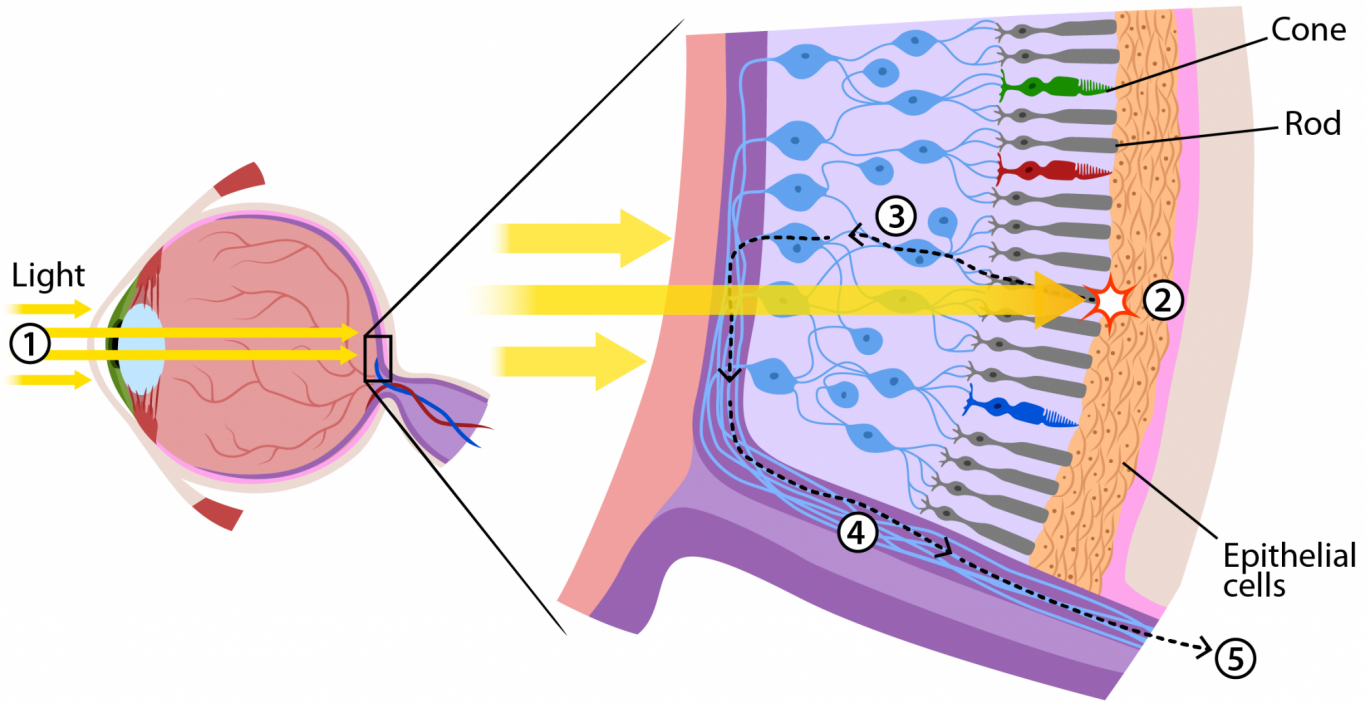
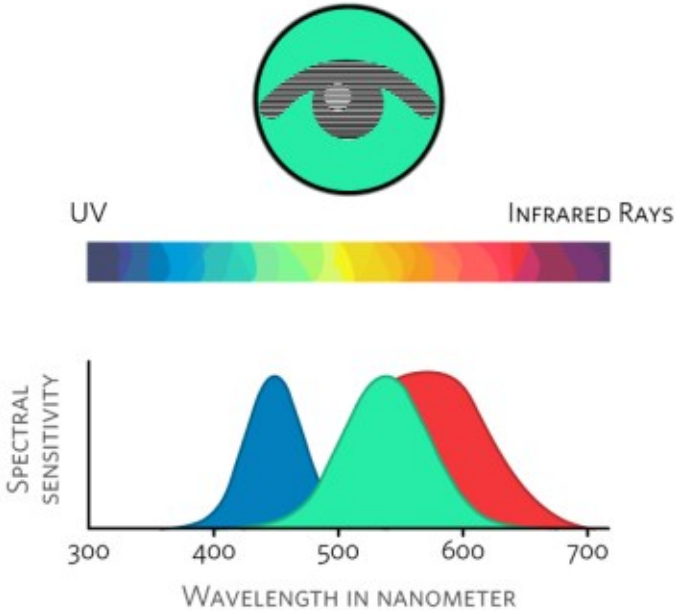
Percepción

Visión



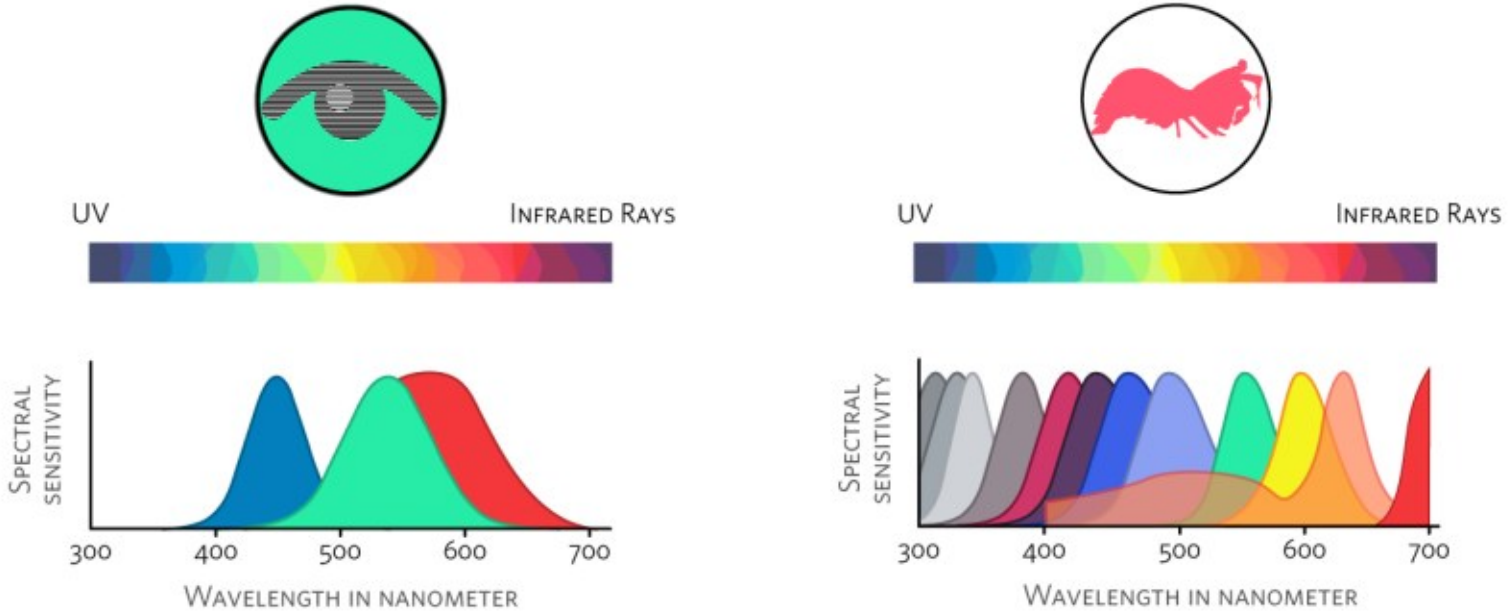
Visión


UV
Infrared Rays
Spectral sensitivity
300
400
500
600
700
Wavelength in nanometer

Camarón mantis

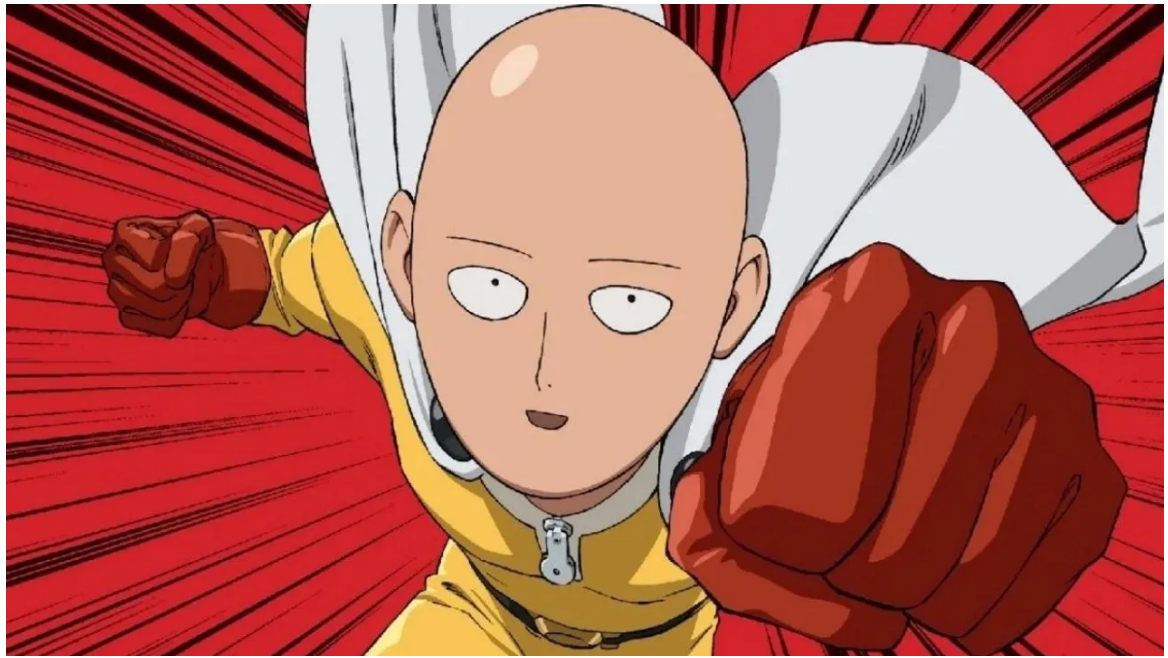
Camarón mantis

Camarón mantis



Camarón mantis

Camarón mantis



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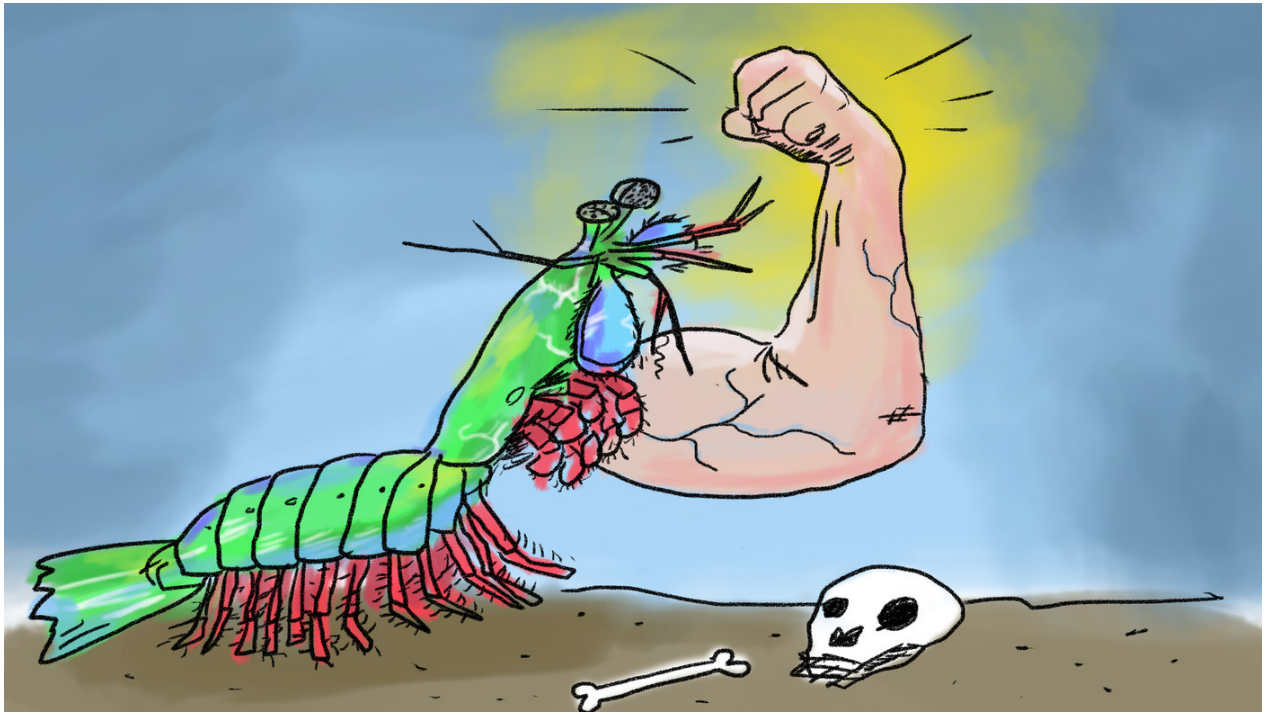

