

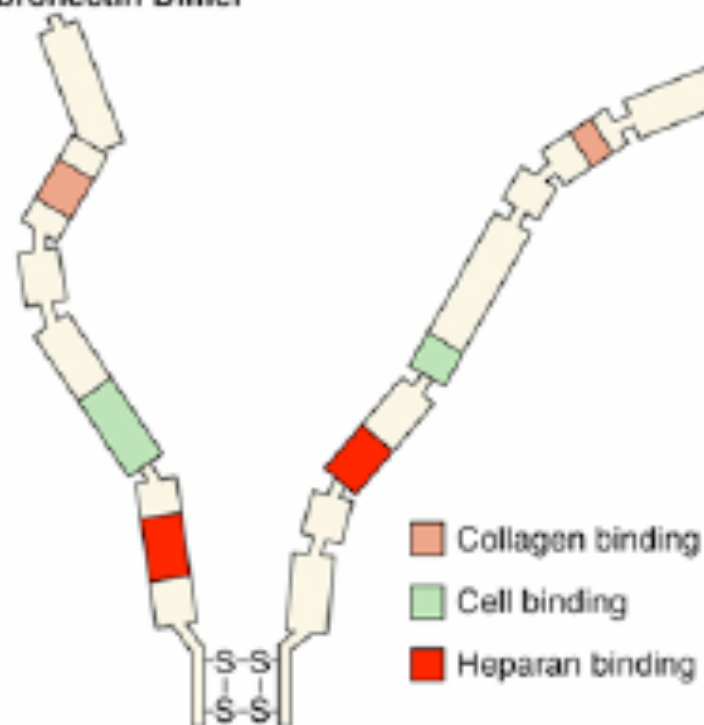
Principali funzioni delle proteine

Tipo di proteina	Funzione	Esempi
Proteine strutturali	Supporto	Il collagene e l'elastina forniscono una trama fibrosa ai tessuti connettivi degli animali, quali tendini e legamenti. La cheratina è la proteina dei peli, dei corni, delle penne, delle piume e di altre appendici cutanee.
Proteine di deposito	Deposito di amminoacidi	L'ovalbumina è la proteina dell'albume delle uova utilizzata dall'embrione come riserva di amminoacidi durante lo sviluppo. La caseina, la proteina del latte, è la principale fonte di amminoacidi per il lattante. Le piante depositano amminoacidi nei loro semi.
Proteine di trasporto	Trasporto di altre sostanze	L'emoglobina, la proteina ematica contenente ferro, trasporta l'ossigeno dai polmoni alle altre parti dell'organismo. Altre proteine trasportano molecole attraverso le membrane cellulari.
Proteine ormonali	Coordinamento attività corporee	L'insulina, un ormone secreto dal pancreas, contribuisce alla regolazione della concentrazione del glucosio nel sangue.
Proteine recettoriali	Risposta della cellula a stimoli chimici	I recettori presenti nella membrana di una cellula nervosa rispondono ai segnali chimici liberati da altre cellule nervose.
Proteine contrattili	Movimento	L'actina e la miosina sono responsabili del movimento dei muscoli. Altre proteine contrattili sono responsabili del movimento ondulatorio di organelli noti come ciglia e flagelli.
Proteine di difesa	Protezione contro le malattie	Gli anticorpi combattono batteri e virus.
Proteine enzimatiche	Accelerazione selettiva di reazioni chimiche	Gli enzimi digestivi idrolizzano le molecole polimeriche contenute negli alimenti.

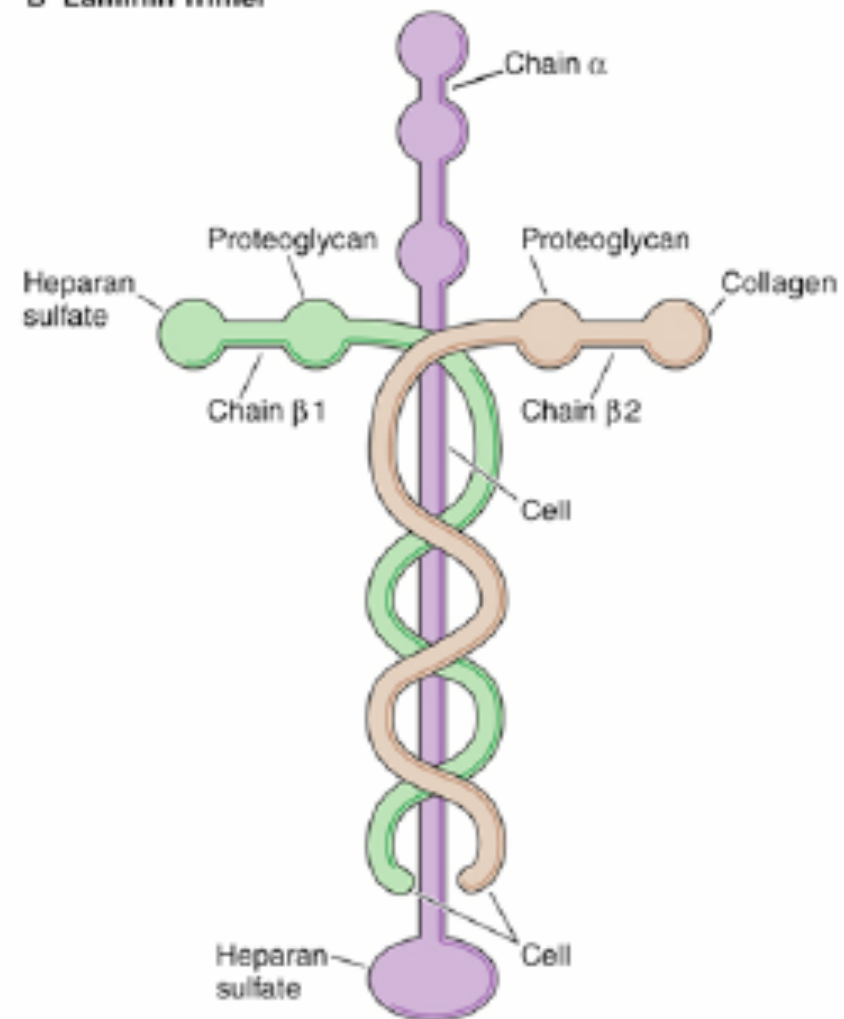
Funzione strutturale proteine della matrice

