

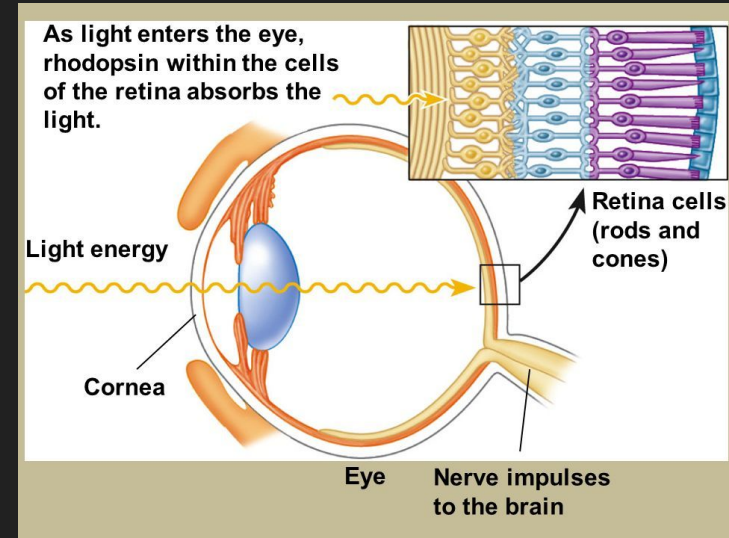


Vision

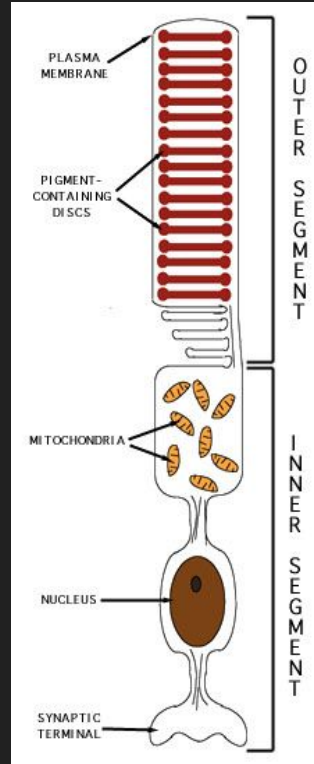
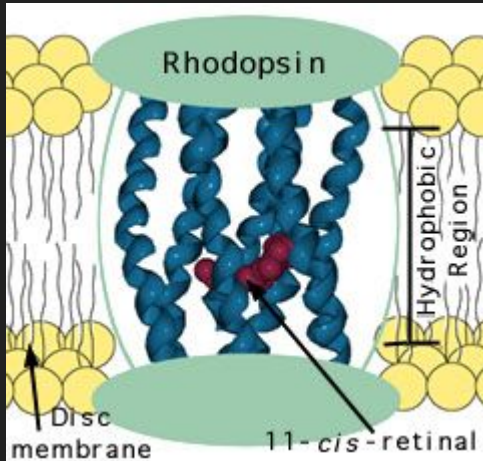
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February 22, 2019

Background Basics

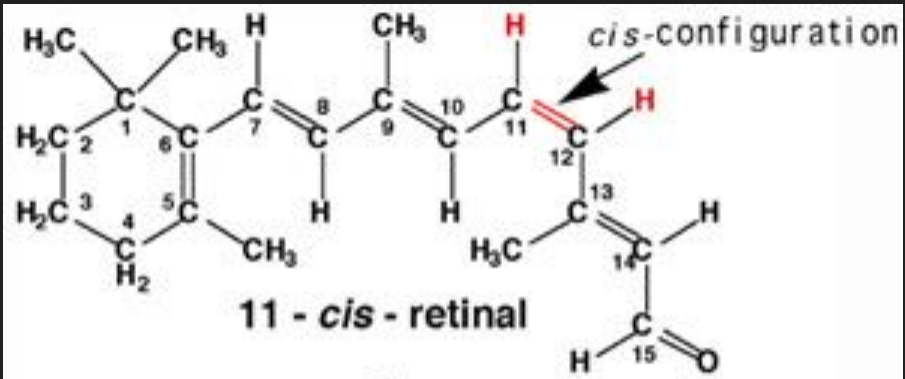
- How we tend to see things-
 - Light bounces off an object
 - Through the pupil, through the lens
 - The lens focuses on the light on the retina in the fovea
- In the retina there are rods and cones which are the receptors that allow us to see
- Which is where the process of vision starts
- The rods and cones act similarly when responding to light.
 - Rods - low light levels, no color
 - Cones - high light levels , capable of color
- In the rods where visual pigment is rhodopsin