Camarón mantis

https://www.youtube.com/watch?v=aabCOzFzMxU

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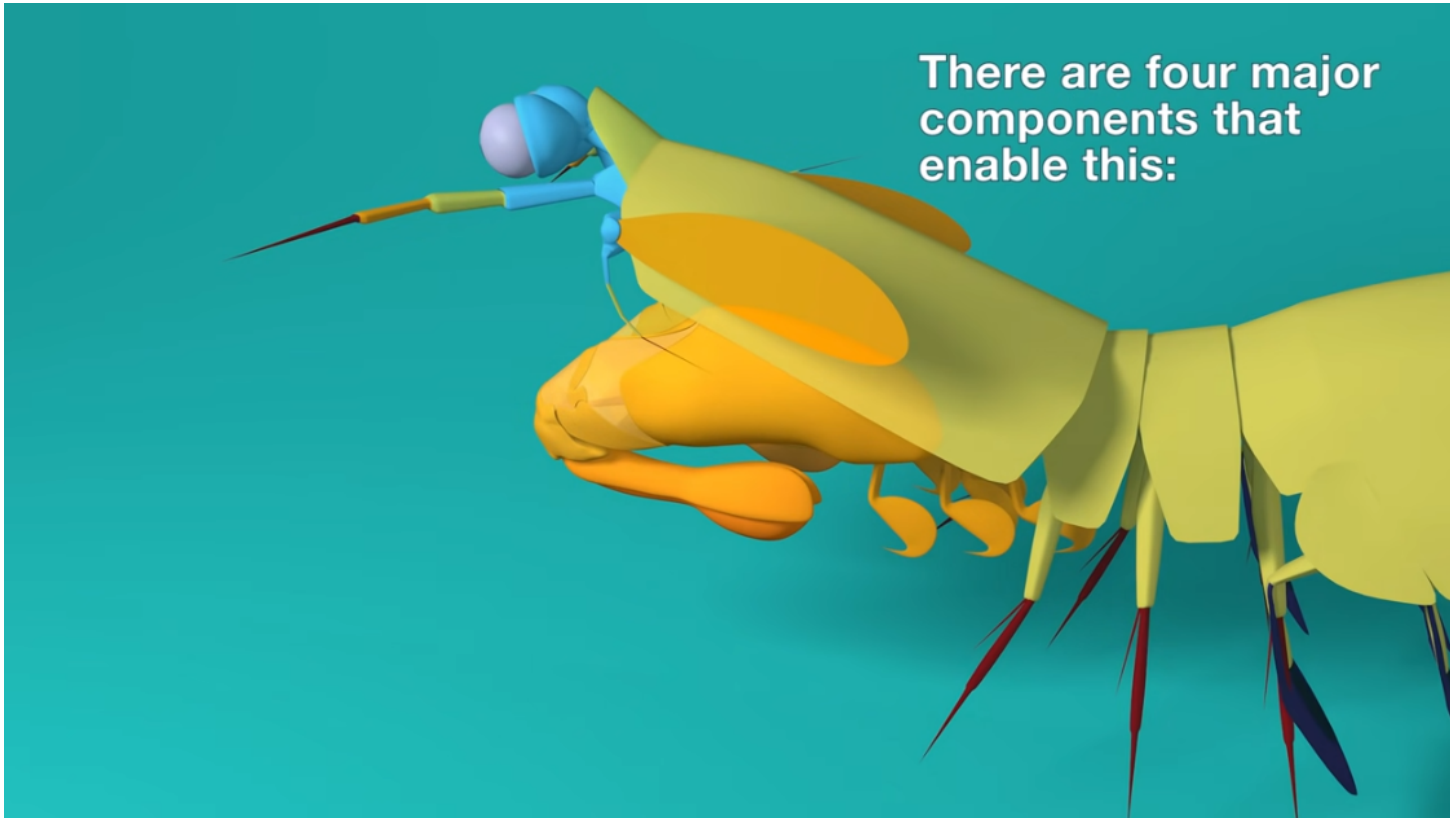

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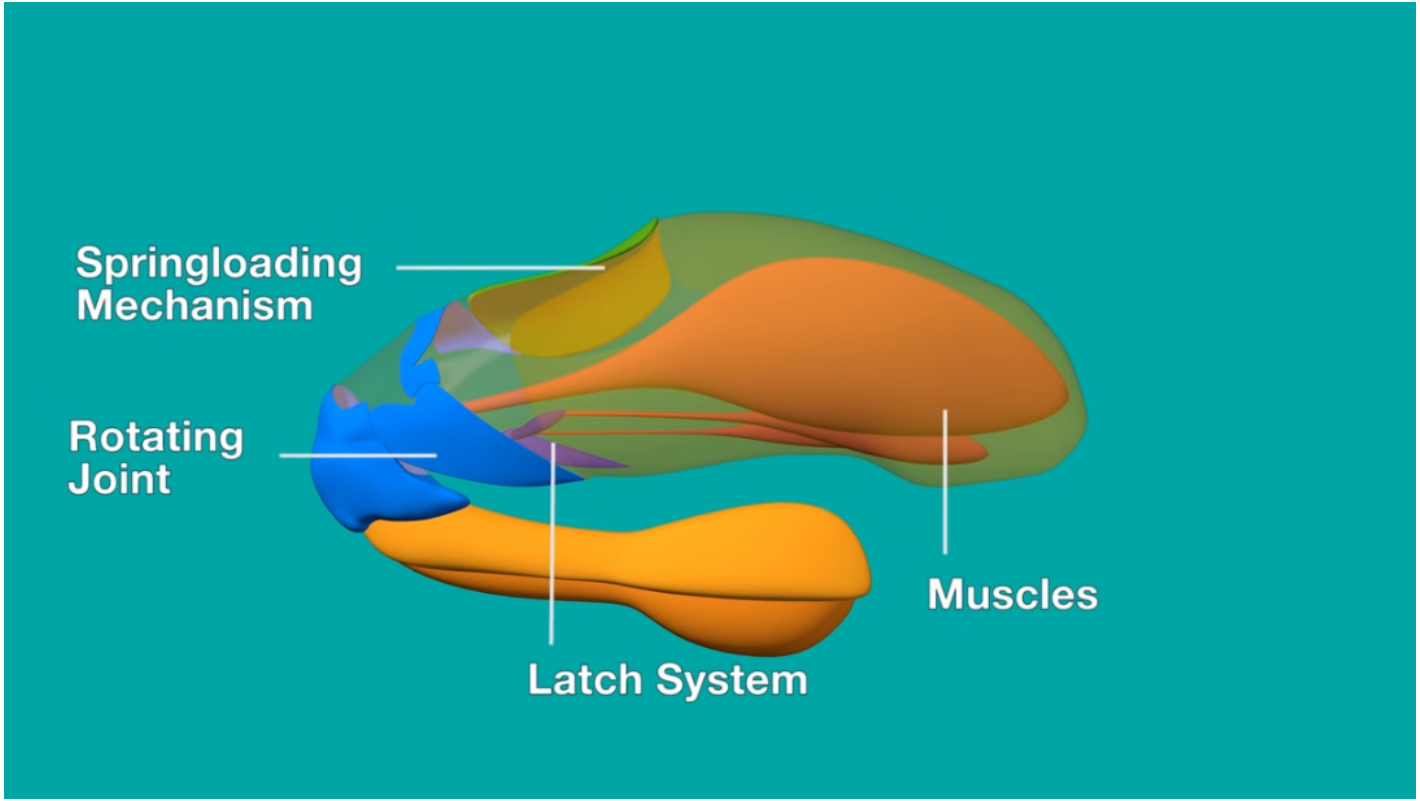

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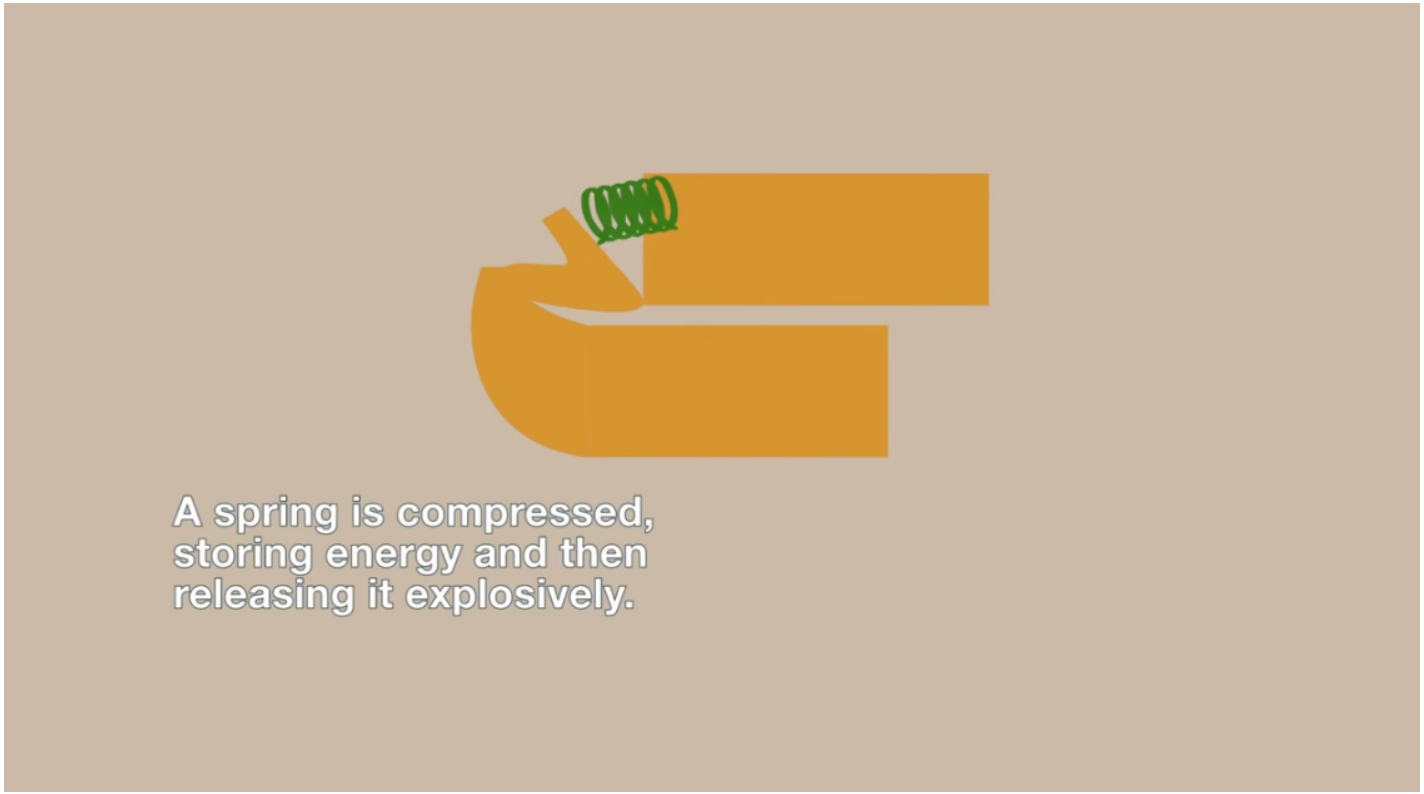

