

# TESSUTO NERVOSO

- composto da cellule eccitabili, **NEURONI**, dotate di :
    - corpo cellulare
    - prolungamenti
  - capaci di generare e propagare a distanza stimoli elettrici, **IMPULSI NERVOSI**
  - interconnessi in **RETI NEURONALI** tramite giunzioni, **SINAPSI**, specializzate per la trasmissione degli impulsi nervosi
- 
- **percezione di stimoli dall'esterno e dall'interno del corpo**
  - **regolazione delle funzioni dei visceri** (secrezione, motilità)
  - **controllo della motilità volontaria**
  - **espletamento delle funzioni intellettive superiori**
    - memoria
    - apprendimento
    - ideazione

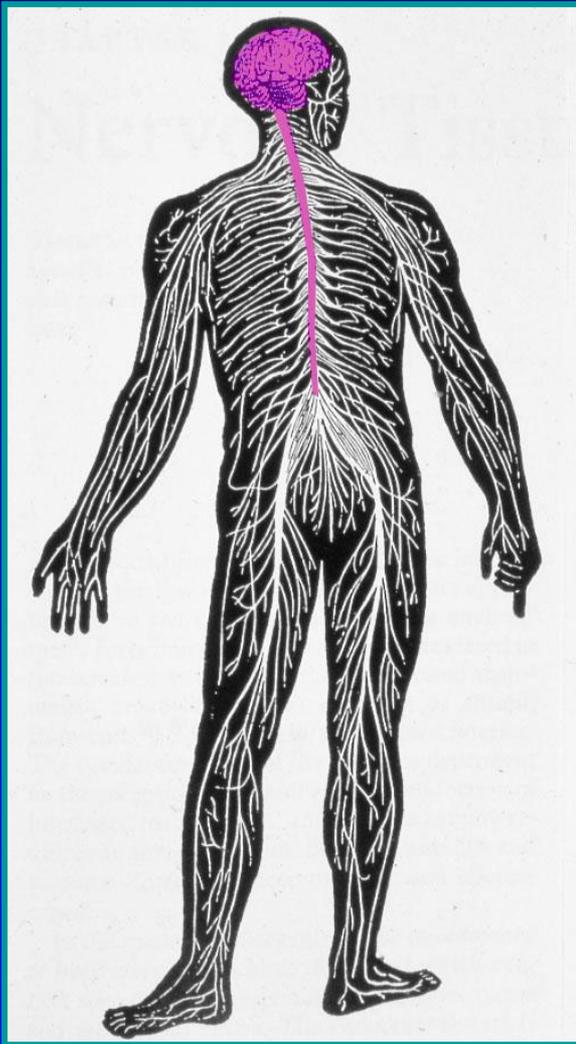
# SISTEMA NERVOSO

## SISTEMA NERVOSO CENTRALE, o NEVRASSE

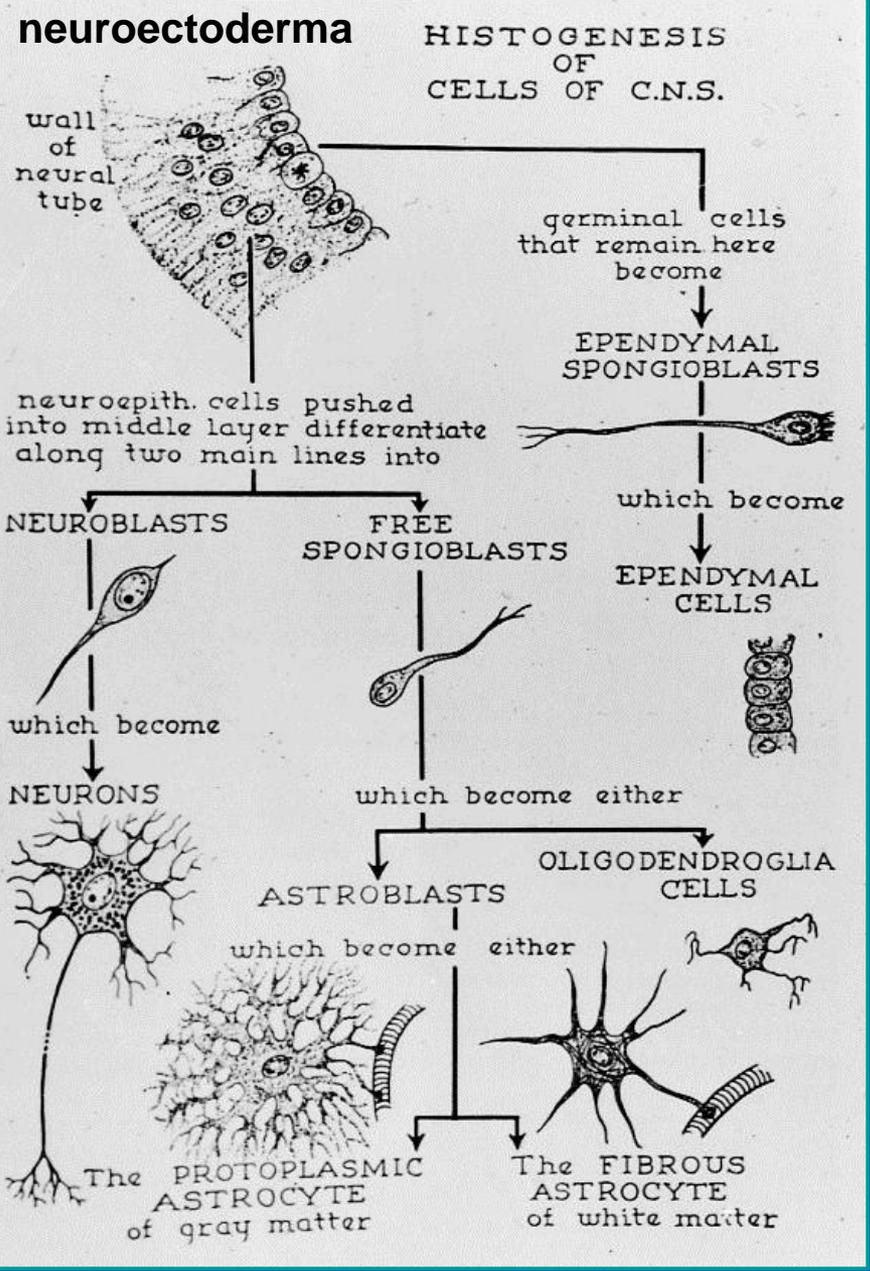
- encefalo
- midollo spinale
- sostanza grigia
  - cortecce
  - nuclei
  - colonne
- sostanza bianca

## SISTEMA NERVOSO PERIFERICO

- cerebro-spinale
- autonomo, o simpatico
  - ortosimpatico
  - parasimpatico
- gangli
- nervi
  - afferenti (sensitivi)
  - efferenti (motori e visceroeffettori)