- Collagene
 - Elastina
 - Laminina
 - Fibronectina
 - proteoglicani

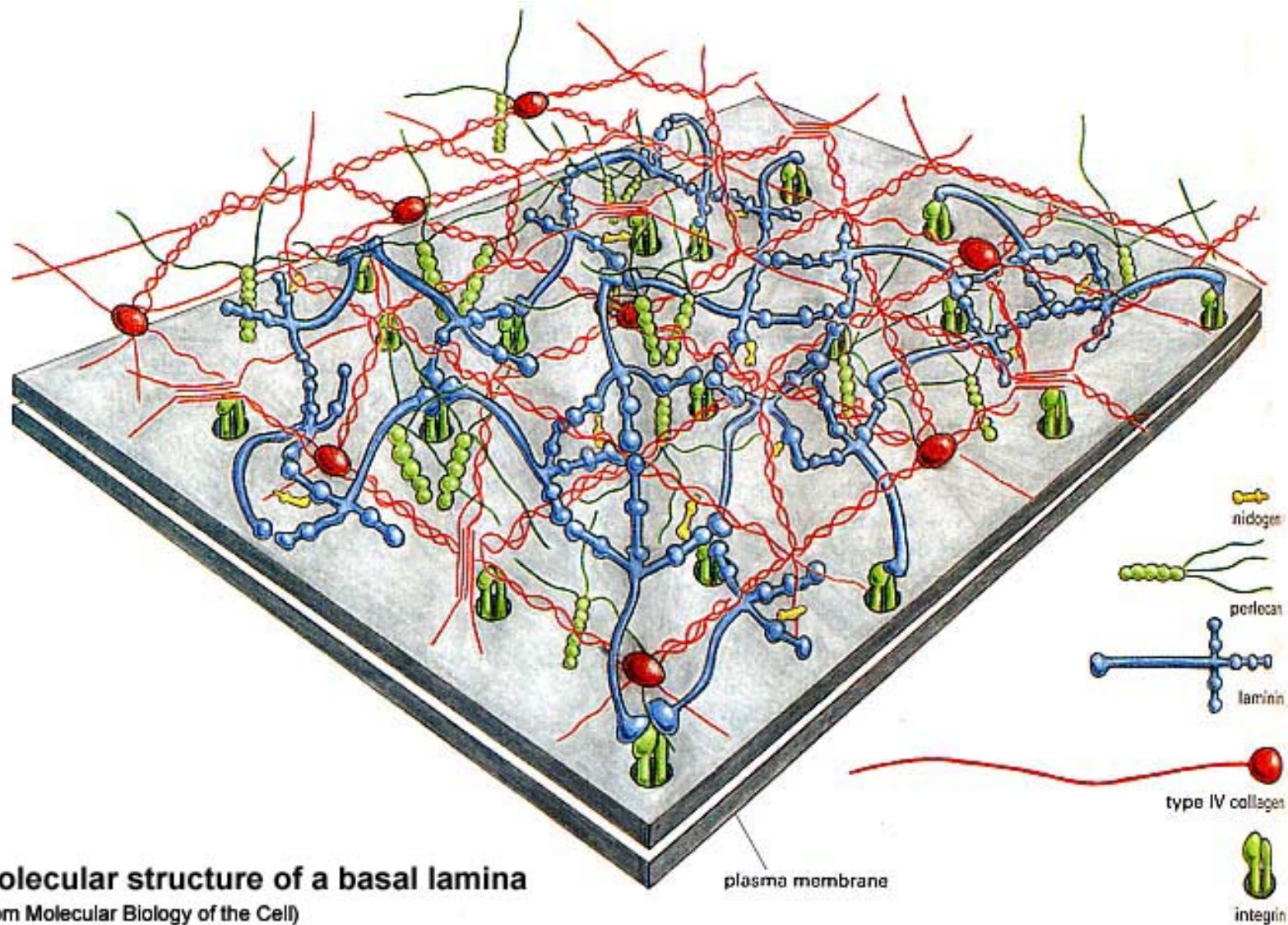
A Fibronectin Dimer



B Laminin Trimer

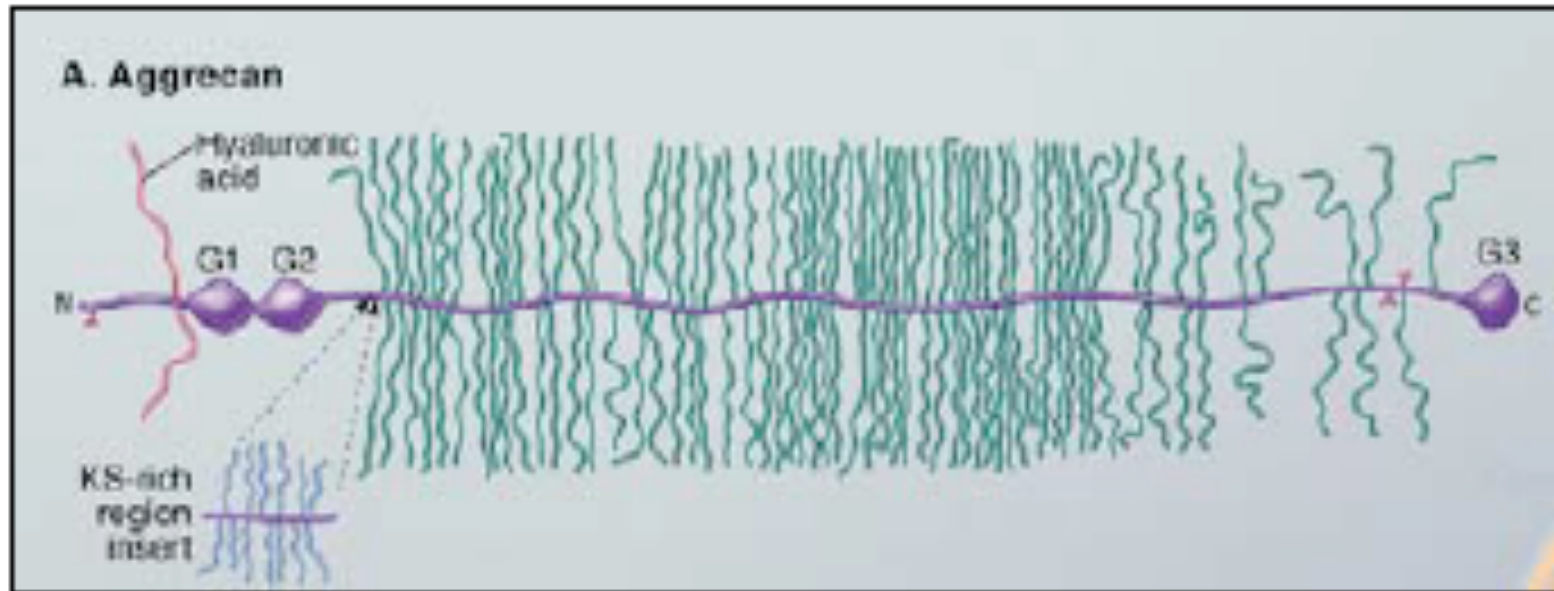


Basal lamina

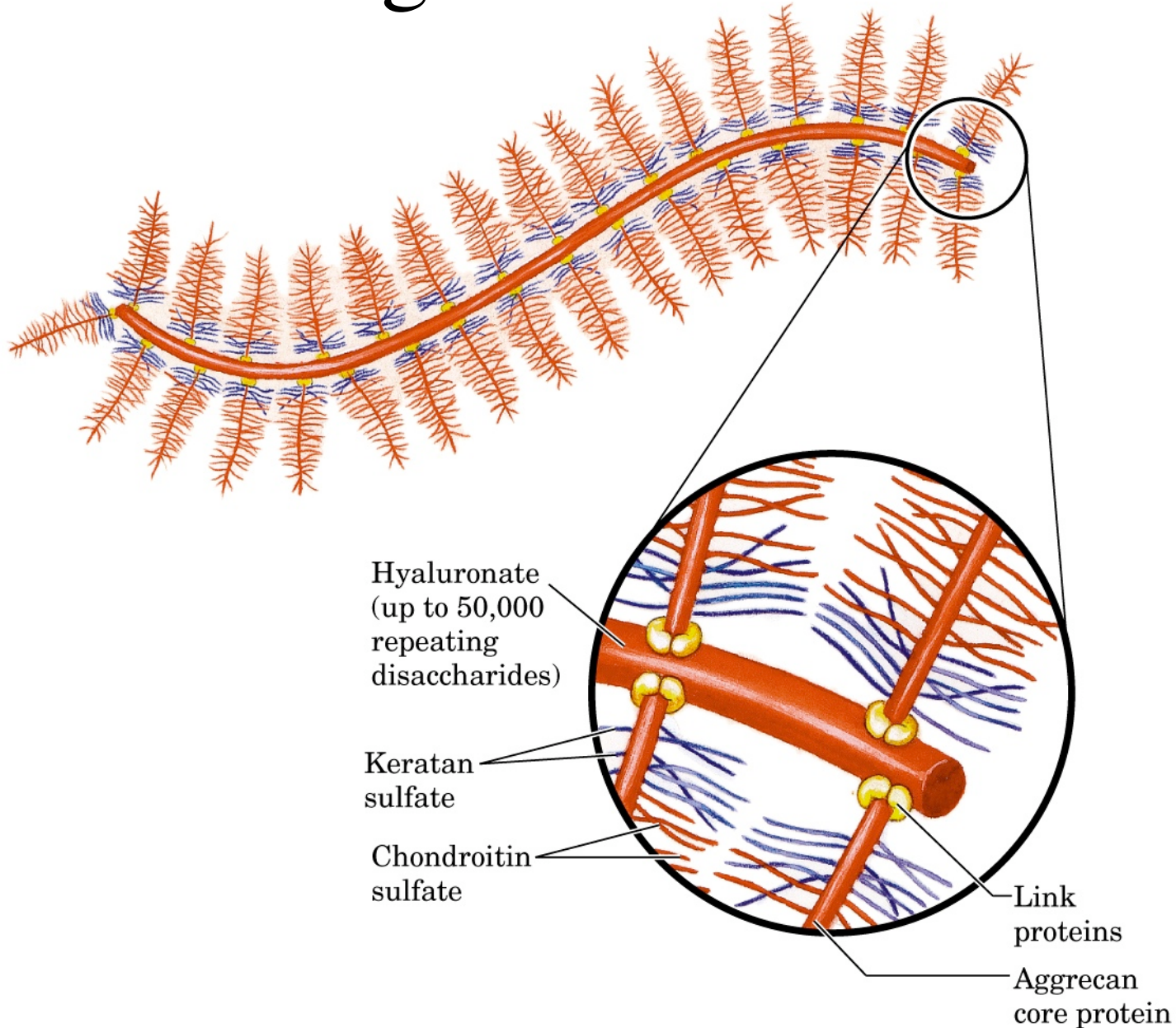


Molecular structure of a basal lamina
(from Molecular Biology of the Cell)