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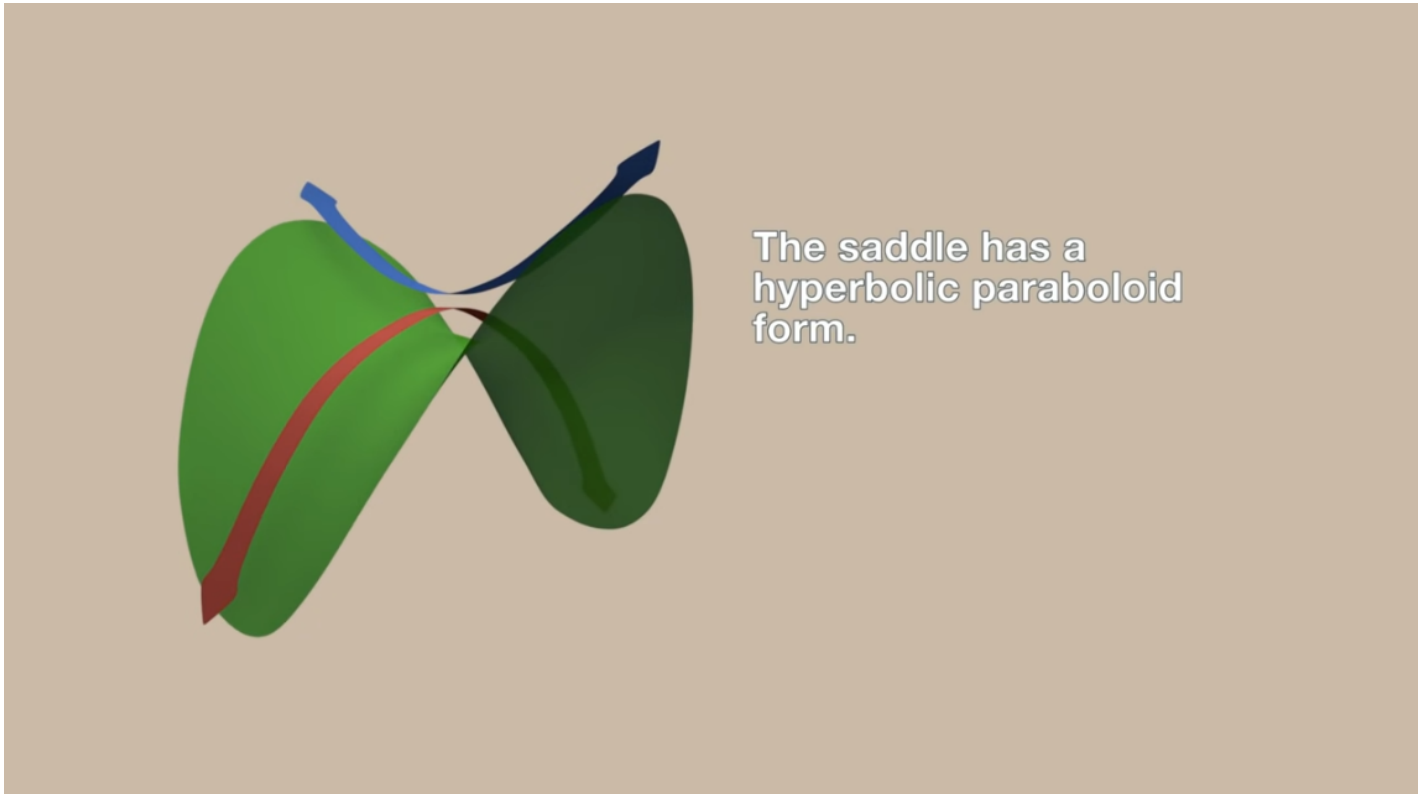
Camarón mantis



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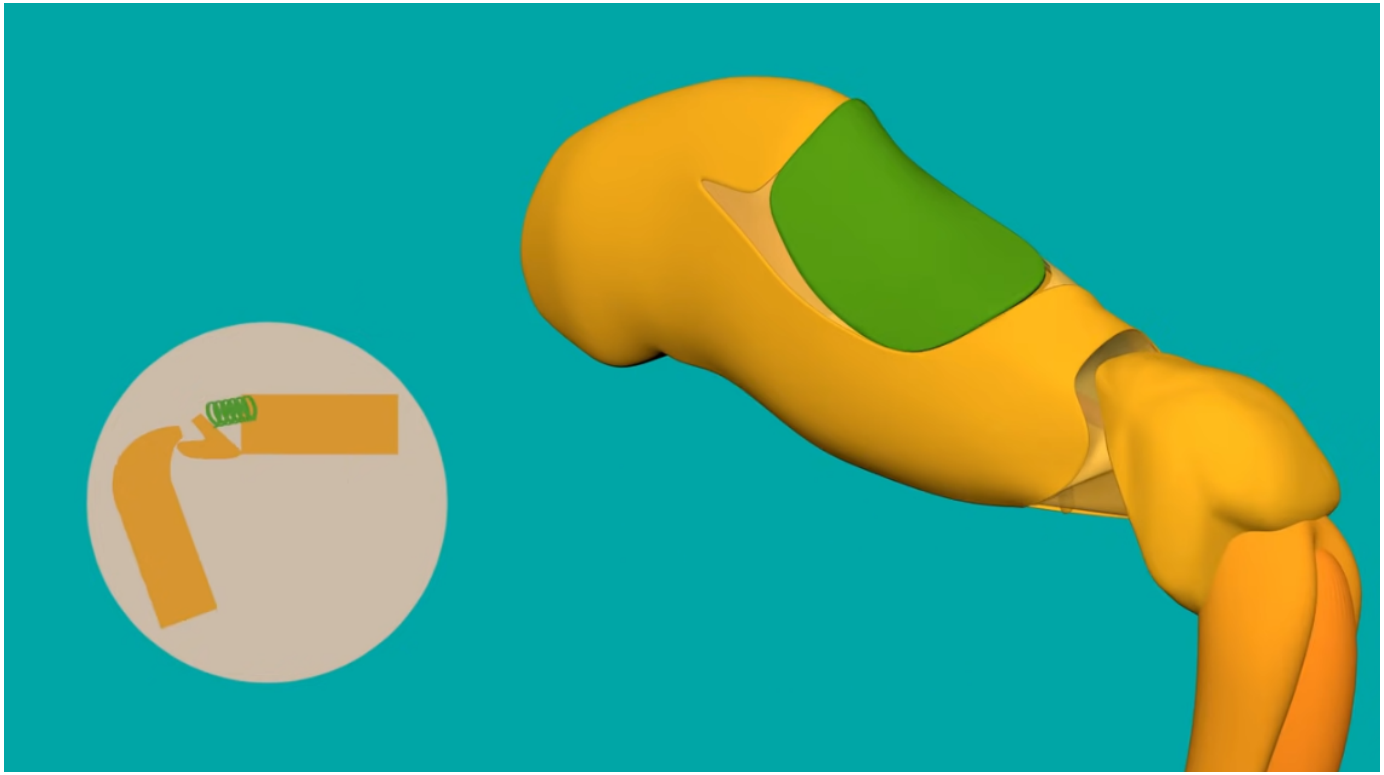

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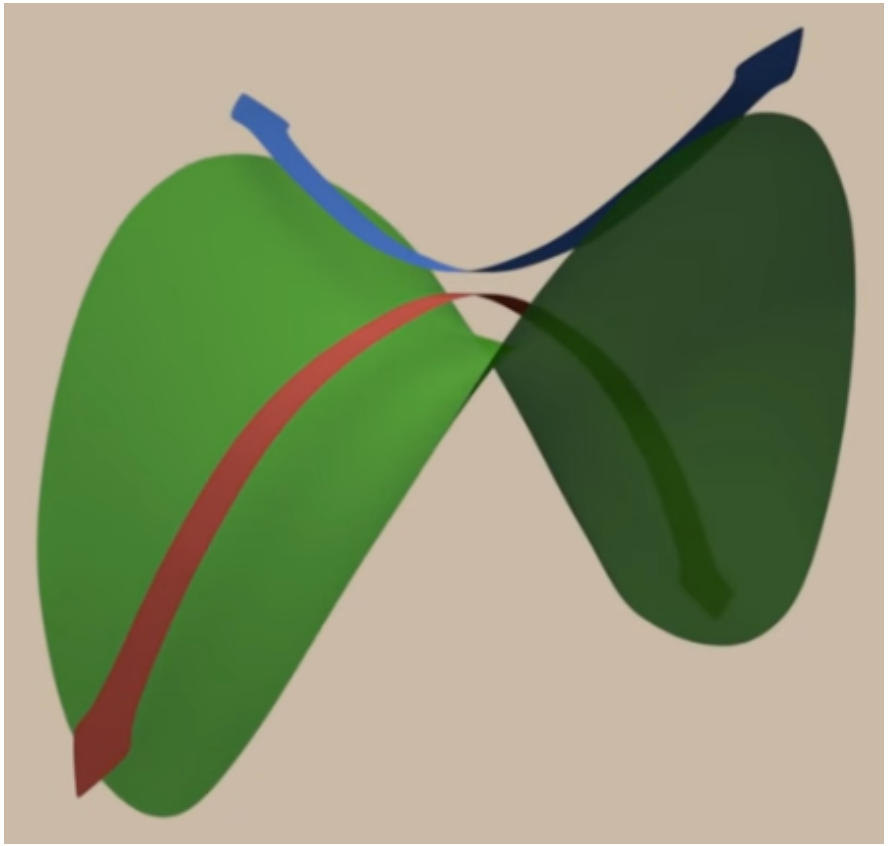
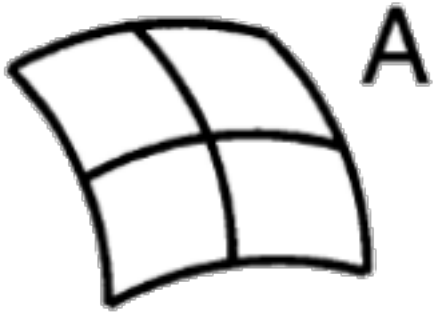
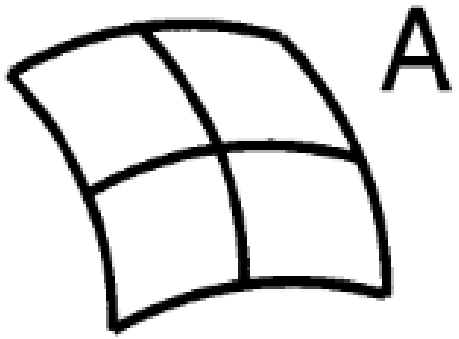



