


CNS I

Obecná anatomie nervového systému

Anatomický ústav 2. LF

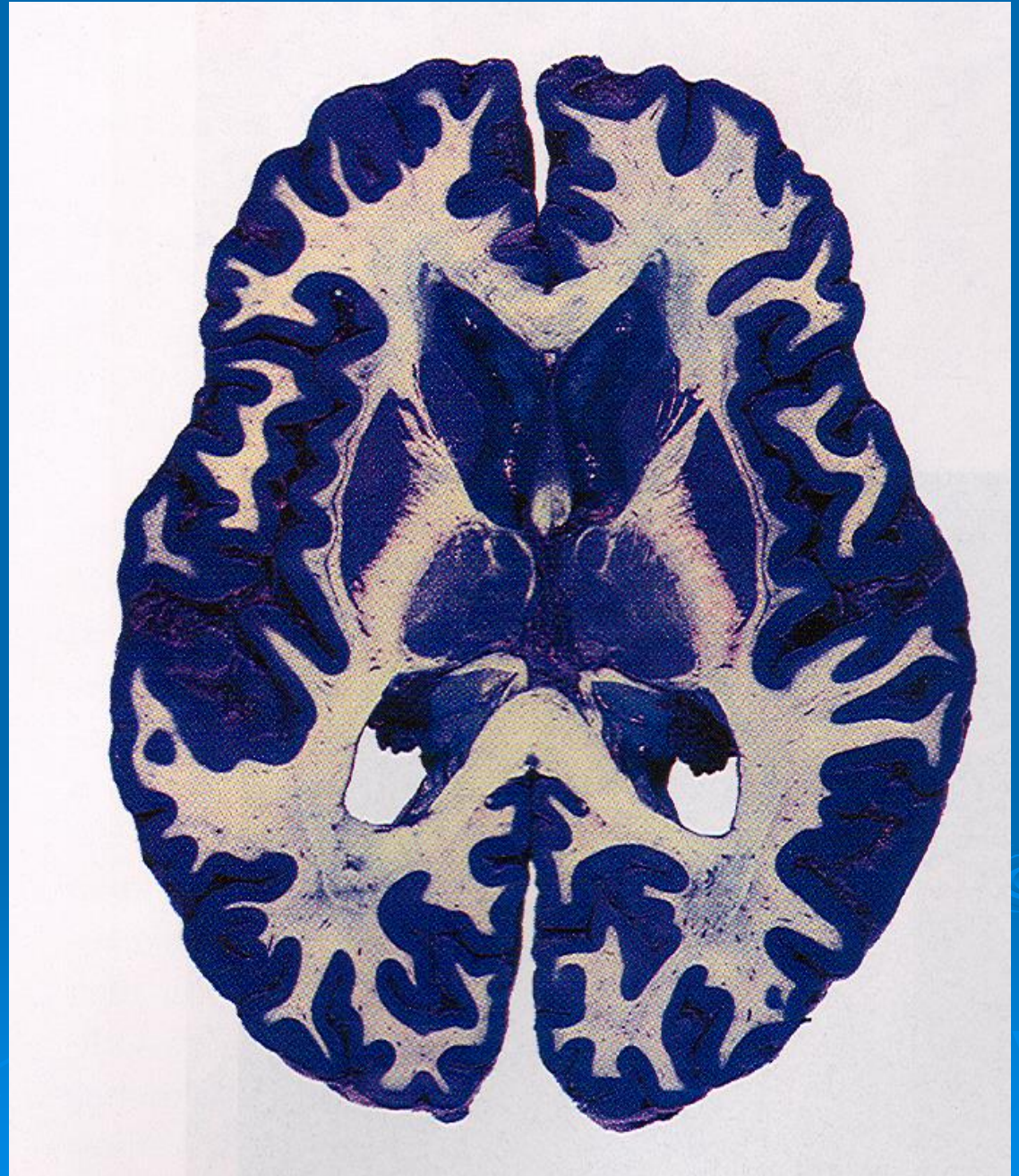


Morfologické studium CNS

- Makroskopické techniky
 - Mikroskopické techniky (barvení neuronů, gliových buněk, vláken, impregnační techniky)
 - Barvení intaktních a degenerovaných vláken (studium drah v CNS)
 - Elektronmikroskopické techniky
- 

Makroskopické barvení

Mulligan (sulfát mědi)



**CEREBRAL CORTEX, PRECENTRAL GYRUS: PYRAMIDAL CELL
COMPARISON OF (A) NISSL AND (B) BODIAN SILVER PROTEINATE TECHNIQUES**

Nisslova substance



Impregnance

C. Golgi

R. y Cajal

R. Moliner

Del Rio
Hortega

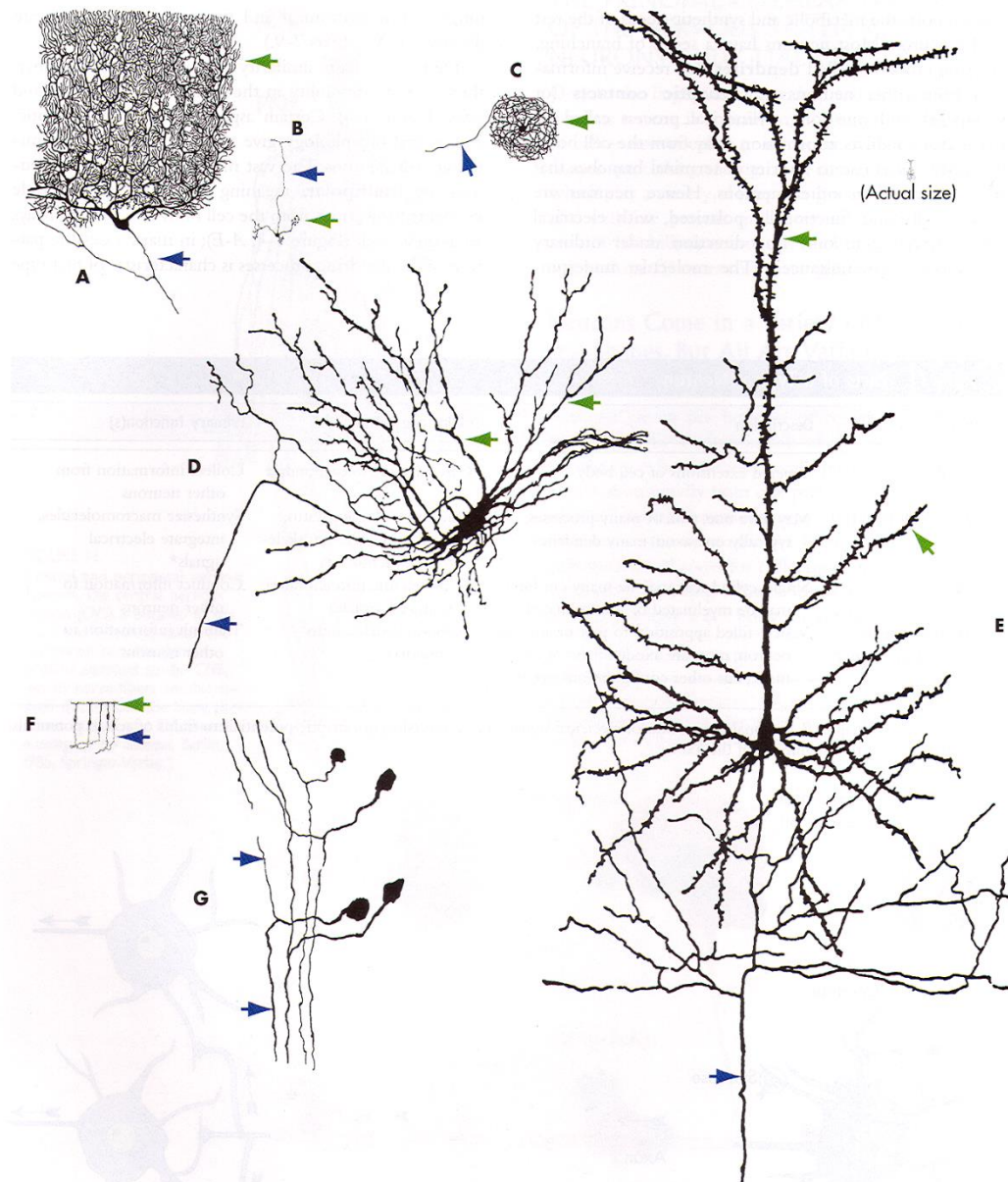


FIGURE 1-4

Examples of multipolar (A-E), bipolar (F), and unipolar (G) neurons, all drawn to about the same scale to demonstrate the range of neuronal sizes and shapes. All were stained by the Golgi method (see Figure 1-15, A); dendrites are indicated by green arrows, axons by blue arrows. A, Purkinje cell from the cerebellar cortex; B, granule cell from the cerebellar cortex; C, projection neuron from the inferior olivary nucleus; D, spinal cord motor neuron; E, large pyramidal neuron from the cerebral cortex; F, olfactory receptor neurons; G, dorsal root ganglion cells (whose processes have axonal properties along almost their entire course). The tiny inset at the upper right shows the actual size of the pyramidal neuron. [Modified from Ramón y Cajal S: *Histologie du système nerveux de l'homme et des vertébrés*, Paris, 1909, 1911, Maloine.]

