

ANATOMY III

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Recommended literature:

Lieb Gott, Bernard. The anatomical basis of dentistry.
3rd ed. Mosby, ISBN 0-323-06807-3

Dubový, Petr. Gross anatomy and structure of the human nervous system. Part I. Surface anatomy and structural arrangement of the central nervous system.
3rd ed. Brno: Masarykova univerzita, 2016. 92 s. ISBN 978-80-210-6125-5

Dubový, Petr. Instructions for anatomical dissection course.
3rd ed. Brno: Masaryk University, 2013. 71 s. ISBN 9788021062023

Stingl, J. et al. Regional anatomy.
1st ed. Galén-Karolinum, 2012. 123s. ISBN 9788072628797

Atlas of Anatomy

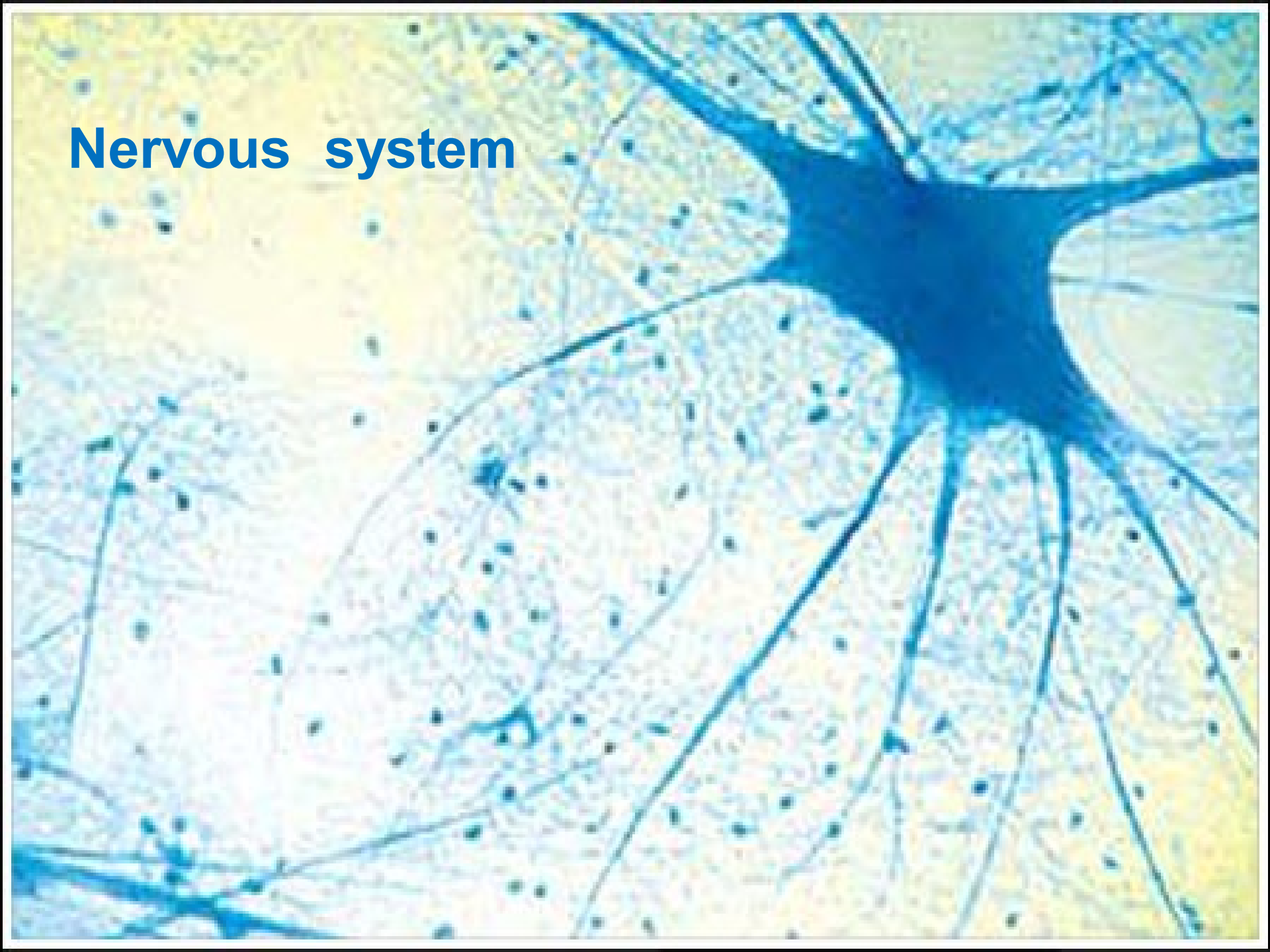
Equipment:

lab coat

dressing forceps

gloves

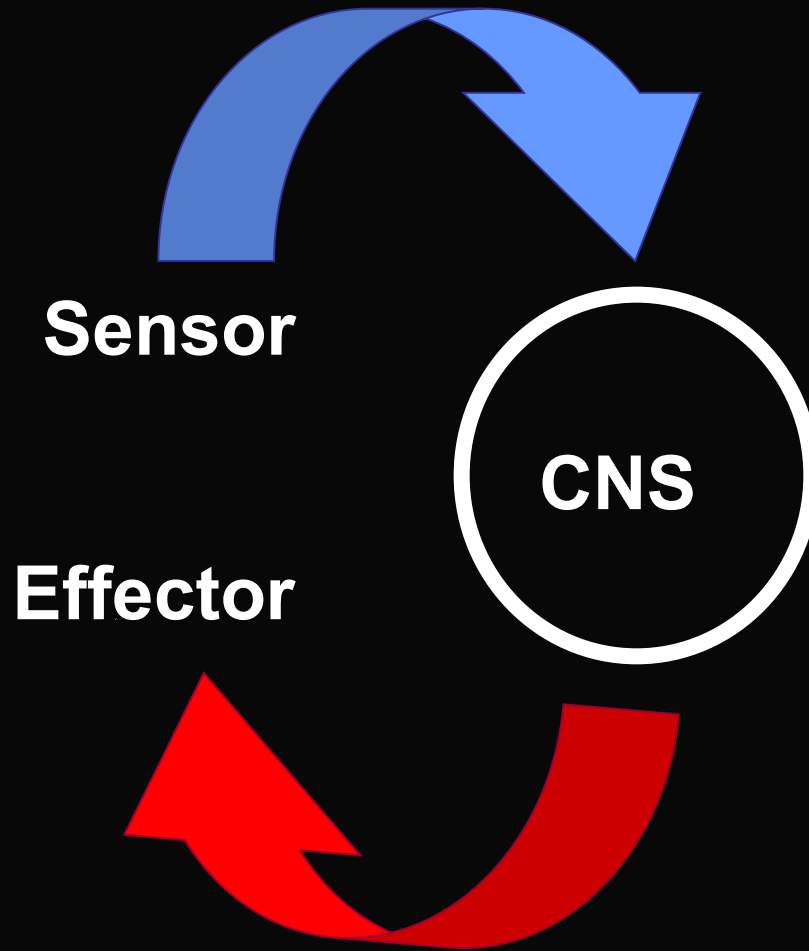
Nervous system



Nervous system

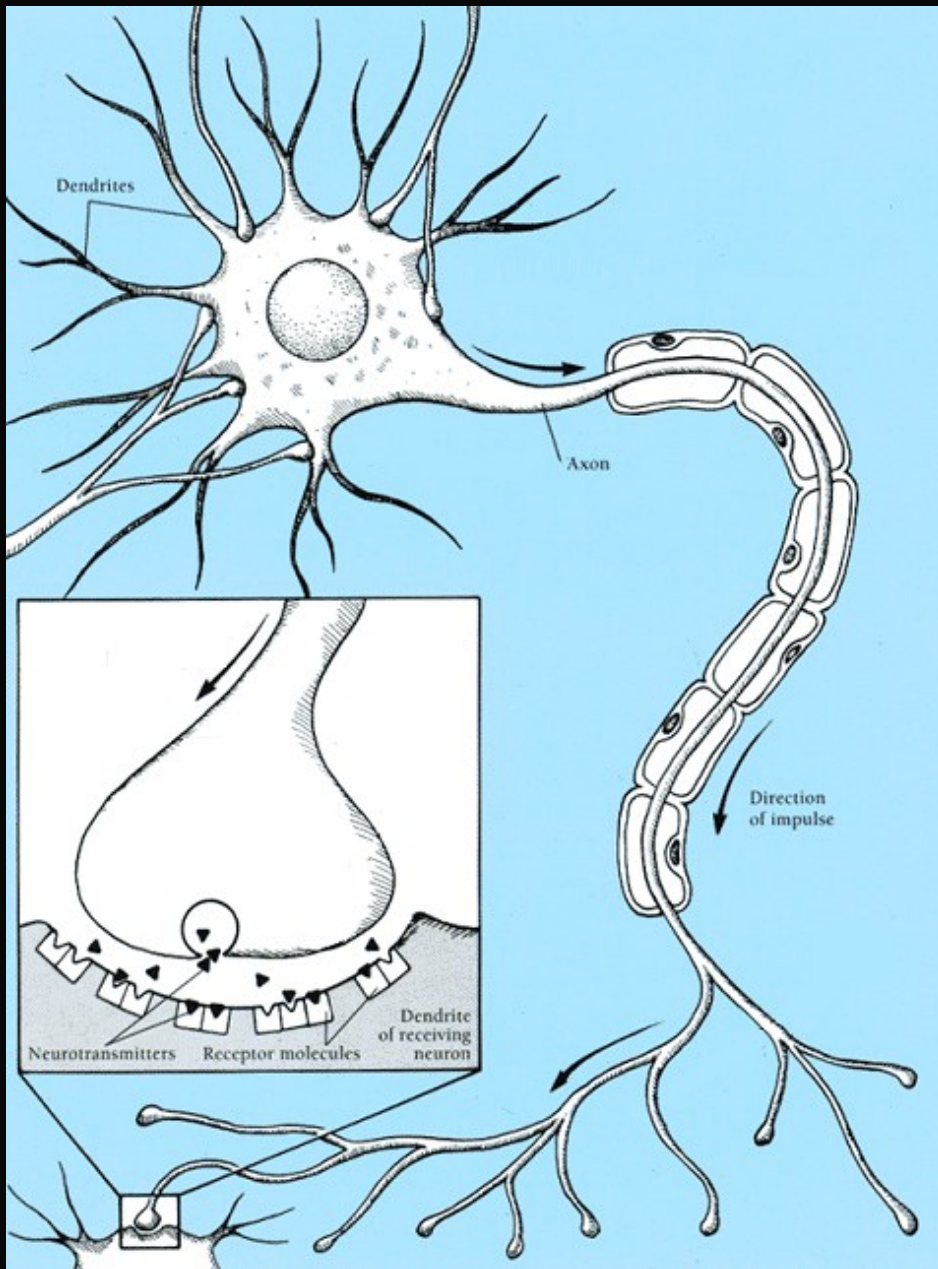
- is a complex, sophisticated system that regulates and coordinates activities of the body
- regulates the body's responses to internal and external stimuli
- has three main functions, sensory input, integration of data and motor output
- is composed of excitable nerve cells
- conducts nerve impulses
- is divided into two categories: the central nervous system- **CNS** and the peripheral nervous system - **PNS**
- the basic structural and functional unit - **neuron**
- cells providing support and protection for neurons – **glial cells**

