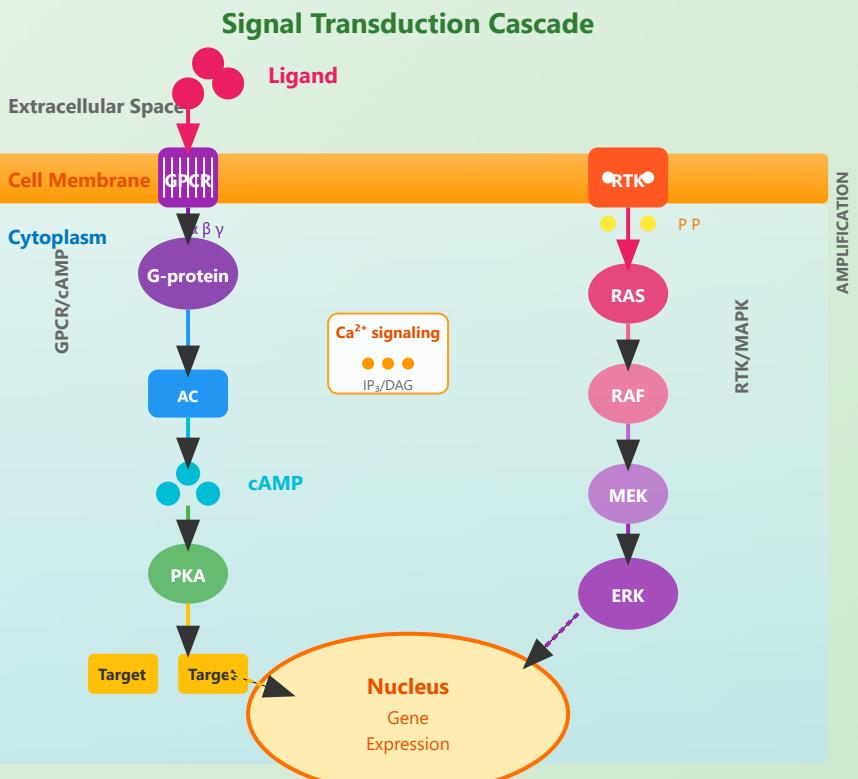


# Cell Signaling Pathways



## Receptor Types

- GPCR: G-protein coupled
- RTK: receptor tyrosine kinase
- Ion channel receptors
- Nuclear receptors

## Second Messengers

- cAMP: activates PKA
- Ca<sup>2+</sup>: multiple targets
- IP<sub>3</sub> and DAG
- Amplify signal

## Kinase Cascades

- MAPK pathway
- Sequential phosphorylation
- Signal amplification
- Specificity and crosstalk

## Feedback Regulation

- Negative feedback: stability

- Positive feedback: switches
- Desensitization
- Temporal dynamics