Intracelulární markery

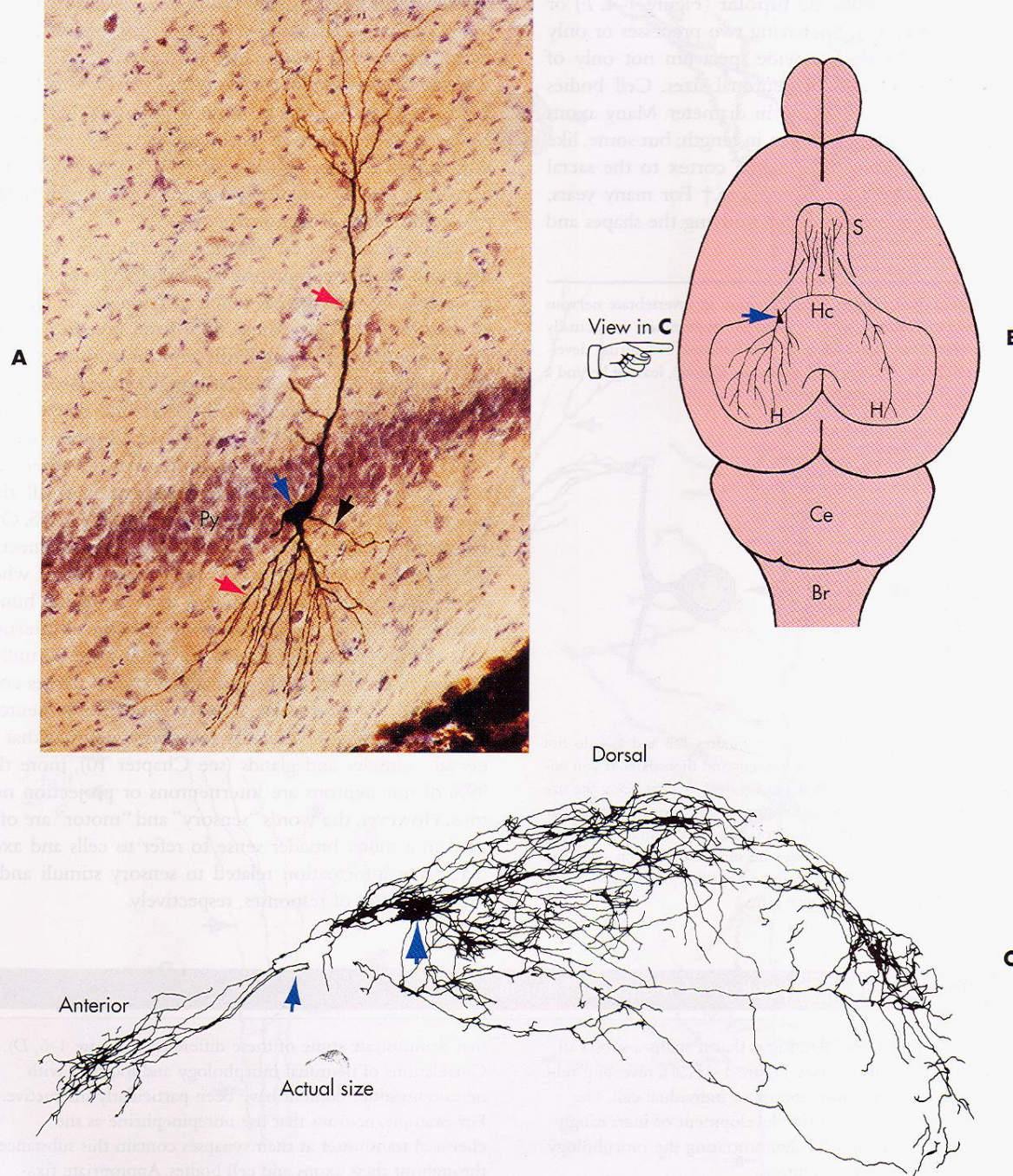
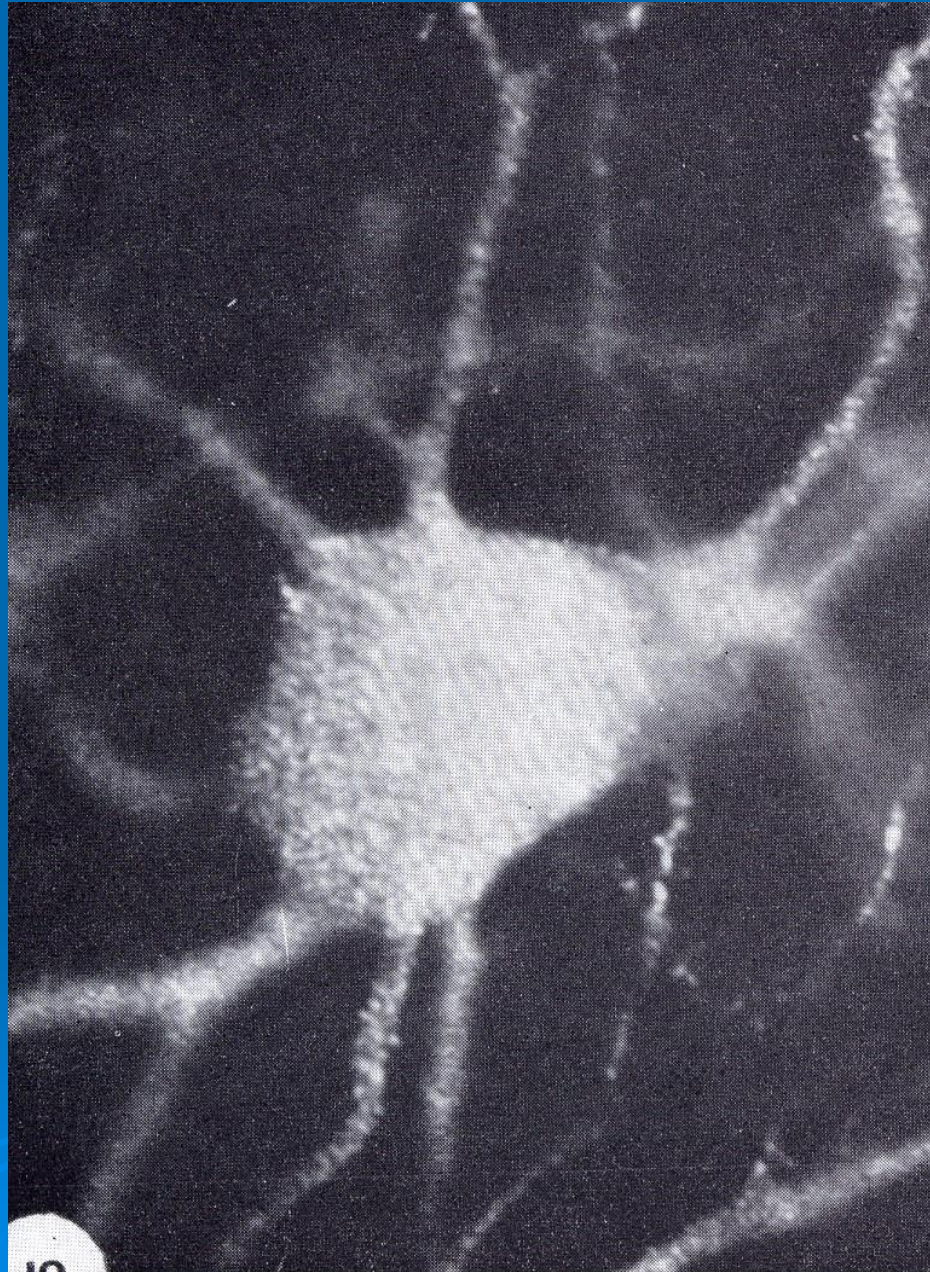


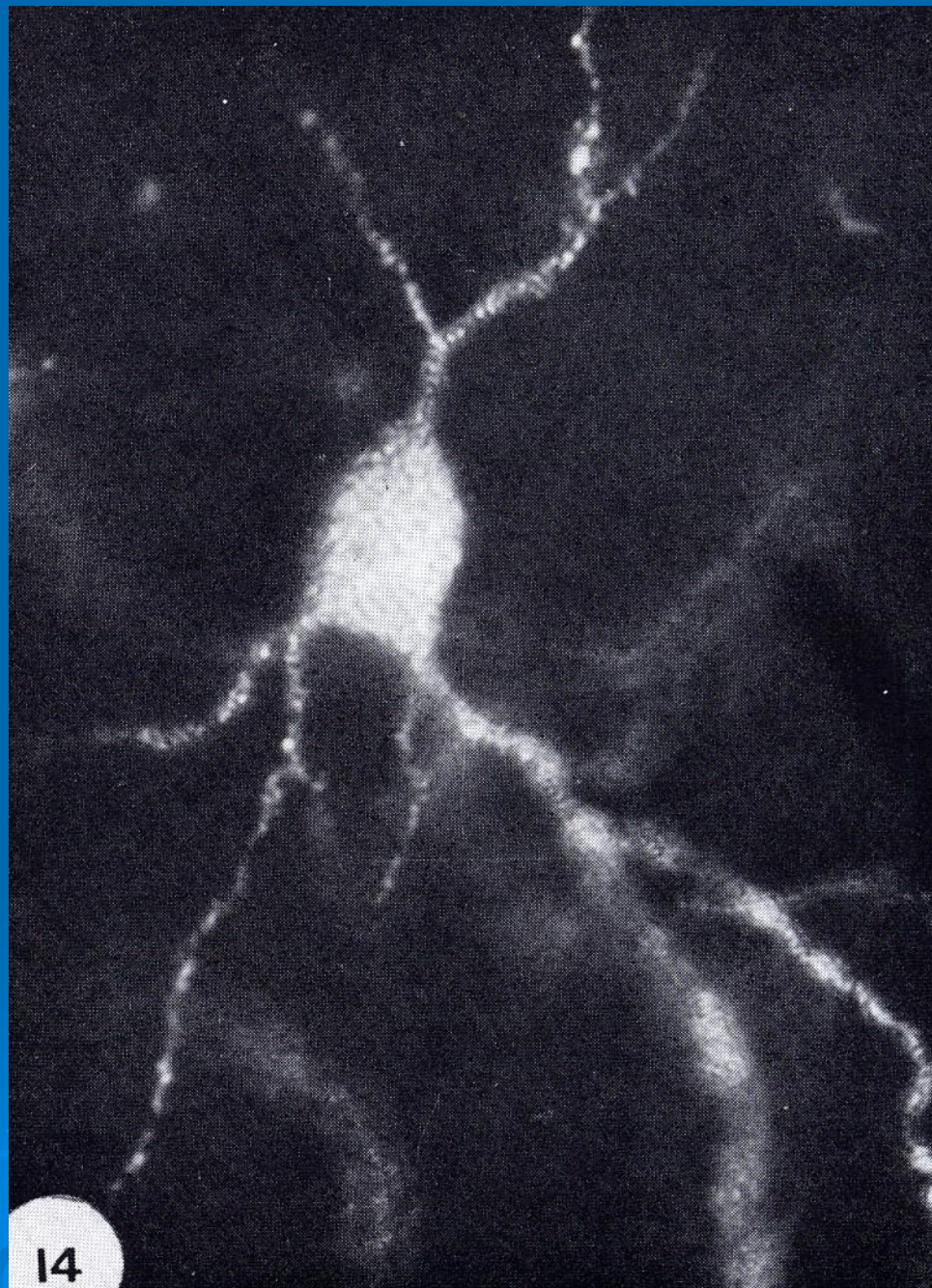
FIGURE 1-5 Morphology of an individual neuron revealed by injection of a marker substance from an intracellular recording electrode. This study not

Golgi-Cox, 530x, VI. Vrstva,
pyramidový neuron, sluchová
korová oblast, kočka.