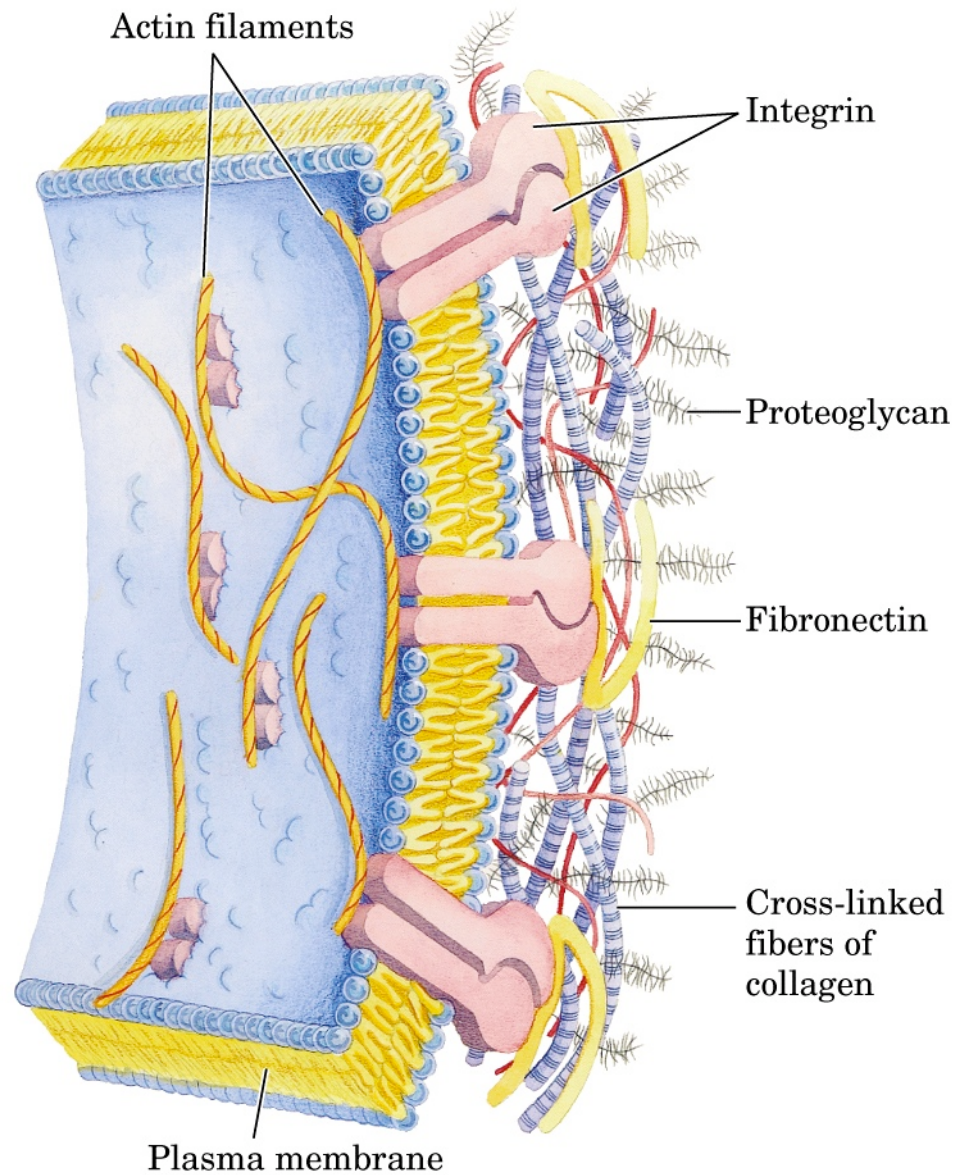
PROTEOGLICANI



Proteoglicano di matrice

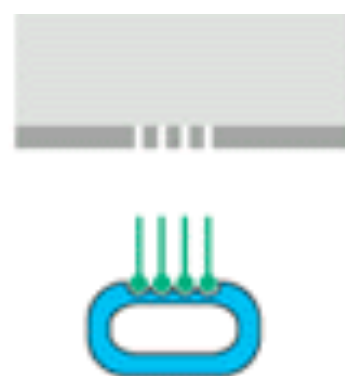
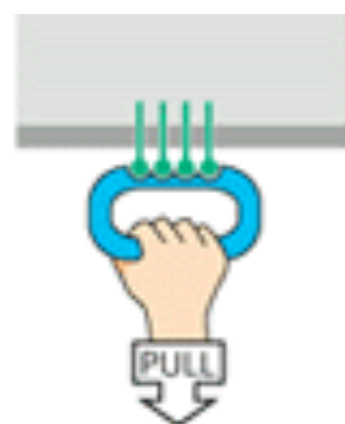


Interazioni tra cellula e matrice



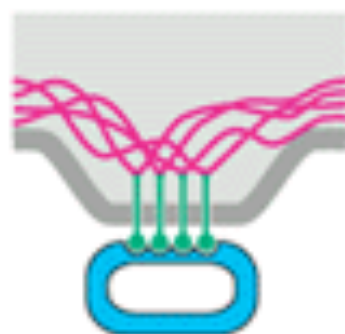
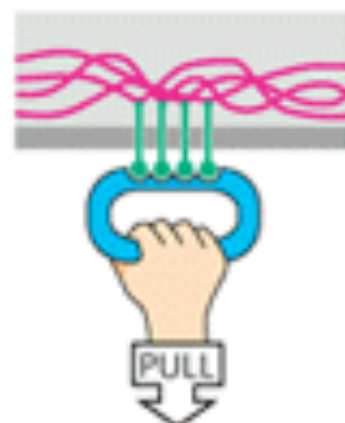
Proteine del citoscheletro

WITHOUT
CYTOSKELETAL
ATTACHMENT



NO AFFECT ON CELL

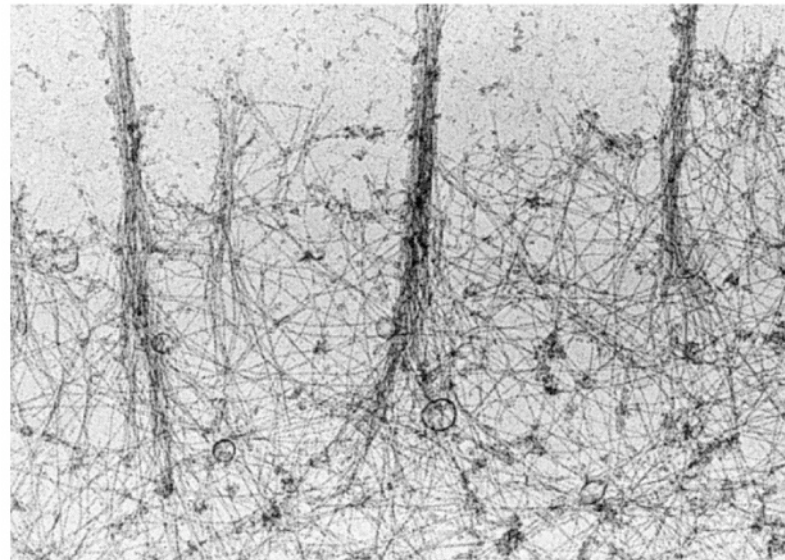
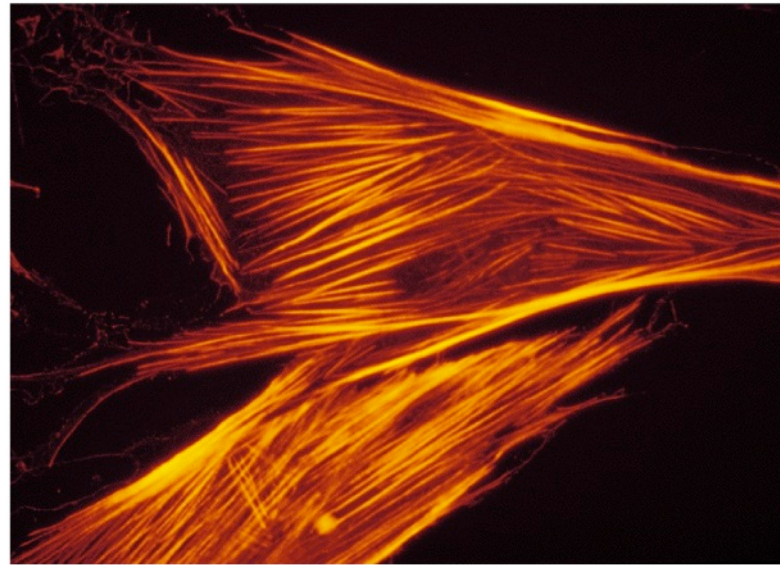
WITH
CYTOSKELETAL
ATTACHMENT



CELL ADHESION

Funzione strutturale proteine del citoscheletro

Filamenti
di actina



Actin stress fibers

(2)

- Actin is the most abundant protein in eukaryotic cells.
 - Muscle cells contain ~10% actin (w/w).
 - Non-muscle cells contain ~1-5% (w/w).
- In mammals, six actin isoforms are expressed.
- Actin exists as a globular monomer (G-actin) or a filamentous polymer (F-actin).
- G-actin binds ATP that is hydrolyzed during the course of polymerization.
- Actin is highly conserved (80% identity between amoeba and human).



