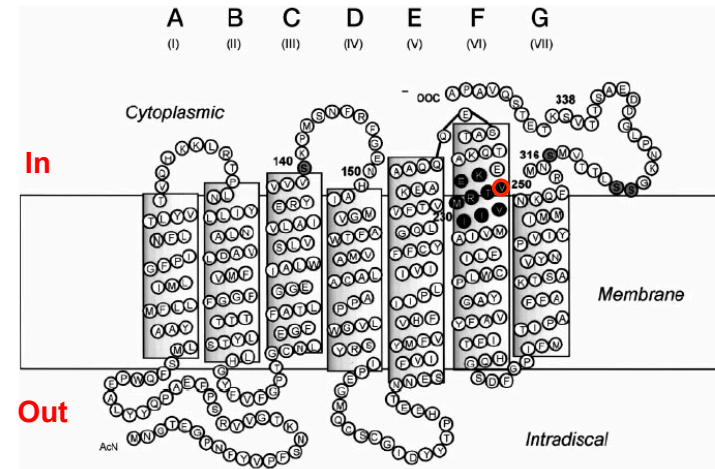


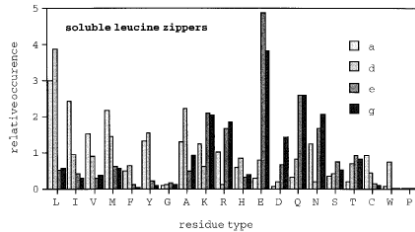
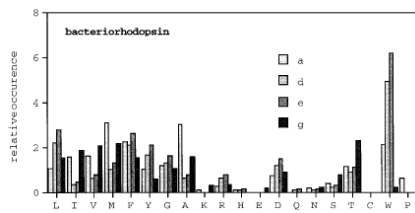
# G-Protein Coupled Receptors

Receptor	Ligand(s)
Rhodopsin	Photon
$\beta$ 2-Adrenergic	Adrenaline & Albuterol
Cannabinoid	Anandamide & THC
Opioid	Endorphins & Morphine
Dopamine	Aripiprazole ("Abilify")
Serotonin	LSD

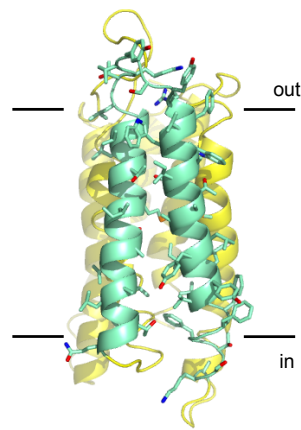
# GPCR's are 7-Helix Transmembrane Proteins



TM helices pack (kinda) like other helices

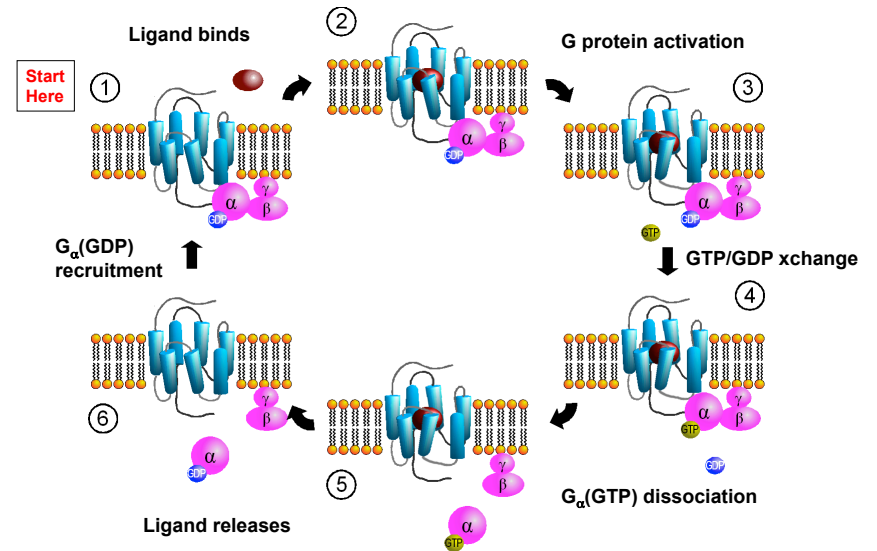


PROTEINS: Structure, Function, and Genetics 31:150-159 (1998)

