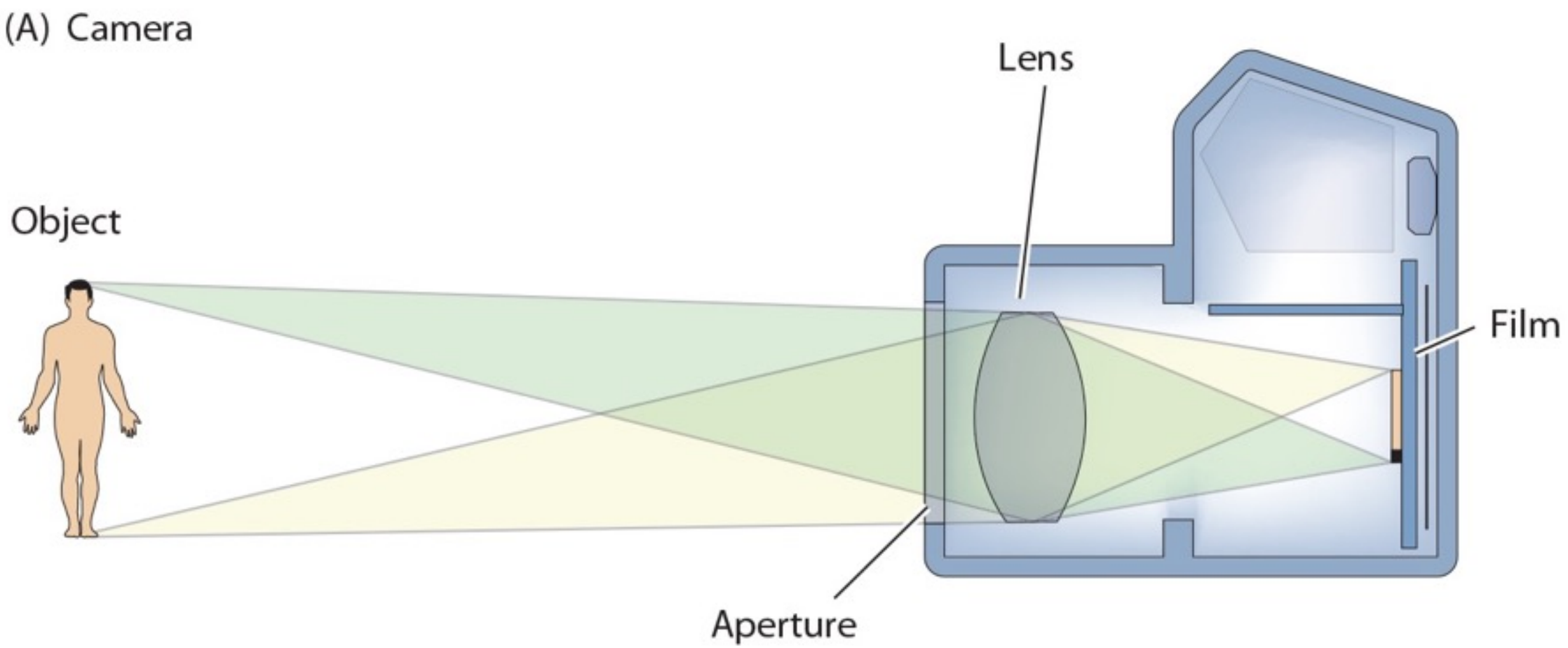


(A) Camera

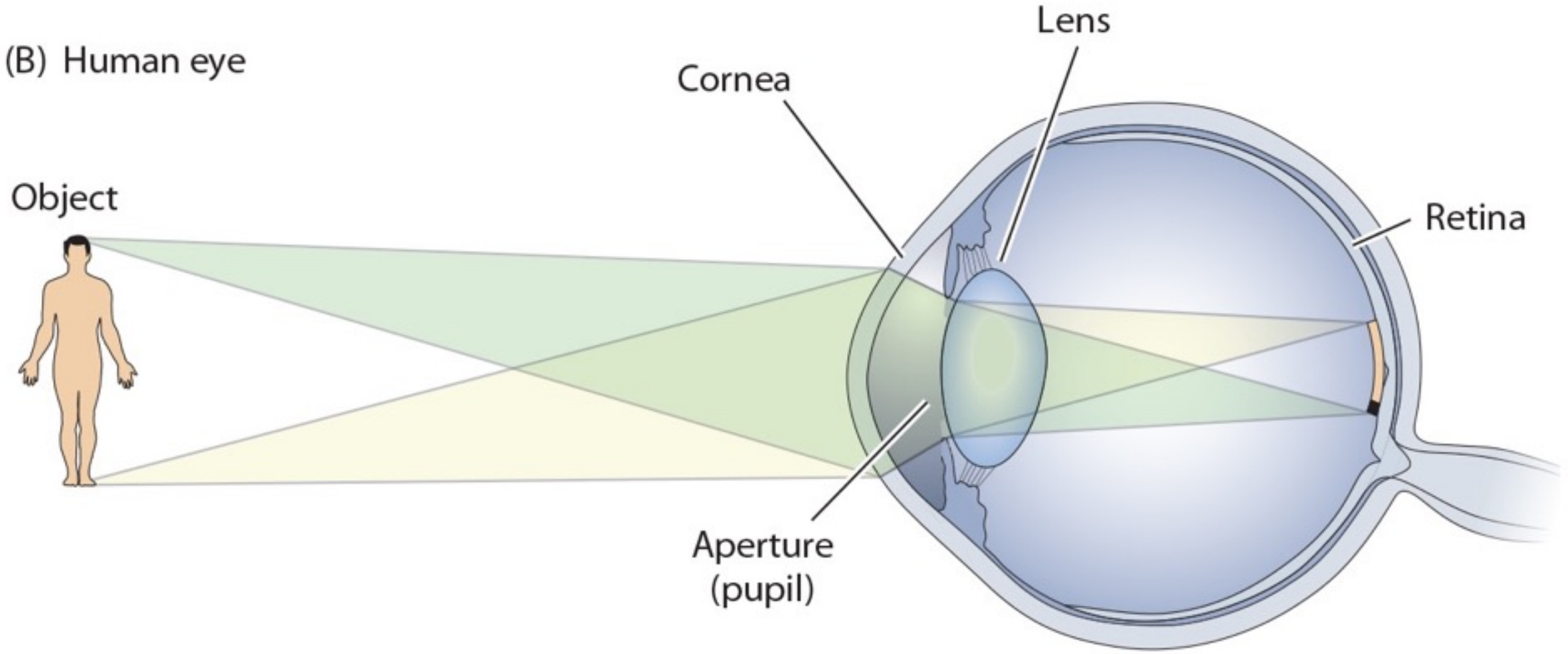


(B) Human eye

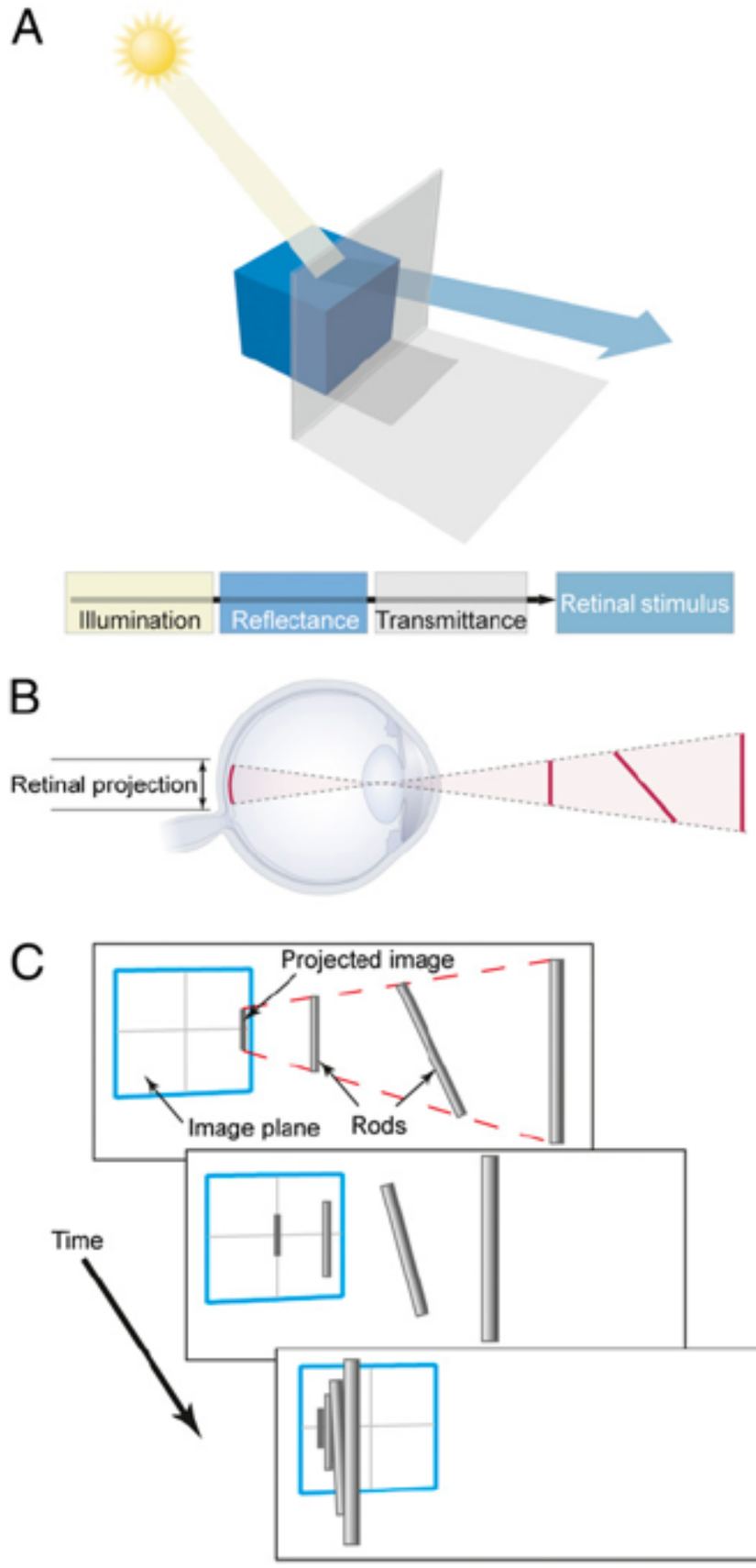


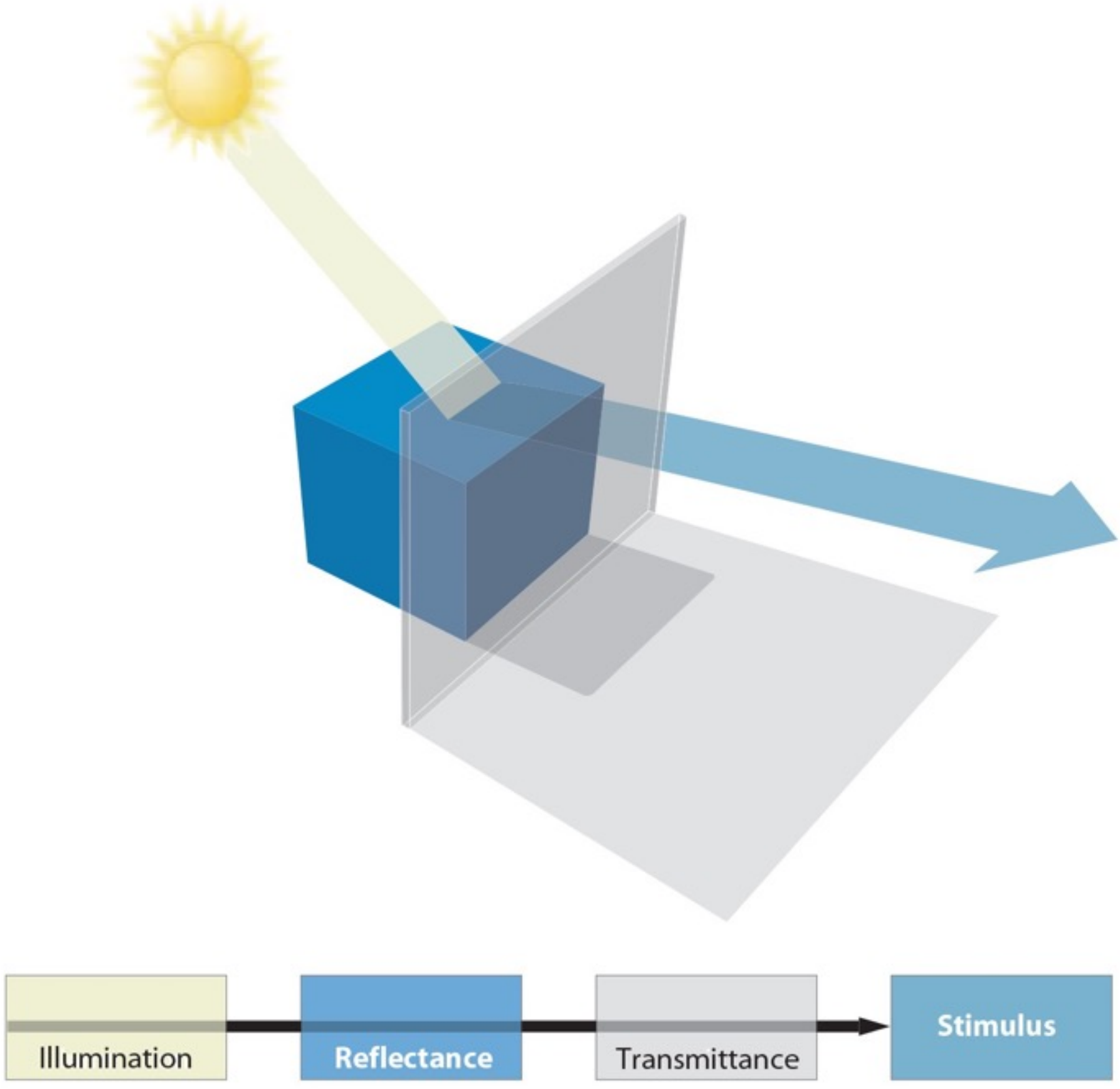


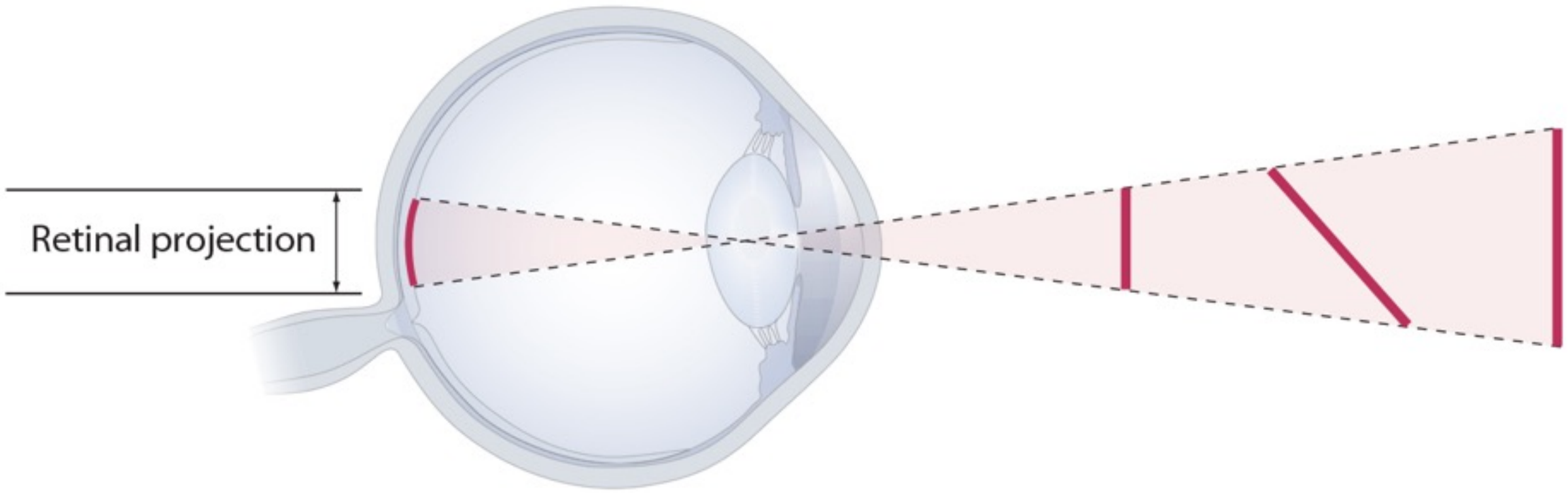
(B) Human eye