(šikmé osvětlení).



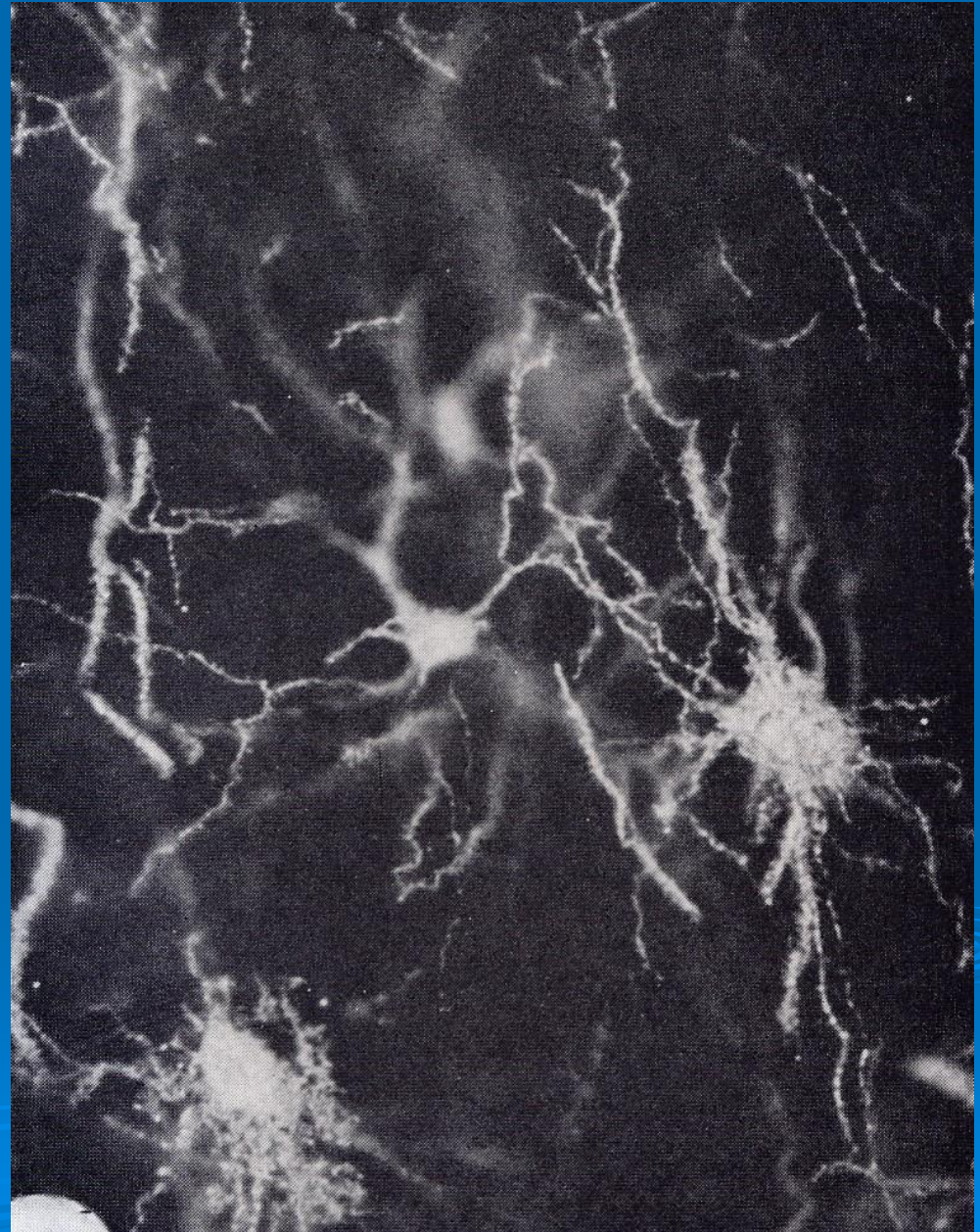
Golgi-Cox, 530x, sluchová
korová oblast, VI. vrstva,
Martinottiho buňka,



14

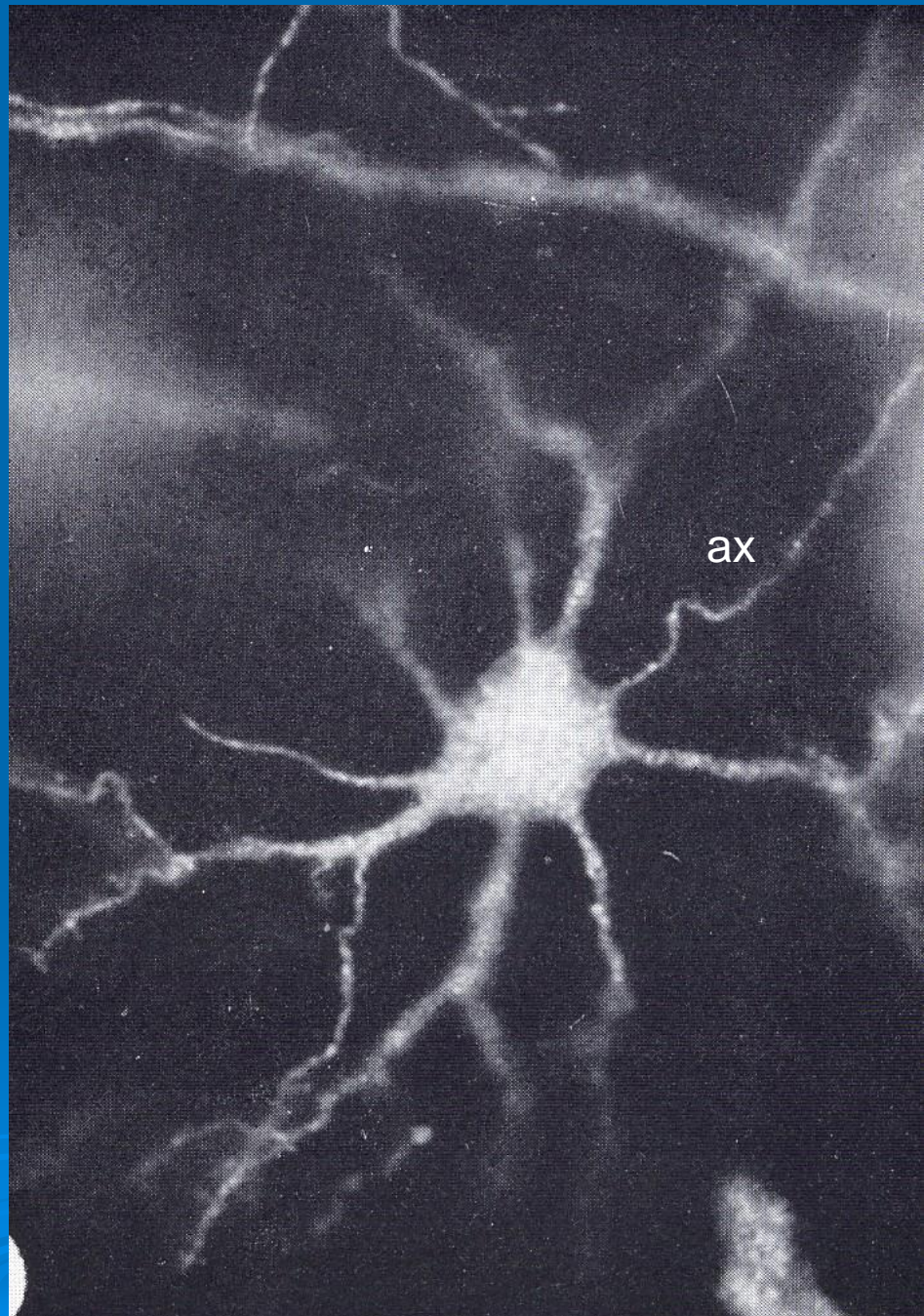
Golgi-Cox, 530x, sluchová
korová oblast, IV. vrstva