A


90 Pringles inside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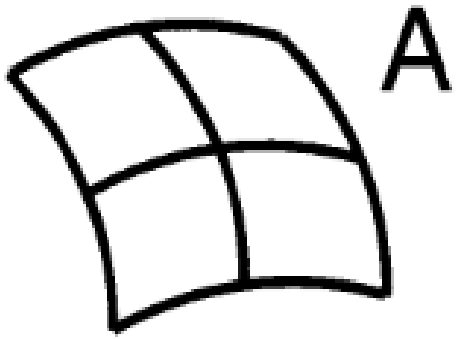
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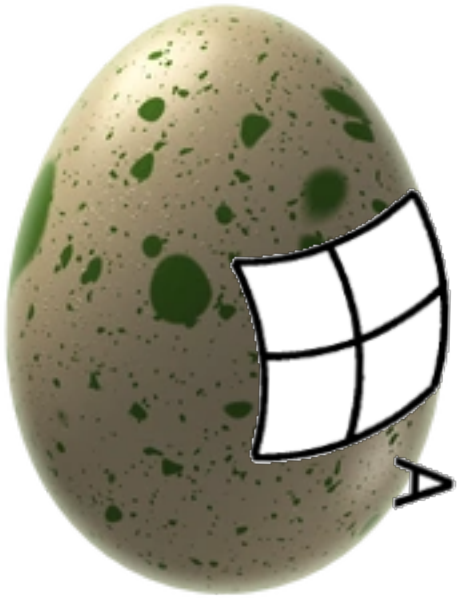
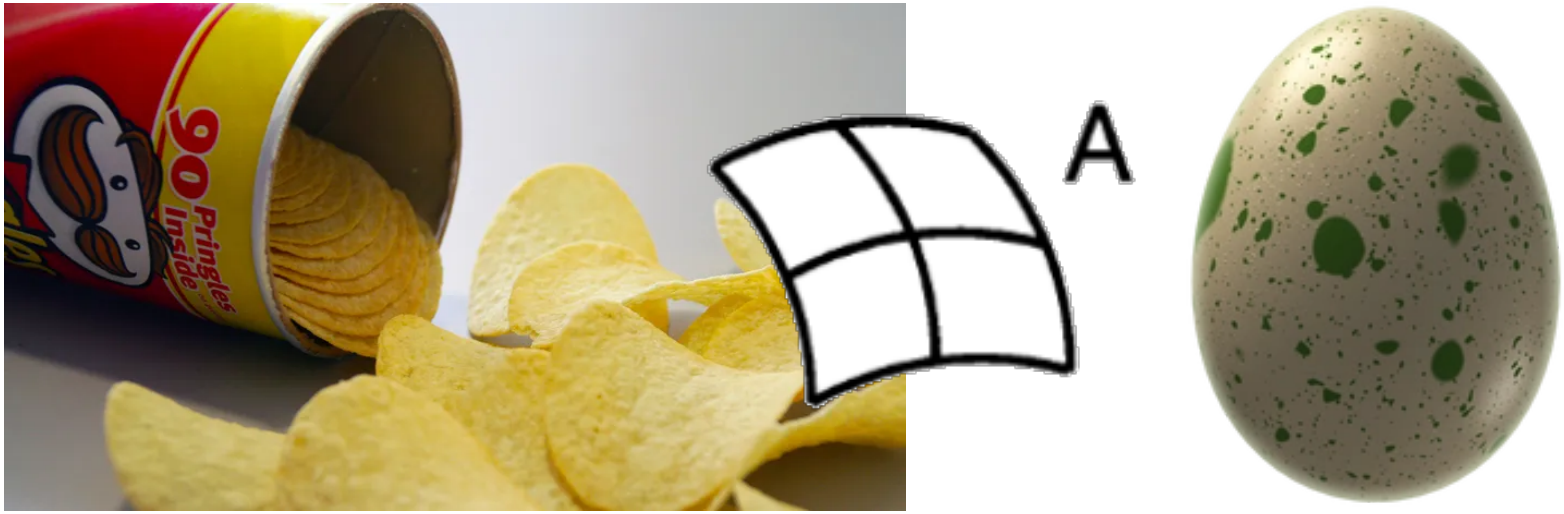
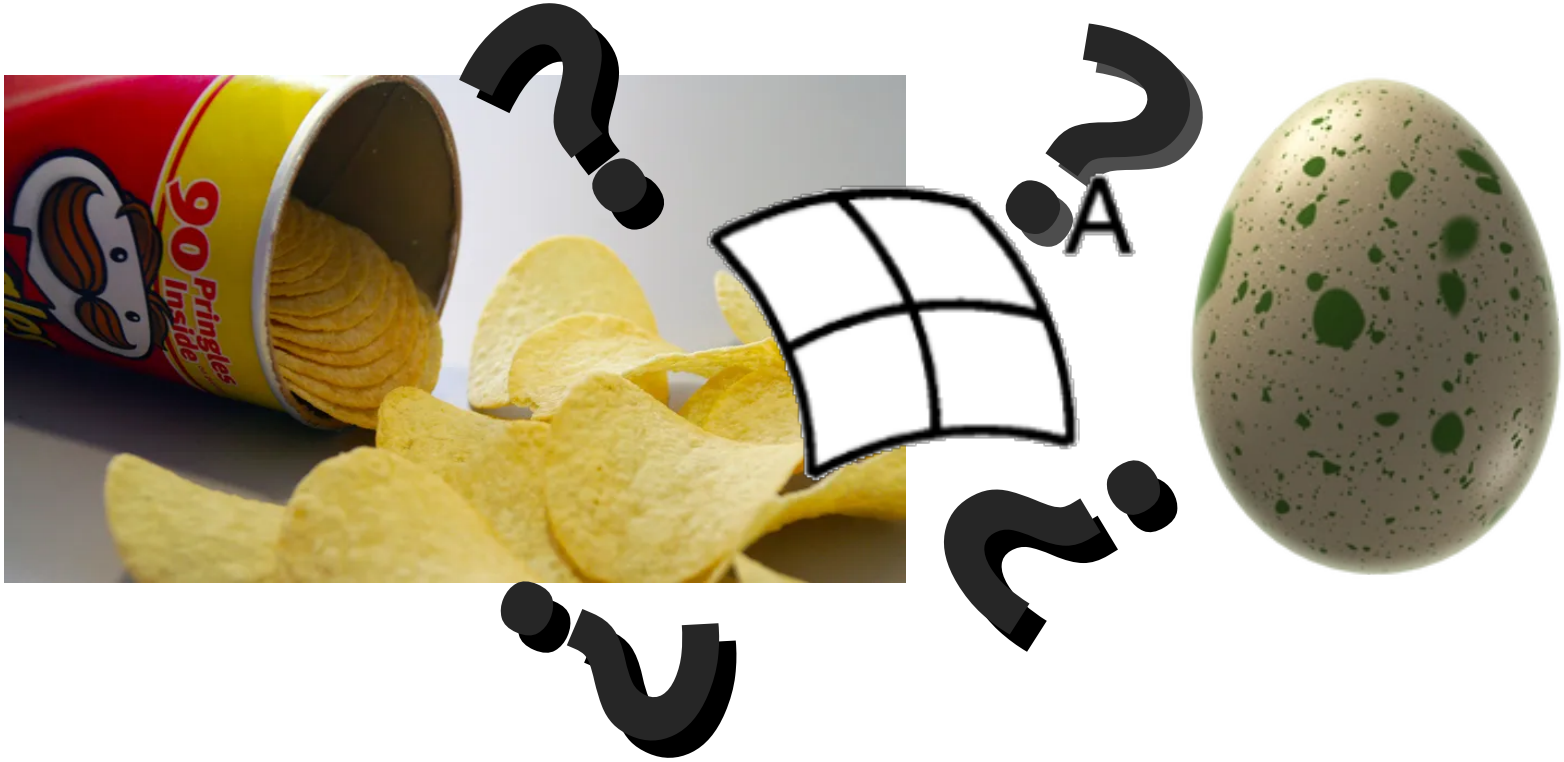



90 Pringles inside
A

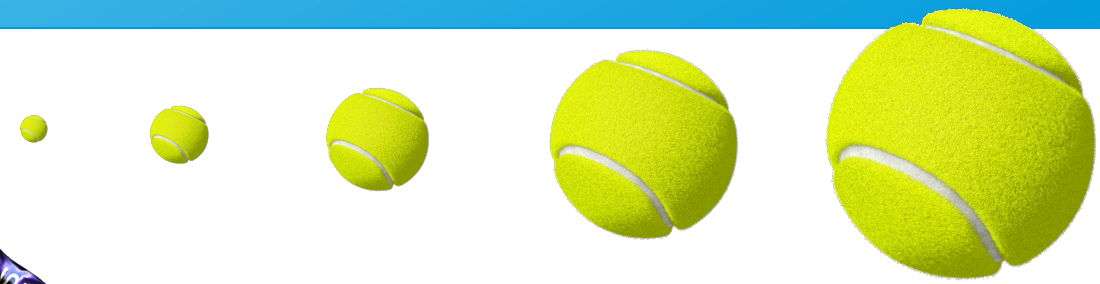

90 Pringles inside


BILLION


BILLION


BILLION


BILLION



¿Cómo decidimos cuál percepto es correcto?

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OBJECT PERCEPTION AS BAYESIAN INFERENCE

Daniel Kersten
Department of Psychology, University of Minnesota, Minneapolis, Minnesota 55455; email: kersten@umn.edu

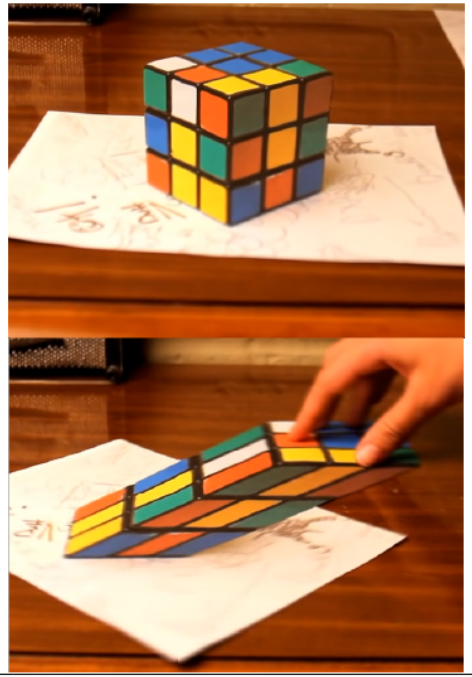
Pascal Mamassian
Department of Psychology, University of Glasgow, Glasgow G12 8QB, Scotland

Alan Yuille
Departments of Statistics and Psychology, University of California, Los Angeles, Los Angeles, California 90095-1554

Key Words shape, material, depth, vision, neural, psychophysics, fMRI, computer vision

■ **Abstract** We perceive the shapes and material properties of objects quickly and reliably despite the complexity and objective ambiguities of natural images. Typical images are highly complex because they consist of many objects embedded in background clutter. Moreover, the image features of an object are extremely variable and ambiguous owing to the effects of projection, occlusion, background clutter, and illumination. The

Inferencia Bayesiana



(a) Una fotografía elongada de un cubo puede verse como un cubo real desde una perspectiva particular.

(b) El mismo edificio visto en condiciones y perspectivas distintas produce imágenes distintas en la retina.

Inferencia Bayesiana

“Helmholtz proposed that the visual system resolves ambiguity through built-in knowledge of the scene and how retinal images are formed and uses this knowledge to automatically and unconsciously infer the properties of objects.”

Inferencia Bayesiana

Estima la probabilidad de una cierta hipótesis con base en la evidencia actual y el conocimiento previo.

Inferencia Bayesiana

$$P(H|E)$$

$$P(H|E) \quad = \quad Probabilidad\ de\ la\ hipótesis\ dado\ un\ evento$$

Inferencia Bayesiana

$$P(H|E) = \frac{P(E|H)}{}$$

$$\begin{aligned} P(H|E) &= Probabilidad\ de\ la\ hipótesis\ dado\ un\ evento \\ P(E|H) &= Probabilidad\ de\ un\ evento\ dada\ la\ hipótesis \end{aligned}$$

Inferencia Bayesiana

$$P(H|E) = \frac{P(E|H) \cdot P(H)}{}$$

$$\begin{aligned} P(H|E) &= Probabilidad\ de\ la\ hipótesis\ dado\ un\ evento \\ P(E|H) &= Probabilidad\ de\ un\ evento\ dada\ la\ hipótesis \\ P(H) &= Probabilidad\ a\ priori\ de\ la\ hipótesis \end{aligned}$$

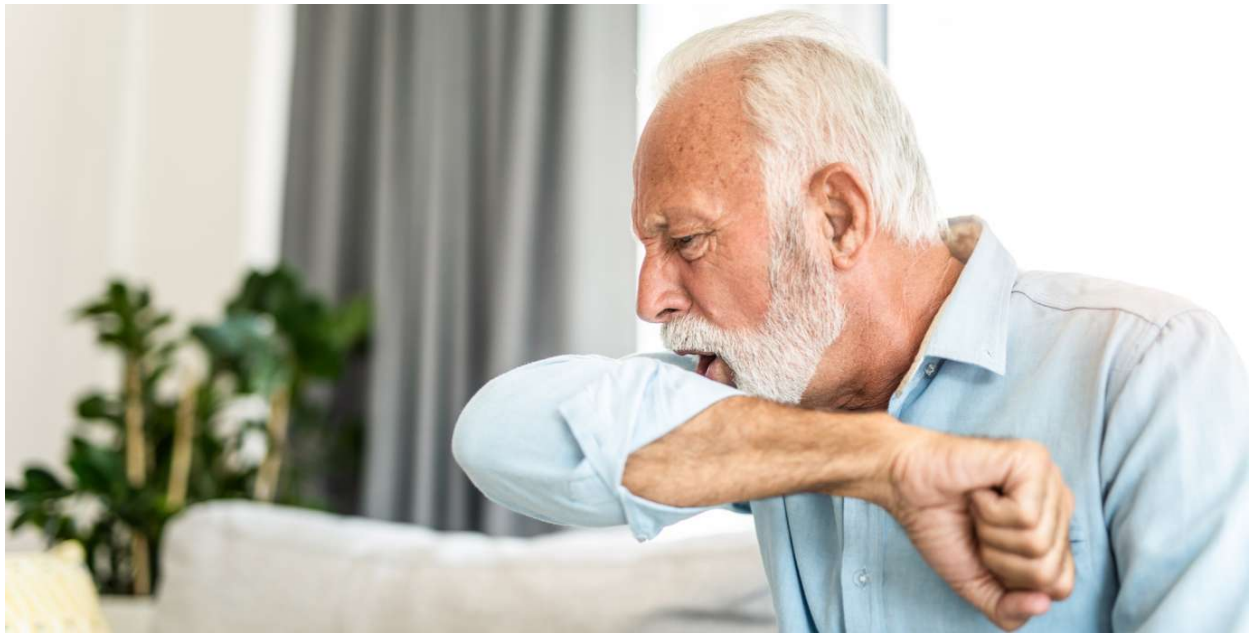
Inferencia Bayesiana

$$P(H|E) = \frac{P(E|H) \cdot P(H)}{P(E)}$$

$$\begin{aligned}
P(H|E) &= Probabilidad\ de\ la\ hipótesis\ dado\ un\ evento \\
P(E|H) &= Probabilidad\ de\ un\ evento\ dada\ la\ hipótesis \\
P(H) &= Probabilidad\ a\ priori\ de\ la\ hipótesis \\
P(E) &= Probabilidad\ total\ del\ evento
\end{aligned}$$