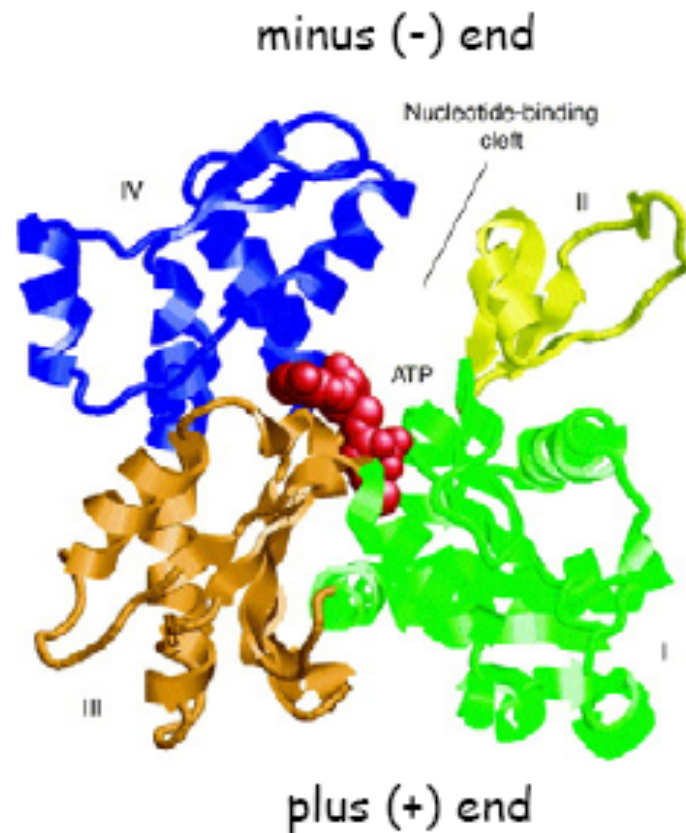
Amoeba



Human

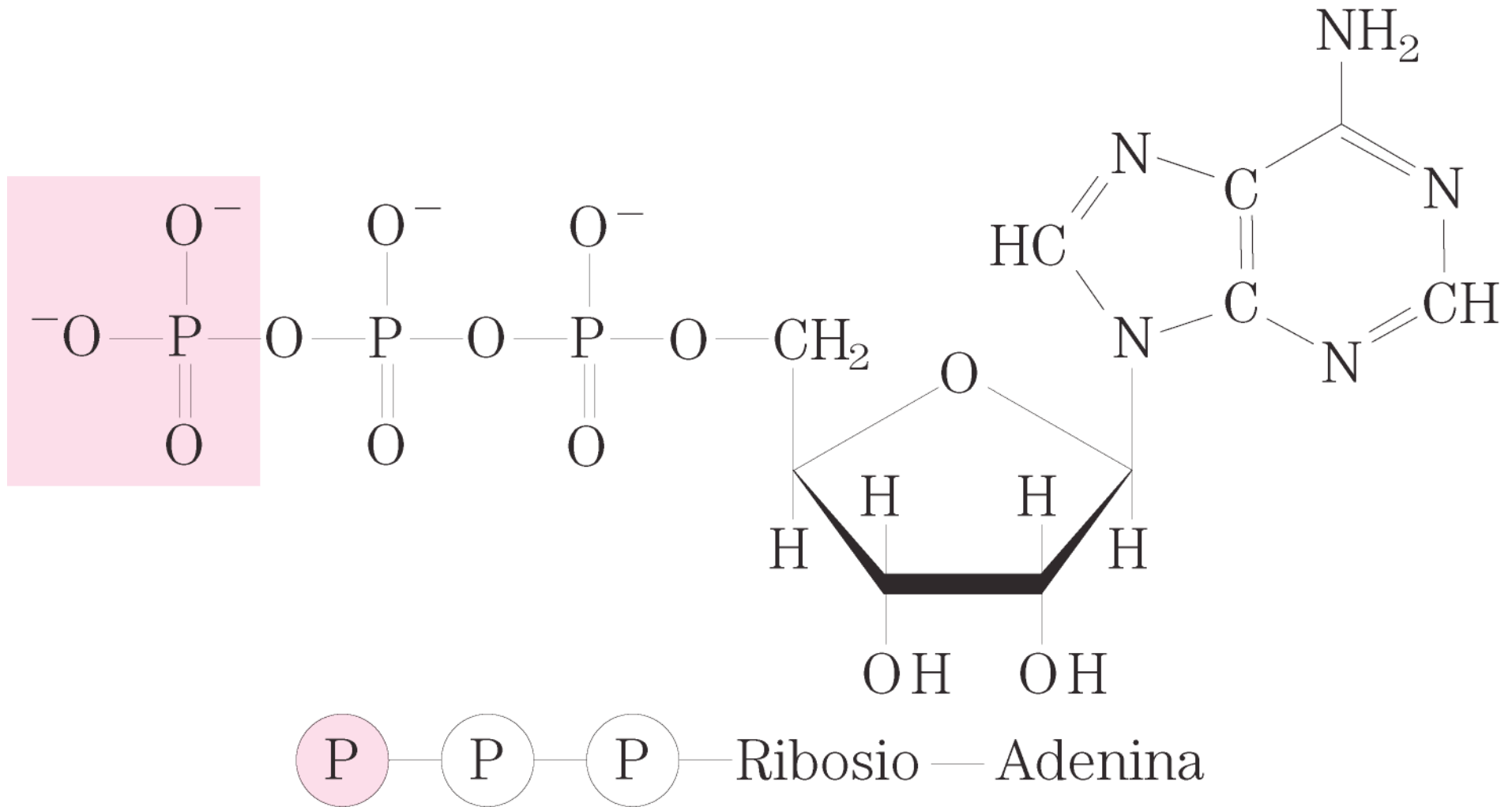
Struttura actina G

Crystal Structure of G-Actin



- Solved by Kabsch & Holmes in 1990
- Bound ATP in the center cleft between right and left lobes
- Four sub-domains are connected to ATP/ Ca^{2+} by salt bridges and H-bonds
- Molecule is pear-shaped: larger end is the kinetic "plus end" and smaller end is the "minus end"

ATP



Estrema complessità della regolazione dell'actina

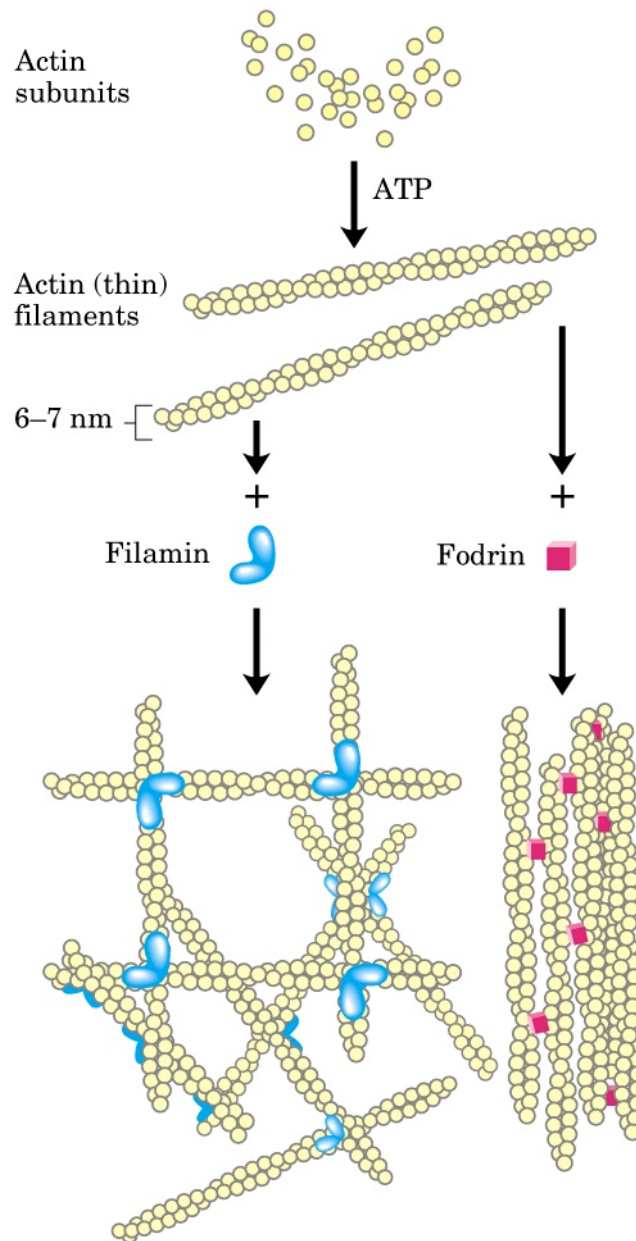
Given relatively stable intracellular ionic concentrations, nearly all the actin should be polymerized as filaments but 40% is not polymerized.