Astrocyty + neuron



Golgi – Cox, 530x

sluchová korová oblast, IV.
vrstva, kočka



Elektronová mikroskopie

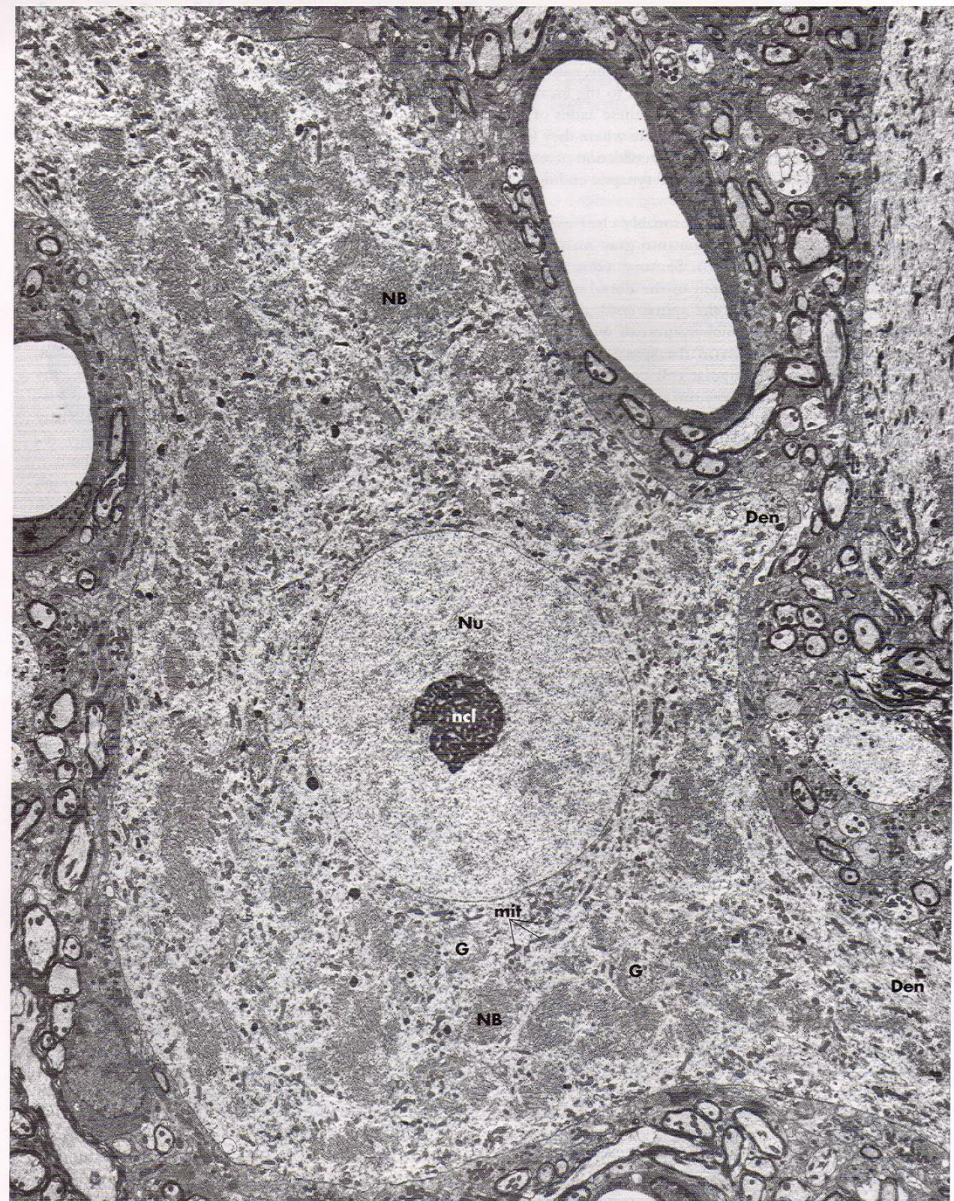
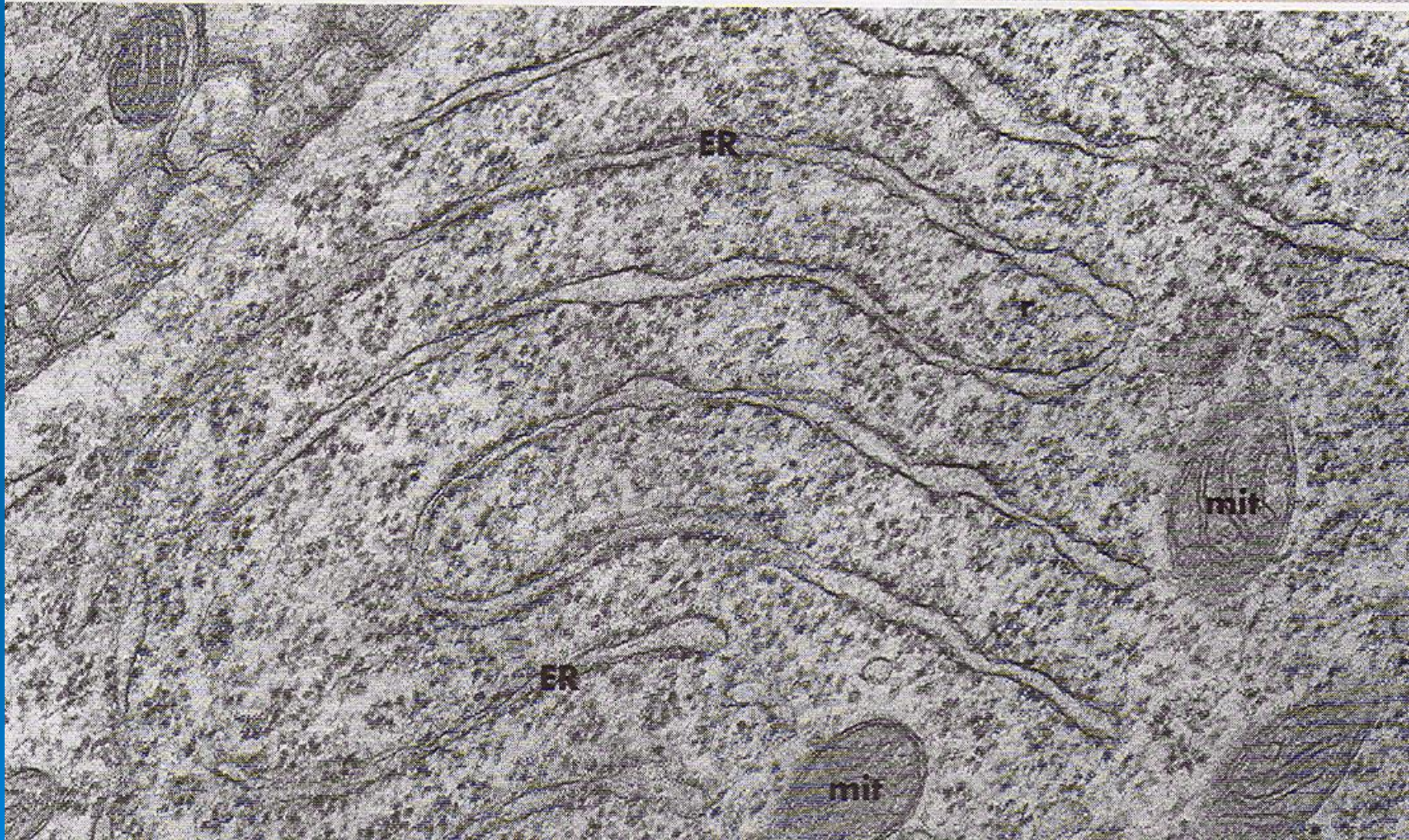


FIGURE 1-9

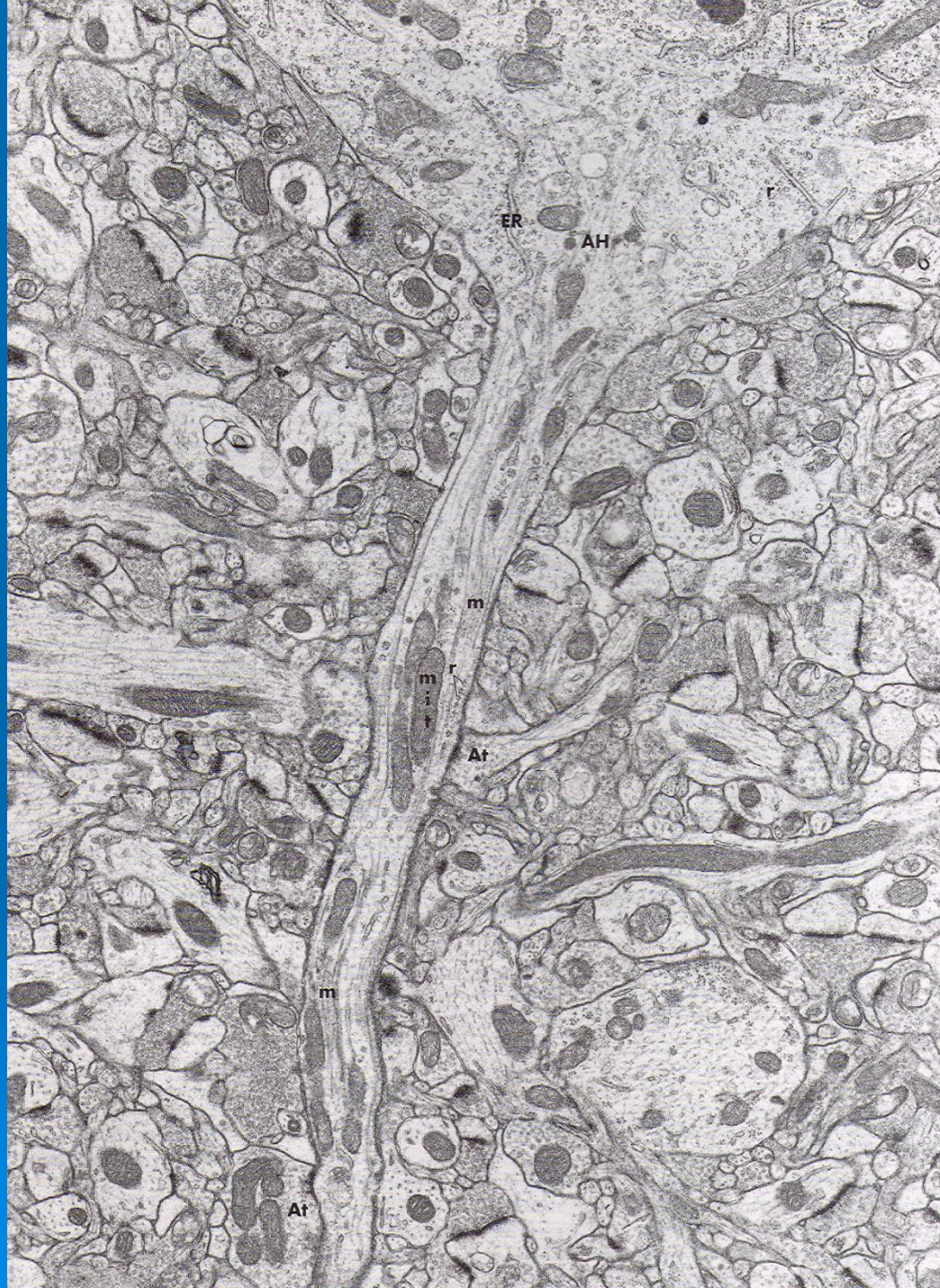
Cell body and some of the proximal dendrites (*Den*) of a spinal cord motor neuron. The nucleus (*Nu*) and prominent nucleolus (*ncl*) are apparent, as are other organelles typical of neuronal cell bodies—Nissl bodies (*NB*), Golgi cisternae (*G*), and mitochondria (*mit*). Cytoskeletal elements, although present, are difficult to resolve at this low magnification. The actual size of the area shown in this micrograph is about $55 \mu\text{m} \times 70 \mu\text{m}$. (From Peters A, Palay SL, Webster H deF: *The fine structure of the nervous system: neurons and their supporting cells*, ed 3, New York, 1991, Oxford University Press.)