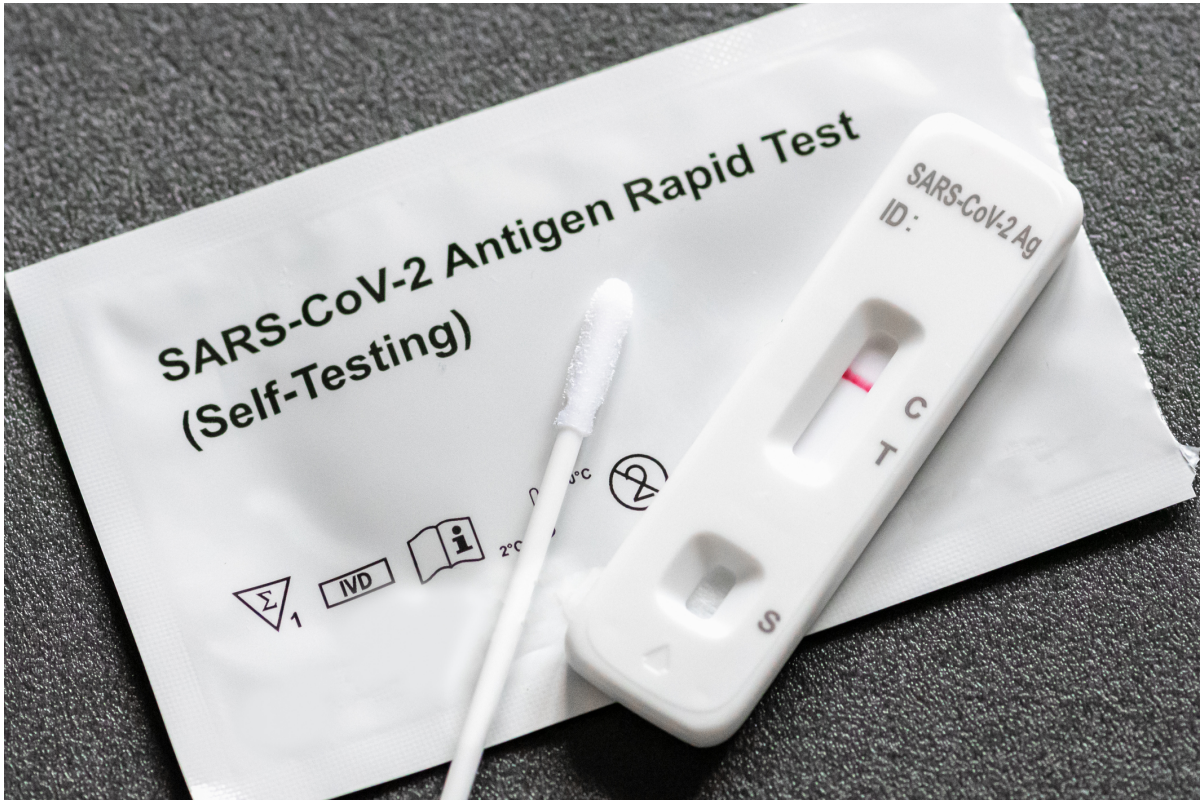

EJEMPLO

Inferencia Bayesiana




Hola, Dios, soy yo de nuevo

Inferencia Bayesiana



Precisión = 99%
Incidencia de 1 en 1000

Inferencia Bayesiana

Inferencia Bayesiana

$$P(H|E) = \frac{P(E|H) \cdot P(H)}{P(E)}$$

$$\begin{aligned}
P(H|E) &= Probabilidad\ de\ la\ hipótesis\ dado\ un\ evento \\
P(E|H) &= Probabilidad\ de\ un\ evento\ dada\ la\ hipótesis \\
P(H) &= Probabilidad\ a\ priori\ de\ la\ hipótesis \\
P(E) &= Probabilidad\ total\ del\ evento
\end{aligned}$$

Inferencia Bayesiana

$$P(\text{enfermo}|\text{prueba}^+) = \frac{P(\text{prueba}^+|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^+)}_{[P(\text{enfermo}) \times P(\text{prueba}^+|\text{enfermo})] + [P(\text{enfermo}^-) \times P(\text{prueba}^+|\text{enfermo}^-)]}}$$

Inferencia Bayesiana

$$P(\text{enfermo}|\text{prueba}^+) = \frac{P(\text{prueba}^+|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^+)}_{[P(\text{enfermo}) \times P(\text{prueba}^+|\text{enfermo})] + [P(\text{enfermo}^-) \times P(\text{prueba}^+|\text{enfermo}^-)]}}$$

$$P(\text{enfermo}|\text{prueba}^+) = \frac{.99 \times .001}{.001 \times .99 + .999 \times .01}$$

Inferencia Bayesiana

$$P(\text{enfermo}|\text{prueba}^+) = \frac{P(\text{prueba}^+|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^+)}_{[P(\text{enfermo}) \times P(\text{prueba}^+|\text{enfermo})] + [P(\text{enfermo}^-) \times P(\text{prueba}^+|\text{enfermo}^-)]}}$$

$$P(\text{enfermo}|\text{prueba}^+) = \frac{.99 \times .001}{.001 \times .99 + .999 \times .01}$$

$$P(\text{enfermo}|\text{prueba}^+) = \frac{.00099}{.00099 + .00999}$$

Inferencia Bayesiana

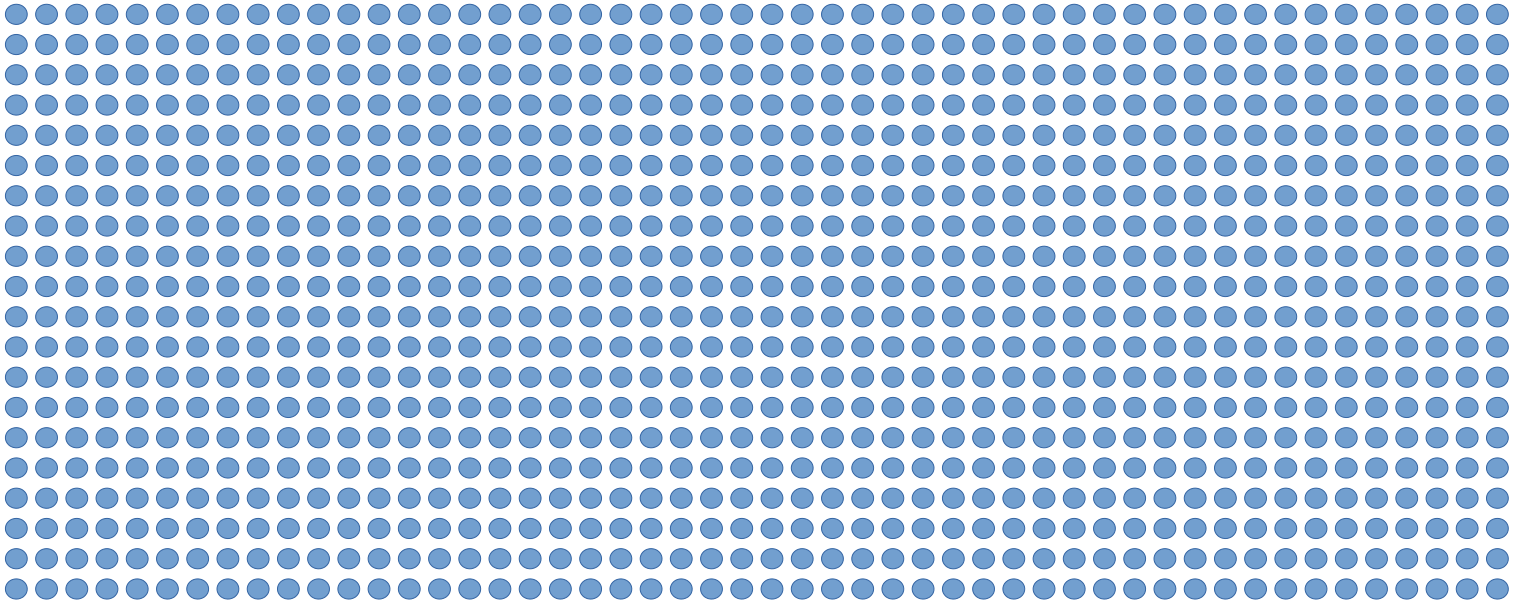
$$P(\text{enfermo}|\text{prueba}^+) = \frac{P(\text{prueba}^+|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^+)}_{[P(\text{enfermo}) \times P(\text{prueba}^+|\text{enfermo})] + [P(\text{enfermo}^-) \times P(\text{prueba}^+|\text{enfermo}^-)]}}$$

$$P(\text{enfermo}|\text{prueba}^+) = \frac{.99 \times .001}{.001 \times .99 + .999 \times .01}$$

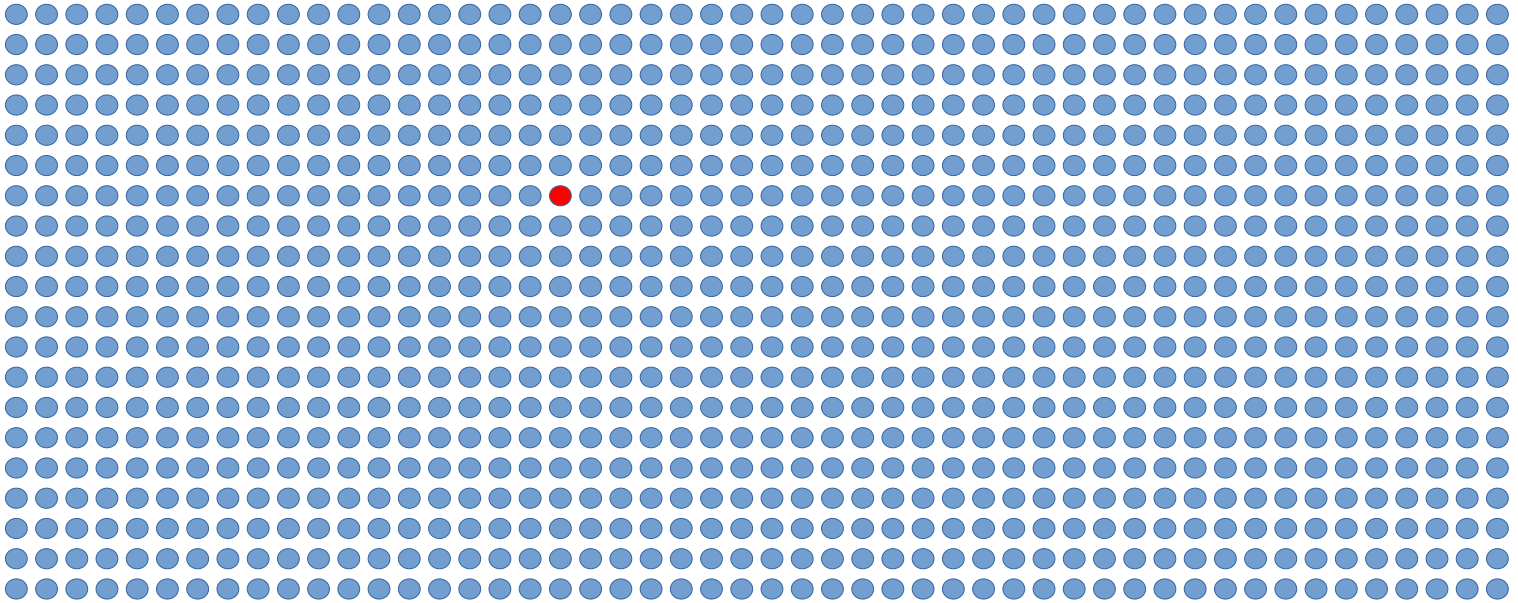
$$P(\text{enfermo}|\text{prueba}^+) = \frac{.00099}{.00099 + .00999}$$