Basic function of NS

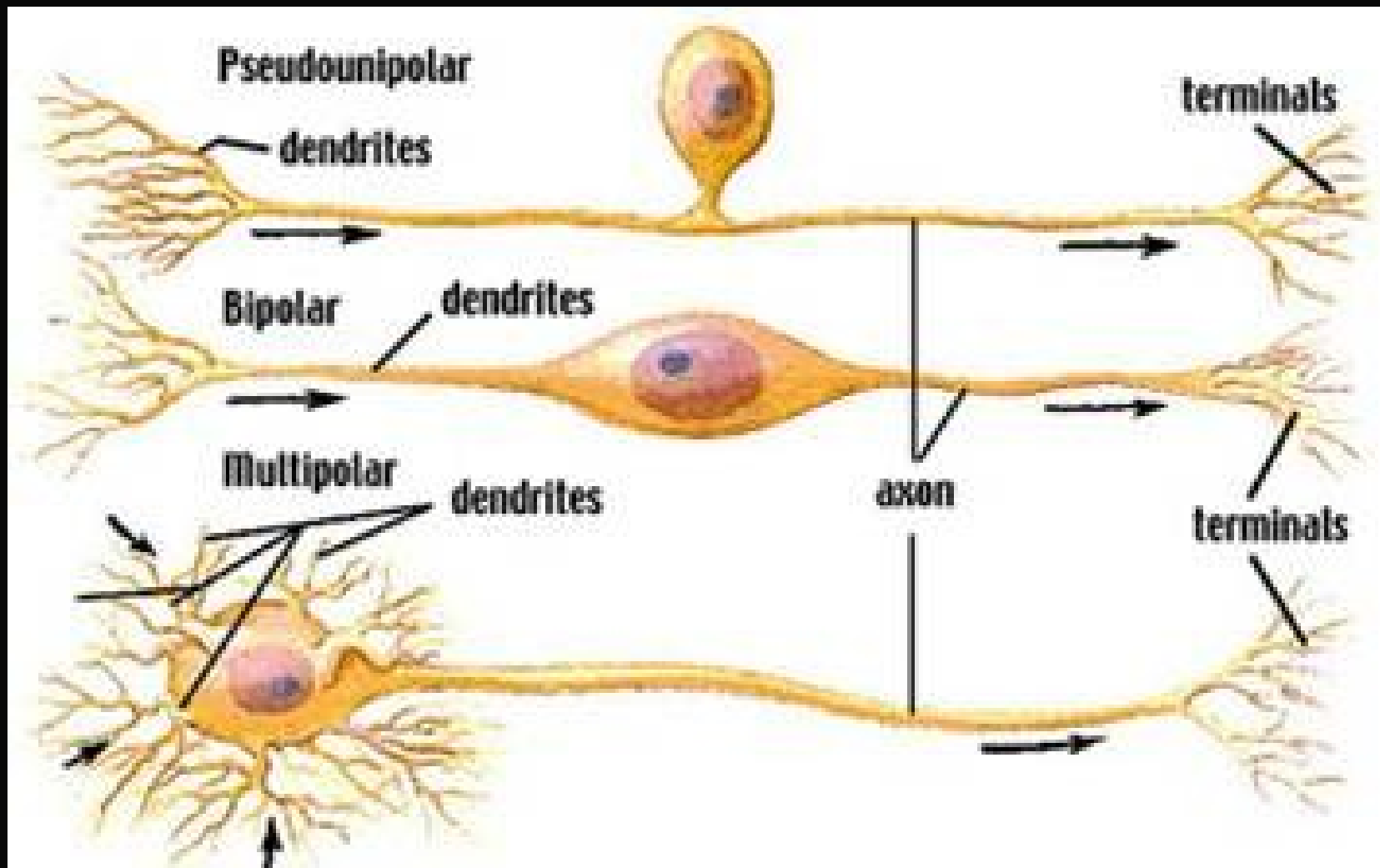


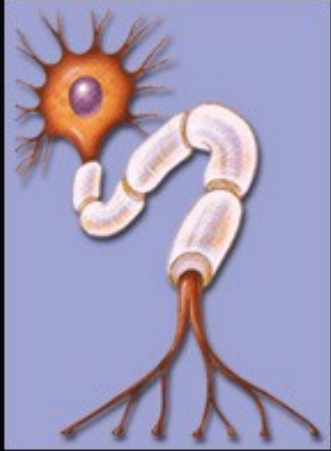
Neuron

- receives stimuli
- transforms stimuli to nerve impulses
- conducts nerve impulses
- processes information
- transmits the electro-chemical signal across a synapse