# TESSUTO NERVOSO

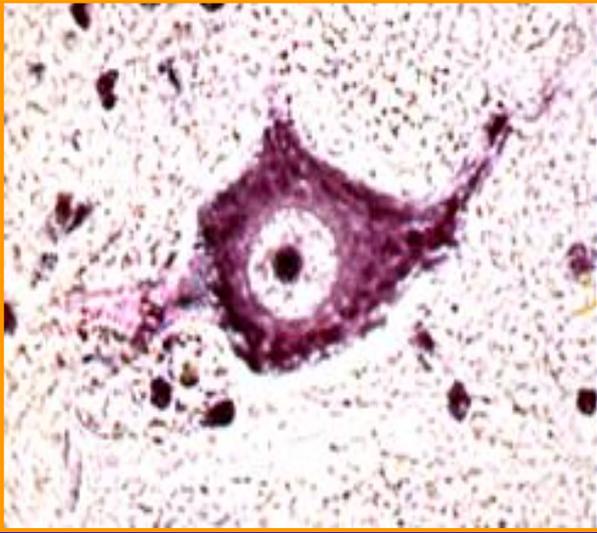


NEURONI

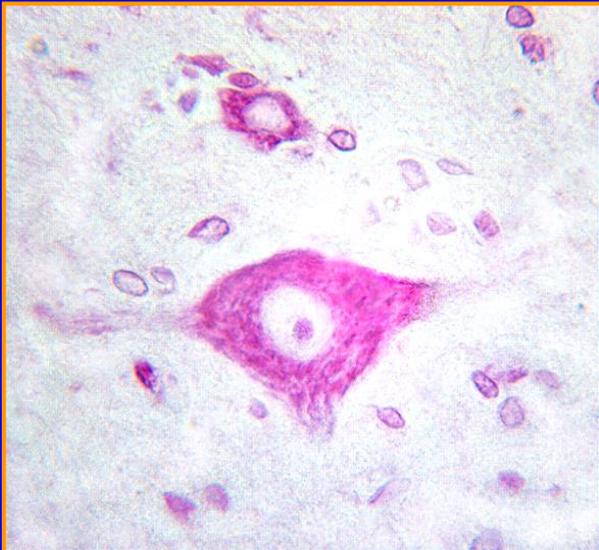
CELLULE DI NEVROGLIA

# TESSUTO NERVOSO

## COLORANTI BASICI



Nissl

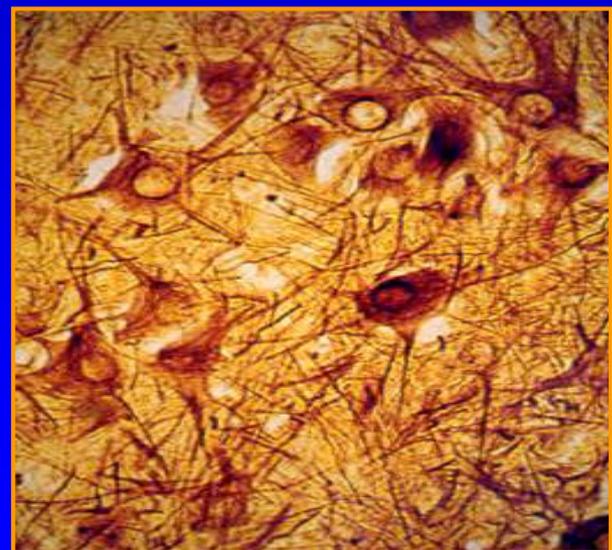


pironina

## IMPREGNAZIONE ARGENTICA



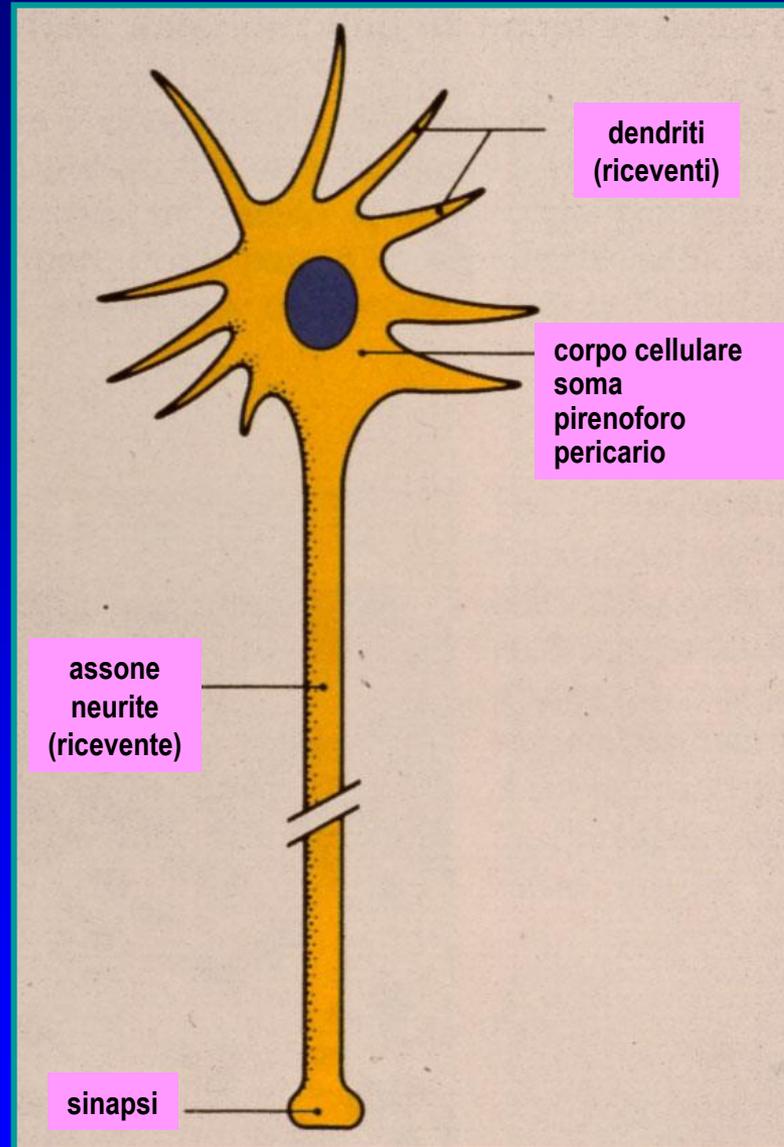
reazione nera di Golgi



metodo fotografico di Cajal

# TESSUTO NERVOSO

## NEURONI

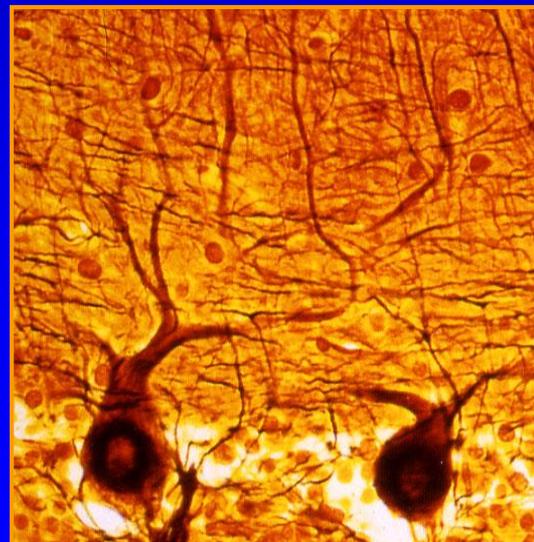
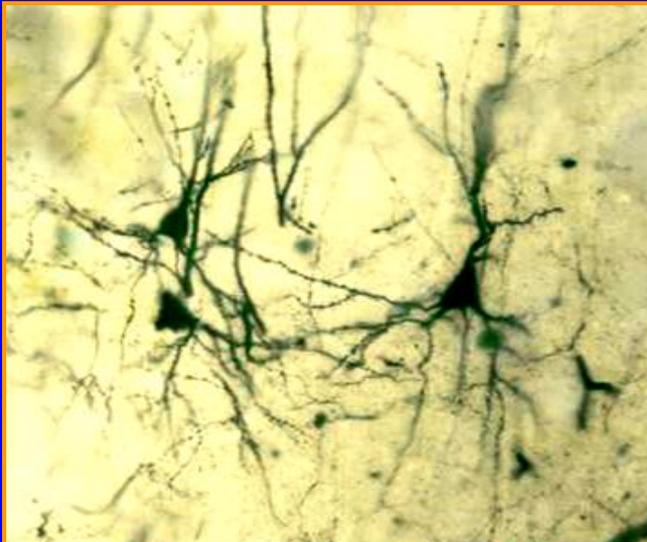
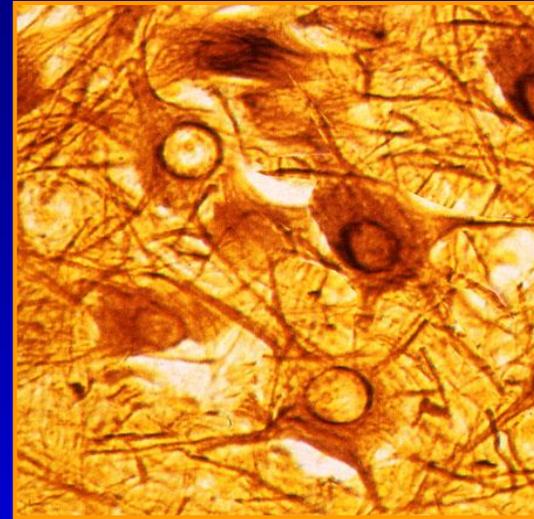
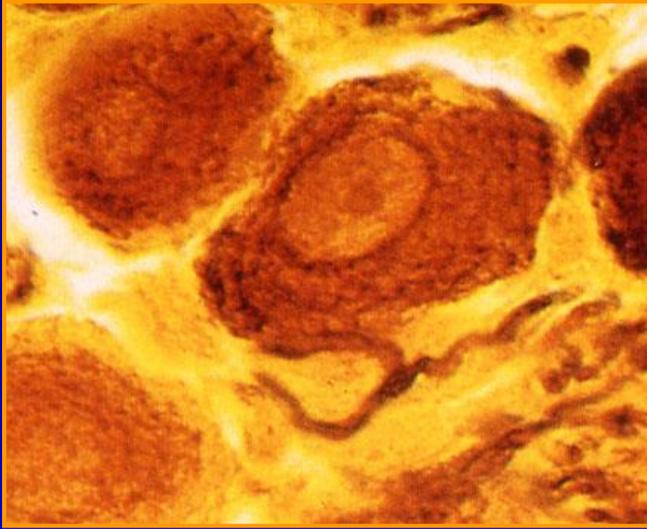