$$P(\text{enfermo}|\text{prueba}^+) = .09$$

Inferencia Bayesiana

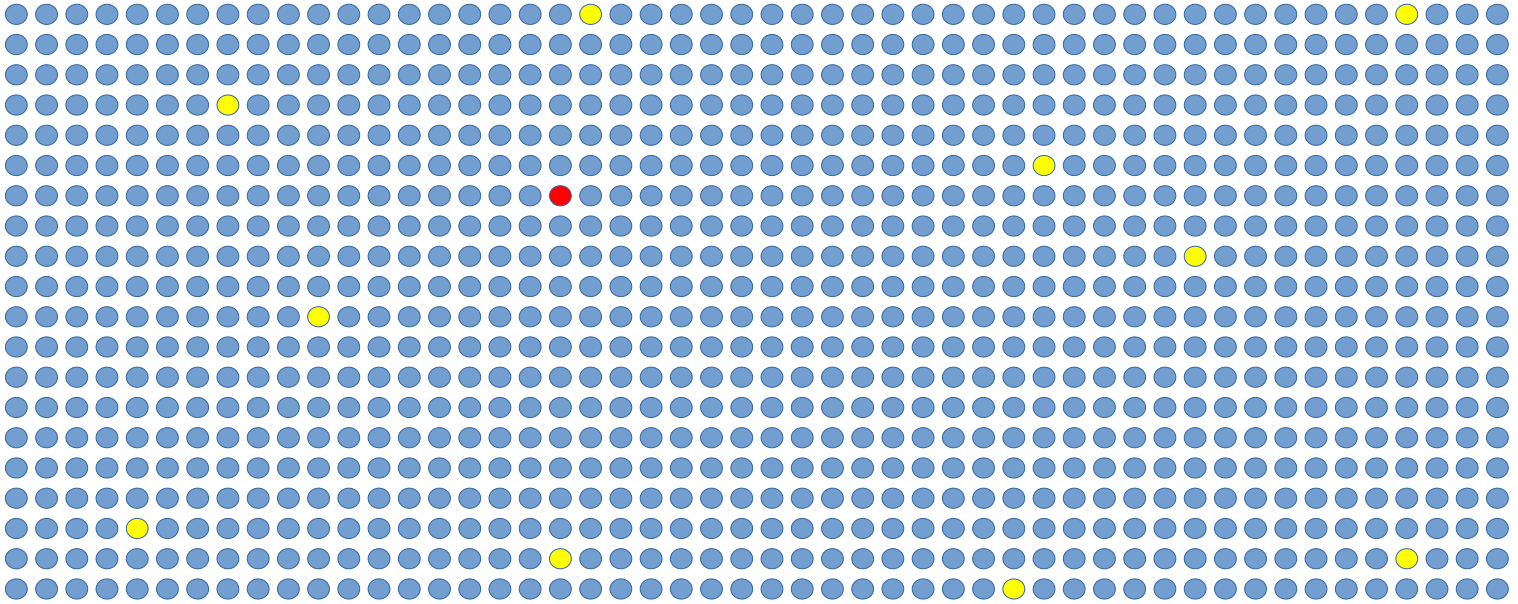


Inferencia Bayesiana



$$p(\text{enfermo}) = \frac{1}{1000} = .001$$

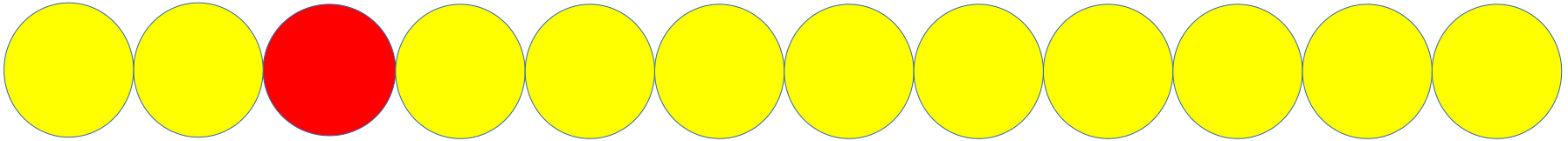
Inferencia Bayesiana



$$p(\text{enfermo}) = \frac{1}{1000} = .001$$

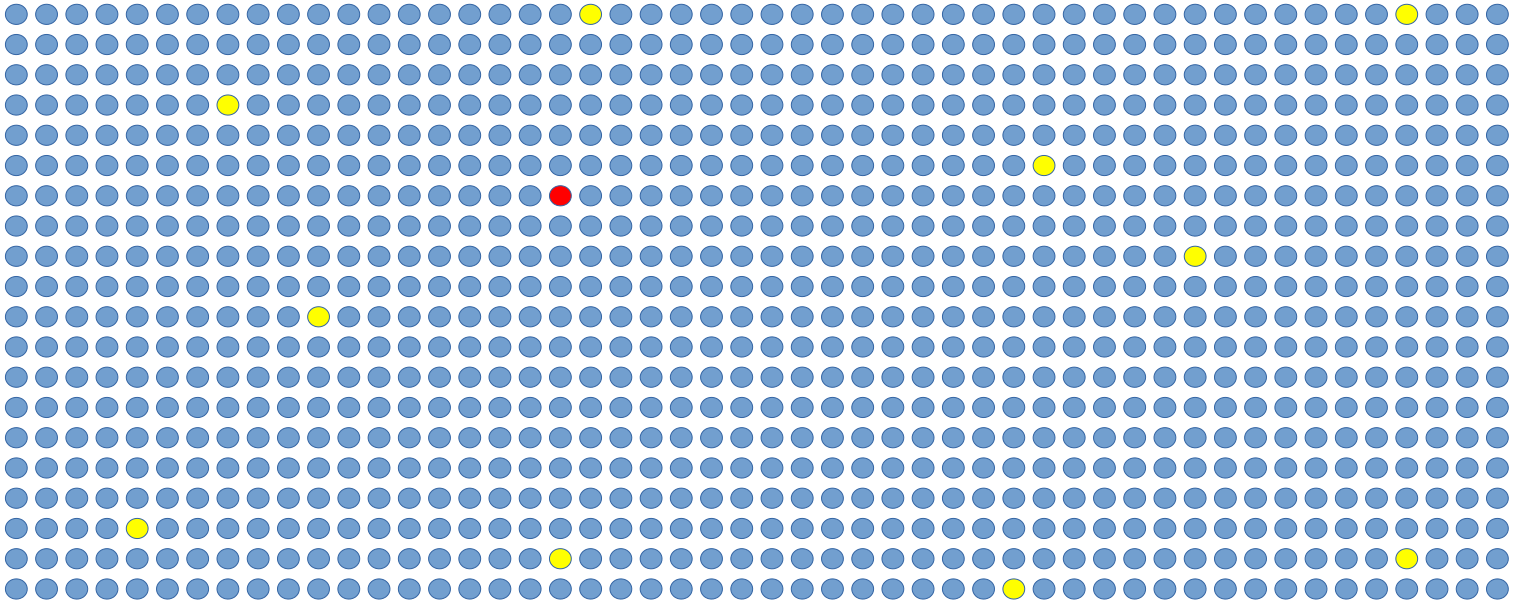
Precisión $= .99$

Inferencia Bayesiana



$$p(\text{enfermo}) = \frac{1}{11} = 0.09$$

Inferencia Bayesiana



$$P(\text{enfermo}|\text{prueba}^{+}) = .09$$

Inferencia Bayesiana

$$P(\text{enfermo}|\text{prueba}^{+}) = \frac{P(\text{prueba}^{+}|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^{+})}_{[P(\text{enfermo}) \times P(\text{prueba}^{+}|\text{enfermo})] + [P(\text{enfermo}^{-}) \times P(\text{prueba}^{+}|\text{enfermo}^{-})]}}$$

$$P(\text{enfermo}|\text{prueba}^{++}) = \frac{.99 \times \cancel{.001}}{\cancel{.001} \times .99 + \cancel{.999} \times .01}$$

Inferencia Bayesiana

$$P(\text{enfermo}|\text{prueba}^{+}) = \frac{P(\text{prueba}^{+}|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^{+})}_{[P(\text{enfermo}) \times P(\text{prueba}^{+}|\text{enfermo})] + [P(\text{enfermo}^{-}) \times P(\text{prueba}^{+}|\text{enfermo}^{-})]}}$$

$$P(\text{enfermo}|\text{prueba}^{++}) = \frac{.99 \times \cancel{.001}}{\cancel{.001} \times .99 + \cancel{.999} \times .01}$$

$$P(\text{enfermo}|\text{prueba}^{++}) = \frac{.99 \times .09}{.09 \times .99 + .91 \times .01}$$

Inferencia Bayesiana

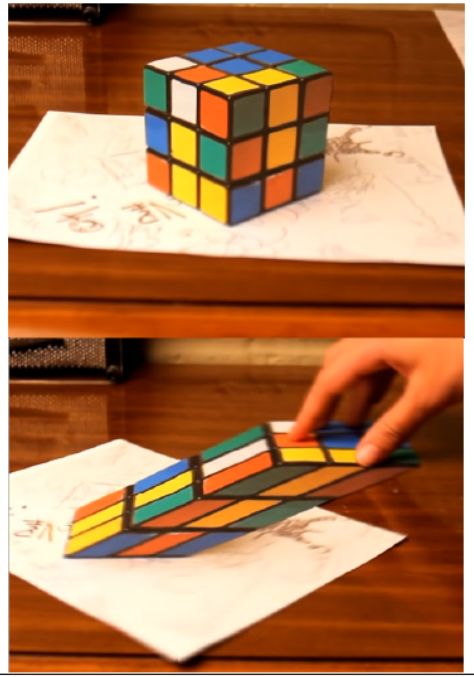
$$P(\text{enfermo}|\text{prueba}^{+}) = \frac{P(\text{prueba}^{+}|\text{enfermo}) \cdot P(\text{enfermo})}{\underbrace{P(\text{prueba}^{+})}_{[P(\text{enfermo}) \times P(\text{prueba}^{+}|\text{enfermo})] + [P(\text{enfermo}^{-}) \times P(\text{prueba}^{+}|\text{enfermo}^{-})]}}$$

$$P(\text{enfermo}|\text{prueba}^{++}) = \frac{.99 \times \cancel{.001}}{\cancel{.001} \times .99 + \cancel{.999} \times .01}$$

$$P(\text{enfermo}|\text{prueba}^{++}) = \frac{.99 \times .09}{.09 \times .99 + .91 \times .01}$$

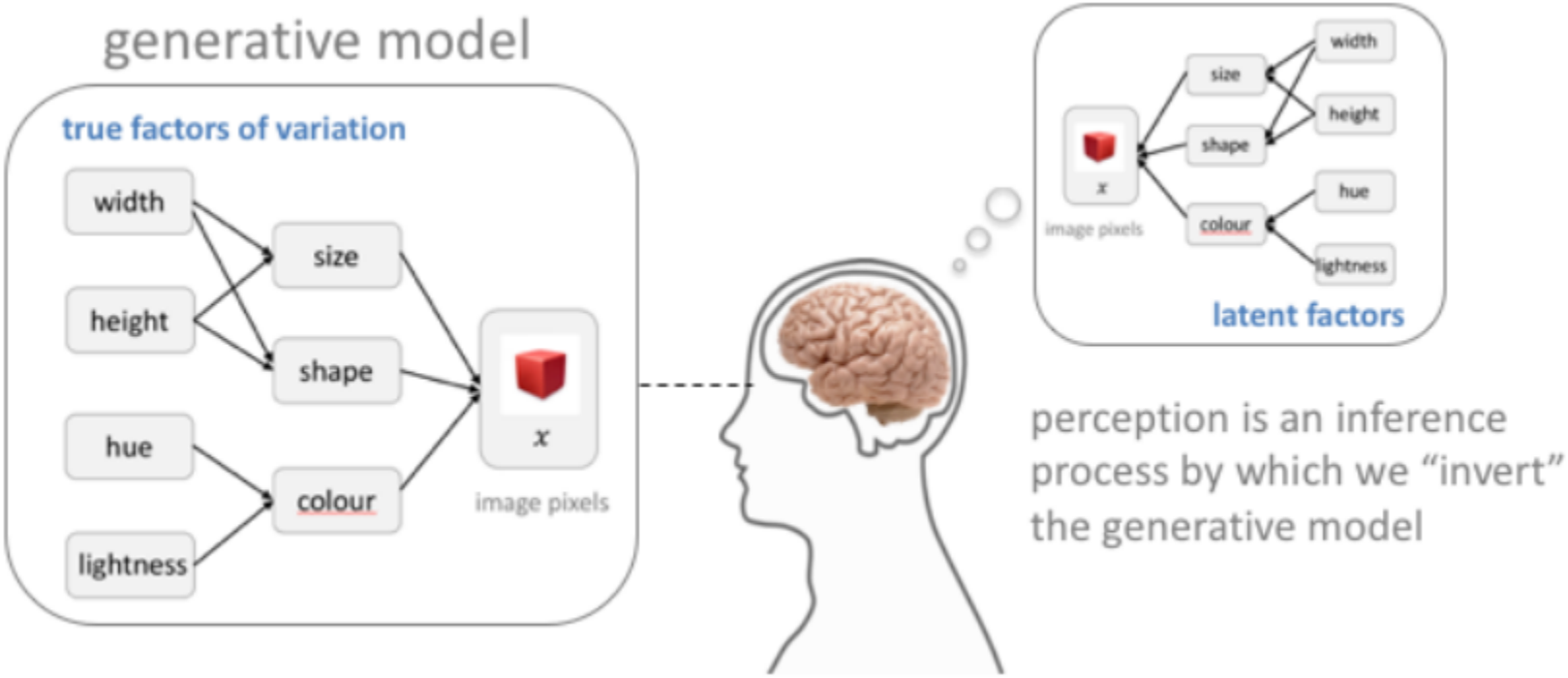
$$P(\text{enfermo}|\text{prueba}^{++}) = 0.907$$