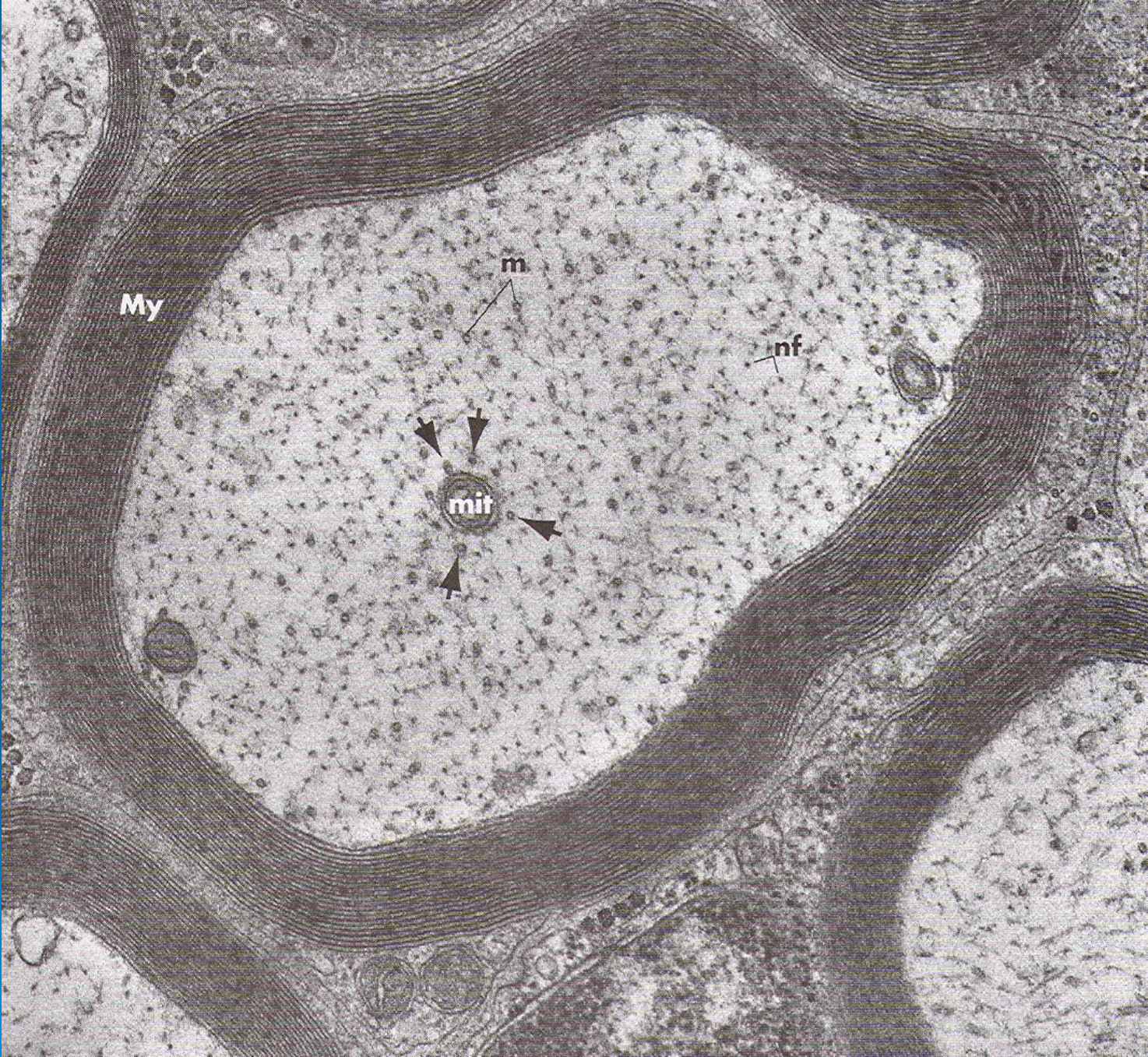
Endoplazmatické retikulum - proteosyntéza



Axon

**Iniciální
segment**





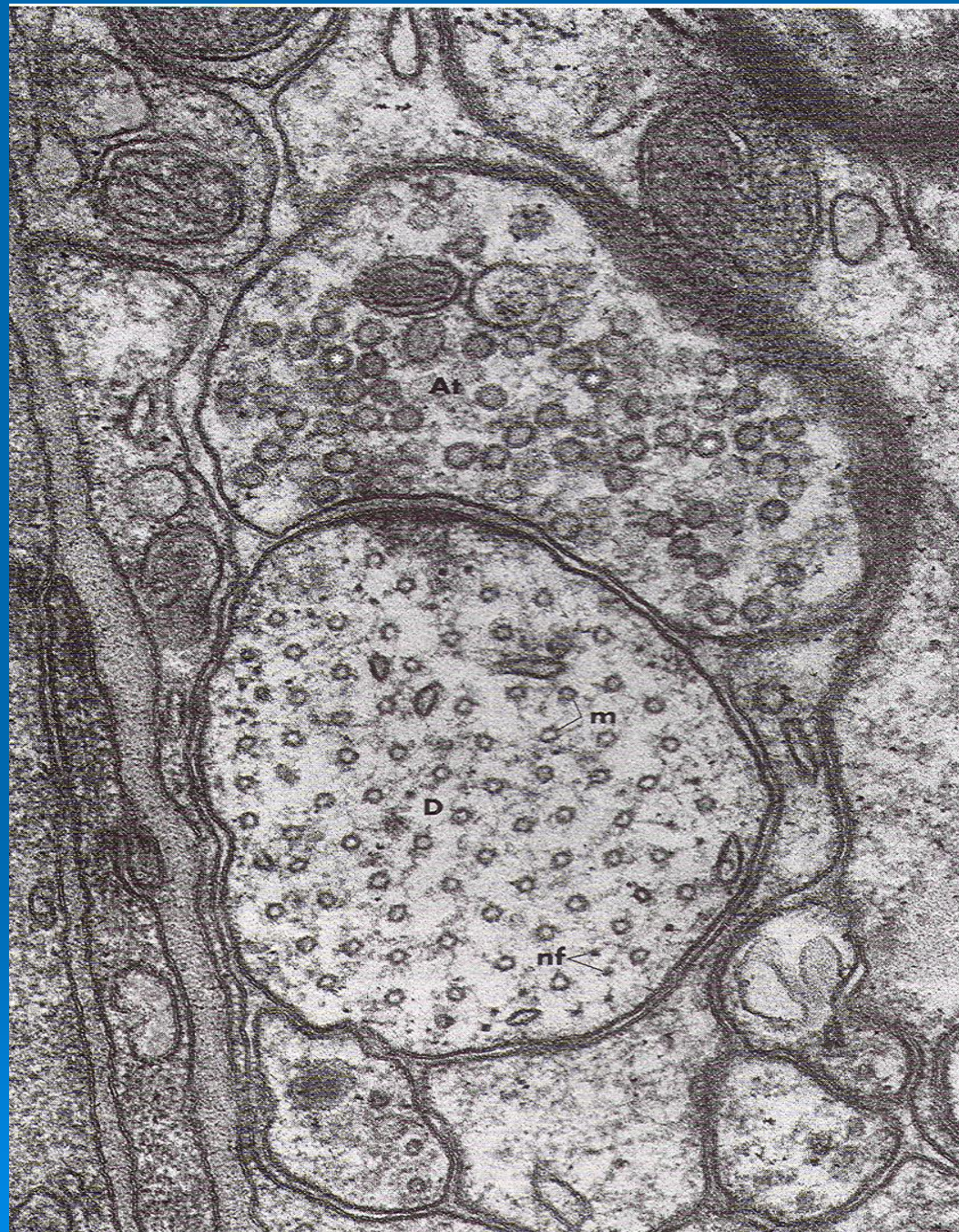
Synaptické

Kontakty

Presynaptická
denzita

Synaptická
štěrbina

Postsynaptická
denzita



Synaptické děje:

Akční potenciál

Influx Ca^{2+}

Pohyb synaptických váčků

Uvolnění mediátoru

Vazba mediátoru na receptor

Re-uptake mediátoru a vezikulárních membrán

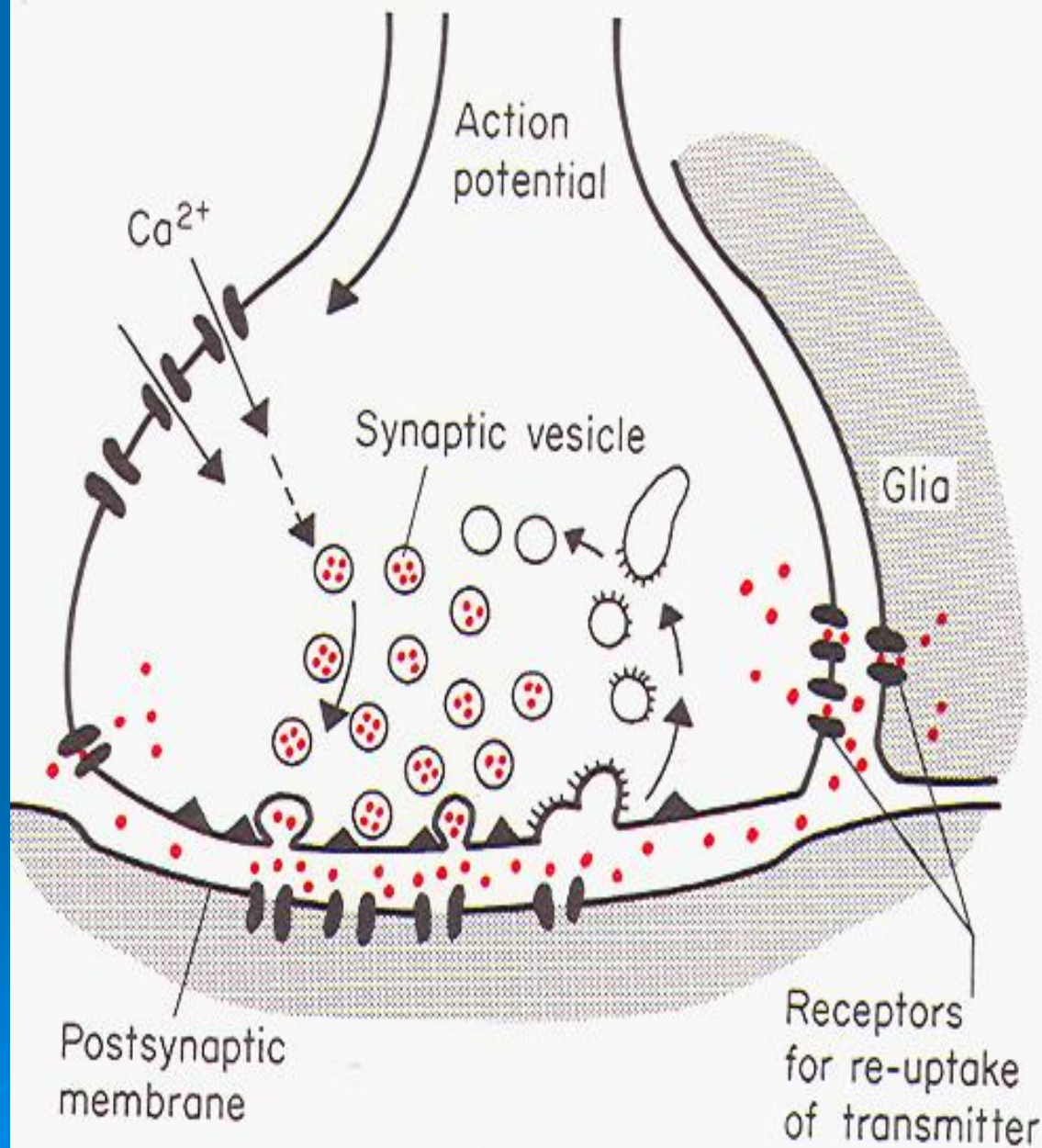
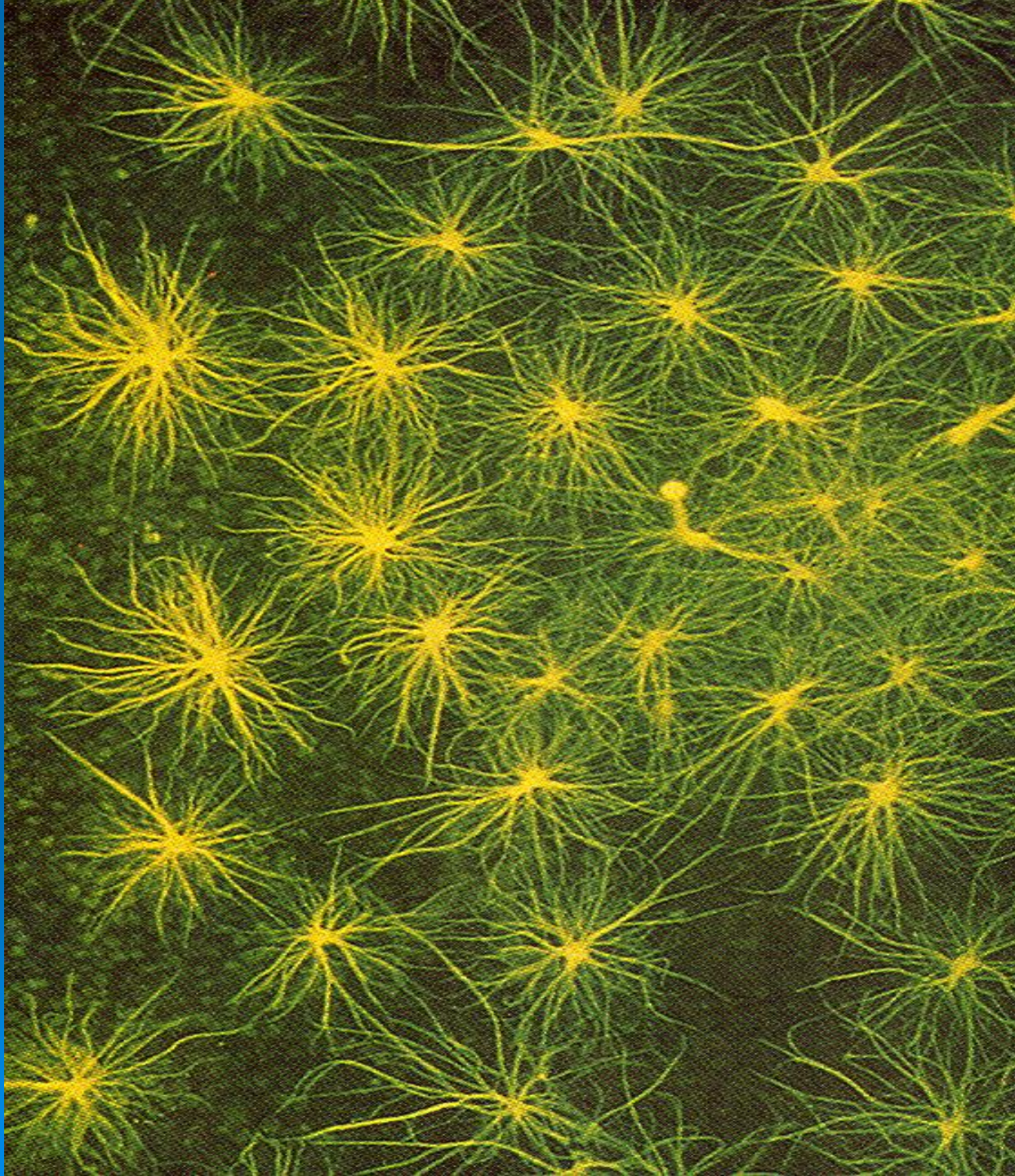




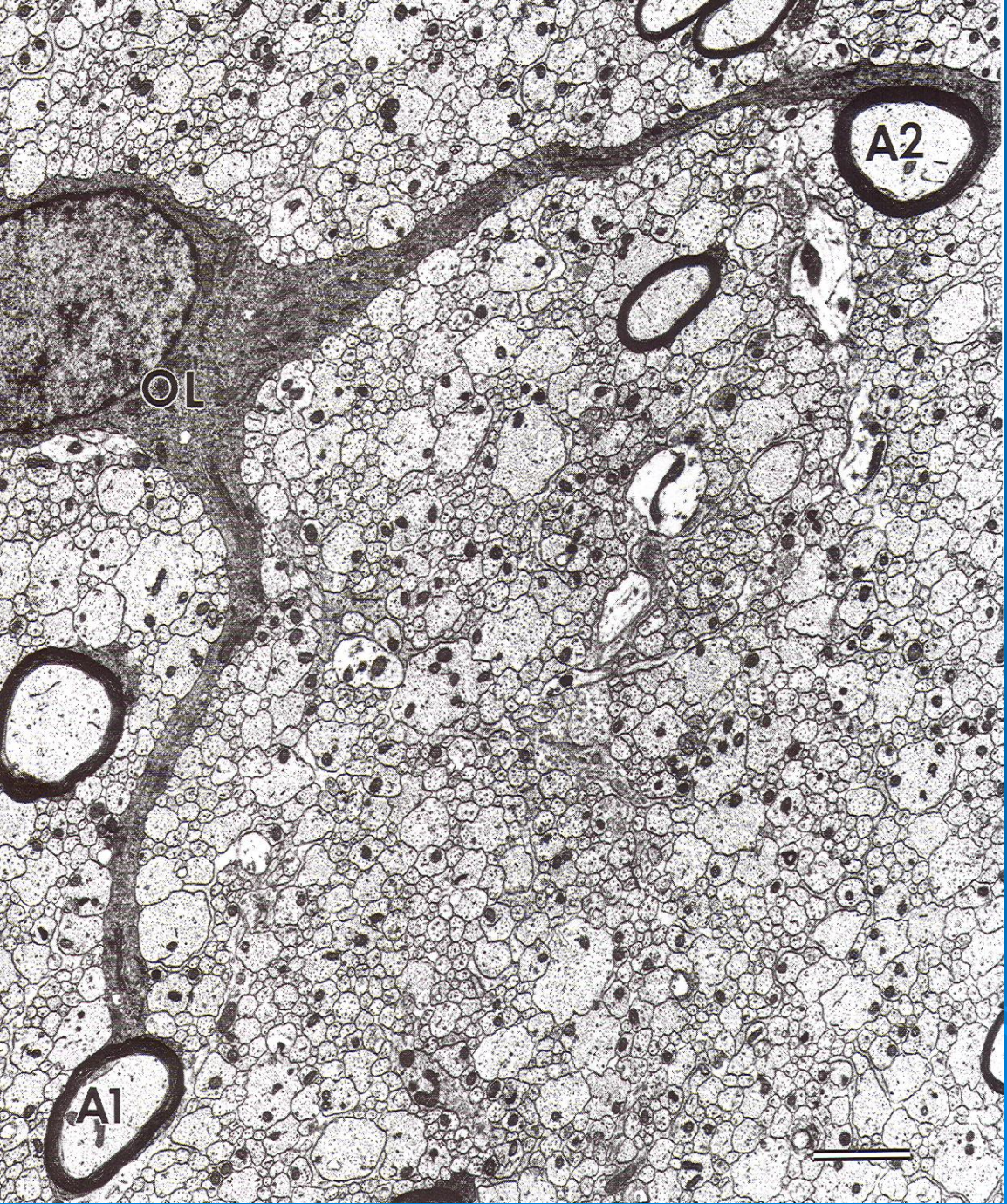
FIGURE 1-36

Glial cells from rabbit CNS, stained by the Golgi method (del Rio Hortega modification) and all shown at the same magnification. **A**, Protoplasmic astrocytes and one microglial cell (*arrow*) associated with thalamic capillaries. **B**, Two fibrous astrocytes in subcortical white matter. **C**, An oligodendrocyte in subcortical white matter. **D**, A microglial cell in the thalamus. (Courtesy Dr. Nathaniel T. McMullen, Department of Cell Biology and Anatomy, The University of Arizona College of Medicine.)