I tipo di Golgi  
- neurite lungo

II tipo di Golgi  
- neurite breve

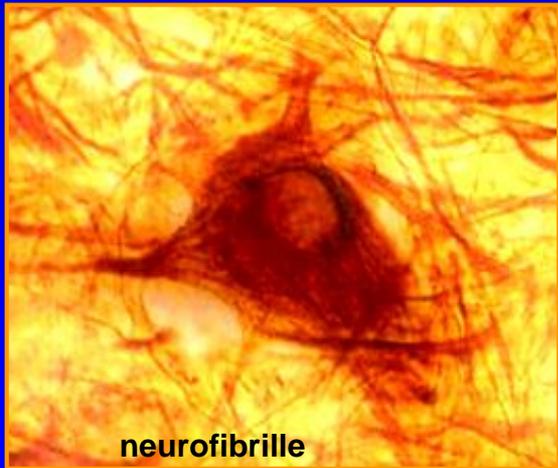
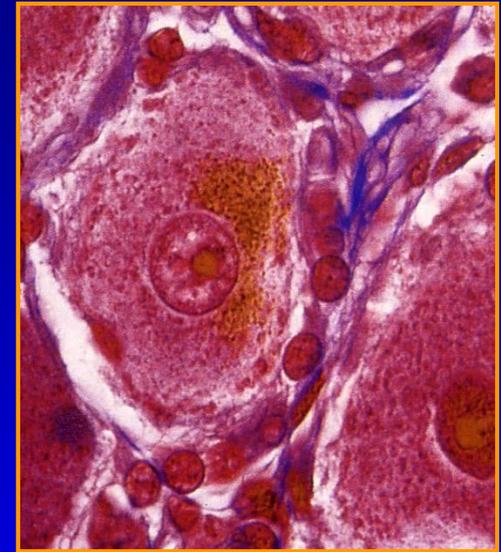
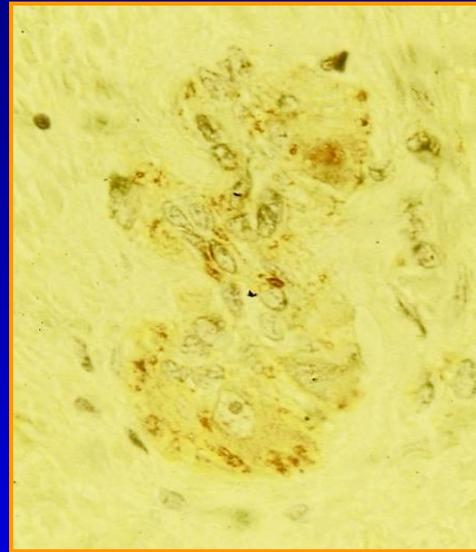
# NEURONI

## FORMA DEL SOMA



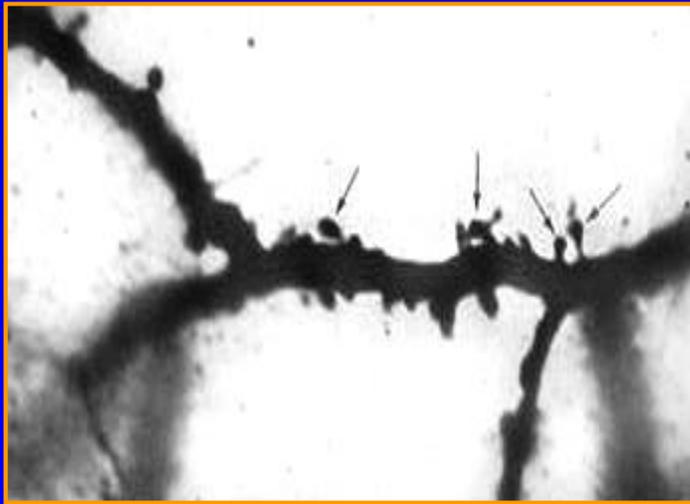
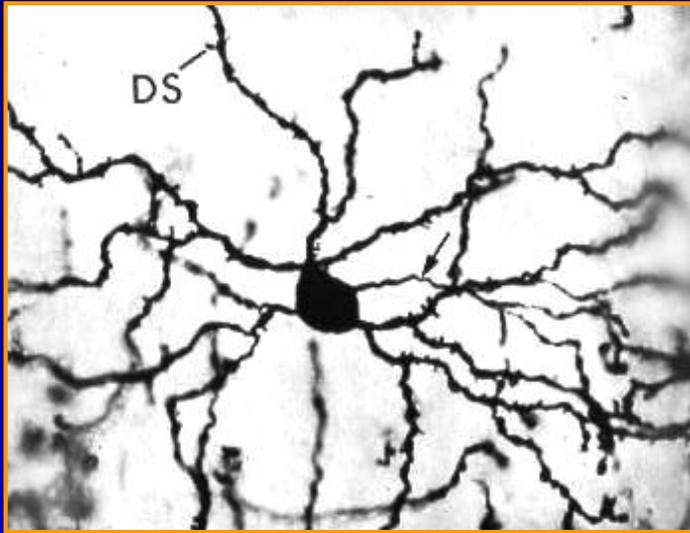
# NEURONI