Percepción visual

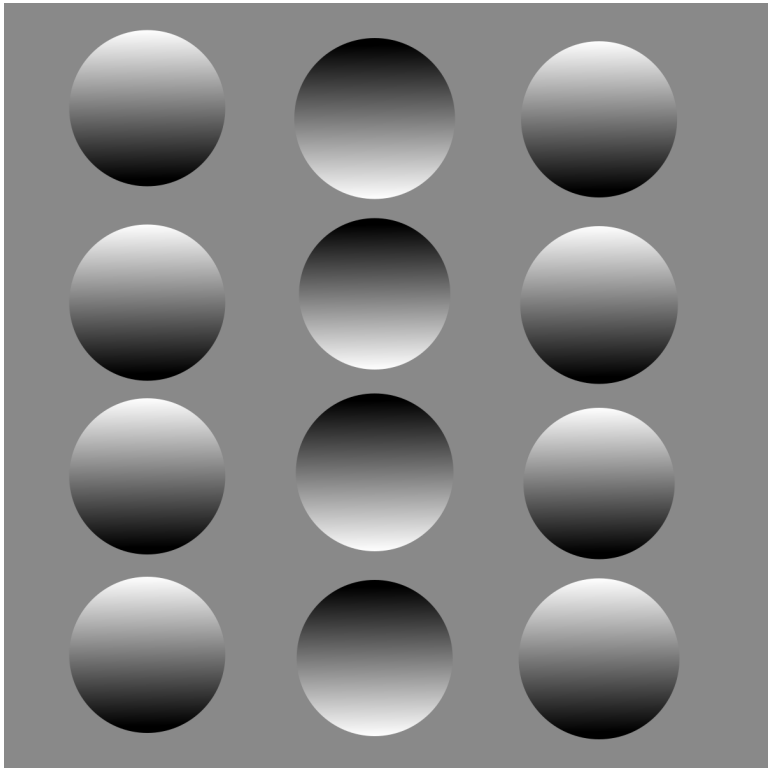


(a) Una fotografía elongada de un cubo puede verse como un cubo real desde una perspectiva particular.