Astrocyty



Oligodendrocyty



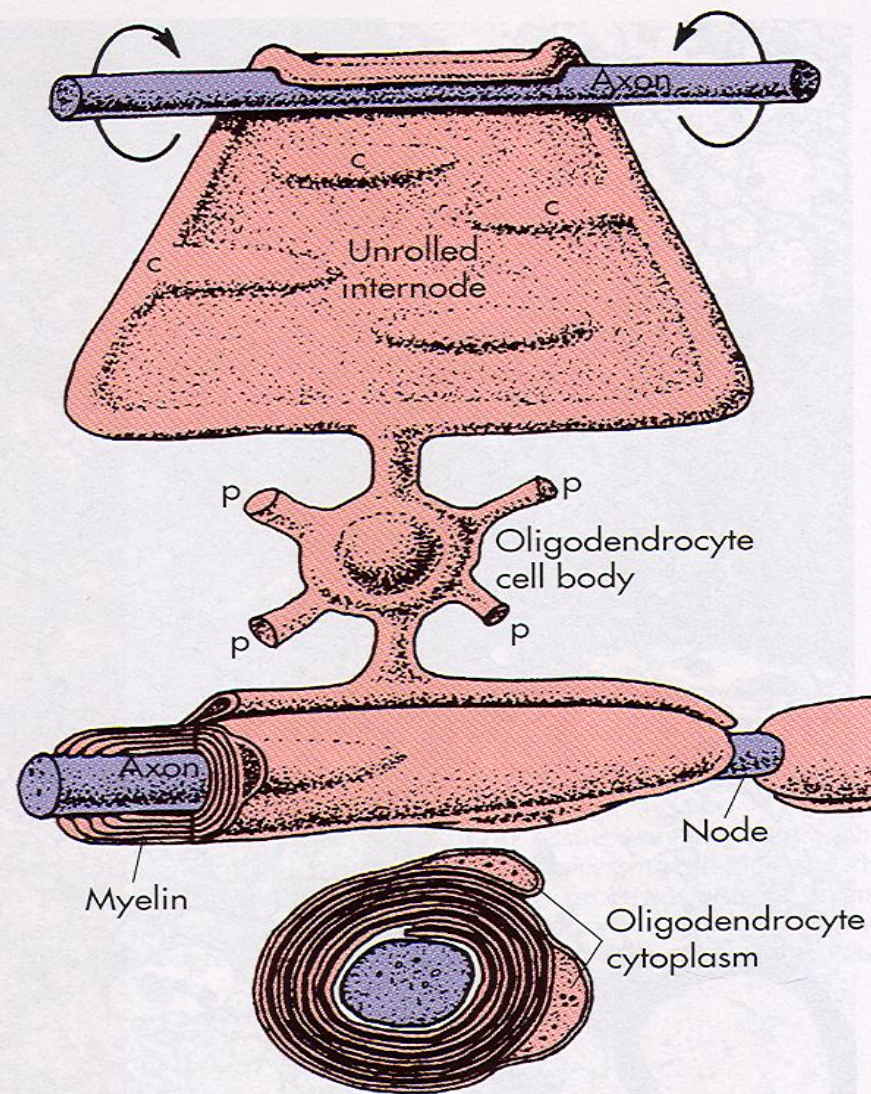
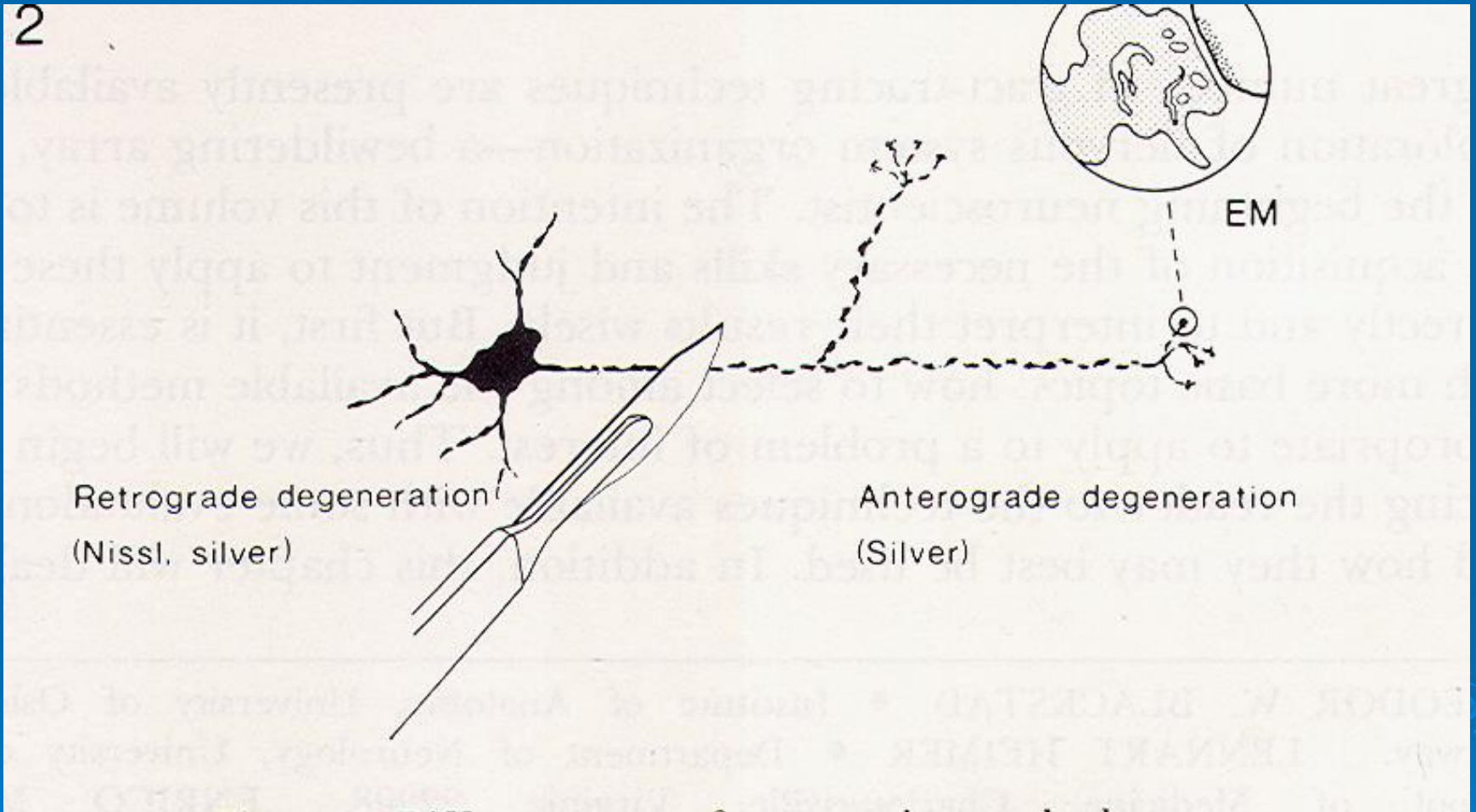


FIGURE 1-31

Schematic diagram of the formation of myelin in the CNS. A series of processes (*p*) emanate from an oligodendrocyte, each one giving rise to a flattened expansion that wraps around an axon to form an internode. As in the case of PNS myelin (see Figure 1-25), most of the internode consists of tightly wrapped membranes, but small rims and fingers of oligodendrocyte cytoplasm (*c*) are also carried along. [Redrawn from Krstić RV: *Illustrated encyclopedia of human histology*, Berlin, 1984, Springer-Verlag.]

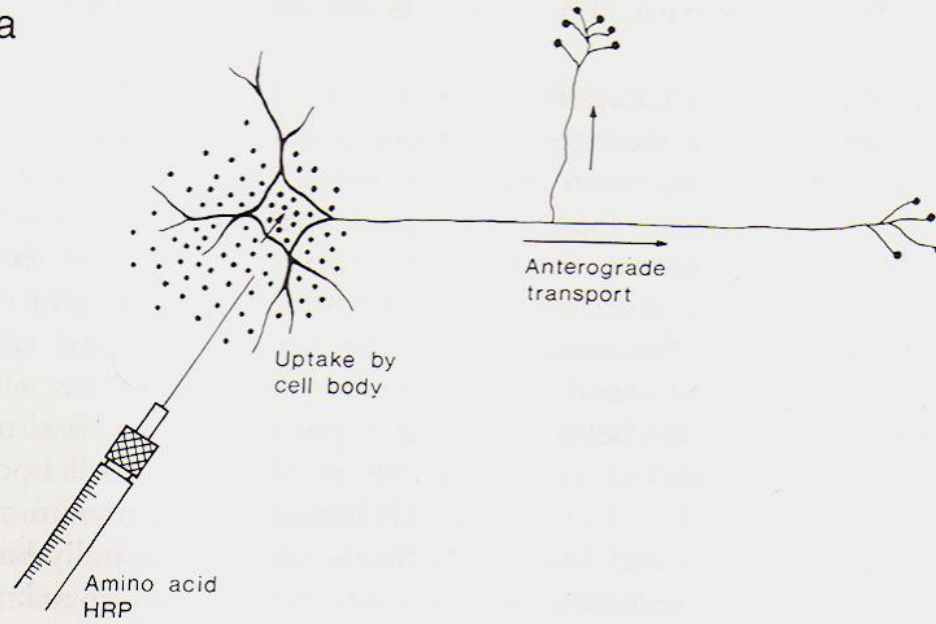
Anterográdní degenerace axonů - Wallerská degenerace