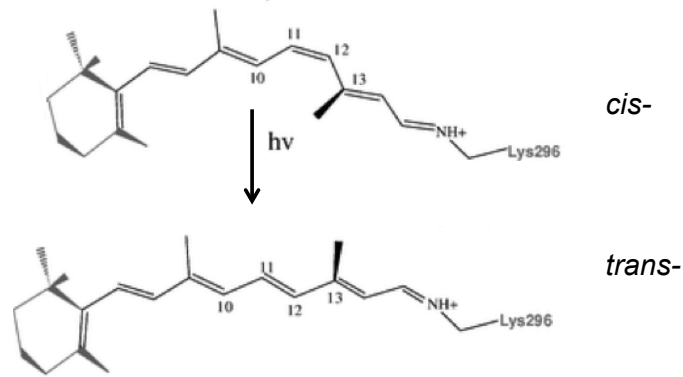


bacteriorhodopsin

# GPCR Functional Cycle

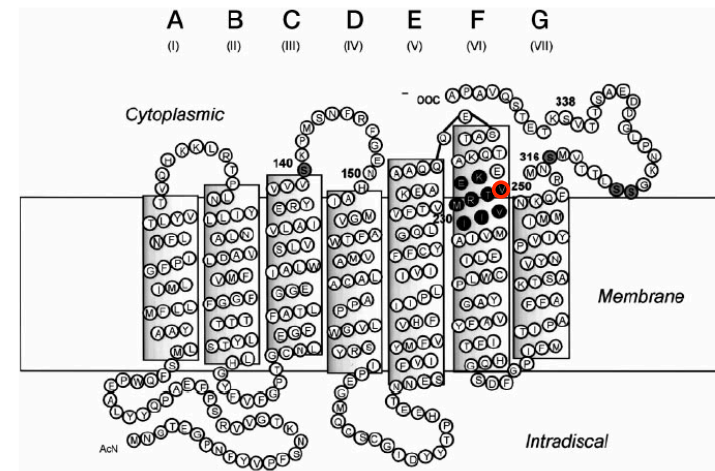


# Photon Capture leads to cis/trans isomerization

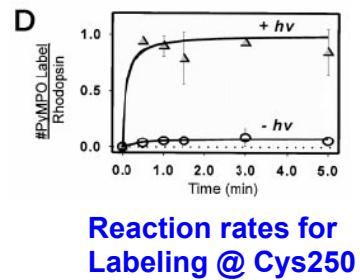
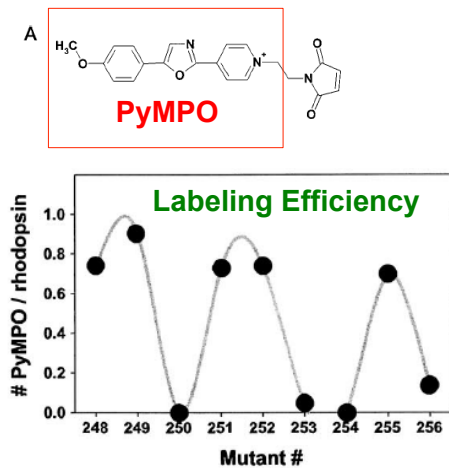