In vitro, at physiological salt and ATP conditions, actin filaments elongate at a rate of $\sim 0.04 \mu\text{m}/\text{min}$; *in vivo*, rates of $\sim 10 \mu\text{m}/\text{min}$ are measured.

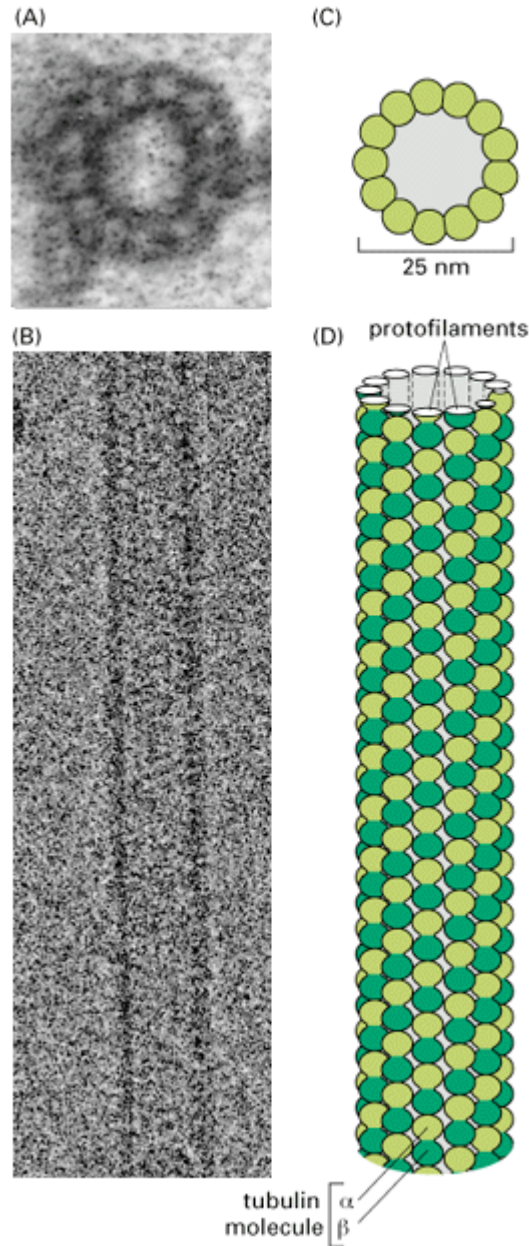
Actin binding proteins (ABPs) regulate G-actin/F-actin turnover:

- Proteins that bind to G-actin:
 - profilin, thymosin
- Proteins that nucleate F-actin:
 - formin, Arp2/3
- Proteins that crosslink/branch F-actin
 - filamin (see b)
 - fimbrin
 - α -actinin
 - fascin (see a)
 - spectrin
- Proteins that bind to F-actin ends and control polymerization:
 - cofilin, gelsolin severing, capping [+ end]
 - gCAP39, capZ capping [+ end]
 - tropomodulin capping [- end]
 - severin severing, capping
 - villin crosslinking, severing, capping
- Proteins that attach actin to the plasma membrane
 - Ezrin/Radixin/Moesin (ERM) protein family