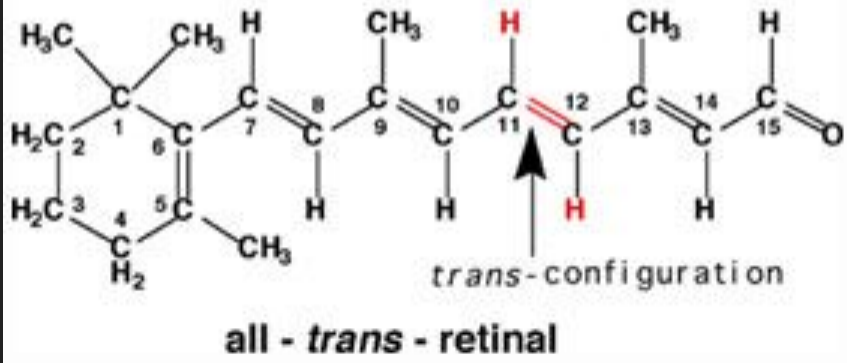
Rhodopsin



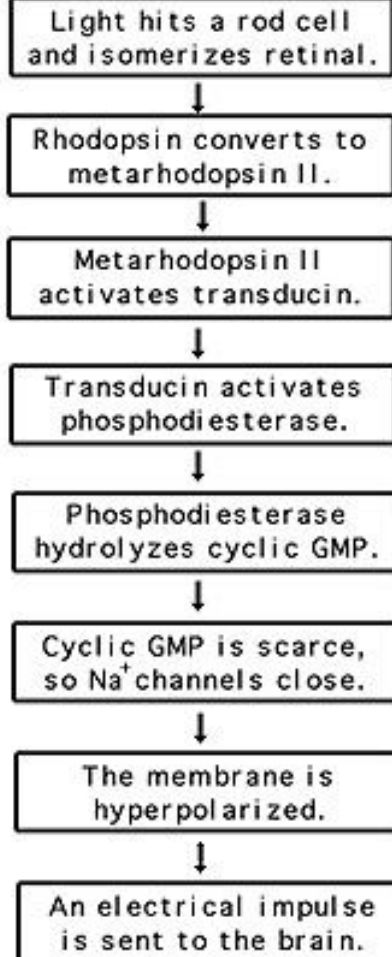
- Light activated G Protein Coupled Receptor
- 7 transmembrane domains (α helices and loops) are called opsin.
- Opsin forms a pocket where retinal, a light-absorbing molecule, resides.
- Retinal is derived from vitamin A and covalently linked to Lys 296.
- Rhodopsin is located in the disc membranes of the photoreceptor cells (rods) in the retina.