Phys. Chem. Chem. Phys., 2011, 13, 3645-3648

# GPCR's are 7-Helix Transmembrane Proteins

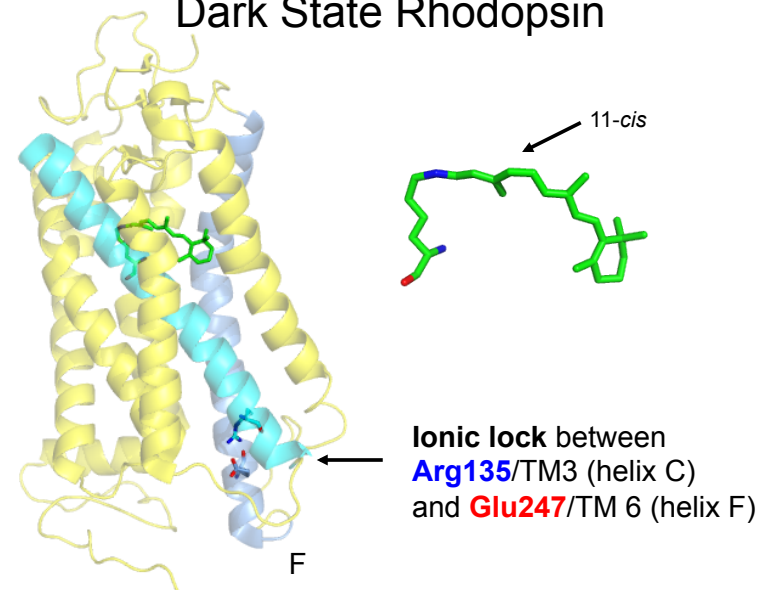


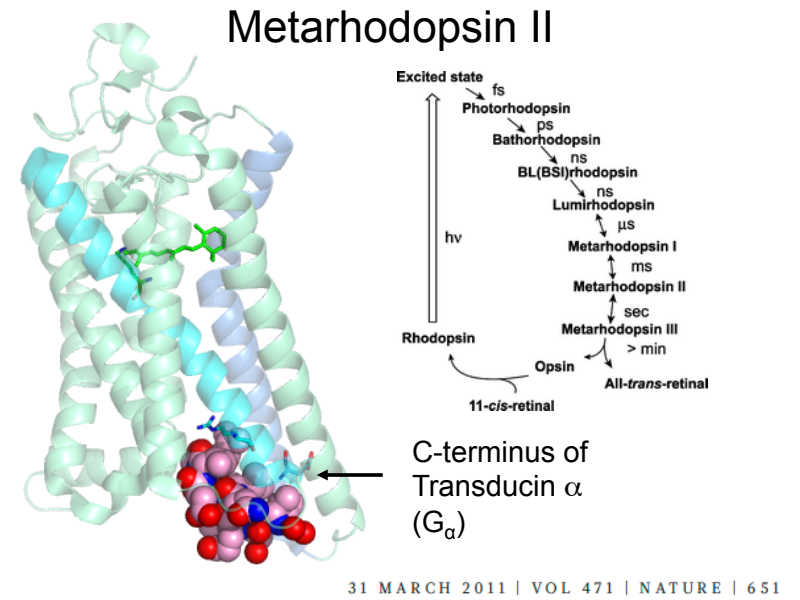
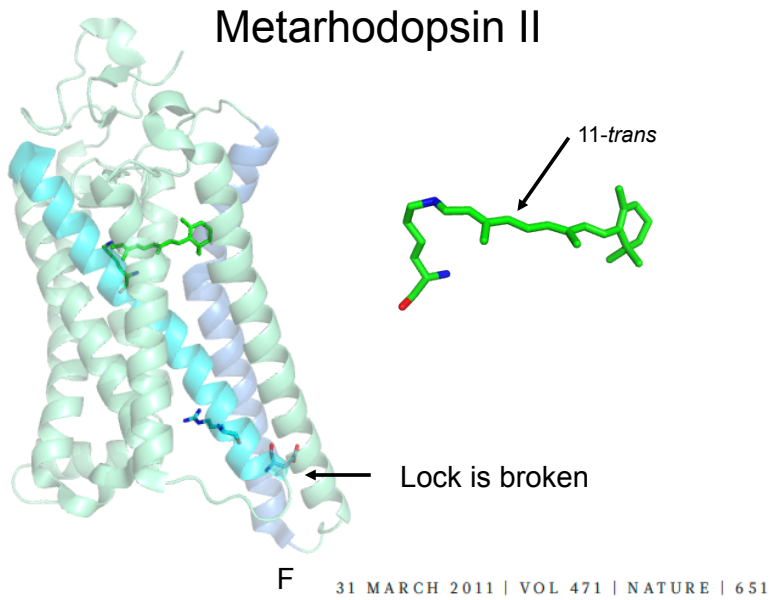
# Evidence for Helix F Movement