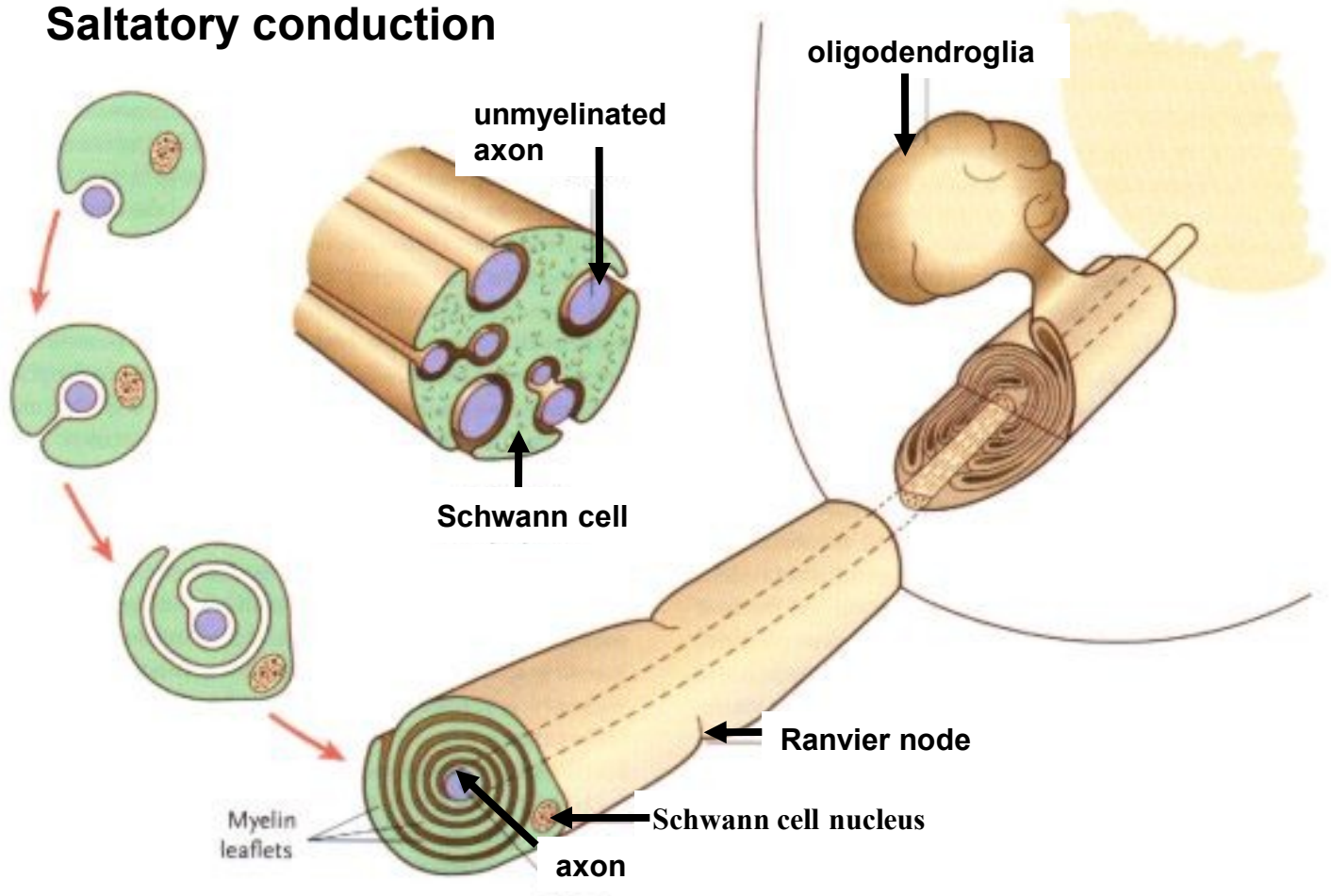
TYPES OF NEURONS





Myelination – node of Ranvier, internodal segment

Saltatory conduction



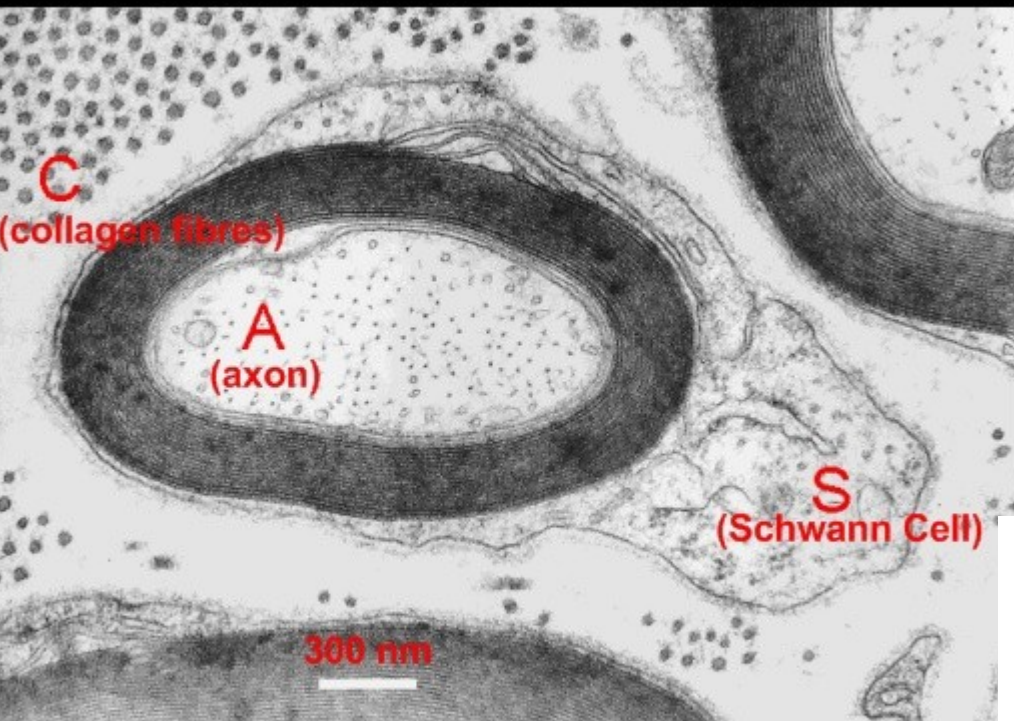
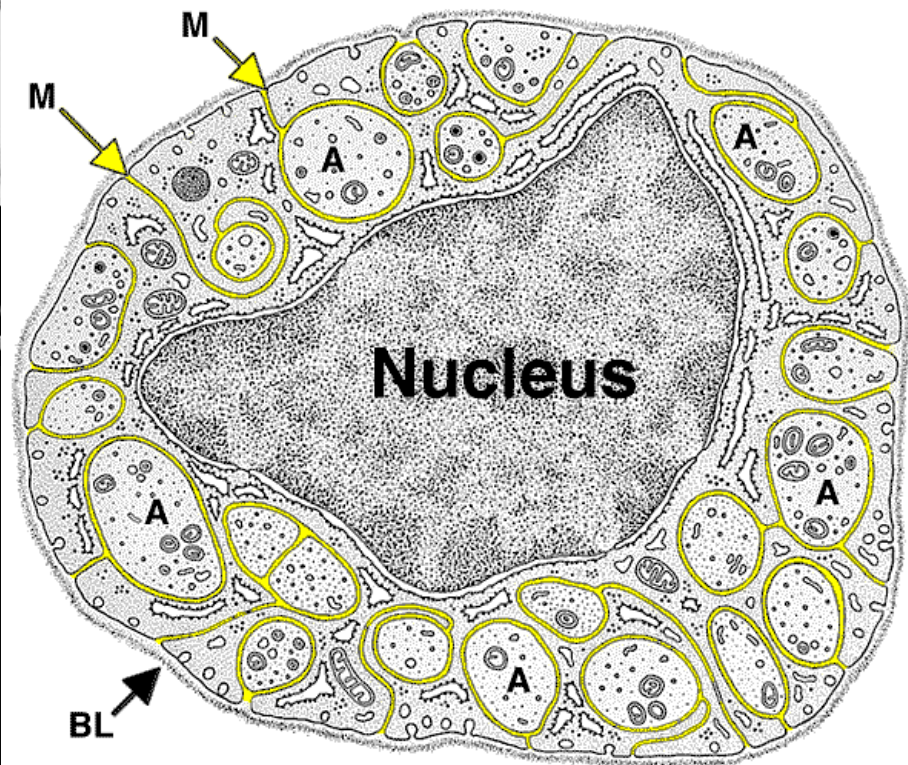
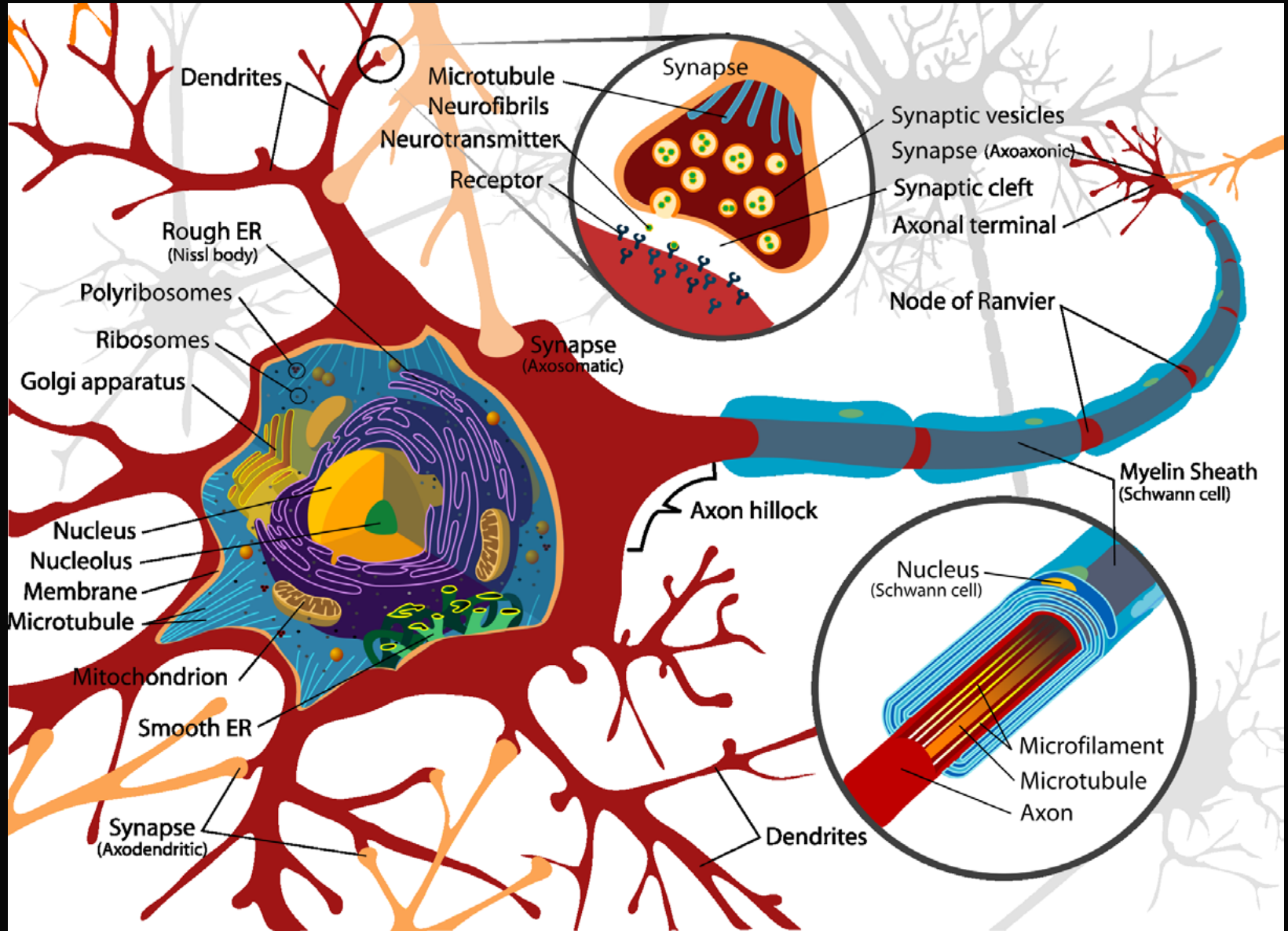


