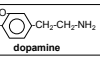
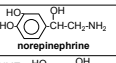
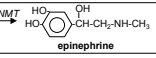
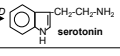
Topics

- Presynaptic: transmitters
  - general considerations
    - criteria, types
  - small molecules
    - synthesis, location
  - peptides
    - roles, synthesis from precursors
  - co-existence

Topics

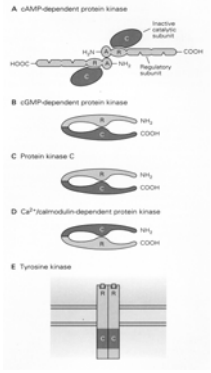
- Postsynaptic: second messengers
  - access
    - 7 transmembrane domain receptors, G proteins
  - types
    - cAMP, AA, DAG, IP_3
  - protein kinases
  - truncating pathway
  - utility

acetyl CoA + choline $\xrightarrow{CAT}$ $CH_3\text{-}C(=O)\text{-}O\text{-}CH_2\text{-}CH_2\text{-}N^+\text{-}(CH_3)_3$ + CoA **acetylcholine**	motor neur. → skel. mus. ANS, esp. parasympath. n. basalis of Meynert presynaptic modulator	myasthenia gravis Alzheimer's
tyrosine + O_2 $\xrightarrow{TH}$ L-DOPA $\xrightarrow{AAAD}$  **dopamine**	substan. nigra → caudate n. midbrain → limbic system	Parkinson's drug addiction schizophrenia
dopamine $\xrightarrow{DBH}$  **norepinephrine**	sympathetic endings locus coeruleus	depression
norepinephrine $\xrightarrow{PNMT}$  **epinephrine**	adrenal medulla (neurohormone)	
tryptophan + O_2 $\xrightarrow{TrH}$ 5-HTP $\xrightarrow{AAAD}$  **serotonin**	raphé n.	depression
glutamate	major excitatory transmitter in brain	stroke
glutamate $\xrightarrow{GAD}$ **gamma-amino butyric acid (GABA)**	major inhibitory transmitter in brain	epilepsy
glycine	major inhibitory transmitter in spinal cord	

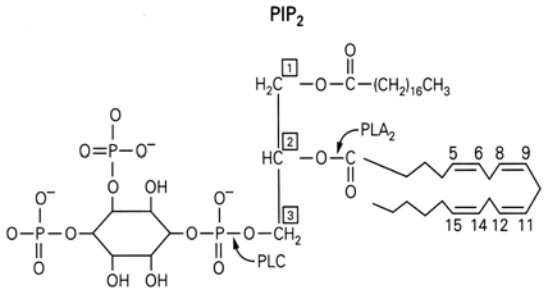
Some Families of Neuroactive Peptides

Family	Peptide members
Opioids	Opiocortins, enkephalins, dynorphin, FMRFamide
Neurohypophyseal hormones	Vasopressin, oxytocin, neurophysins
Tachykinins	Substance P, physalaemin, kassinin, uperolein, eledoisin, bombesin, substance K
Secretins	Secretin, glucagon, vasoactive intestinal peptide, gastric inhibitory peptide, growth hormone–releasing factor, peptide histidine isoleucineamide
Insulins	Insulin, insulin-like growth factors I and II
Somatostatins	Somatostatins, pancreatic polypeptide
Gastrins	Gastrin, cholecystokinin

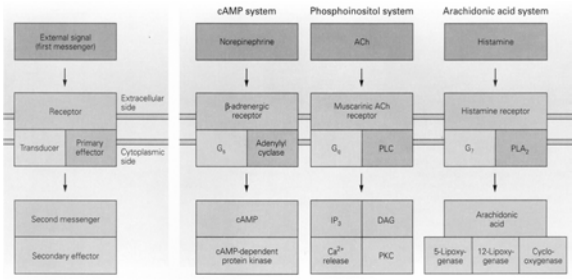
Principles, Table 15-3



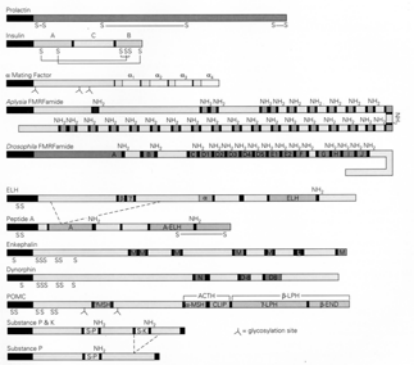
Principles, Fig. 13-6



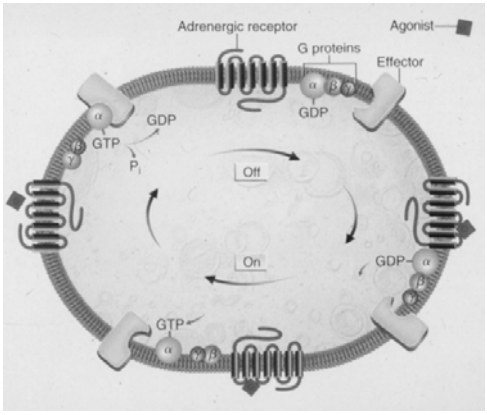
Principles, pg. 236



Principles, Fig. 13-2



Principles, Fig. 15-2



Utility of second messengers

- lengthening of signal
- amplification of signal
- divergence to several targets
- convergence to single target
- spatial spreading of signal
- regulation of gene transcription