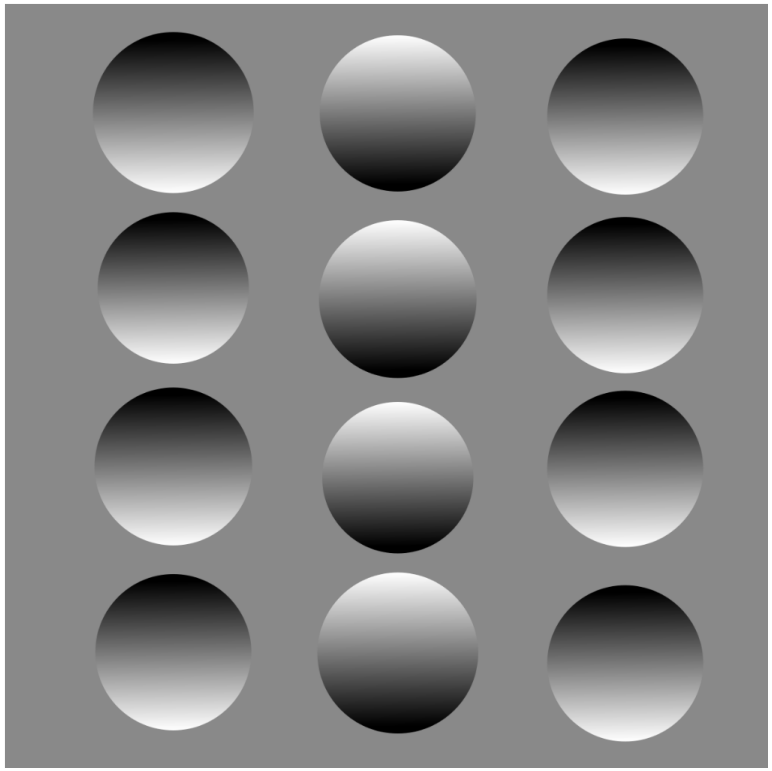
Percepción visual



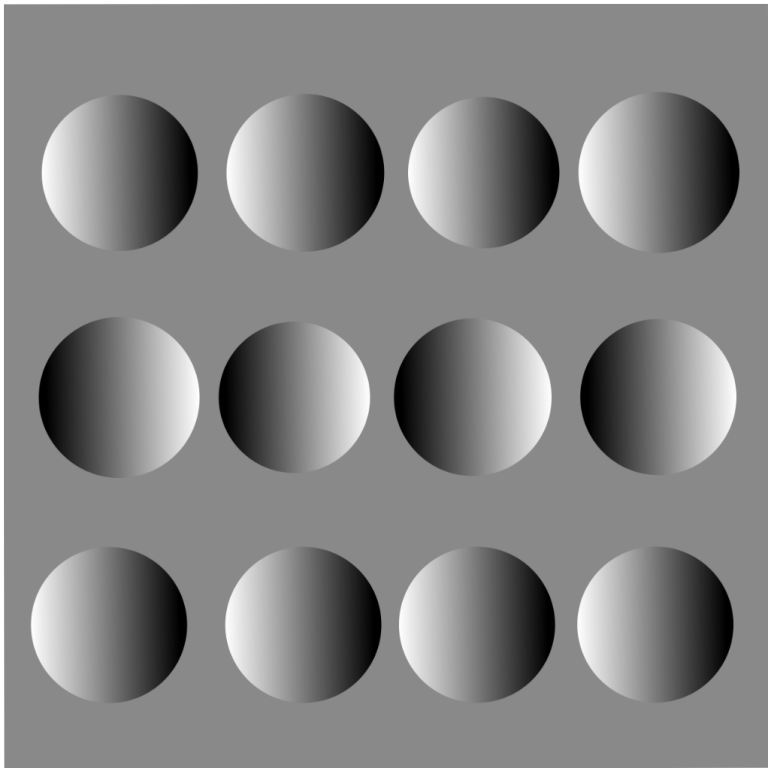
Percepción visual



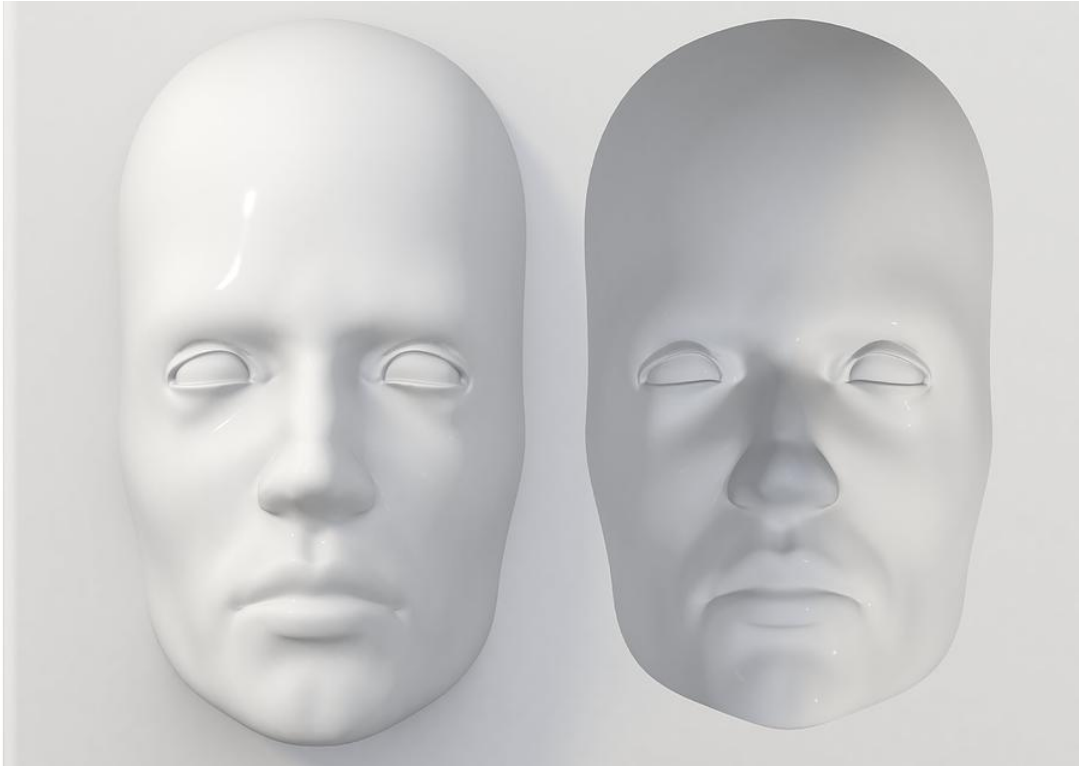
Percepción visual



Percepción visual



Percepción visual



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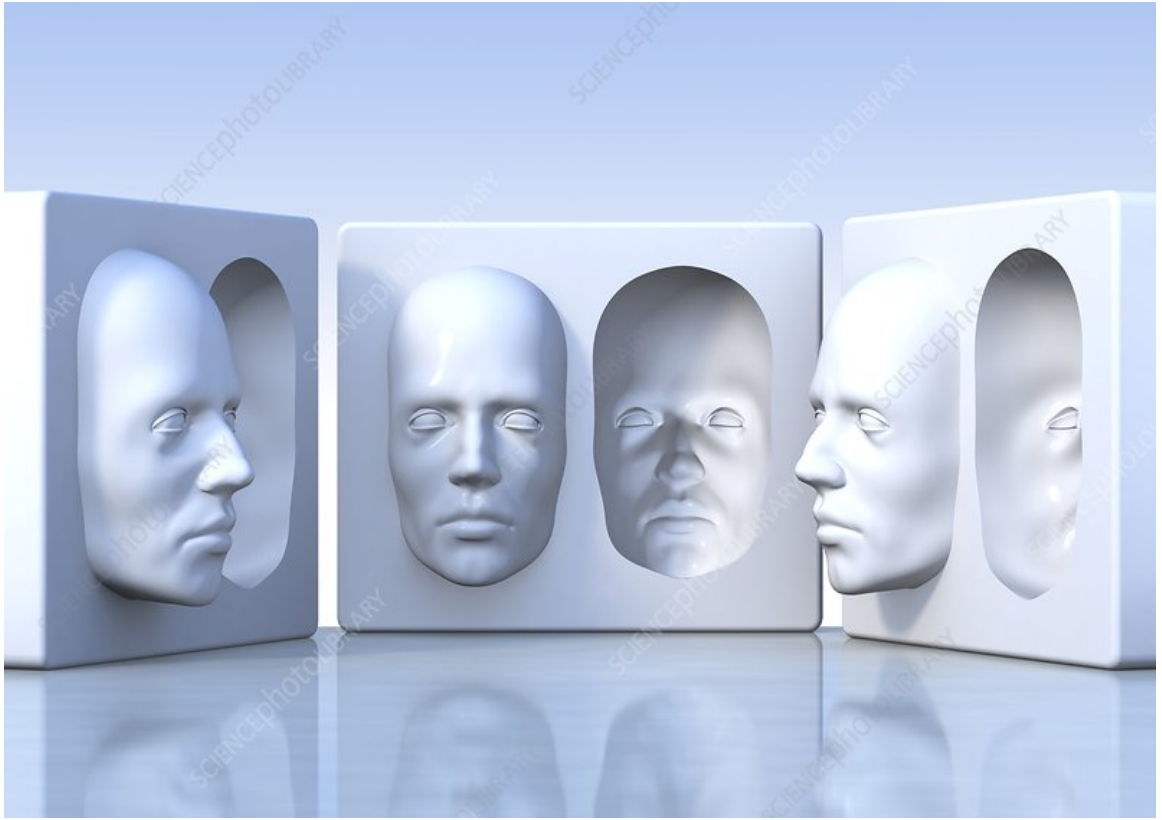
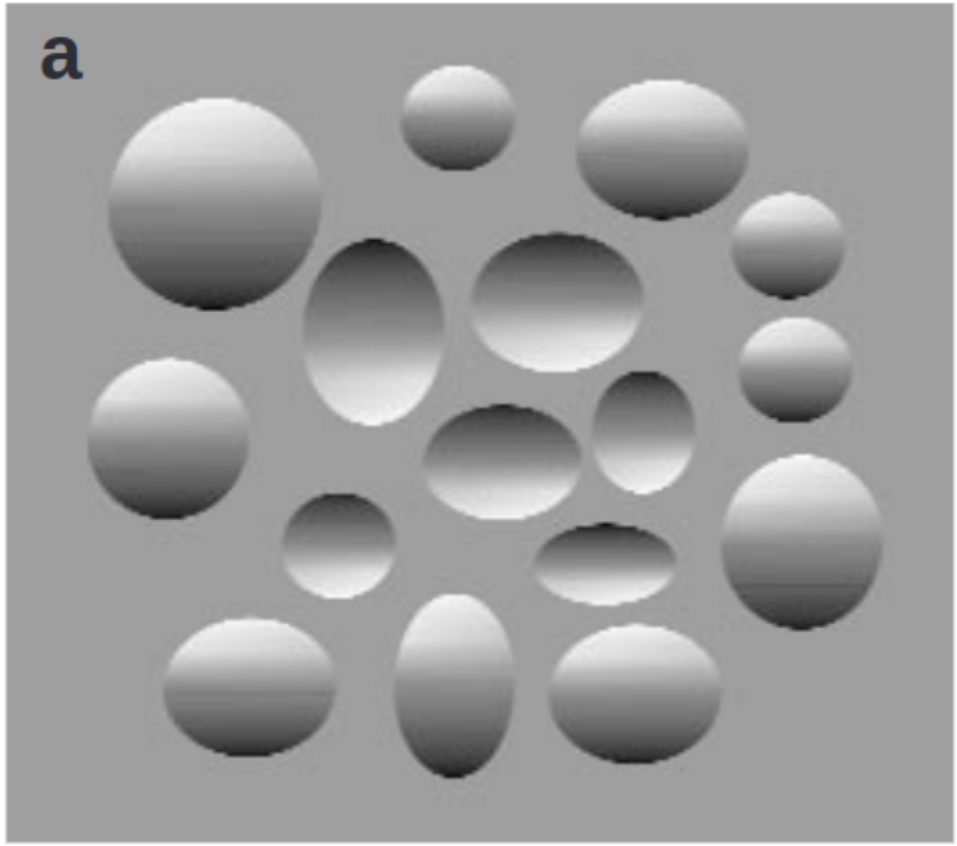
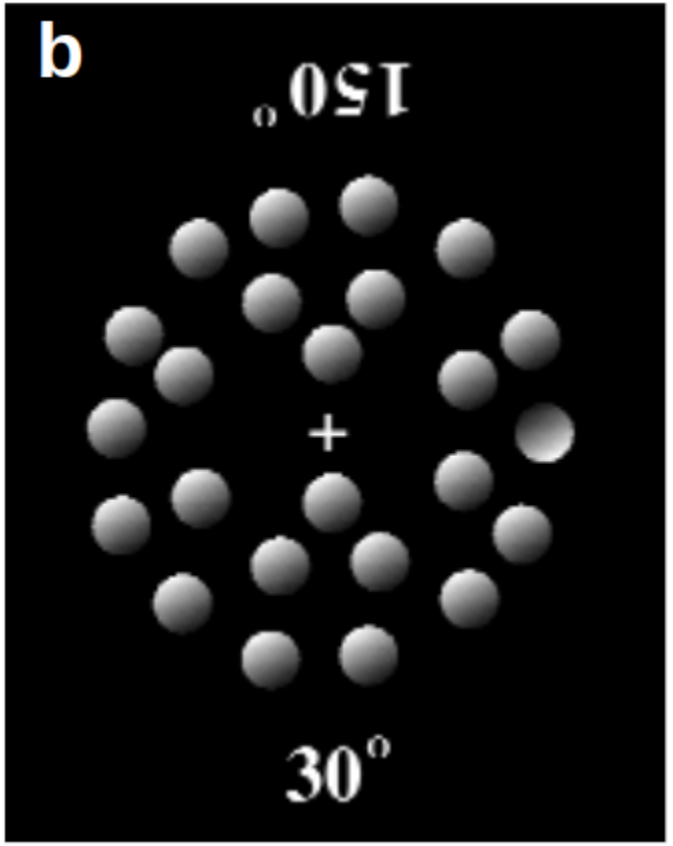
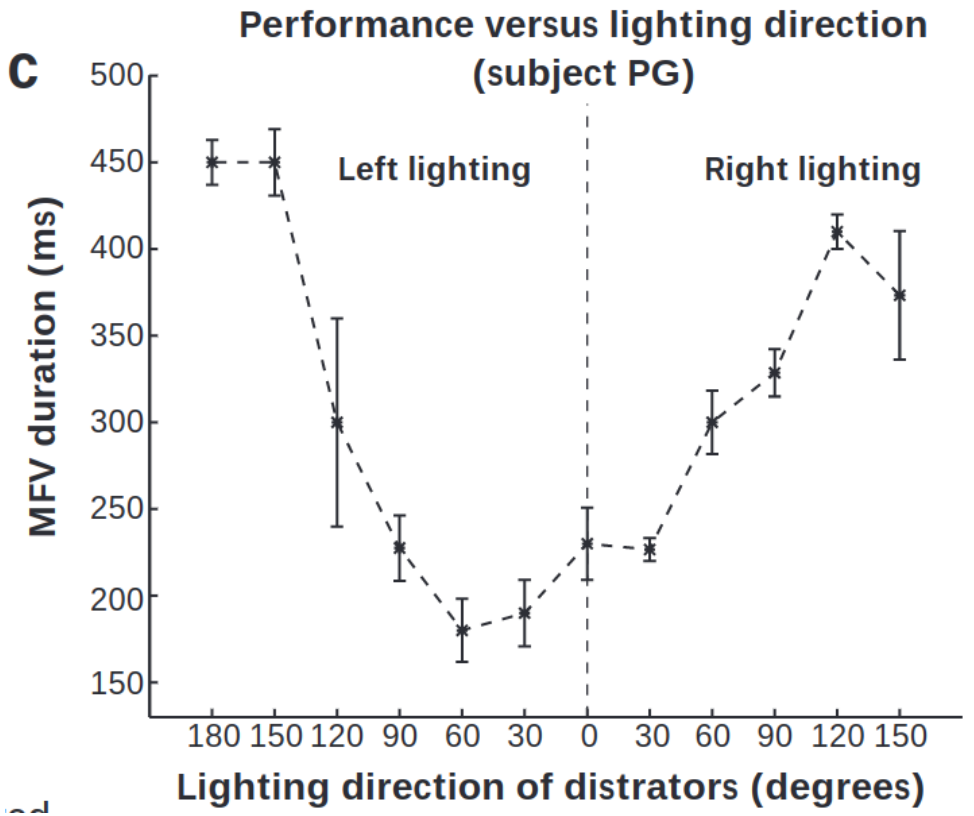


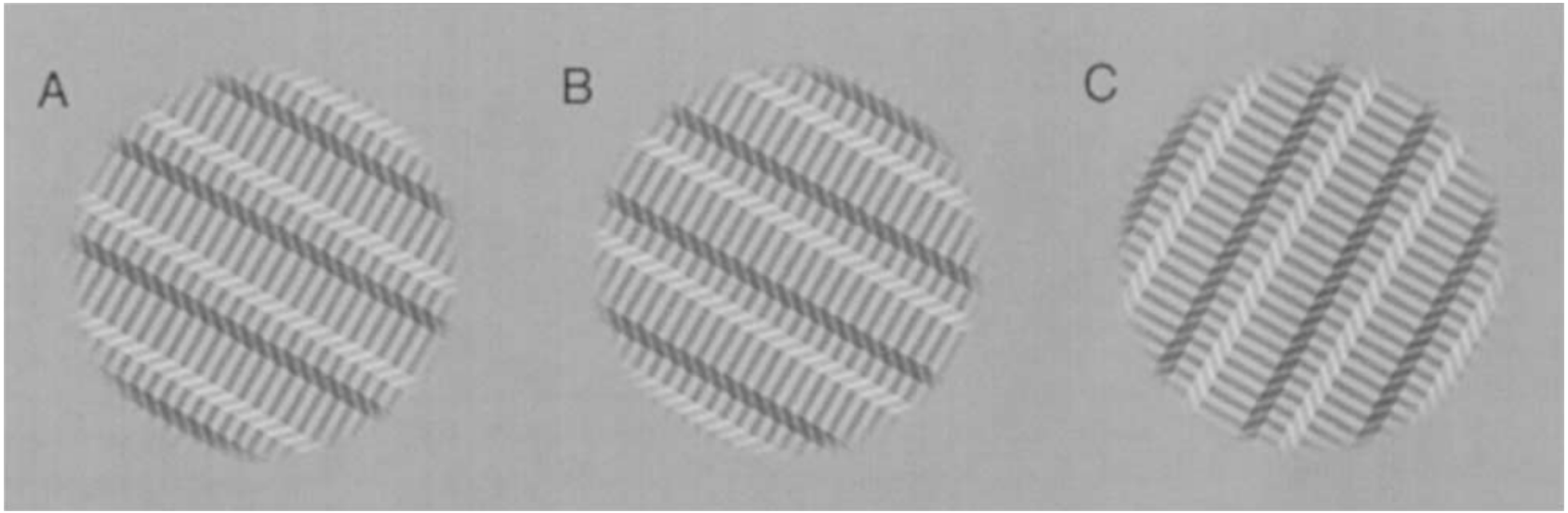
Percepción visual



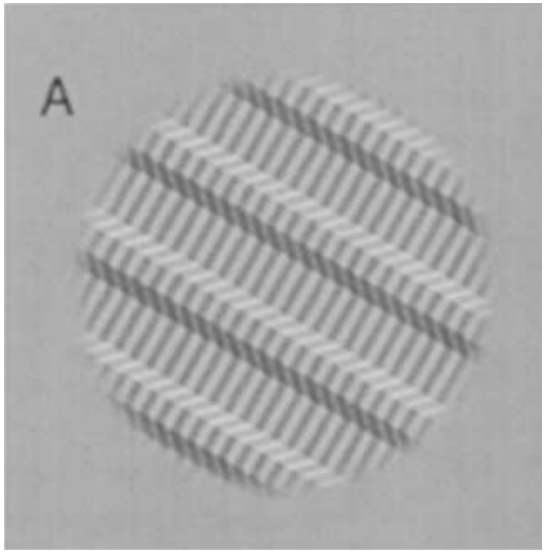



C
Performance versus lighting direction
(subject PG)
Left lighting
Right lighting
MFV duration (ms)
500
450
400
350
300
250
200
150
180 150 120 90 60 30 0 30 60 90 120 150
Lighting direction of distrators (degrees)

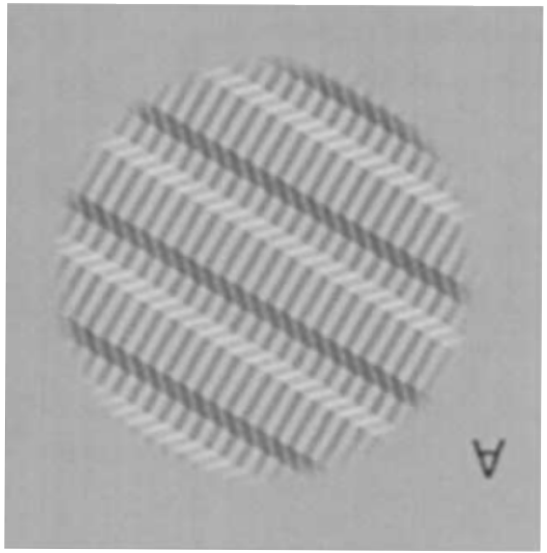
Percepción visual



Percepción visual



Percepción visual



Percepción visual