image obtained from Synapse Web
http://synapse-web.org/atlas/5_3.str

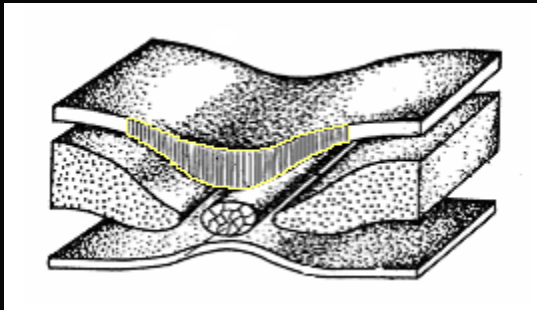


Synapse

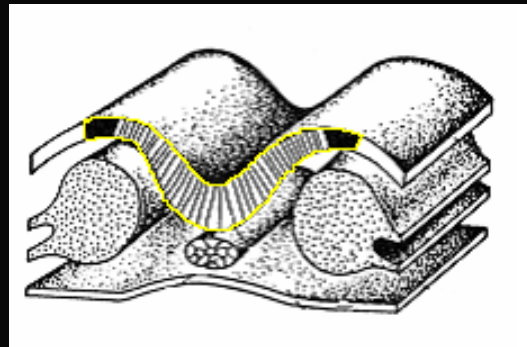


Development of NS

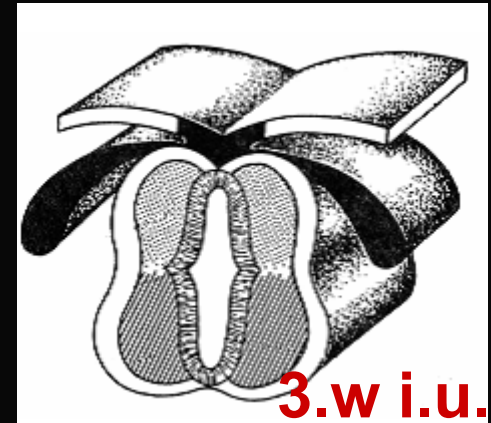
- from ectoderm (under influence of the notochord) arises the neural:



plate



groove



tube

+ neural crest

Parts derived from the neural tube

brain

spinal cord

Parts derived from the neural crest

cranial nerve ganglia

dorsal root ganglia and autonomic ganglia

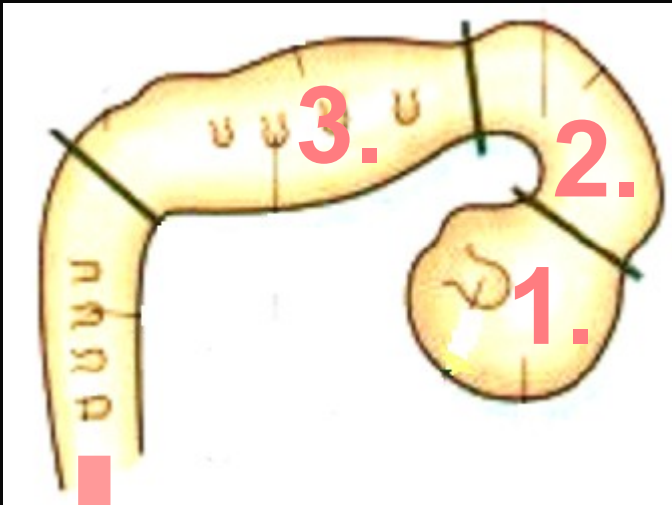
medulla of the suprarenal gland

some bones, cartilages and connective

tissue of the head

pigment cells

Cerebral vesicles from the rostral part of the neural tube



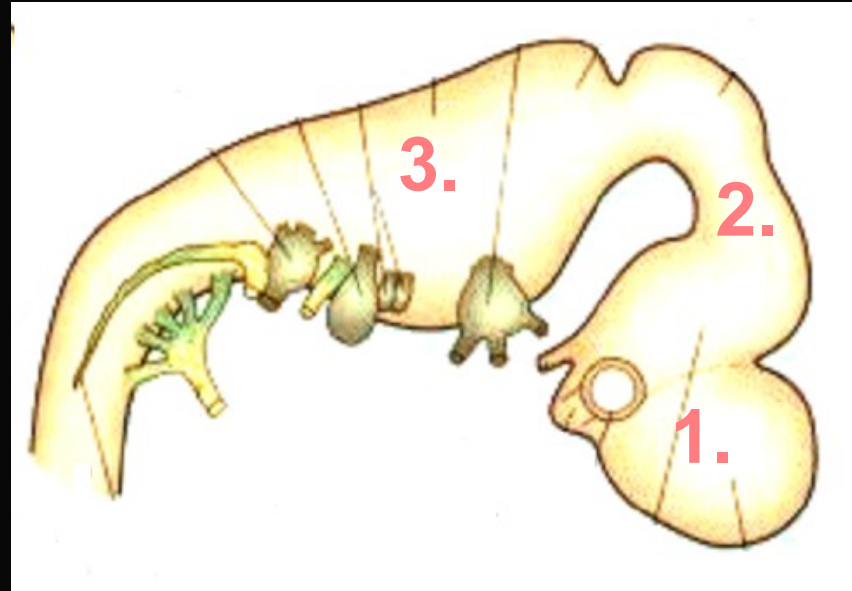
Spinal cord
medulla spinalis

3. rhombencephalon
(hindbrain)

2. mesencephalon
(midbrain)

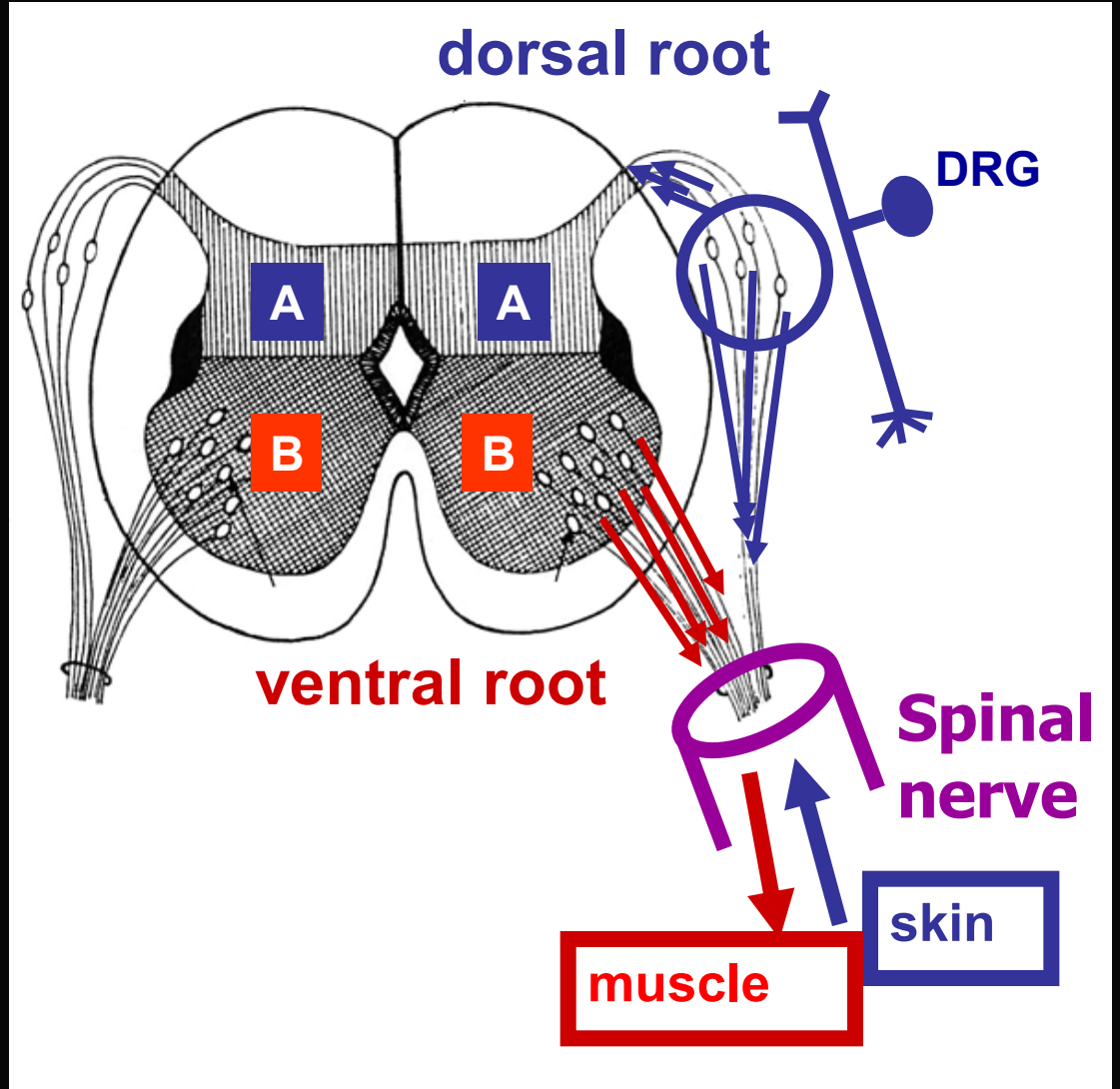
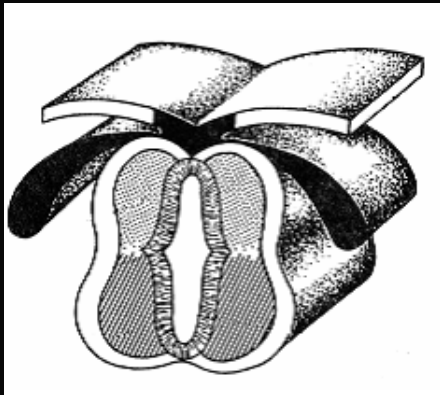
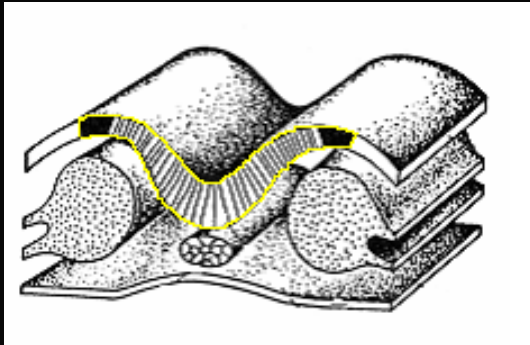
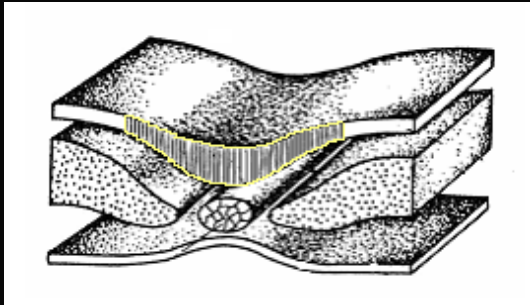
1. prosencephalon
(forebrain)