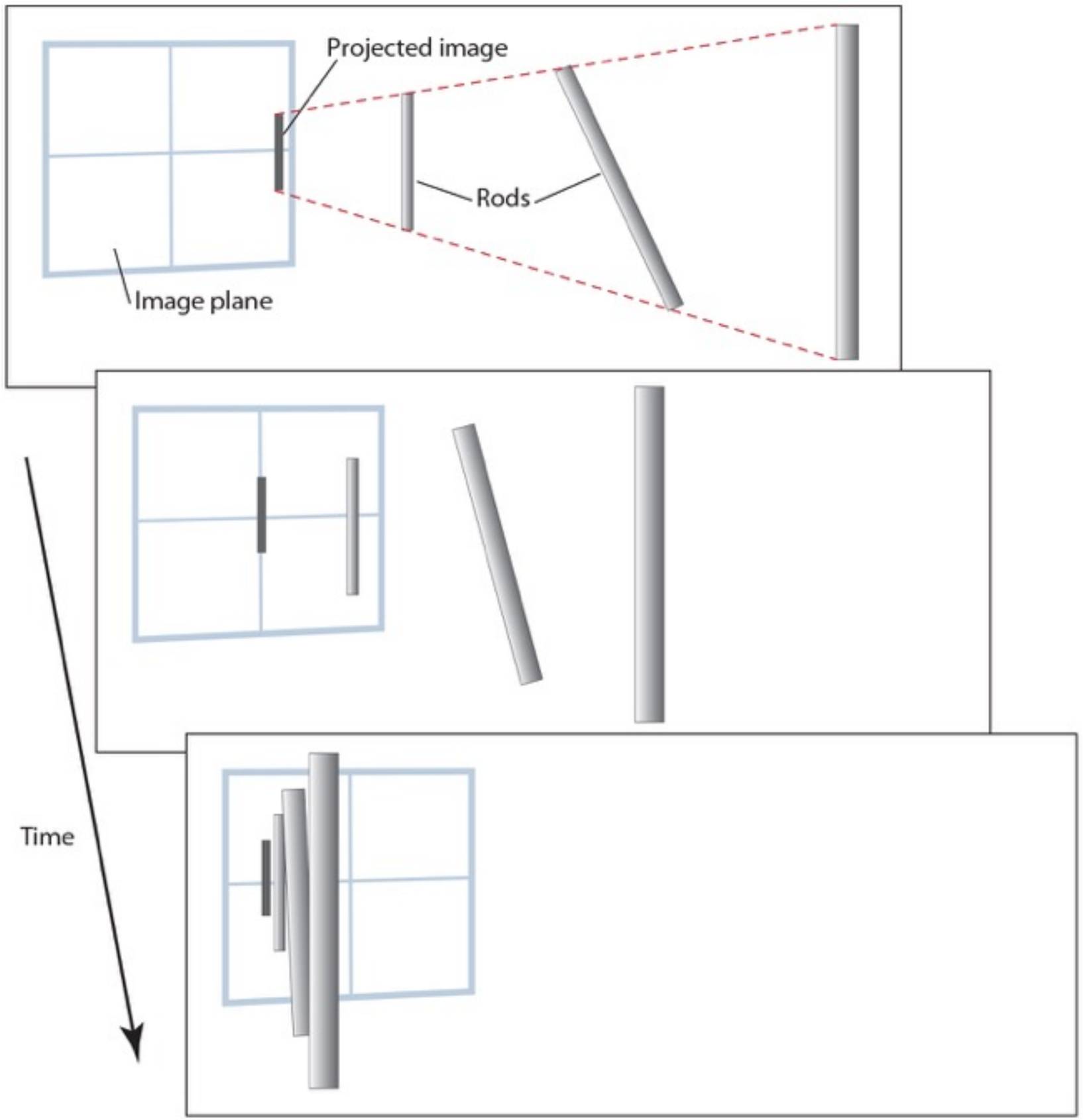


Remember the fundamental challenge for vision: the inverse problem makes the source of any image uncertain.









Evolving a way of dealing with this “inverse problem” has determined both how we see and what we see.

Summary of the Main Points

- We see a tiny fraction of the electromagnetic spectrum that has been useful to our species
- The chaotic flux of photons that reaches the eye must be ordered to make an image

Summary of the Main Points

- Because of the inverse problem the sources of visual images and their significance for behavior in the world is inherently uncertain
- This means that the real world is “unknowable” by any direct, logical operation on retinal images
- How then does vision succeed in a hidden physical world?

Credits

Dale Purves, R. Beau Lotto. *Why We See What We Do Redux*, Sinauer Associates Inc. 2011

- Electromagnetic spectrum, pg. 16
- Eye structure, pg. 208
- Camera/eye lense comparison, pg. 202
- Contributions to retinal stimulus, pg. 71
- Retinal projection, pg. 92
- Uncertain meaning of motion stimuli, pg. 159