

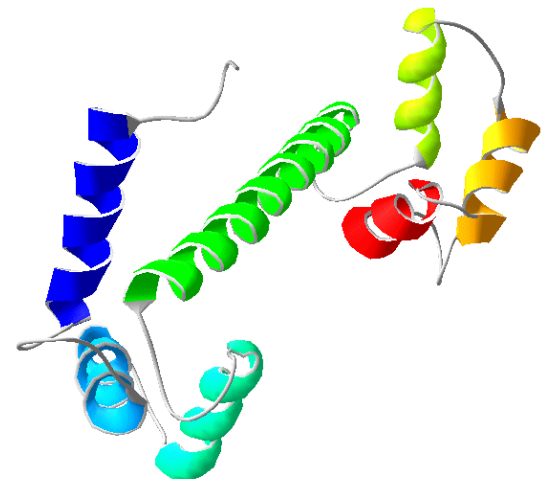
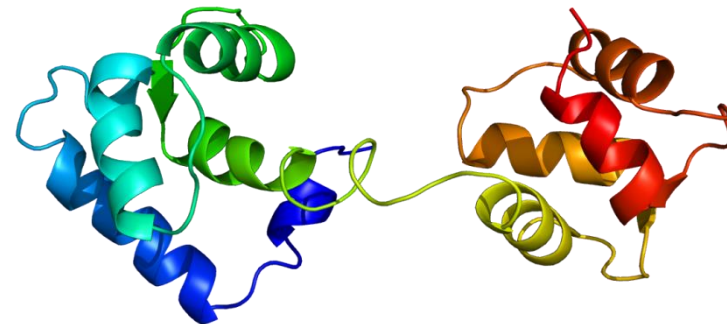
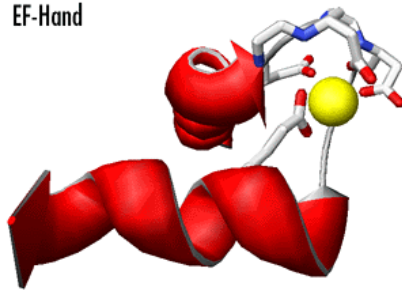


# Calcium Binding Proteins

- Mediate the effects of Calcium ( $\text{Ca}^{+2}$ )
- Many proteins  
Calmodulin, Troponin C, Parvalbumin