Secondary vesicles



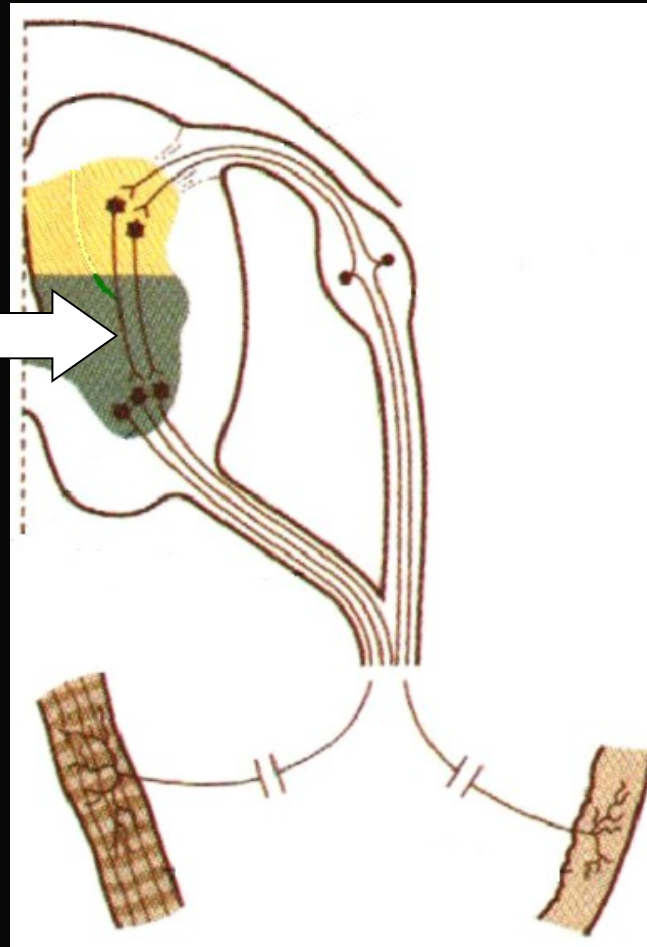
rostral

- | | | |
|----|-----------------------|-------------------|
| 3. | myelencephalon | medulla oblongata |
| | metencephalon | pons, cerebellum |
| 2. | mesencephalon | midbrain |
| 1. | diencephalon | diencephalon |
| | telencephalon | telencephalon |



sulcus limitans

Interneuron →



Muscle

Skin

SENSOR

EFFECTOR

- Surface of the body
- Extero-receptors**
- Organs of motions
- Proprio-receptors**
- Viscera
- Intero-receptors**
- Senses



Afferent



CNS

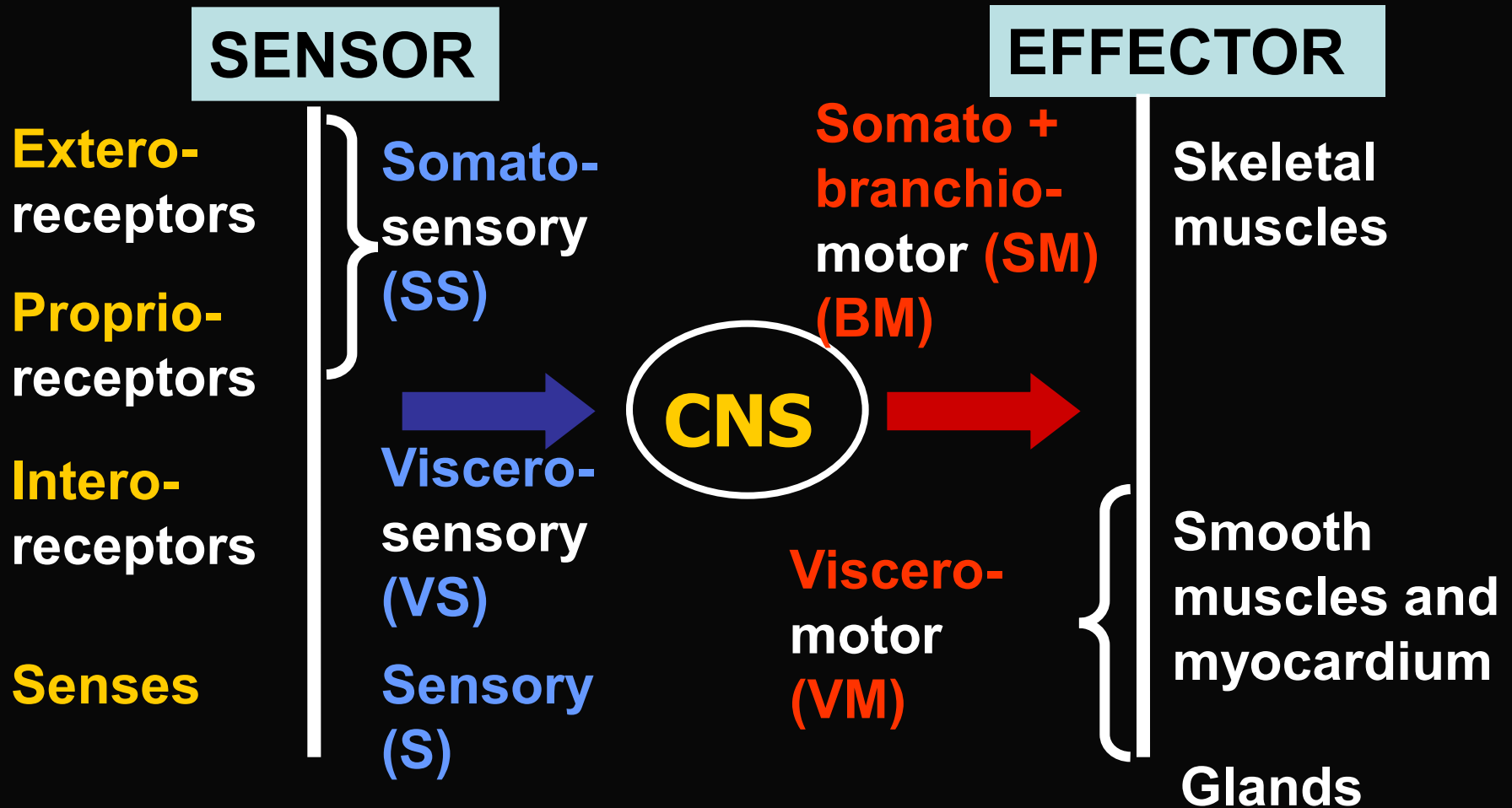


Efferent

PNS

- Skeletal muscles
- Smooth muscles + myocardium
- Glands

Functional types of axons



PNS

Cranial nerves III. - XII. (I.- XII.)