## STRUTTURA DEL SOMA

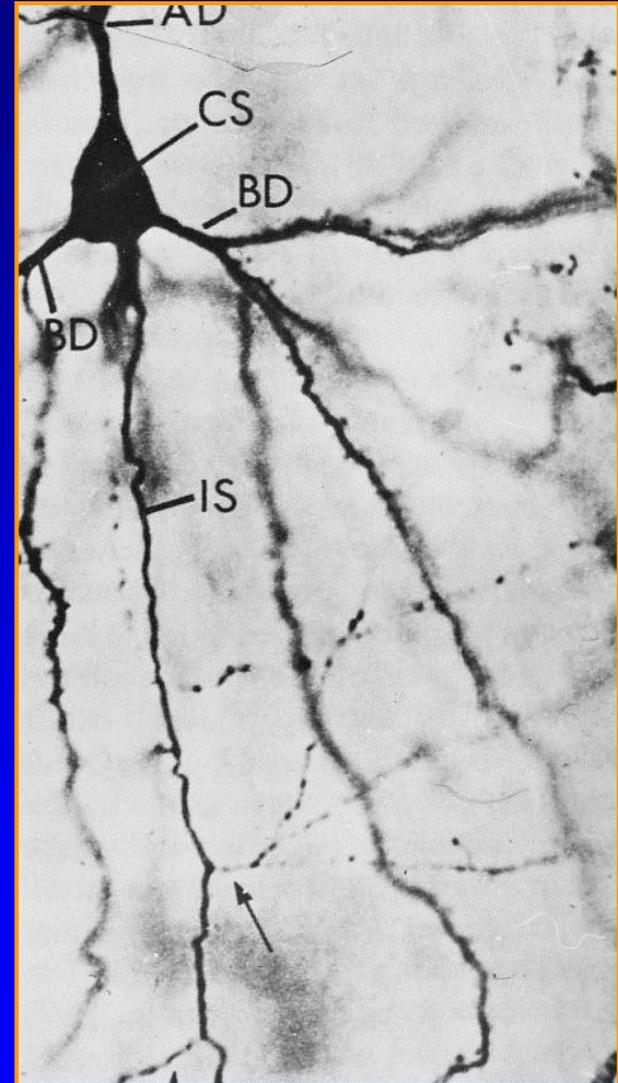


# NEURONI

## DENDRITI



## NEURITE o ASSONE

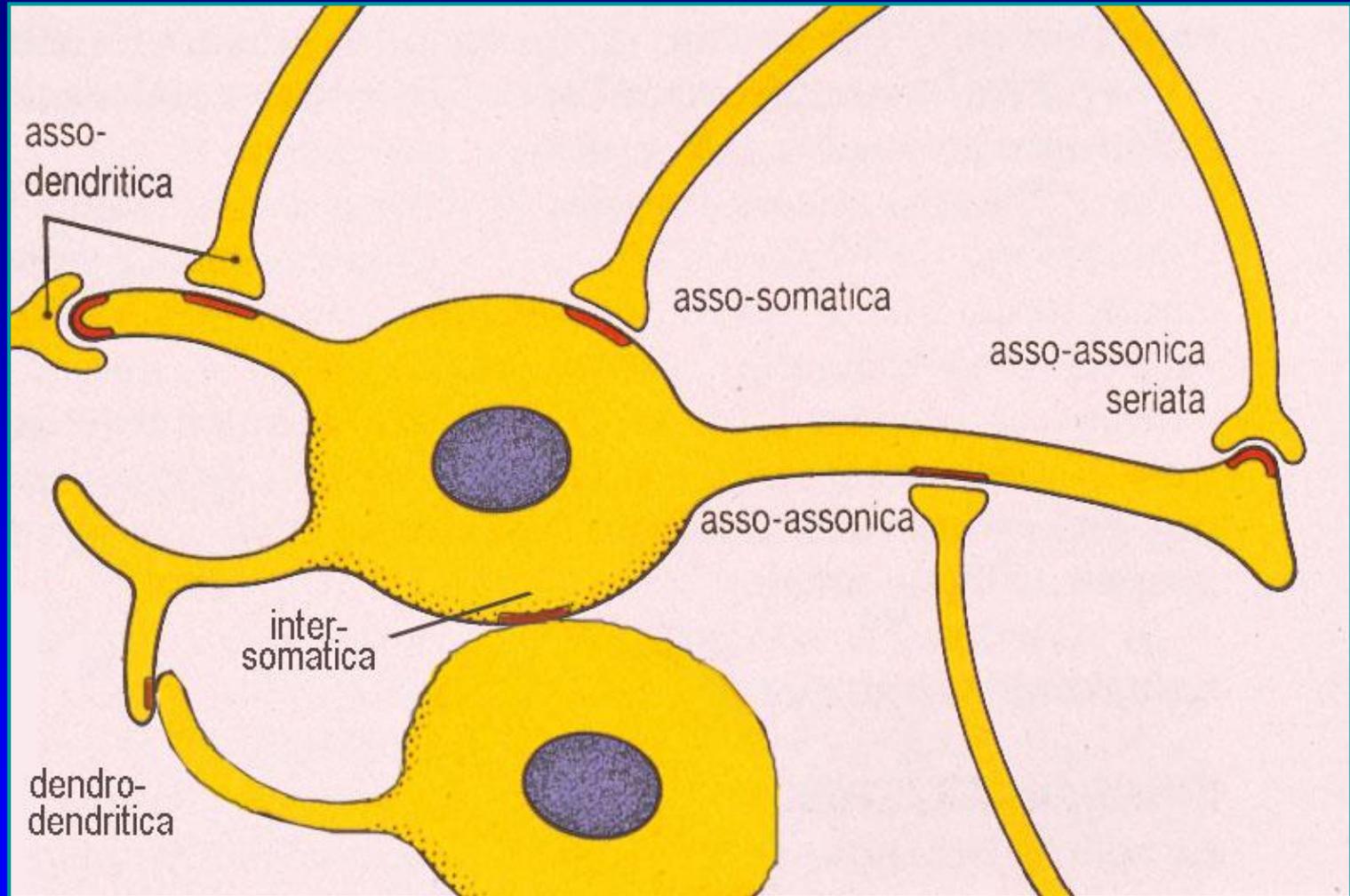


# NEURONI

## FLUSSO ASSONICO

- anterogrado veloce (~ 200 mm/giorno) ← CHINESINA { vescicole di NT  
vescicole di membrana  
enzimi
- anterogrado lento (~ 1 mm/giorno) ← ACTO-MIOSINA { monomeri citoscheletrici  
mitocondri
- retrogrado (~ 200 mm/giorno) ← DINEINA { multivesicular bodies  
organuli usurati  
coated vesicles (misterine ?)

# NEURONI SINAPSI



# NEURONI SINAPSI

## 1. SINAPSI ELETTRICHE



## 2. SINAPSI CHIMICHE (++++)



$\Delta T$  = tempo perduto di sinapsi

# NEURONI SINAPSI CHIMICHE



apertura canali del  $\text{Ca}^{2+}$

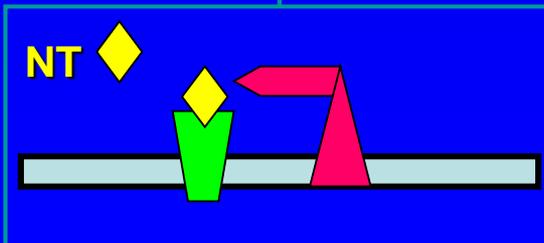
attivazione CaM-chinasi

fosforilazione sinapsina 1

mobilizzazione vescicole  
sinaptiche

attivazione neuroactina della  
griglia sinaptica

esocitosi e rilascio del NT



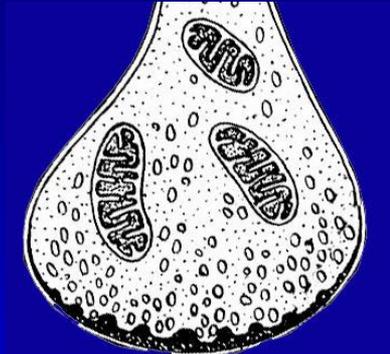
# NEURONI

## SINAPSI CHIMICHE

LIVELLI PRESINAPTICI  
DI NEUROTRASMETTITORE

- 
1. *reuptake* presinaptico
  2. sintesi nel bulbo sinaptico
  3. apporto di vescicole sinaptiche dal soma

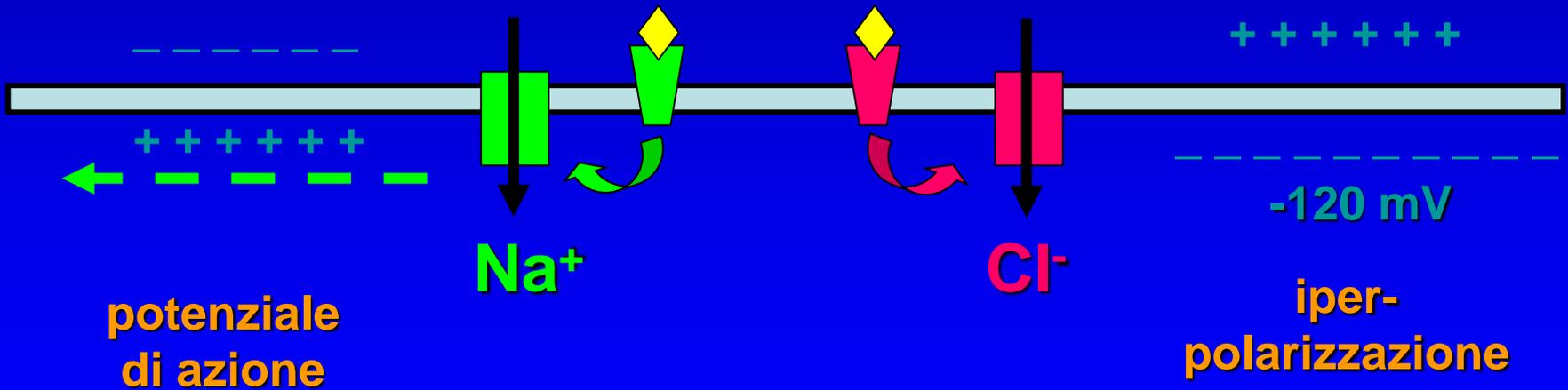
# NEURONI SINAPSI CHIMICHE



ECCITATORIE

NT 

INIBITORIE



# NEURONI SINAPSI CHIMICHE

tipo colinergico  
tipo adrenergico  
tipo peptidergico

	es.	
NEUROTRASMETTITORE	ACh	NA
NEUROMODULATORE	VIP	SP

# CELLULE DI NEVROGLIA

- **NEVROGLIA del SNC**

- cellule ependimali
- astrociti
- oligodendrociti
- microglia

mesenchima

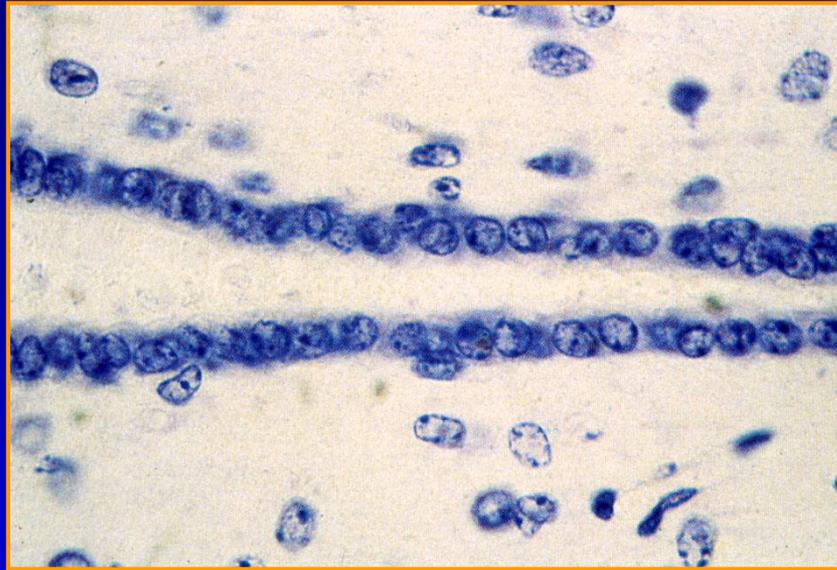


- **NEVROGLIA del SNP**

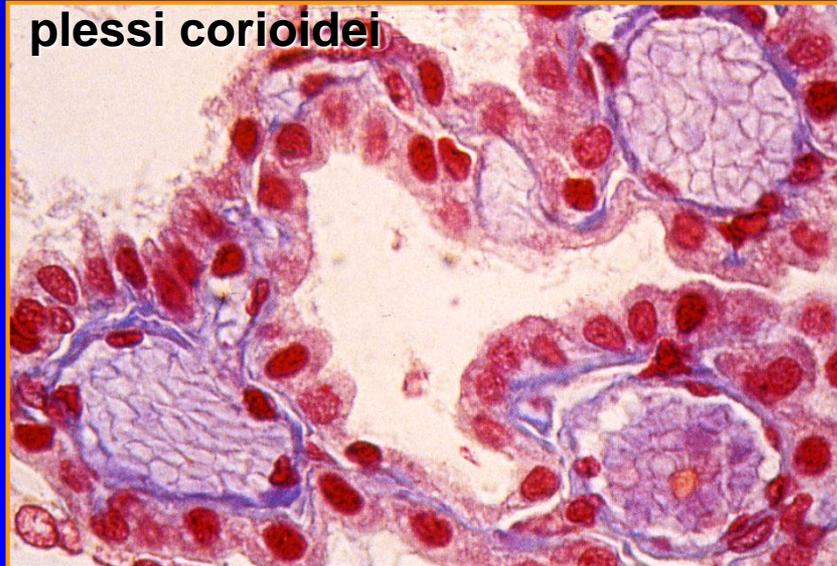
- cellule satelliti gangliari
- cellule di Schwann
- cellule di telogia