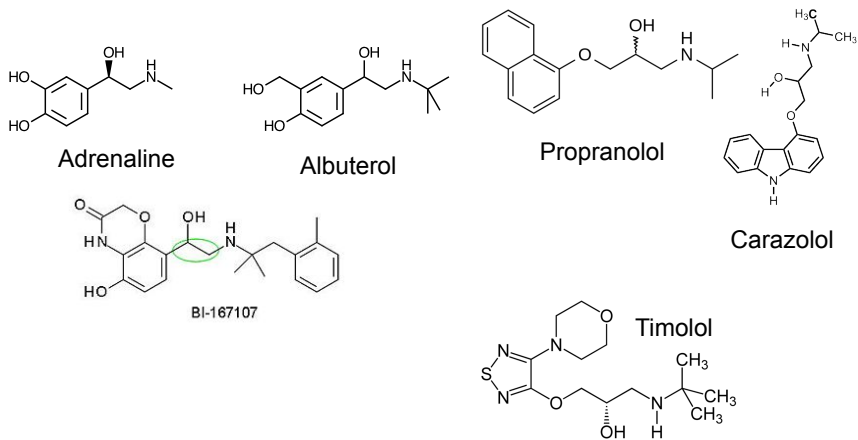
Thomas D. Dunham and David L. Farrens  
J. Biol. Chem. 1999, 274:1683-1690.