pass through the skull base

Spinal nerves - 31 pairs

**pass through the intervertebral
foramina**

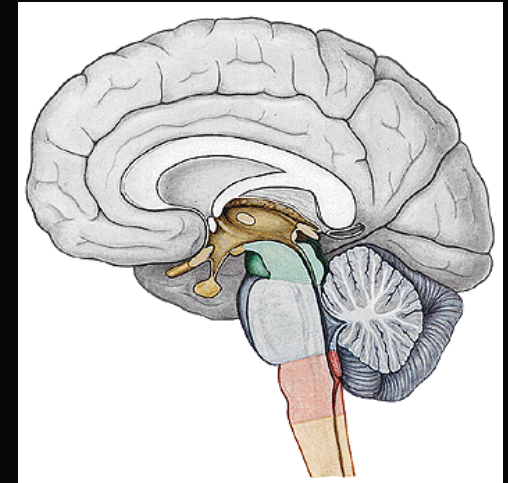
CNS

I. Brain

- medulla oblongata
- pons
- mesencephalon

- cerebellum
- diencephalon
- telencephalon

II. Spinal cord



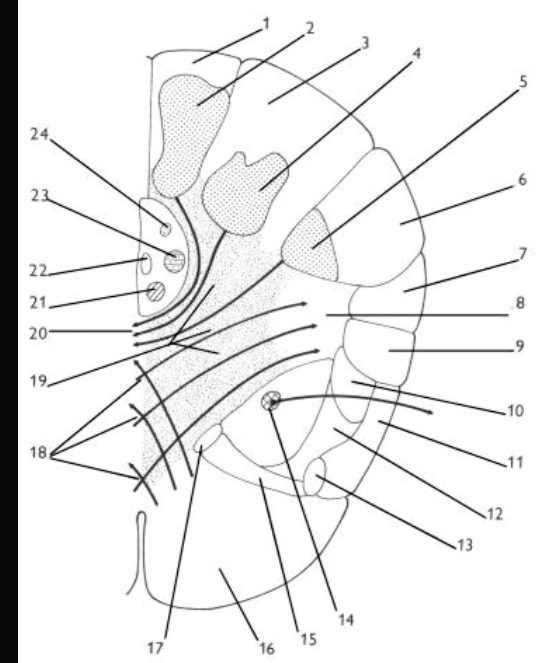
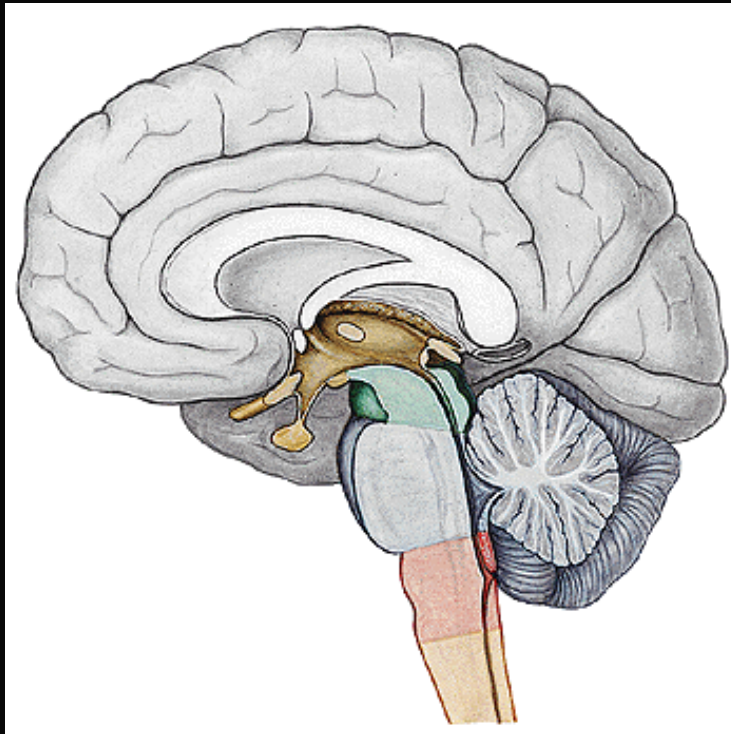
Structure of the CNS

Gray matter - **nuclei**

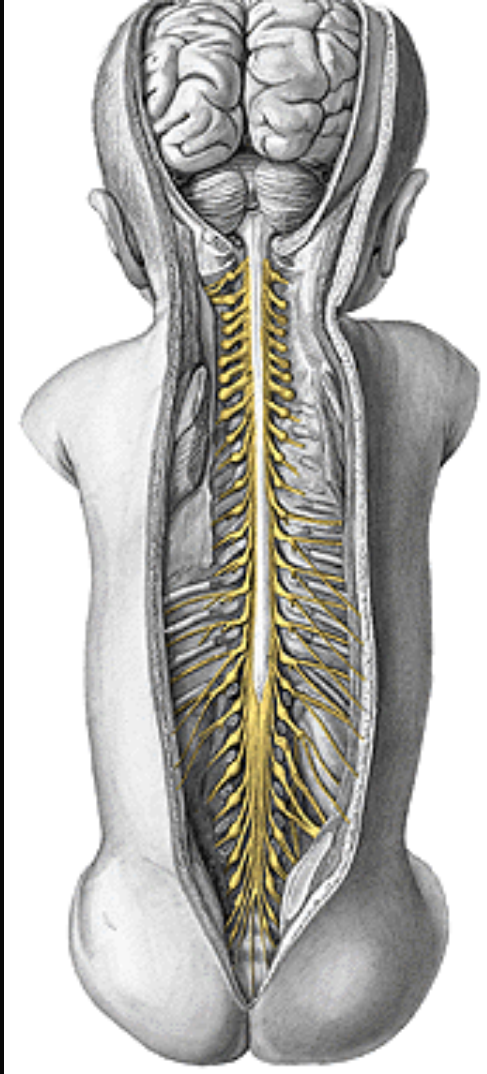
White matter – **nerve tracts:**

- tractus

- fasciculus (lemniscus)



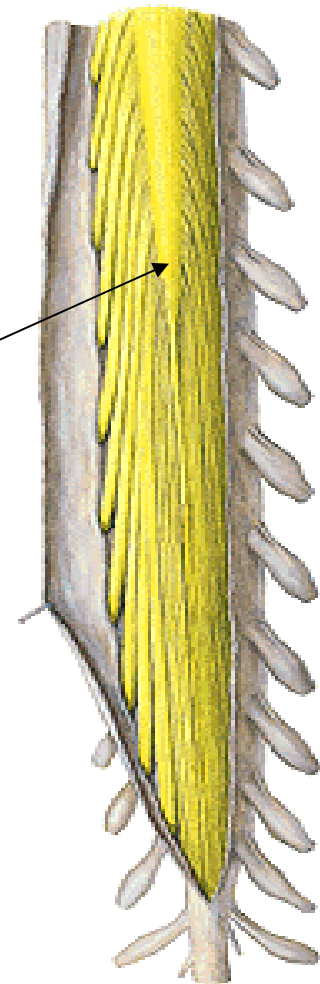
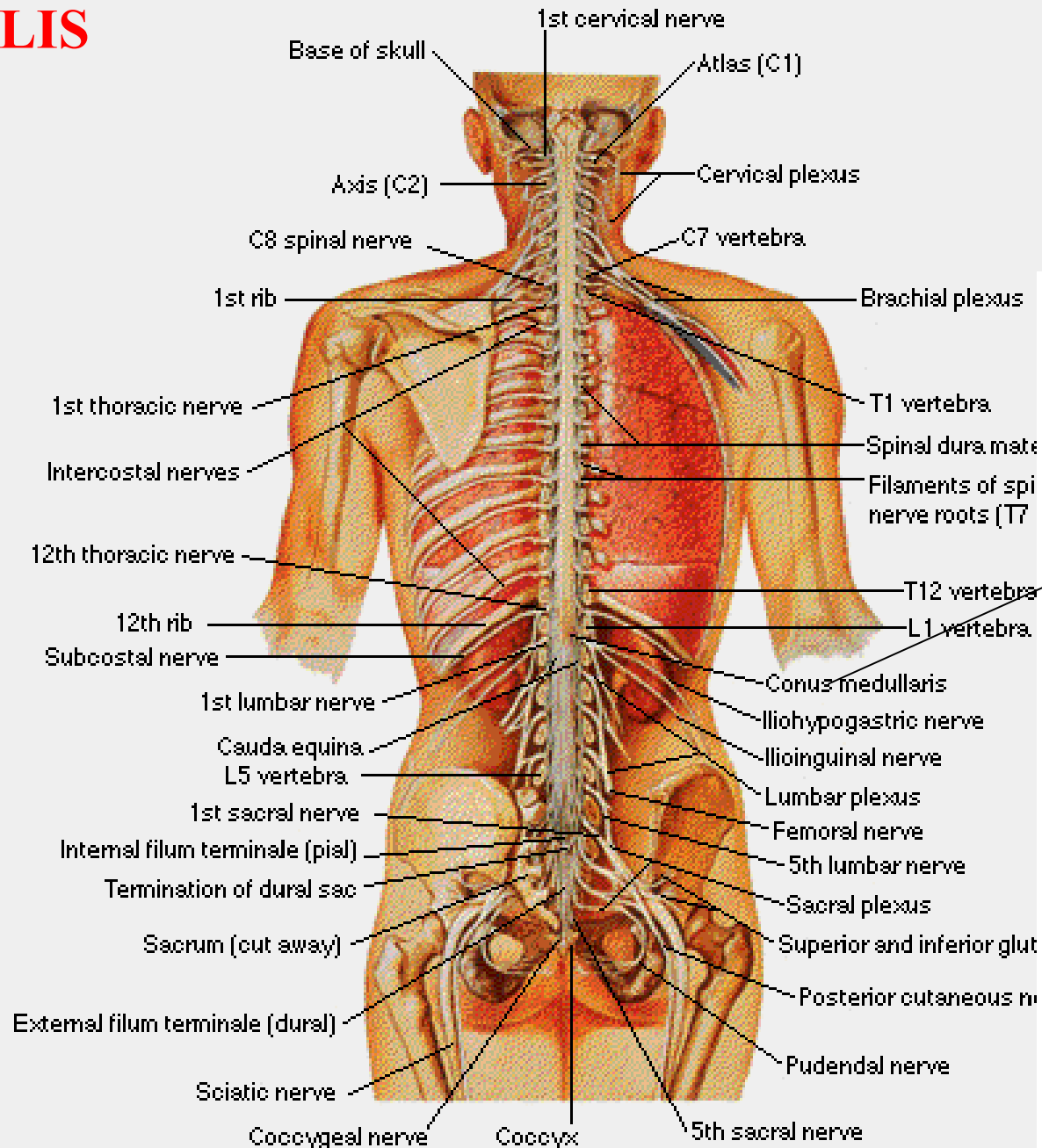
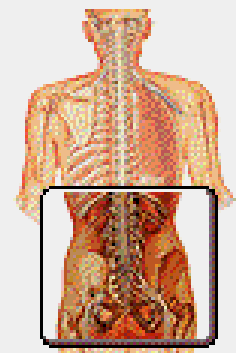
Spinal cord