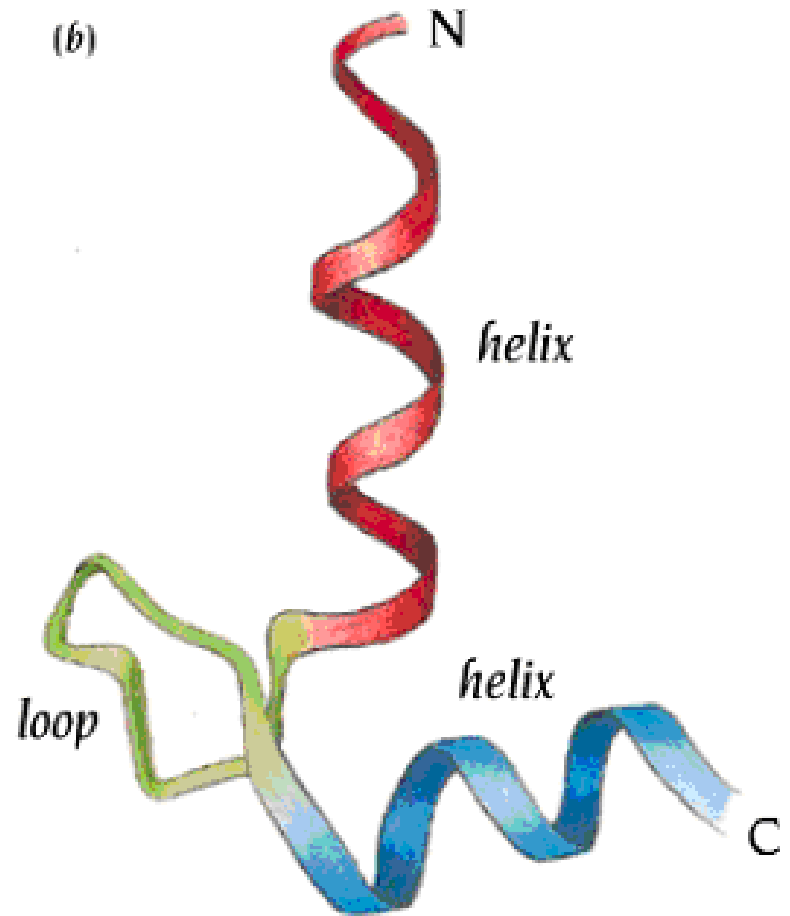
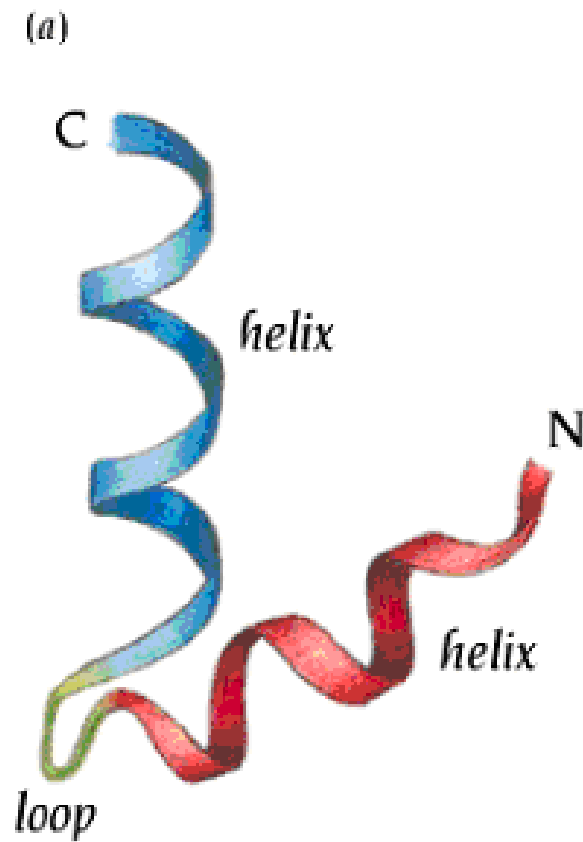
- Similar structures
  - Rich in Asp and Glu
    - Gln, Asn, Ser
  - Several  $\alpha$  helical segments
  - Binding site is formed by
    - Helix Loop Helix
      - Super-secondary structure

EF-Hand





# Calcium Binding Proteins

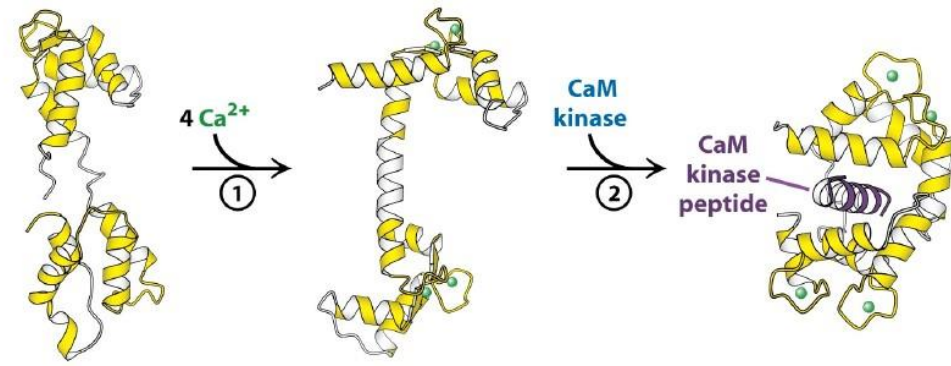




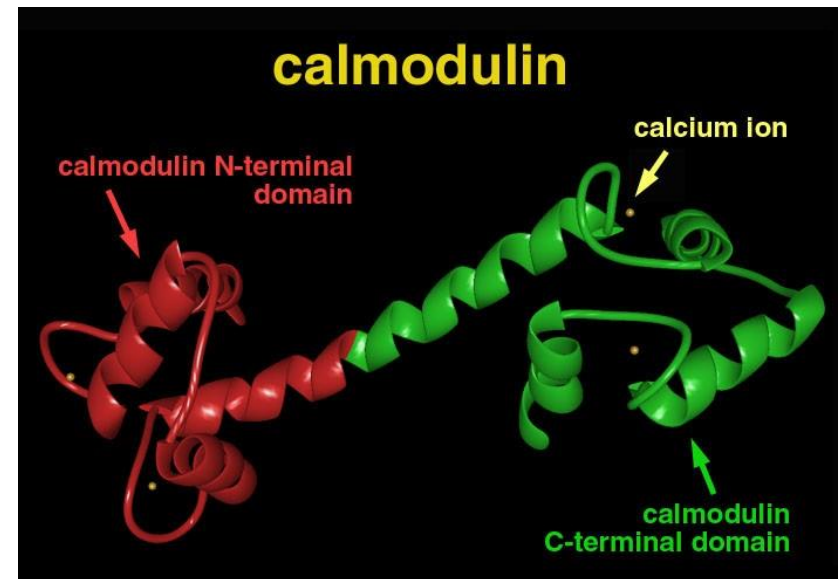
# Calmodulin ( $\approx 17$ kD)