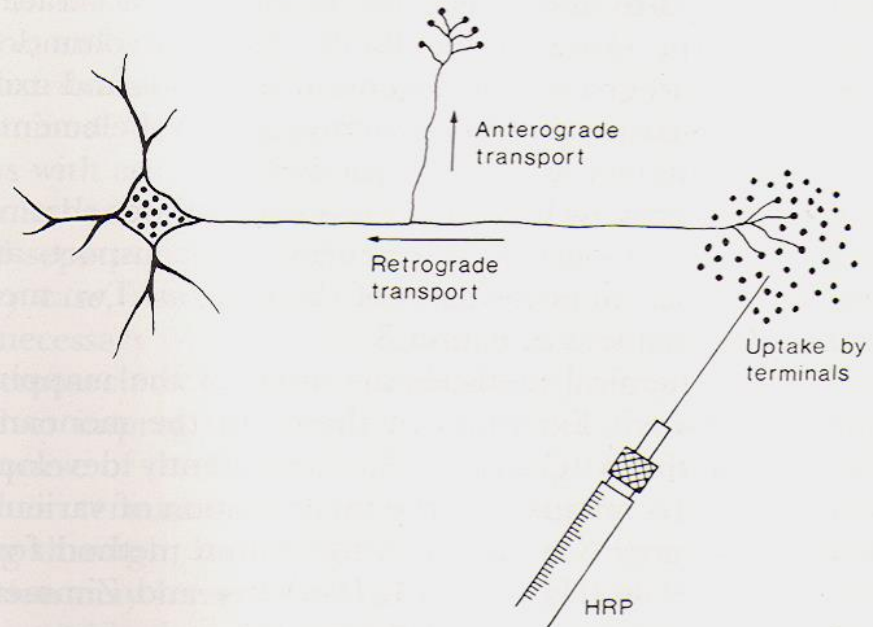
Organizace CNS = spoje uvnitř CNS

- Sledování impregnovaného axonu
- Léze buněčného těla neuronu –anterográdní degenerace
- Intraaxonální transport – anterográdní, H3-aminokyseliny, (autoradiografie), fluorescenční anter. markery
- Intraaxonální transport – retrográdní markery (HRP, fluorescenční markery).
- Elektronová mikroskopie – analýza synaptických kontaktů

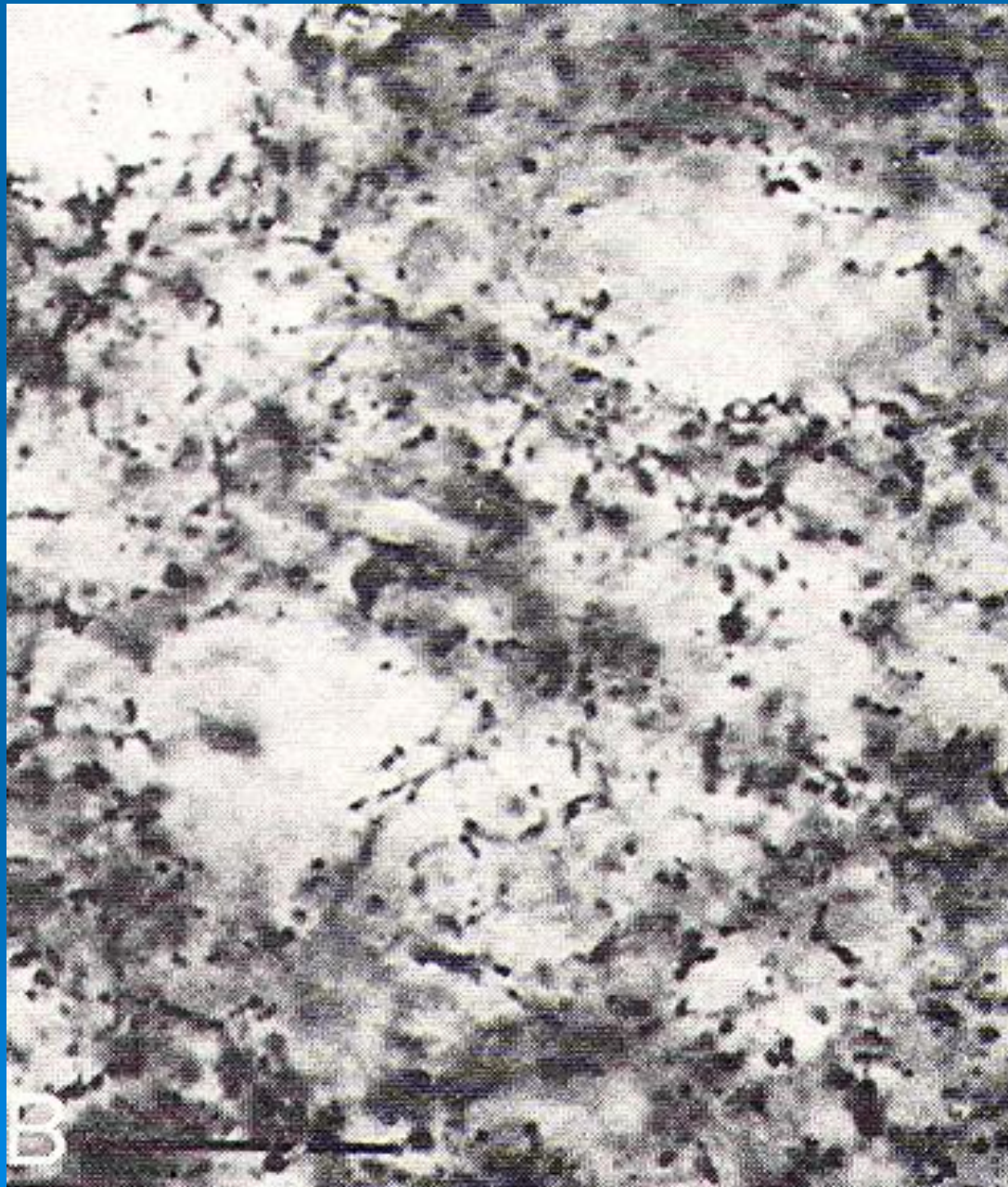
3a

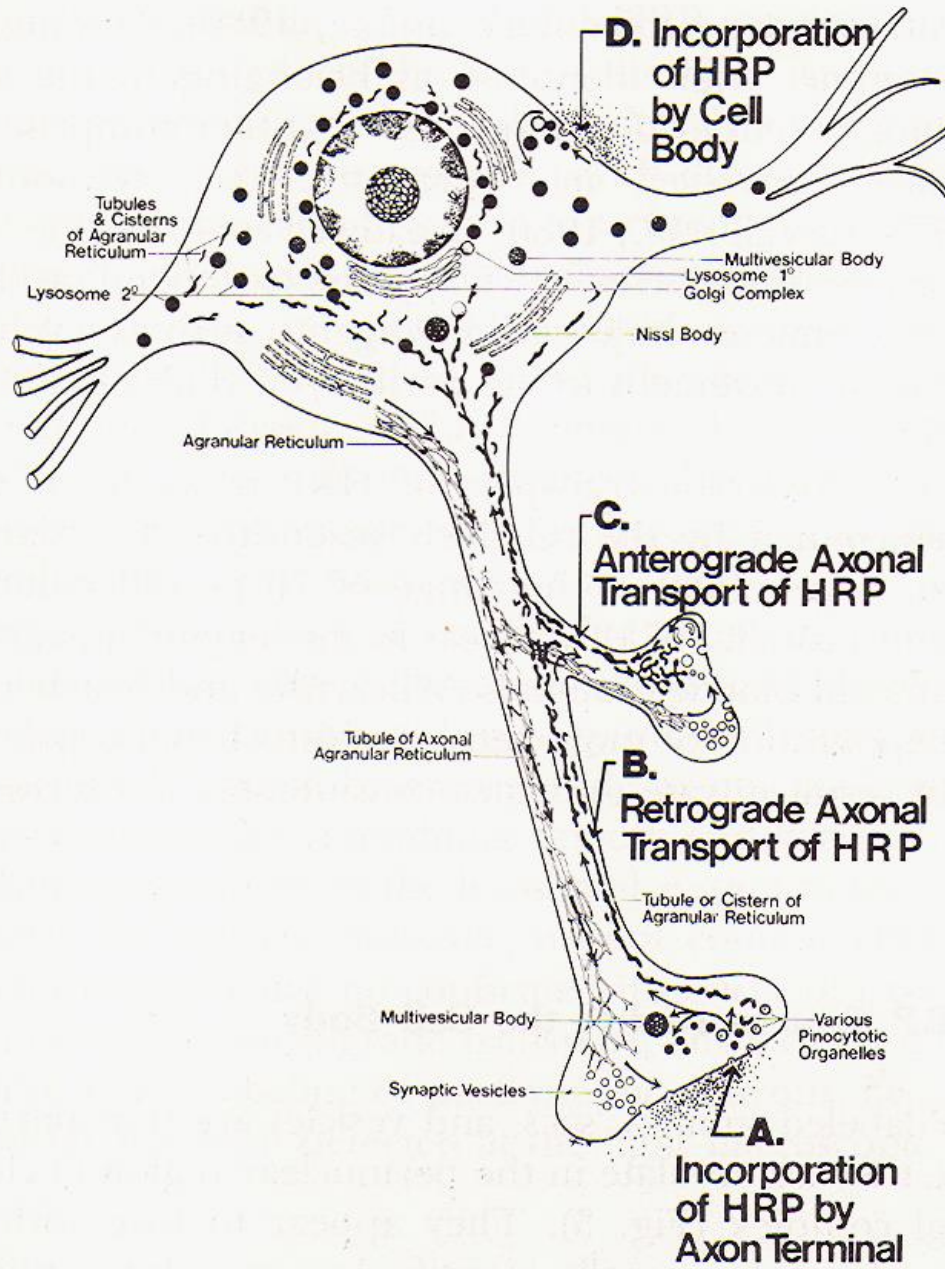


3b



Anterográdní degenerace, Fink - Heimer





Kortiko-striatické

neurony

Retrográdně transportovaná

HRP ze striata



**HRP-pozitivní
neurony V.
korové vrstvy**