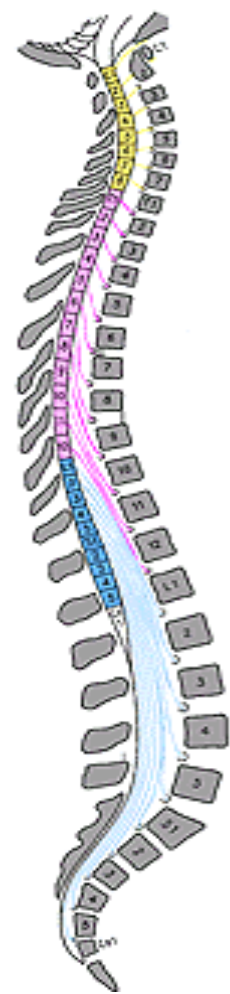
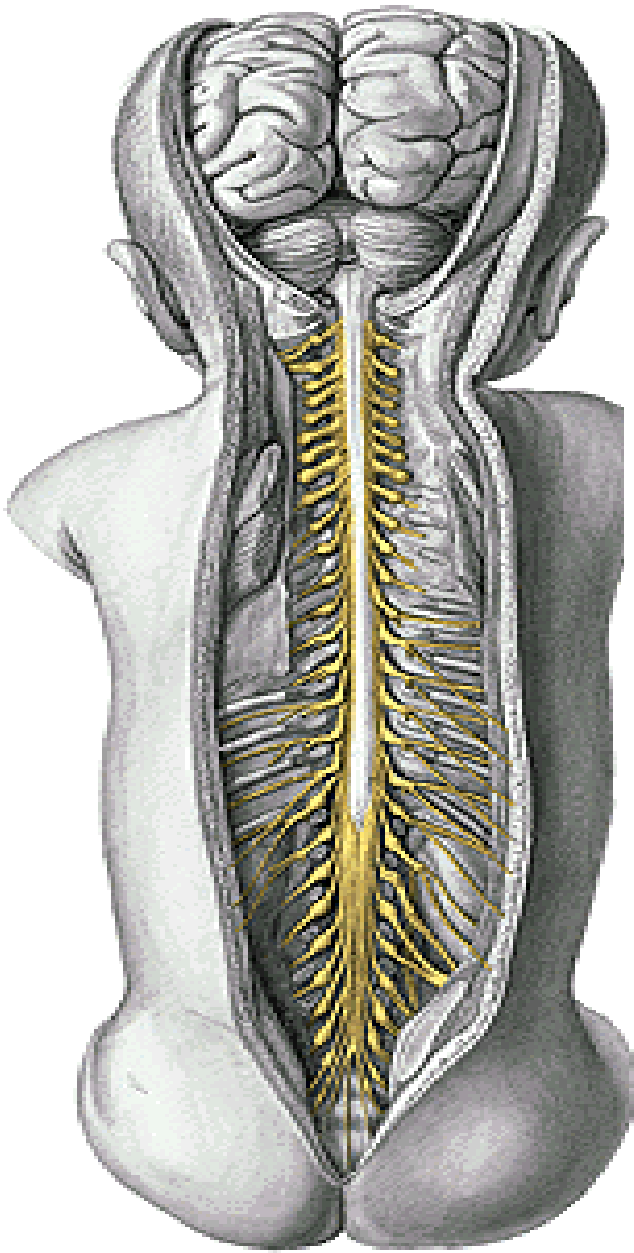


- transmission of neural signals between the brain and the periphery
- contains neural circuits that can control numerous reflexes and central pattern generators independently on the cortex