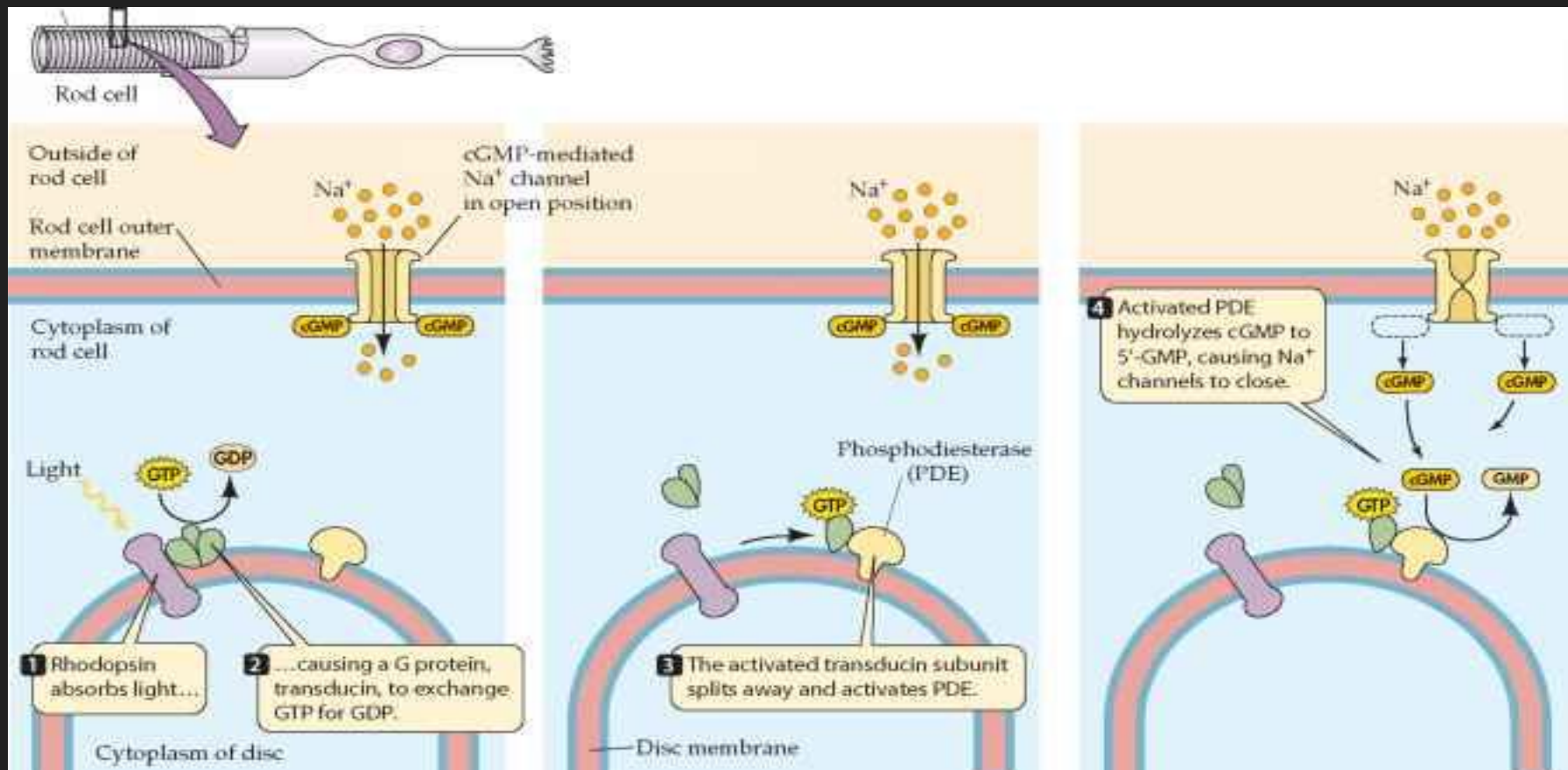
Visible light



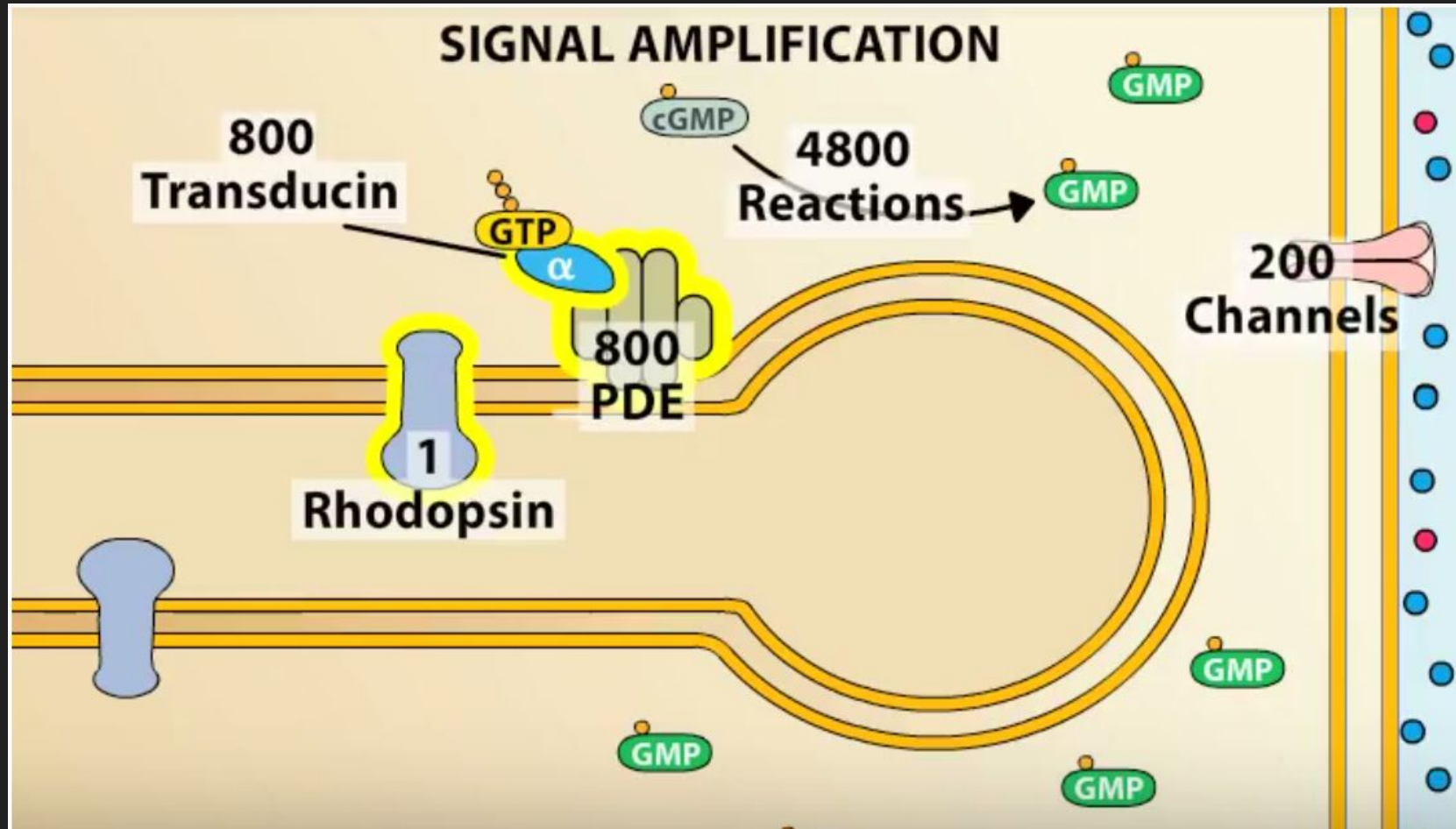
Activation



Mechanism



SIGNAL AMPLIFICATION



Inactivation

_____ rhodopsin is phosphorylated by _____ which permits the protein, _____, to bind to activated rhodopsin. This prevents the transformation into metarhodopsin II from occurring. Hydrolyzed (GTP-->GDP) transducin has a built-in _____ that _____ itself. Without the presence of metarhodopsin II, transducin remains _____, and _____ also turns off.

WORD BANK:

Arrestin inactivates activated timer rhodopsin kinase PDE inactive

In the dark:

- Ion channels are open
- Depolarizing inward current
- Guanylate cyclase builds up the numbers of cGMP, which then open the ion channels. This depolarizes the cell.
- Rhodopsin regenerates

In the light:

- Ion channels are closed
- Hyperpolarizing outward current, making the cell more negative
- Leads to signal amplification

K⁺ ions are always flowing out
(hyperpolarizing outward current)

References

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- Miesfeld, Roger L., and Megan M. McEvoy. *Biochemistry*. W.W. Norton & Company, 2017. pages 384-386.
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Questions?