Assemblaggio dei filamenti di actina

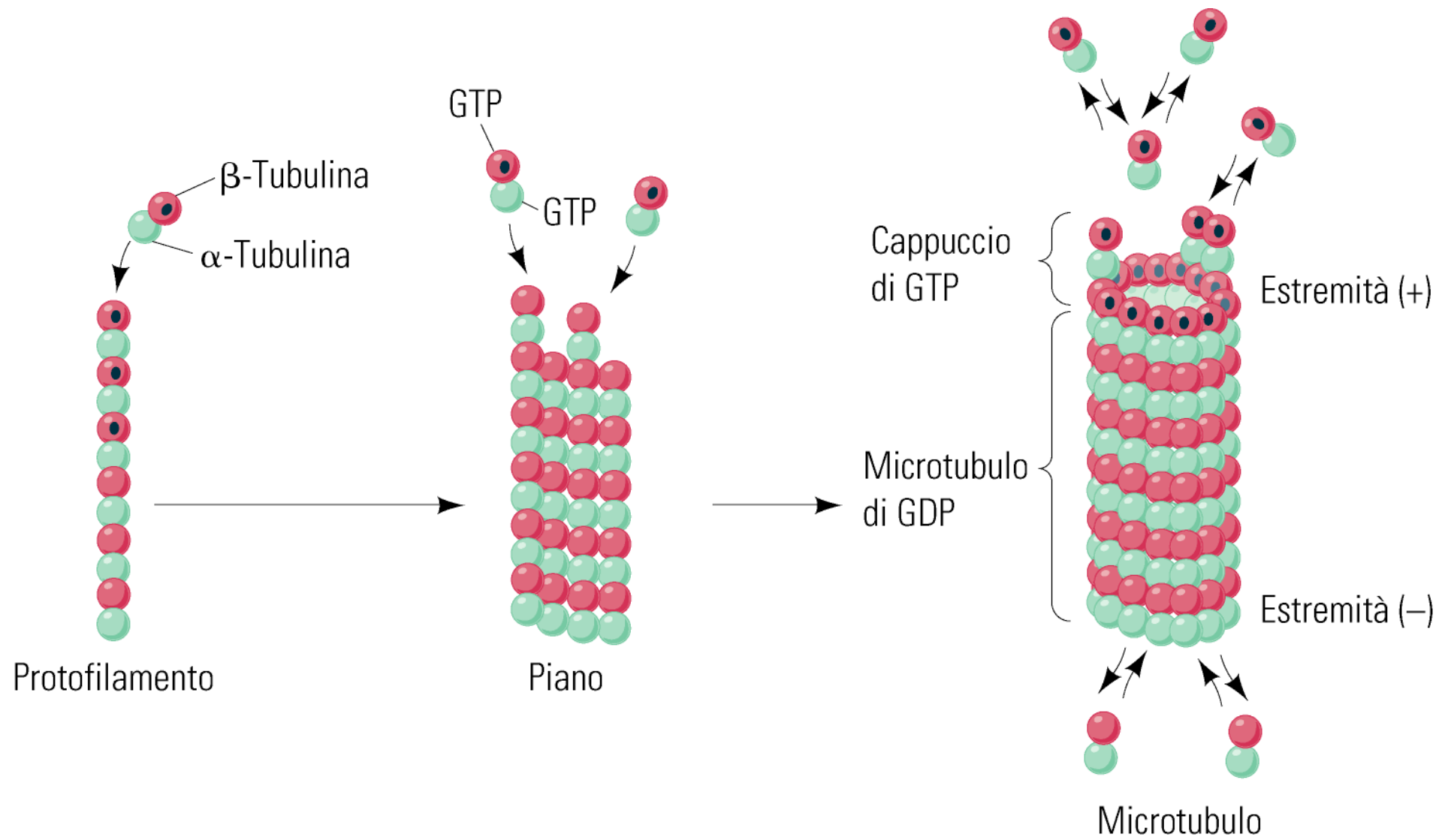


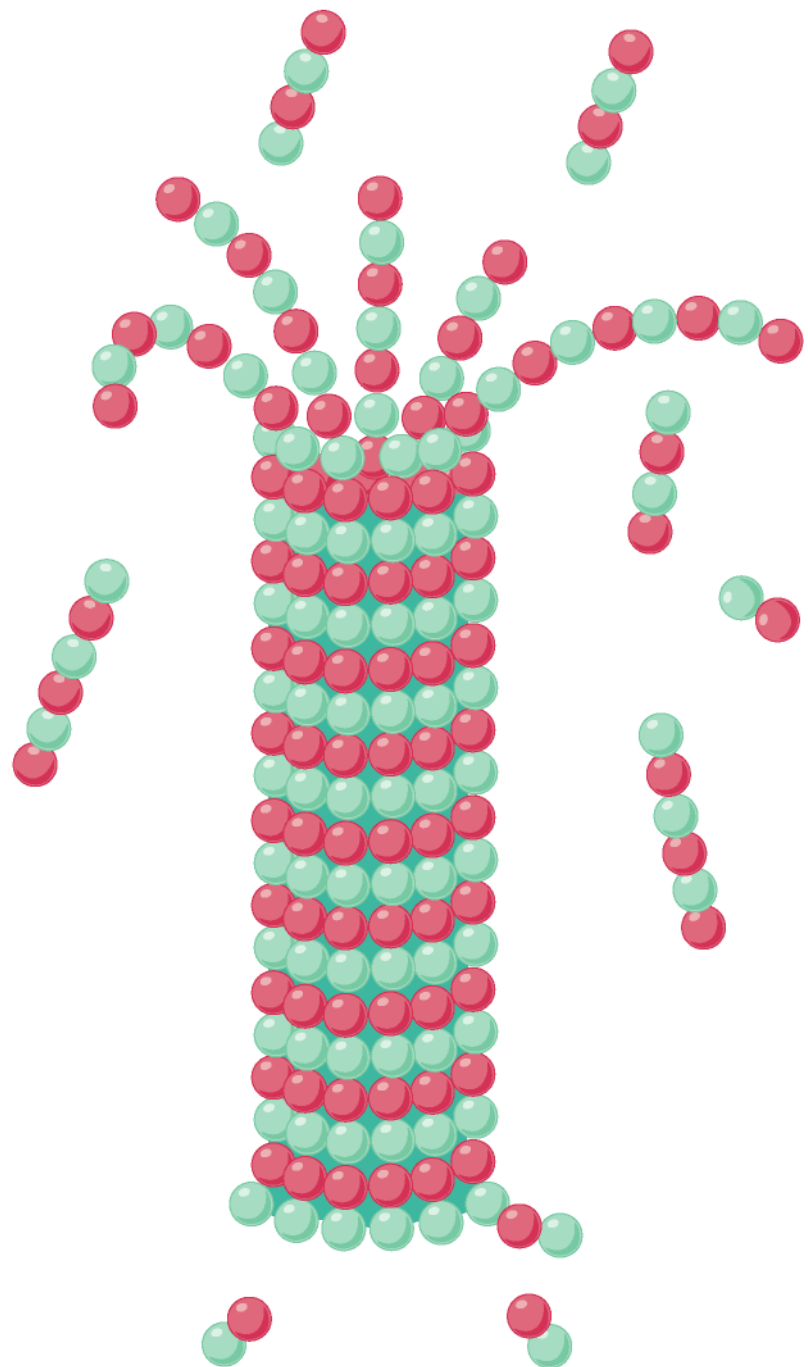
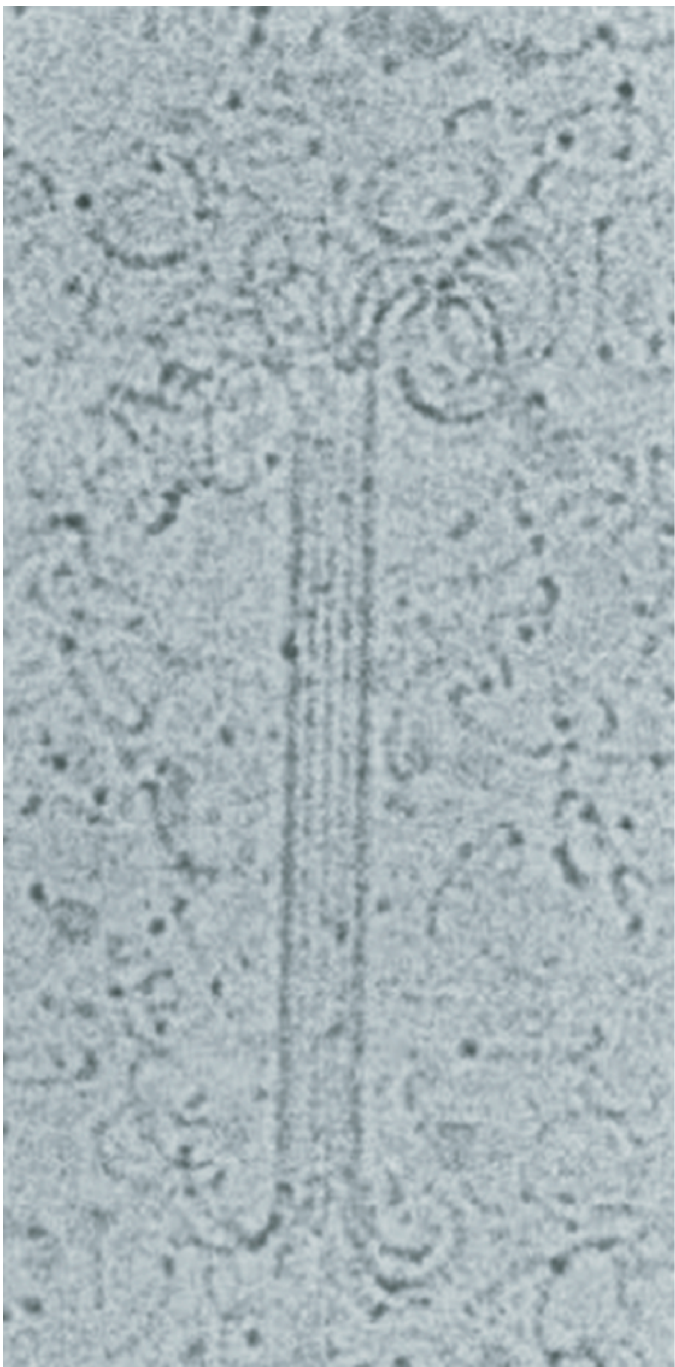
Microtubuli

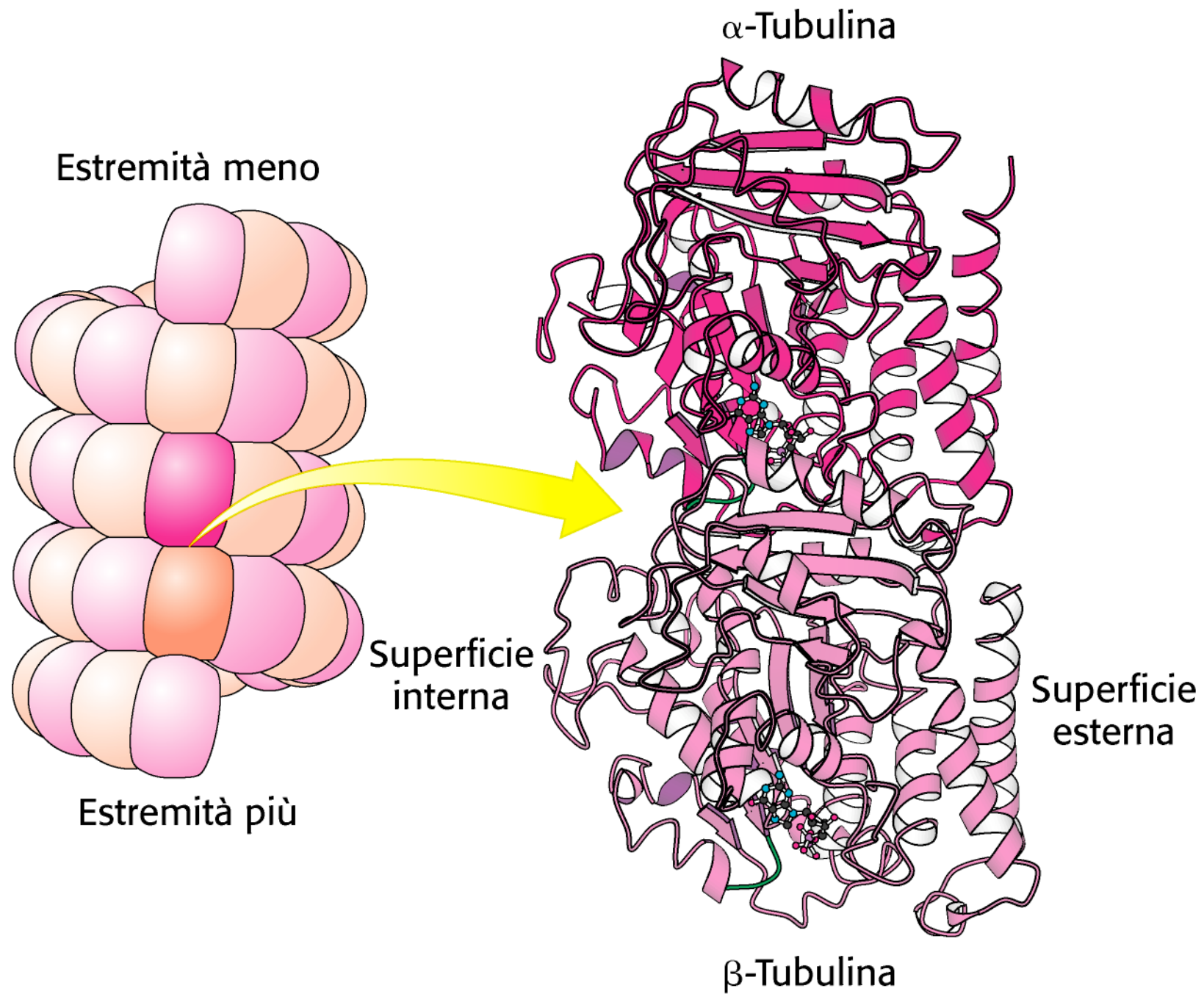


I microtubuli sono formati da tubulina alfa e tubulina beta, due polipeptidi globulari, che polimerizzano in 13 protofilamenti lineari. I protofilamenti sono allineati in parallelo con la stessa polarità.

Il microtubulo è polare con un estremità positiva (in crescita veloce) ed una negativa (a crescita lenta).