# NEVROGLIA del SNC

## EPENDIMA



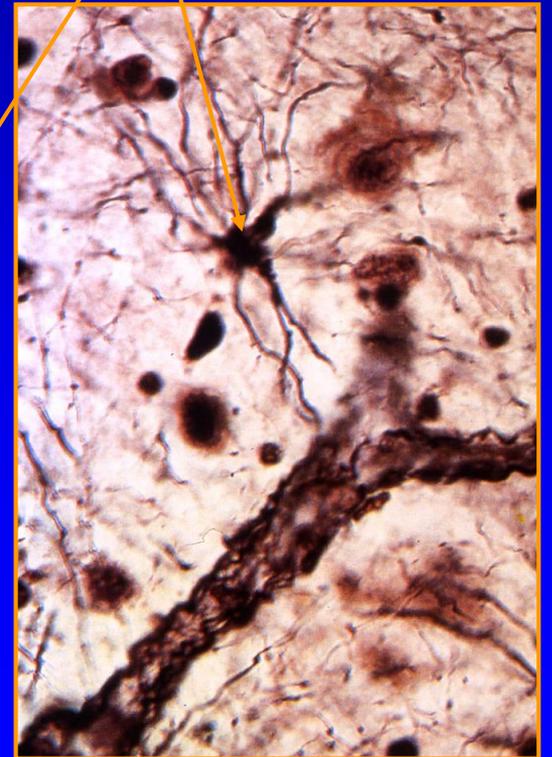
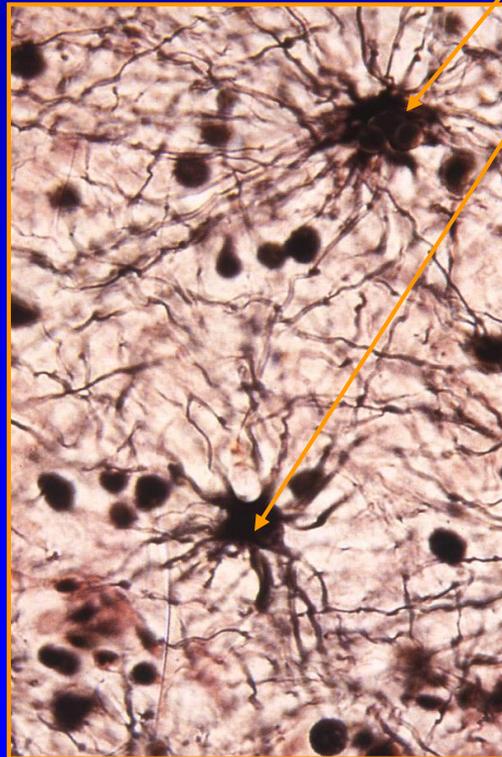
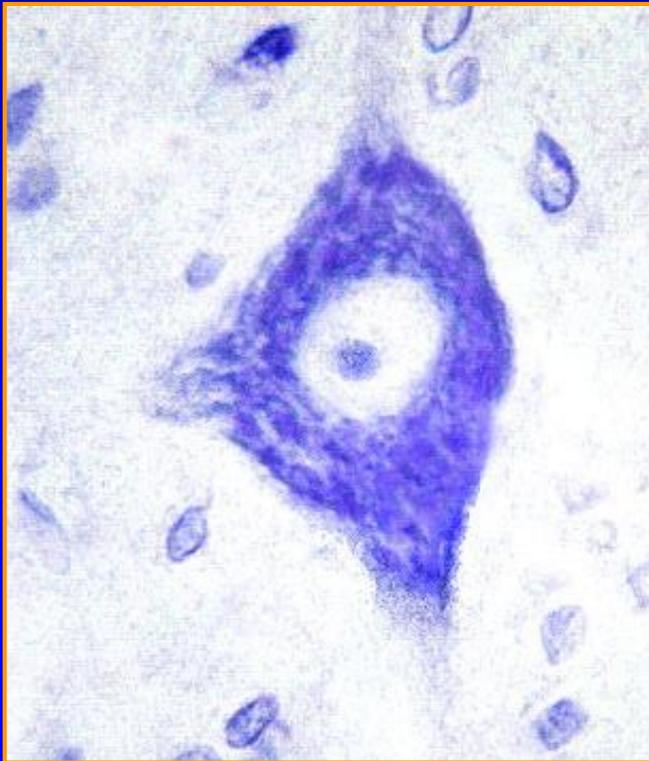
**plessi corioidei**



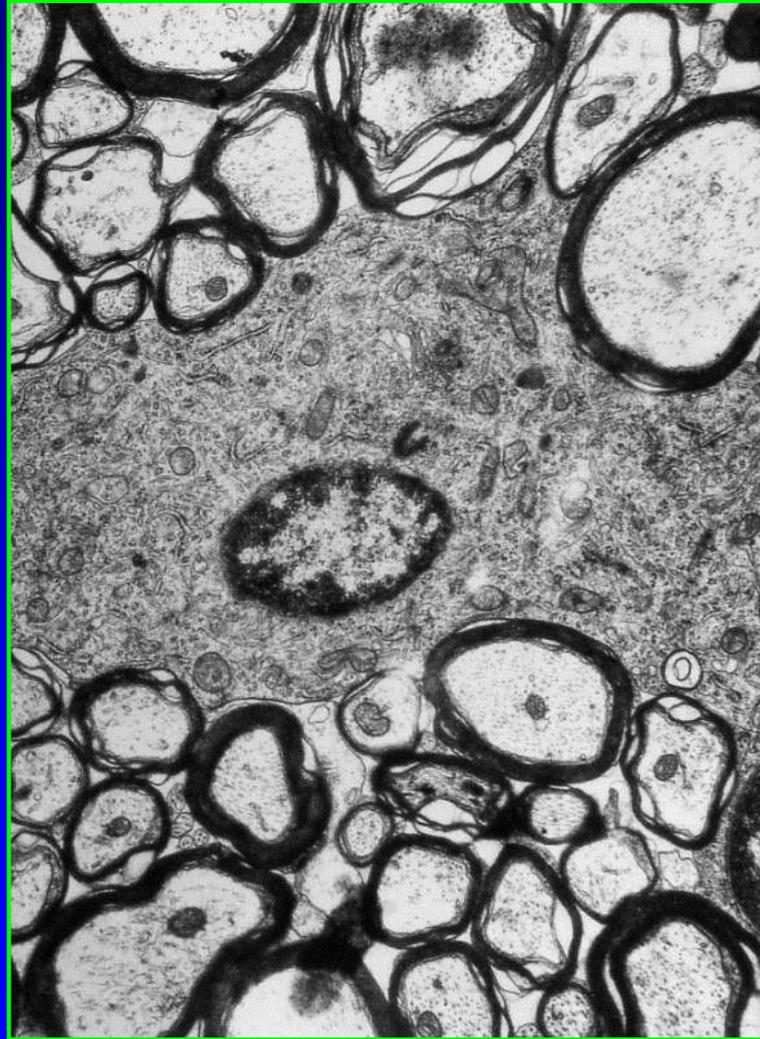
# NEVROGLIA del SNC ASTROCITI

• **protoplasmatici**

• **fibrosi**

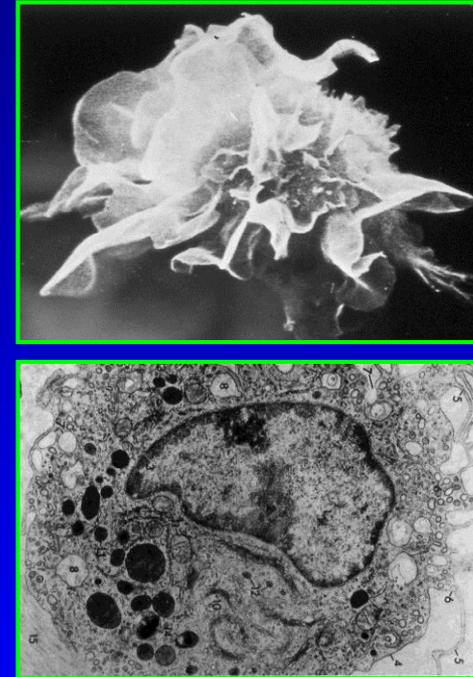
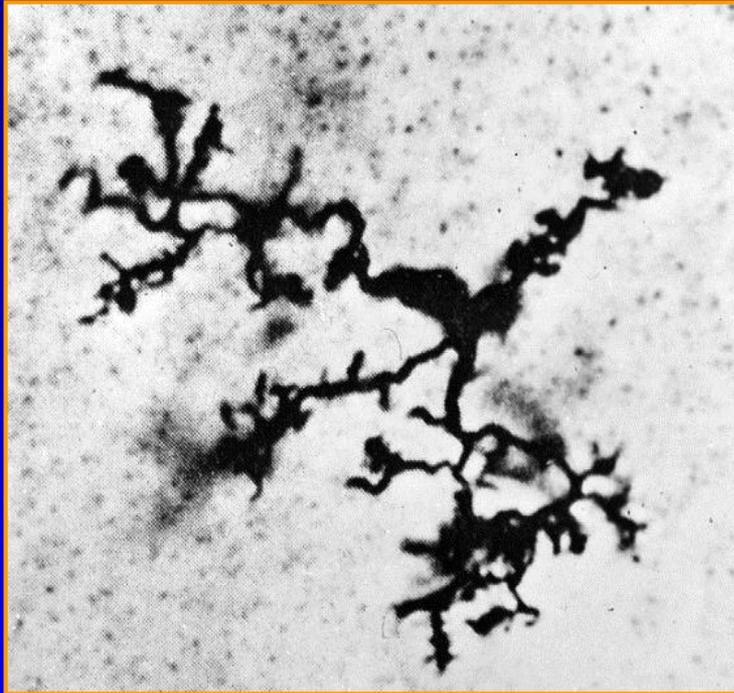