# Dark State Rhodopsin

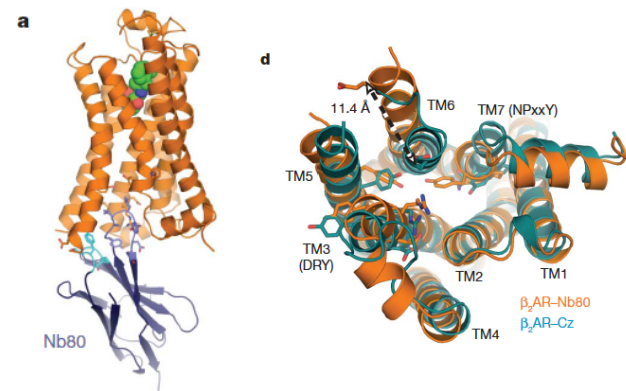




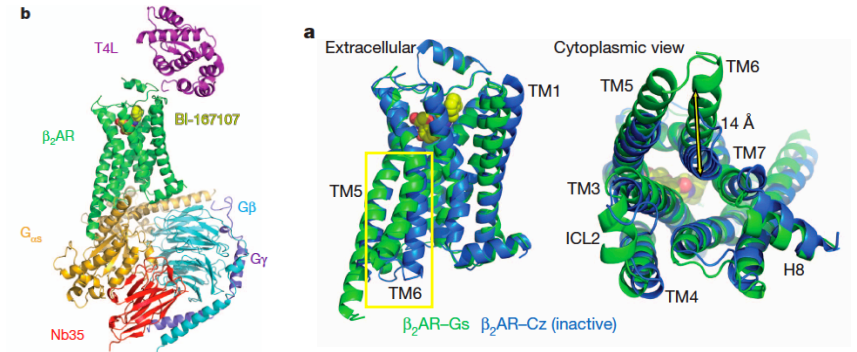
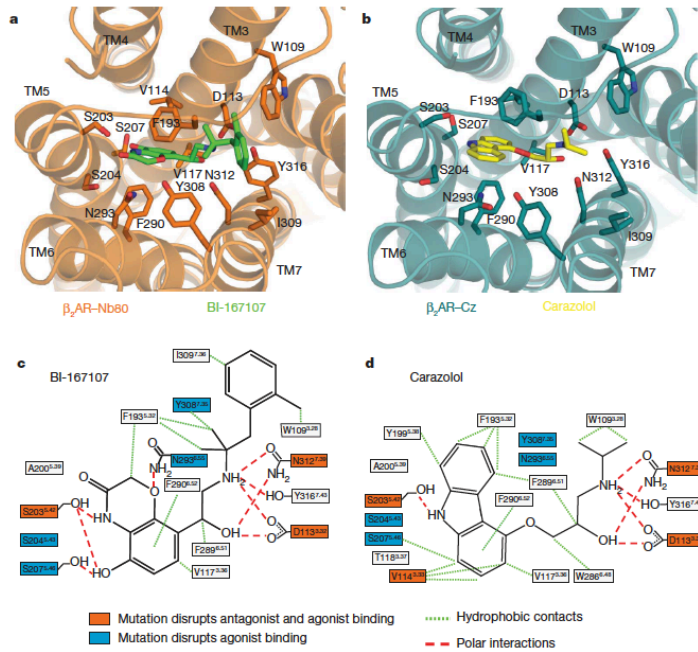
## $\beta_2$ Adrenergic Receptor Ligands



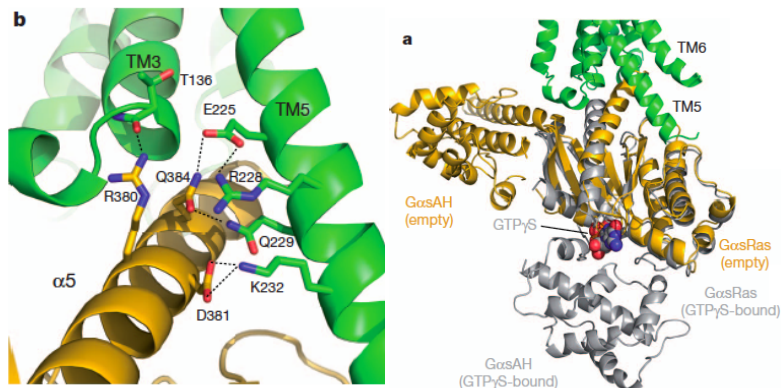
## Agonist vs. Antagonist



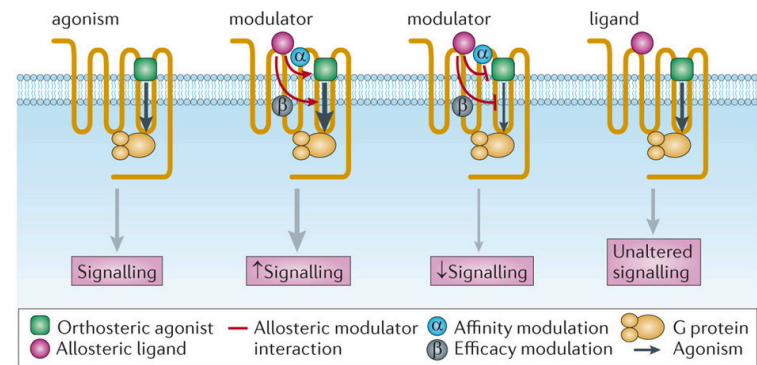
# Crystal structure of the $\beta_2$ adrenergic receptor-Gs protein complex



# Crystal structure of the $\beta_2$ adrenergic receptor-Gs protein complex



$G_s\alpha_5$  interaction with  $\beta_2$ AR



Nature Reviews Drug Discovery 12, 630–644 (2013)