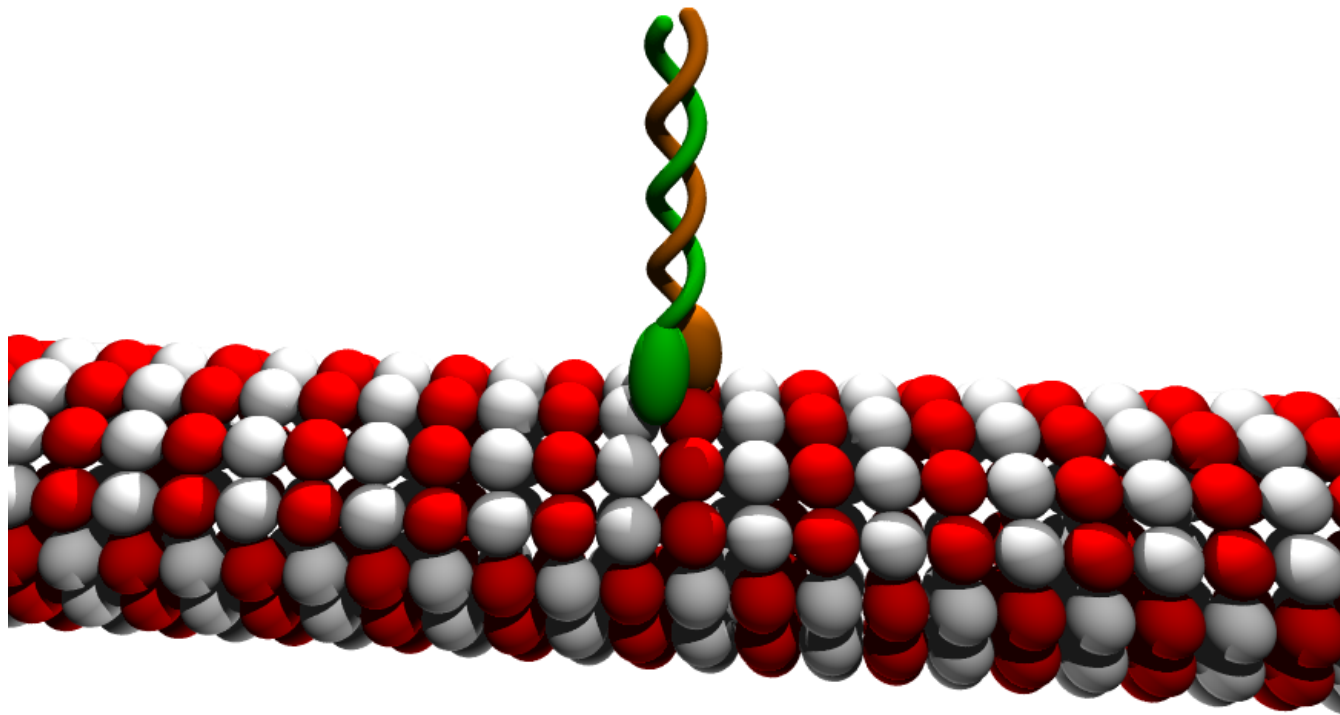


MOTORI MOLECOLARI

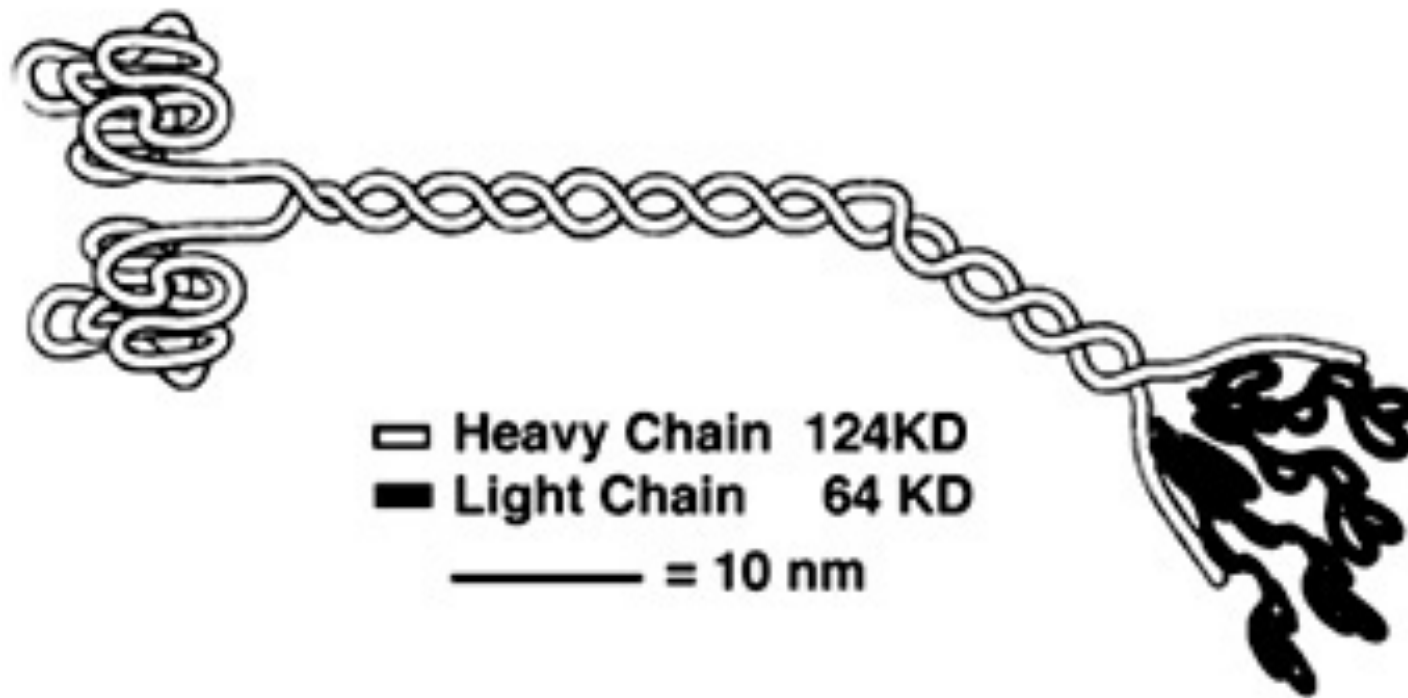
PROTEINE TRASPORTATRICI
DI ORGANELLI INTRACELLULARI

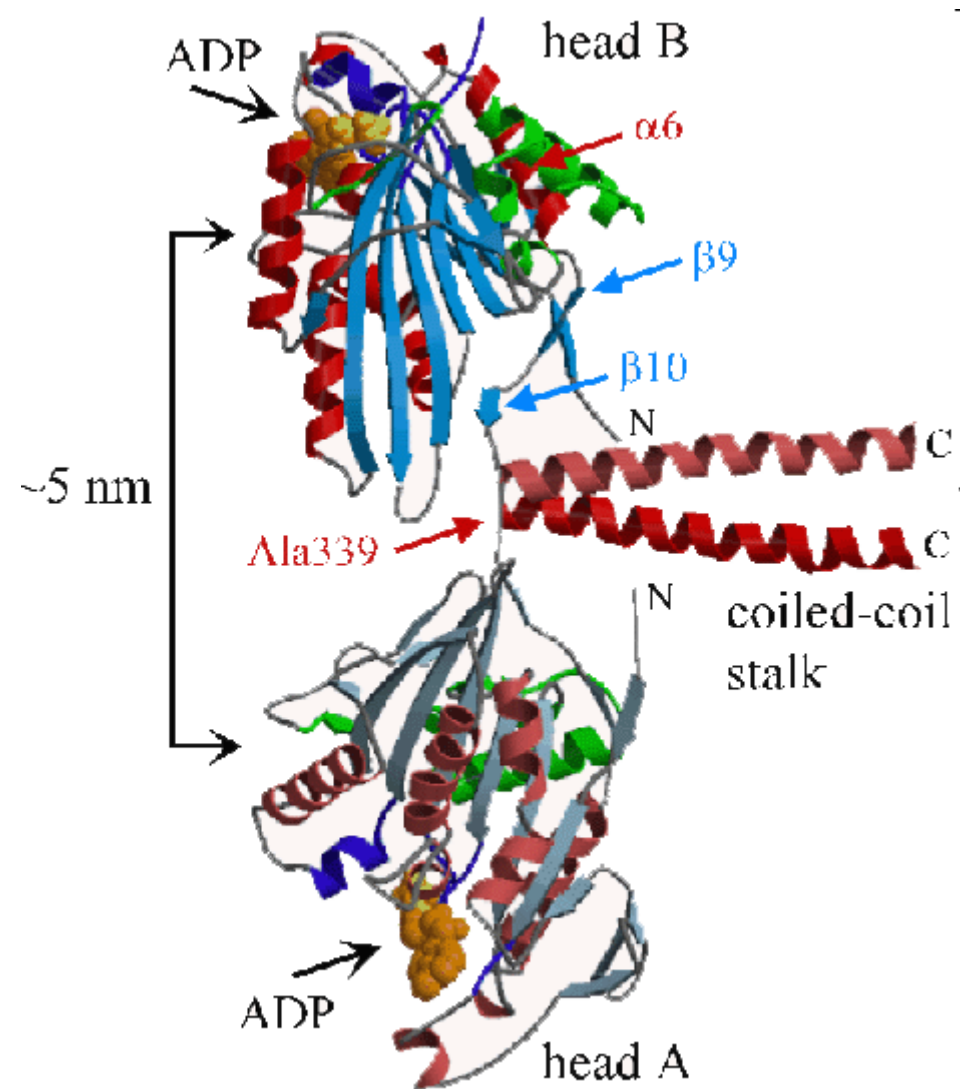
LE STRUTTURE ED IL MOVIMENTO