NEVROGLIA del SNC  
**OLIGODENDROCITI**



# NEVROGLIA del SNC

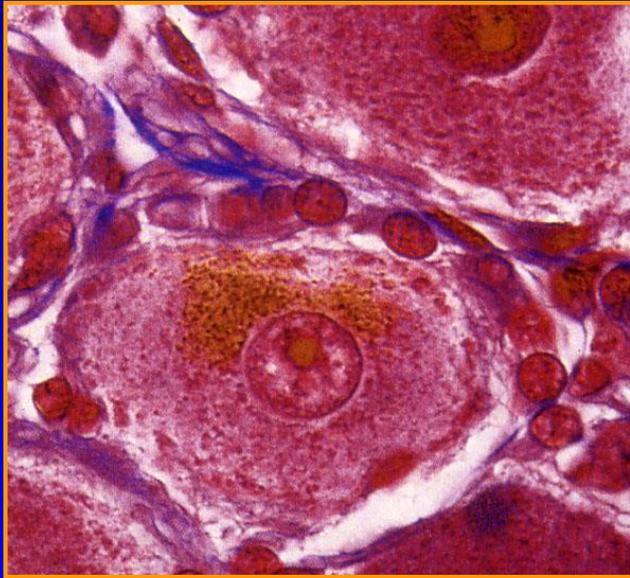
## MICROGLIA



sistema del fagocita mononucleato

# NEVROGLIA del SNP

## CELLULE SATELLITI



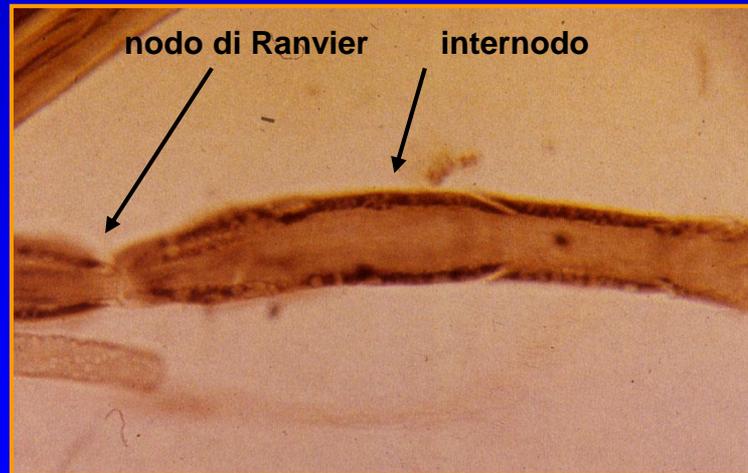
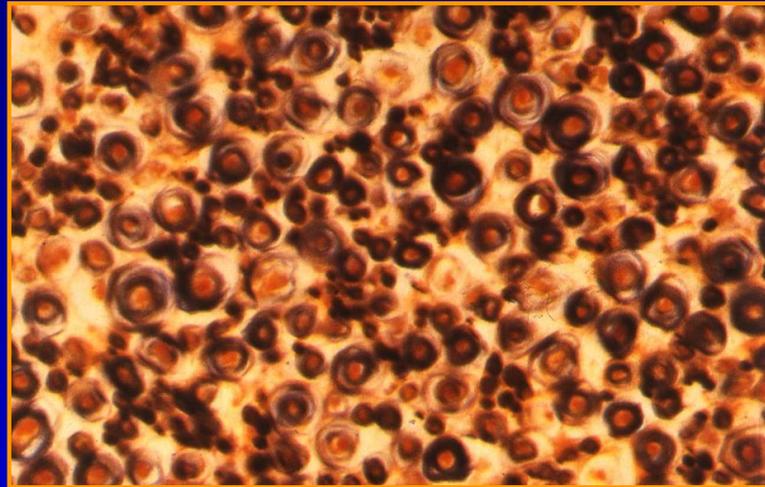
gangli

## CELLULE di SCHWANN



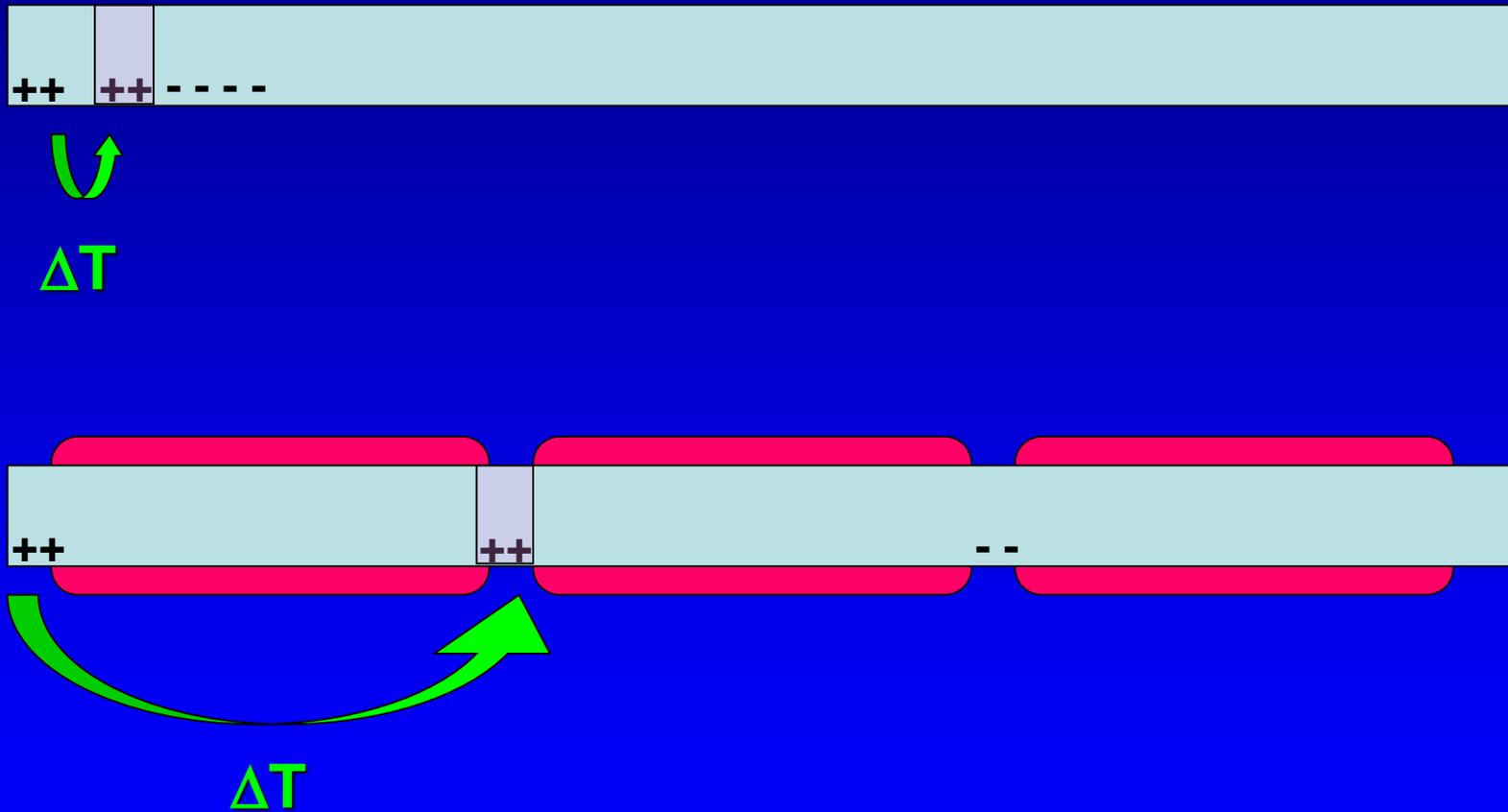
nervi

# GUAINA MIELINICA



# GUAINA MIELINICA

## CONDUZIONE SALTATORIA DELL'IMPULSO NERVOSO



# FIBRE NERVOSE

1. **AFFERENTI** (sensitive) ← di solito DENDRITI
2. **EFFERENTI** (motorie / effettrici) ← di solito ASSONI