## Calcium-modulated protein

- Found in almost all eukaryotes
- Consists of two globular regions
  - Connected by flexible region
  - Each contains 2 EF hands
  - Four  $\text{Ca}^{2+}$  binding sites
- Calcium-Calmodulin Complex can Bind to a large Number of Target proteins including:



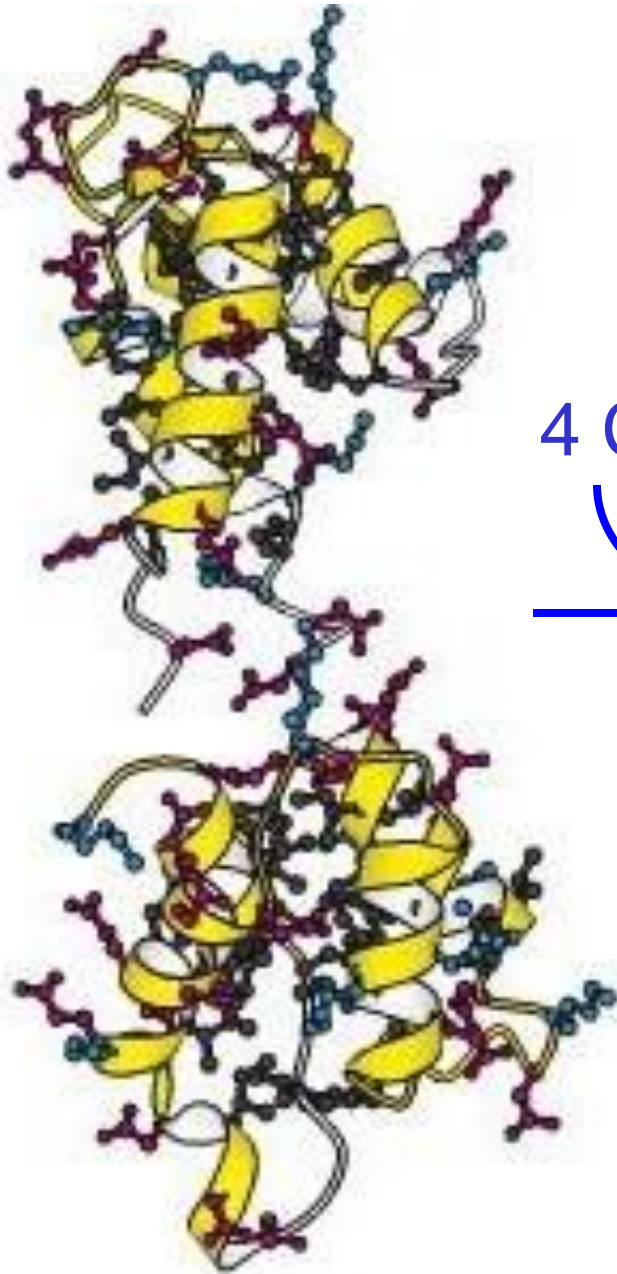
**149 amino acids**



**Calmodulin-dependant Protein Kinase**

**$\text{Ca}^{2+}$  ATP'ase Pump**

**Sort of memory**



4  $\text{Ca}^{2+}$

Calmodulin binds to  $\text{Ca}^{2+}$   
which results in  
change in conformation

( Moving some hydrophobic  
residues from  
the inside to the outside  
of the domains)



# Ca<sup>2+</sup> Transporter

- In sarcoplasmic reticulum
  - 80% of the membrane proteins
  - 10 membrane spanning helices
  - Ca<sup>2+</sup> move against a large concentration gradient
  - 2 Ca<sup>2+</sup> / ATP (high)
    - Depletion of ATP leads to tetany, Rigor mortis