Un motore molecolare: la chinesina

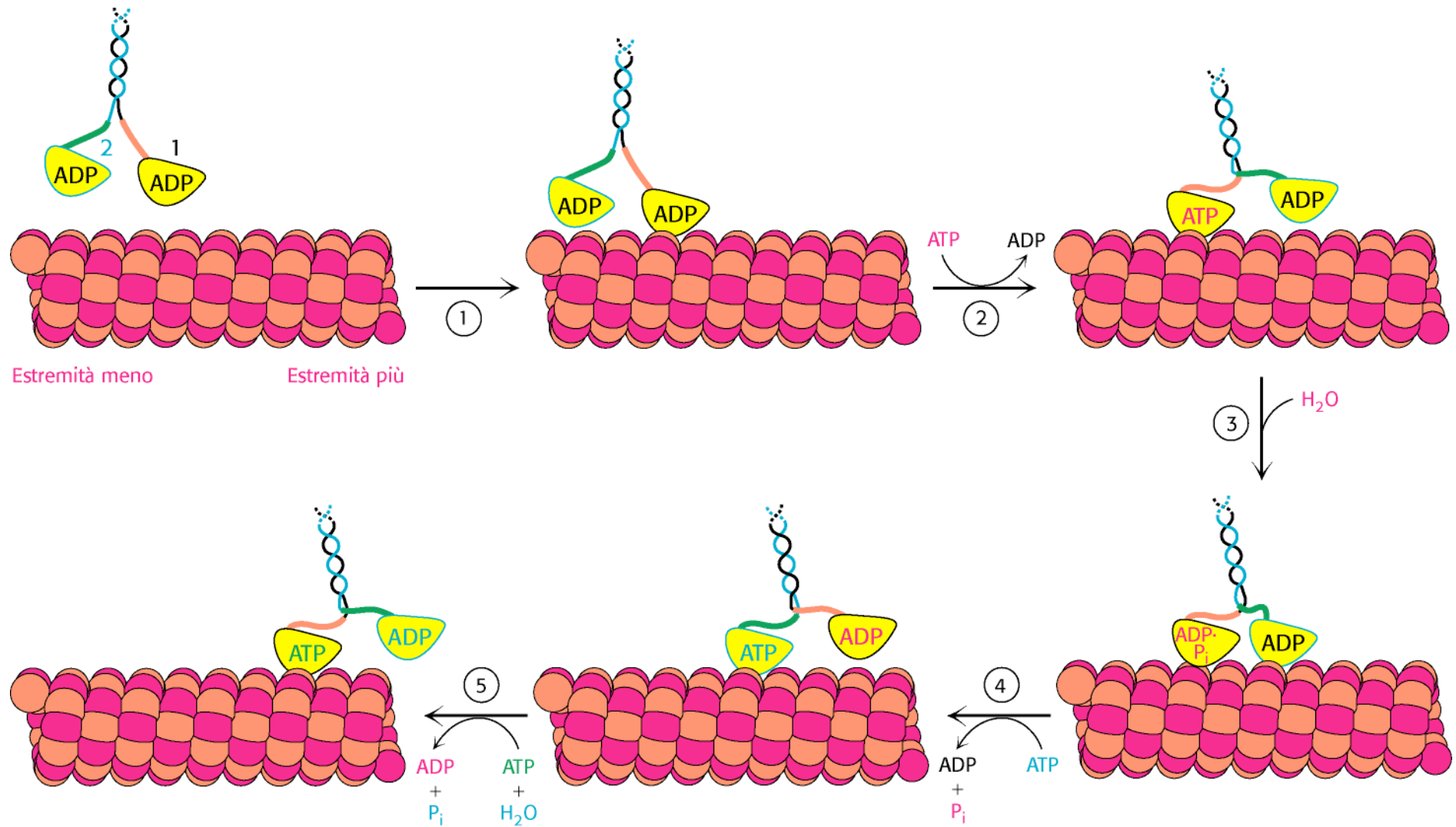


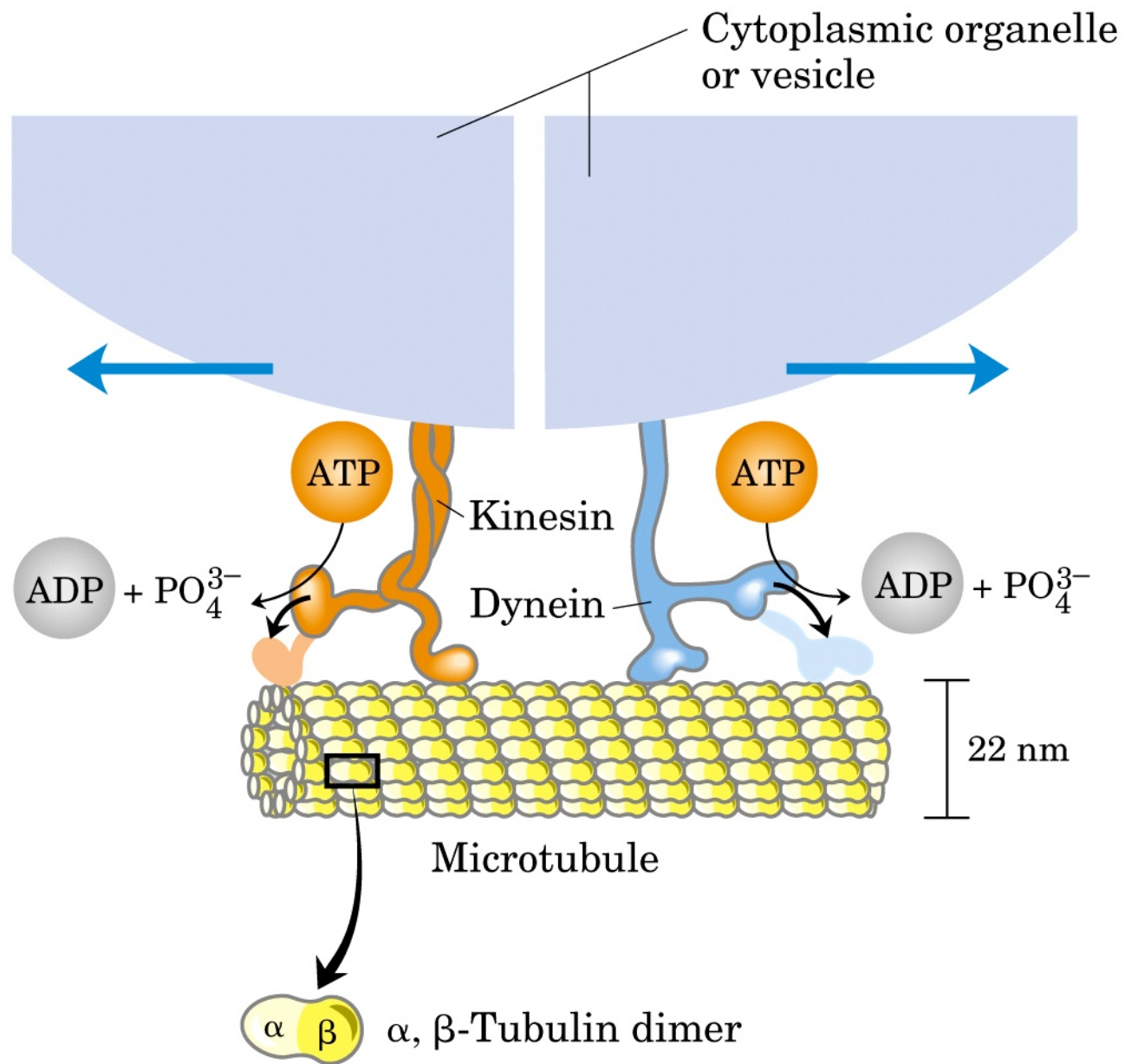
Struttura chinesina-1





Schema del funzionamento delle chinesine





Filmato studio daily