## 1. MIELINICHE

## 2. AMIELINICHE

# CLASSIFICAZIONE DELLE FIBRE NERVOSE

**A**

- mieliniche 
- cilindrassi grandi ( $\emptyset \sim 100-30 \mu\text{m}$ )
- internodi lunghi ( $\sim 1000 \mu\text{m}$ )
- VELOCITA'  $> 100 \text{ m/sec}$

- fibre motrici somatiche  $\alpha$
- fibre sensitive

**B**

- mieliniche 
- cilindrassi piccoli ( $\emptyset \sim 30-3 \mu\text{m}$ )
- internodi brevi ( $\sim 500 \mu\text{m}$ )
- VELOCITA'  $\sim 10 \text{ m/sec}$

- fibre motrici fusali  $\gamma$
- fibre simpatiche pre-gangliari

**C**

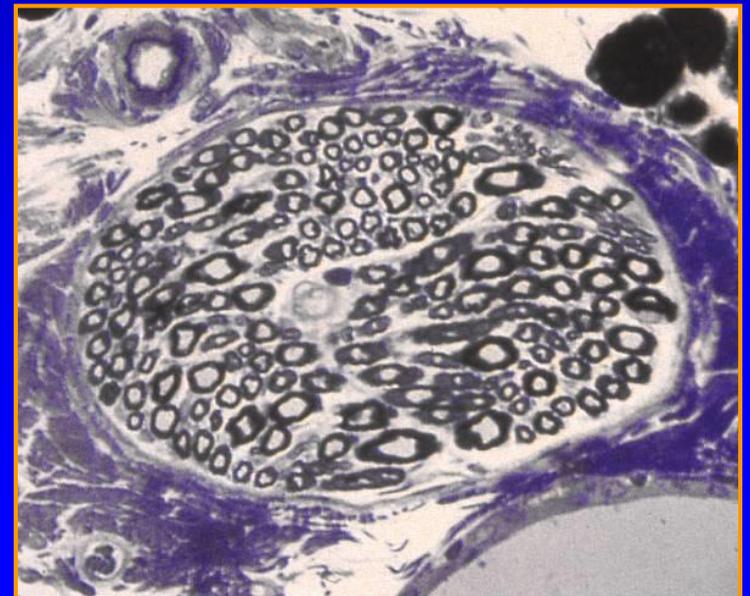
- amieliniche 
- cilindrassi molto piccoli ( $\emptyset \sim 3-0,5 \mu\text{m}$ )
- VELOCITA'  $\sim 10 \text{ cm/sec}$

- fibre simpatiche post-gangliari
- fibre sensitive dolorifiche viscerali

# NERVI PERIFERICI



- epinevrio
- perinevrio
- endonevrio



# TERMINAZIONI NERVOSE PERIFERICHE

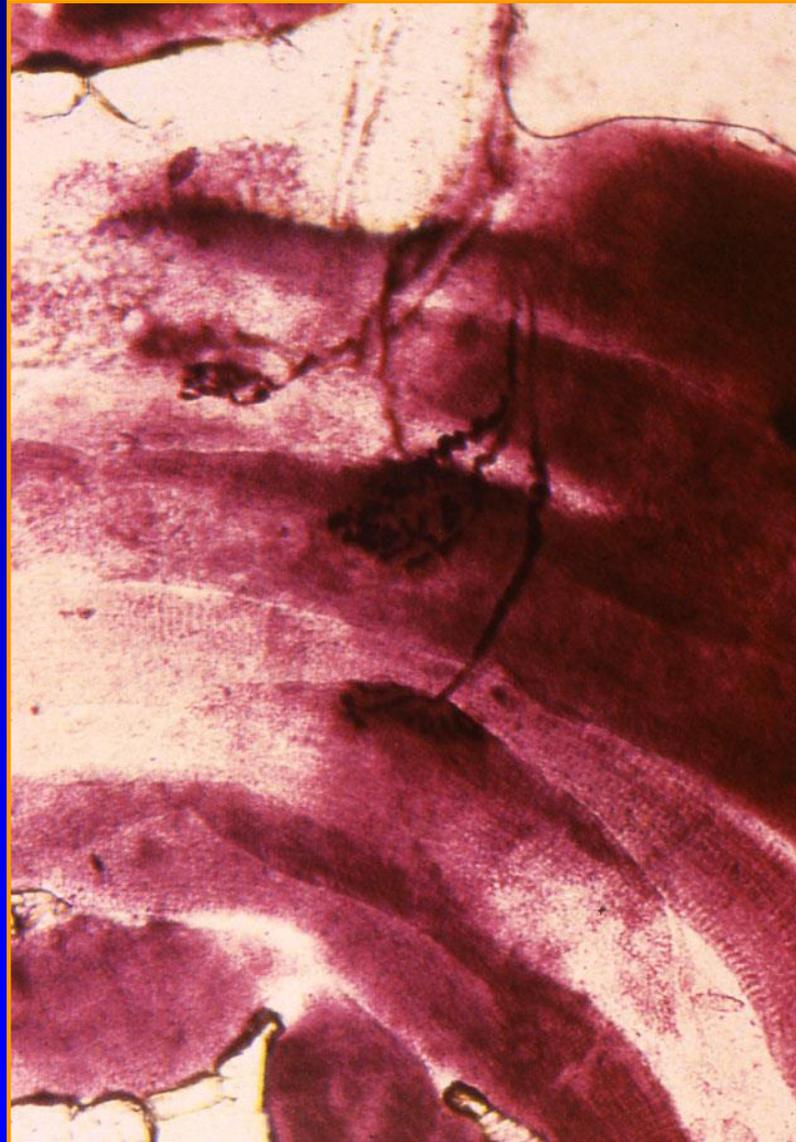
## 1. EFFERENTI (giunzioni cito-neurali)

- **motrici somatiche** (placca motrice)
- **viscero-effettrici**
- **eccito-secretrici**

## 2. AFFERENTI (sensitive / sensoriali)

- **libere**
- **corpuscolate**

**TERMINAZIONI NERVOSE EFFERENTI**  
**PLACCA MOTRICE**

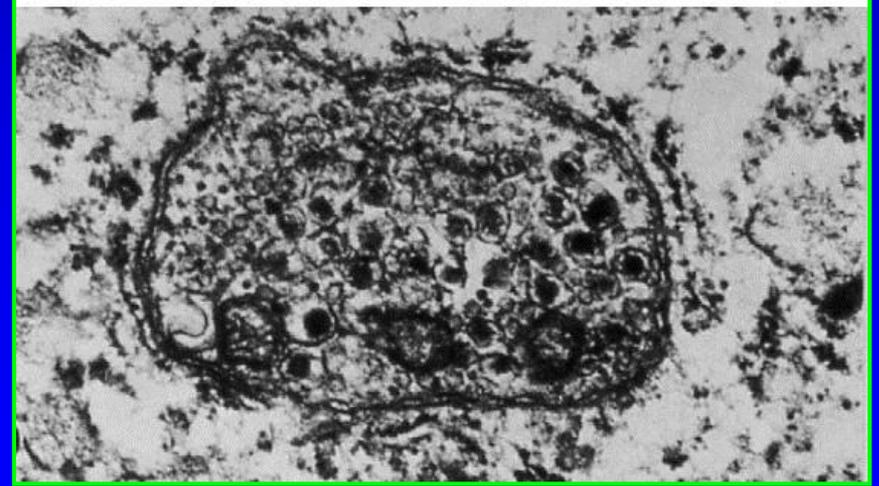
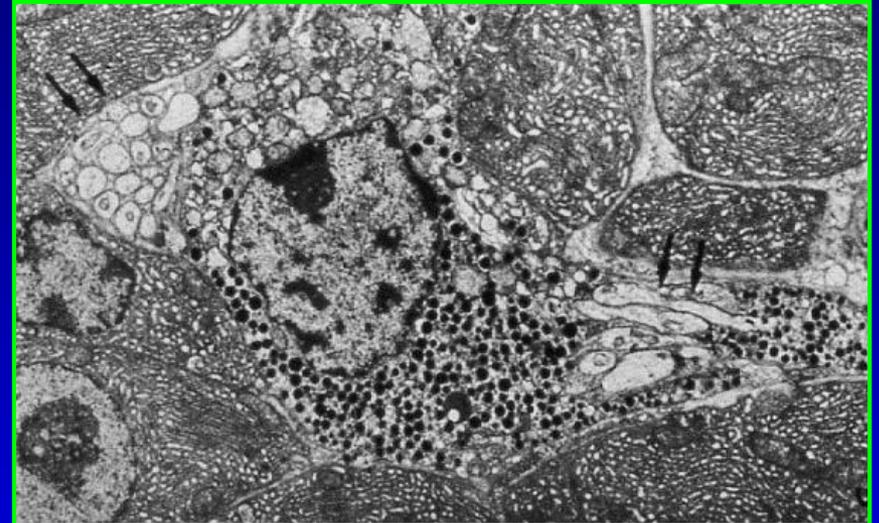


# TERMINAZIONI NERVOSE EFFERENTI

## VISCERO-EFFETTRICI



## ECCITO-SECRETORICI



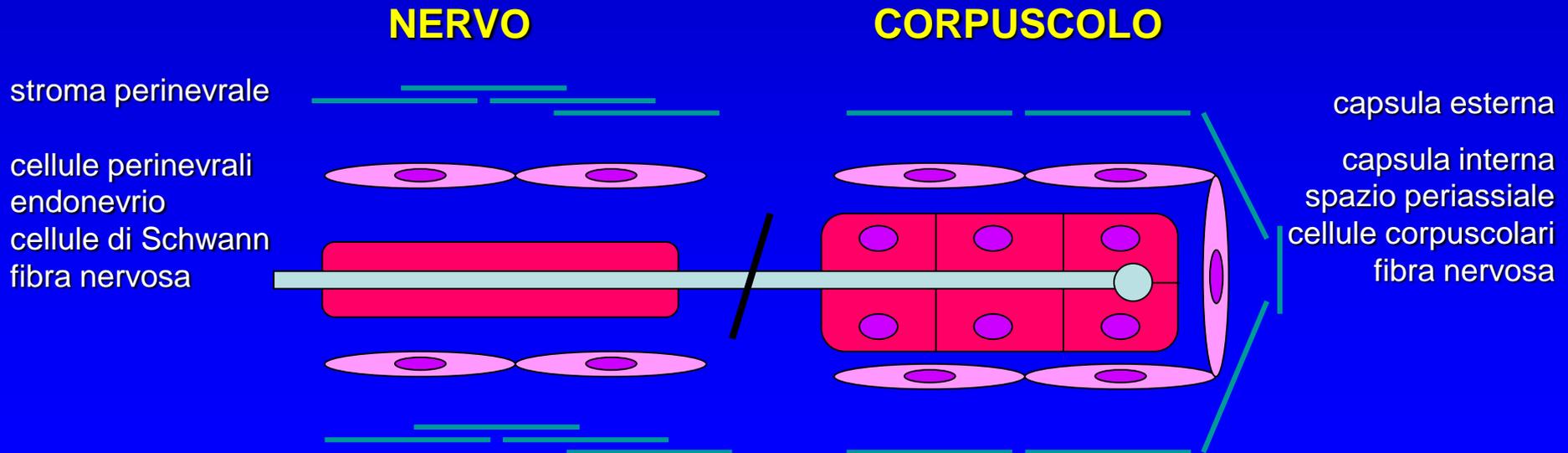
# TERMINAZIONI NERVOSE AFFERENTI

## 1. LIBERE

- negli epiteli
- nei connettivi

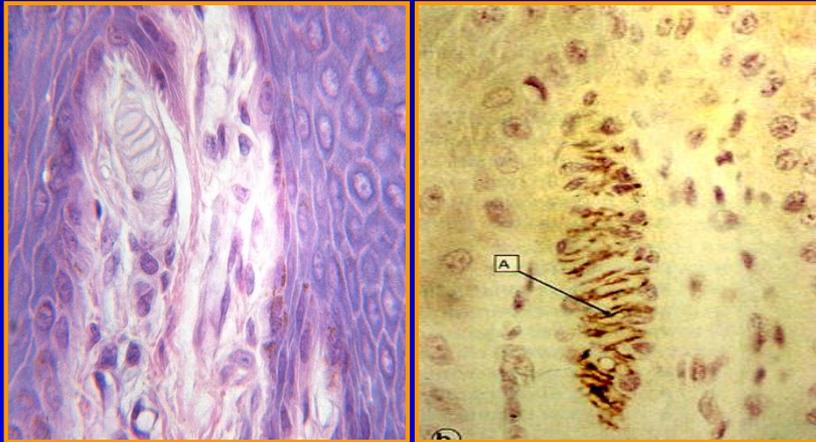
## 2. CORPUSCOLATE

- nei connettivi
- nello stroma muscolare



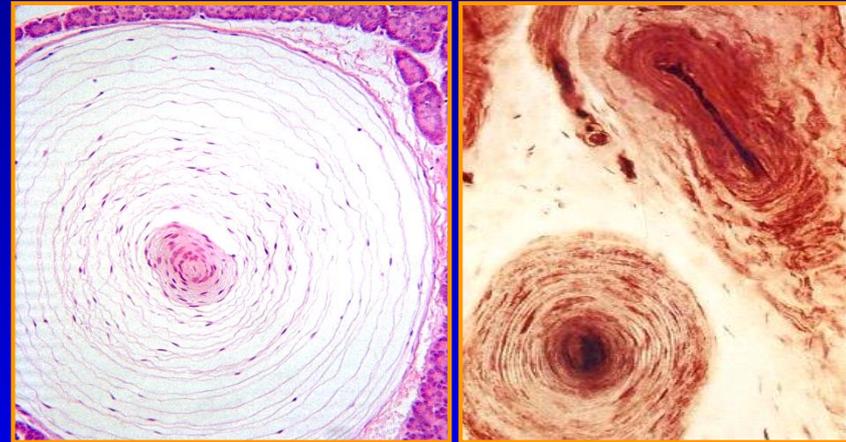
# TERMINAZIONI NERVOSE CORPUSCOLATE

## corpuscolo di Meissner



**meccanocettore  
tattile**

## corpuscolo di Pacini-Vater

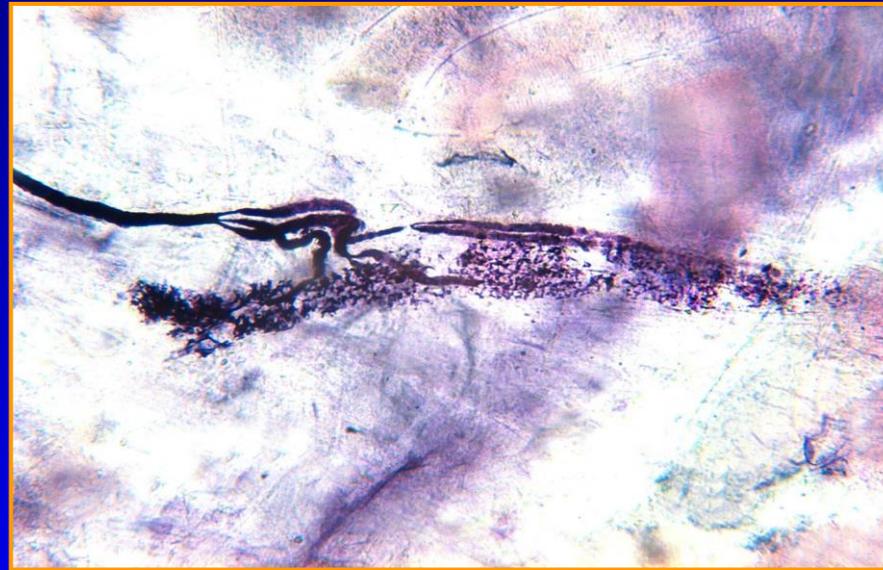


**meccanocettore  
pressione  
vibrazioni**

# TERMINAZIONI NERVOSE CORPUSCOLATE

corpuscolo di Ruffini

organo muscolo-tendineo di Golgi



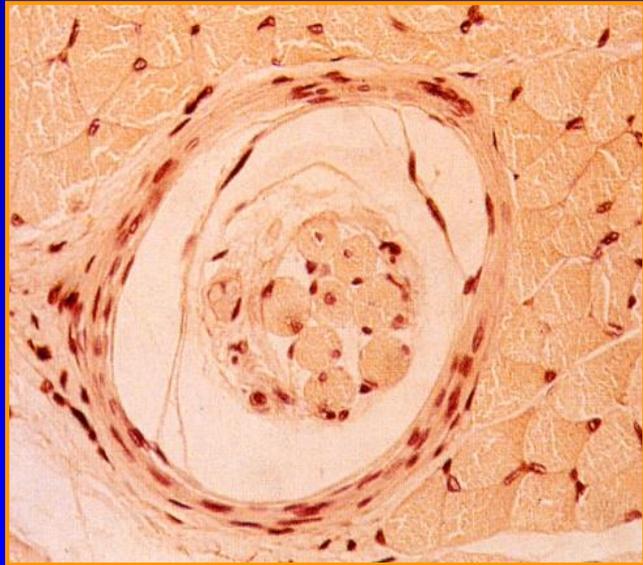
meccanocettore



meccanocettore  
tensione sul tendine  
- attiva  
- passiva

# TERMINAZIONI NERVOSE CORPUSCOLATE

## FUSO NEURO-MUSCOLARE



1. **fibre muscolari intrafusali**
  - a catena nucleare
  - a sacco nucleare
2. **terminazioni afferenti**
  - anulospirali
  - a fiorami
3. **terminazioni efferenti**
  - placche motrici dei motoneuroni  $\gamma$