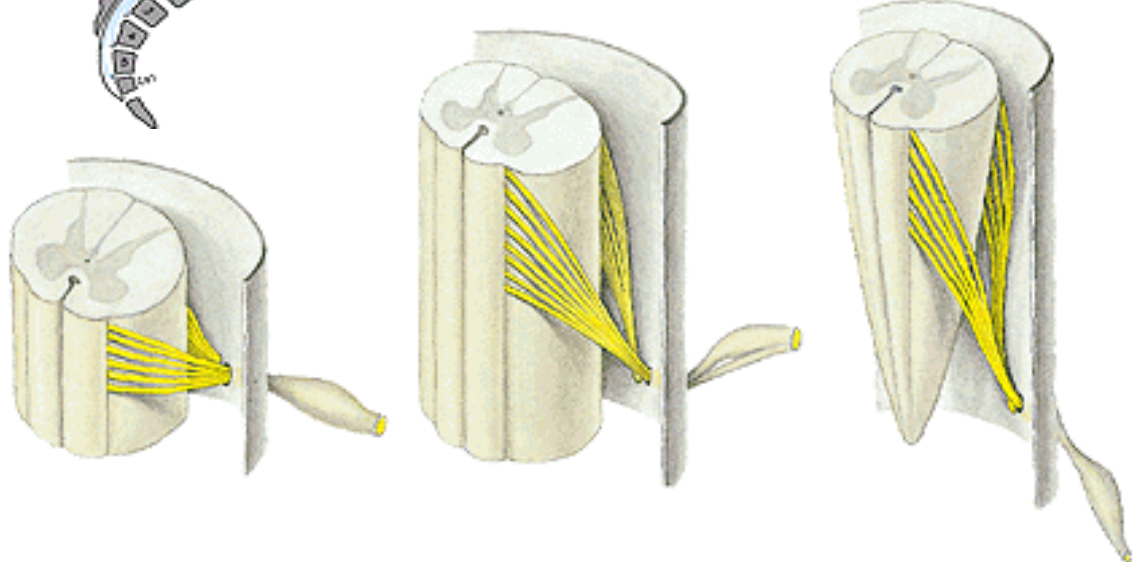
MEDULLA SPINALIS

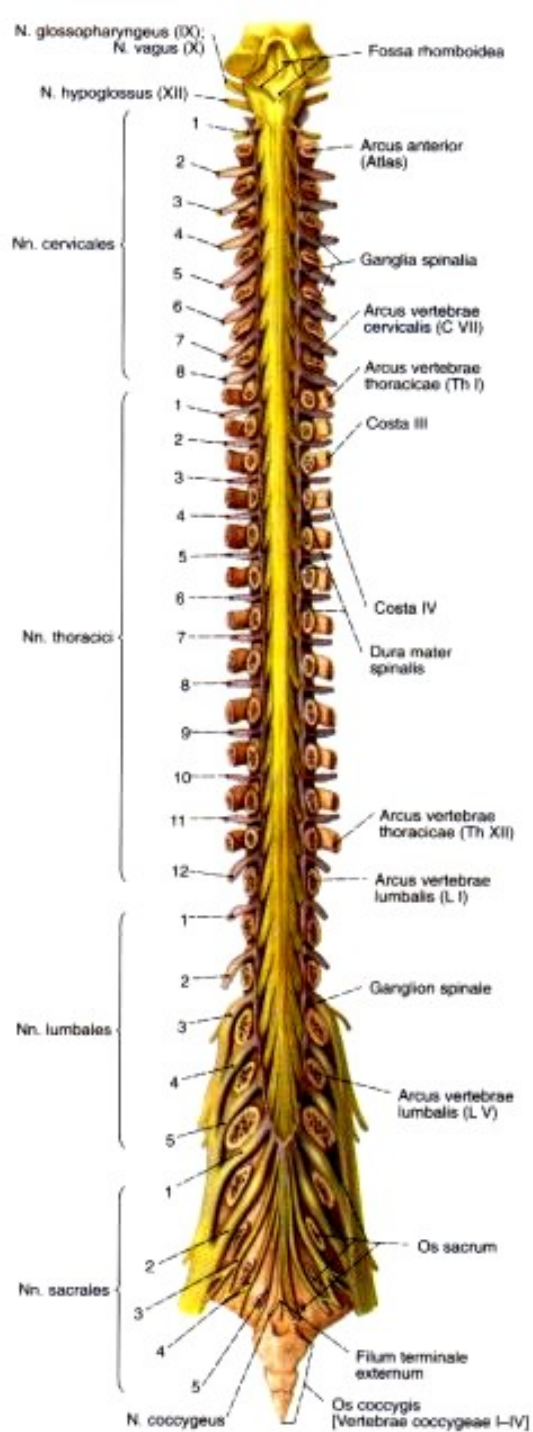
Spinal Cord in Situ





Cauda equina
Fila radicularia



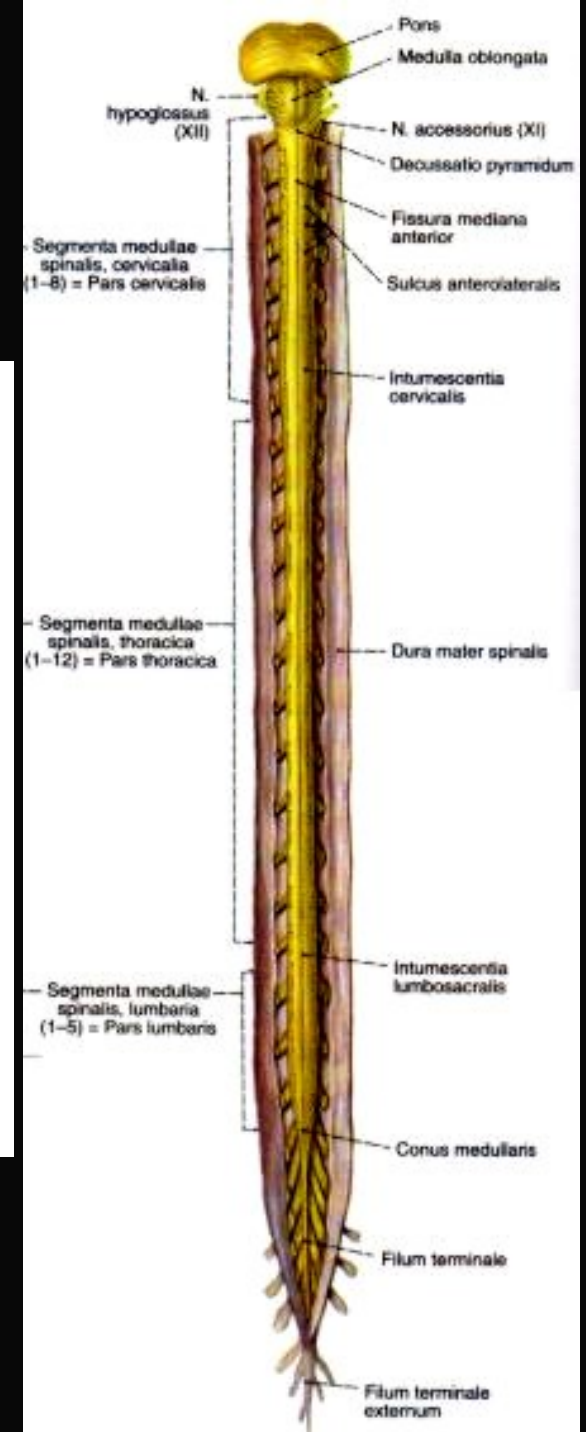


Intumescentia cervicalis

C5 – T1 segments
C4 – T1 vertebrae

Intumescentia lumbalis

L2 – S1 segments
T9 – T12 vertebrae





Segment C5



Segment C8



Segment Th2



Segment L4



Segment S4



Segment C1



Segment C5



Segment C8



Segment Th2



Segment Th10



Segment L1

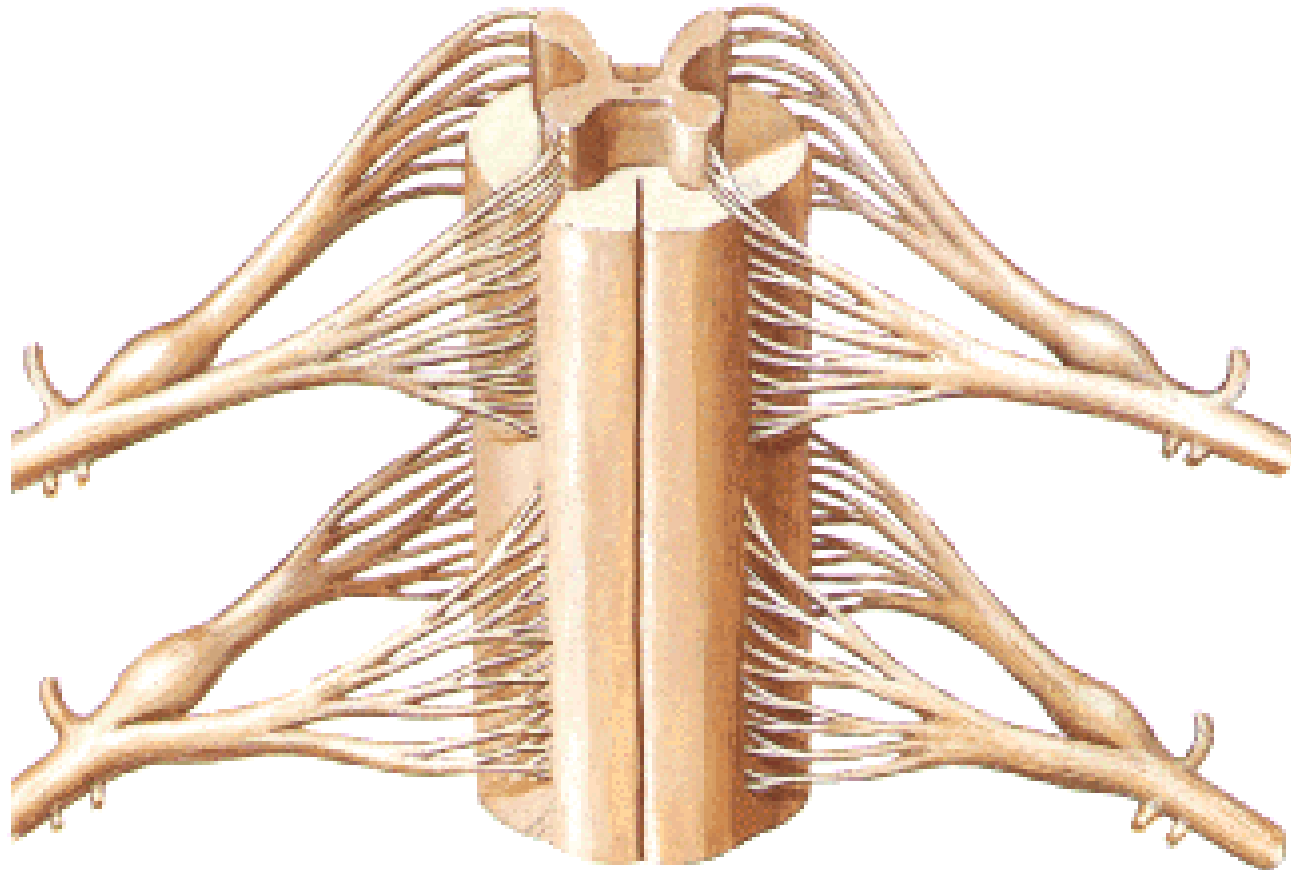


Segment L4

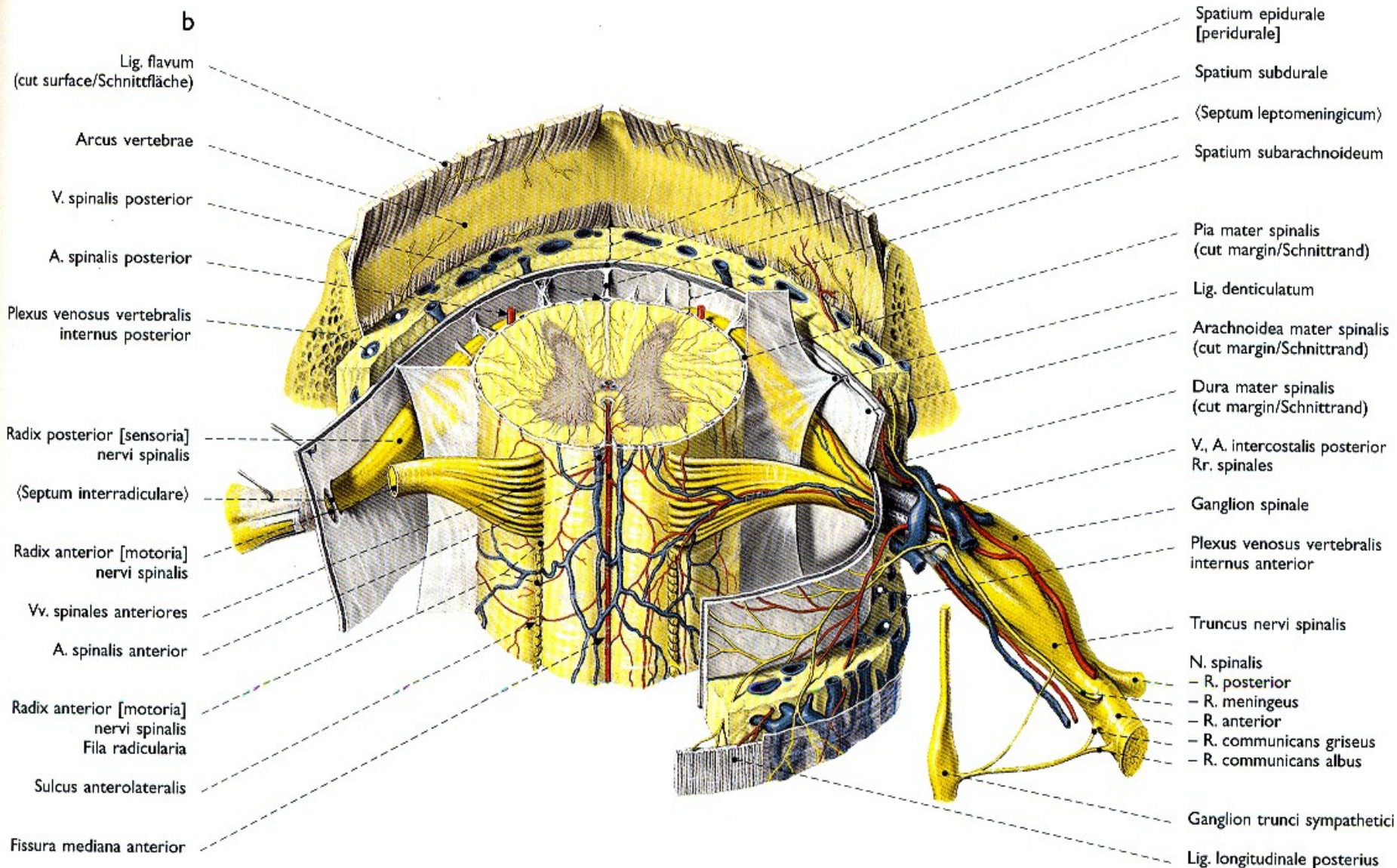


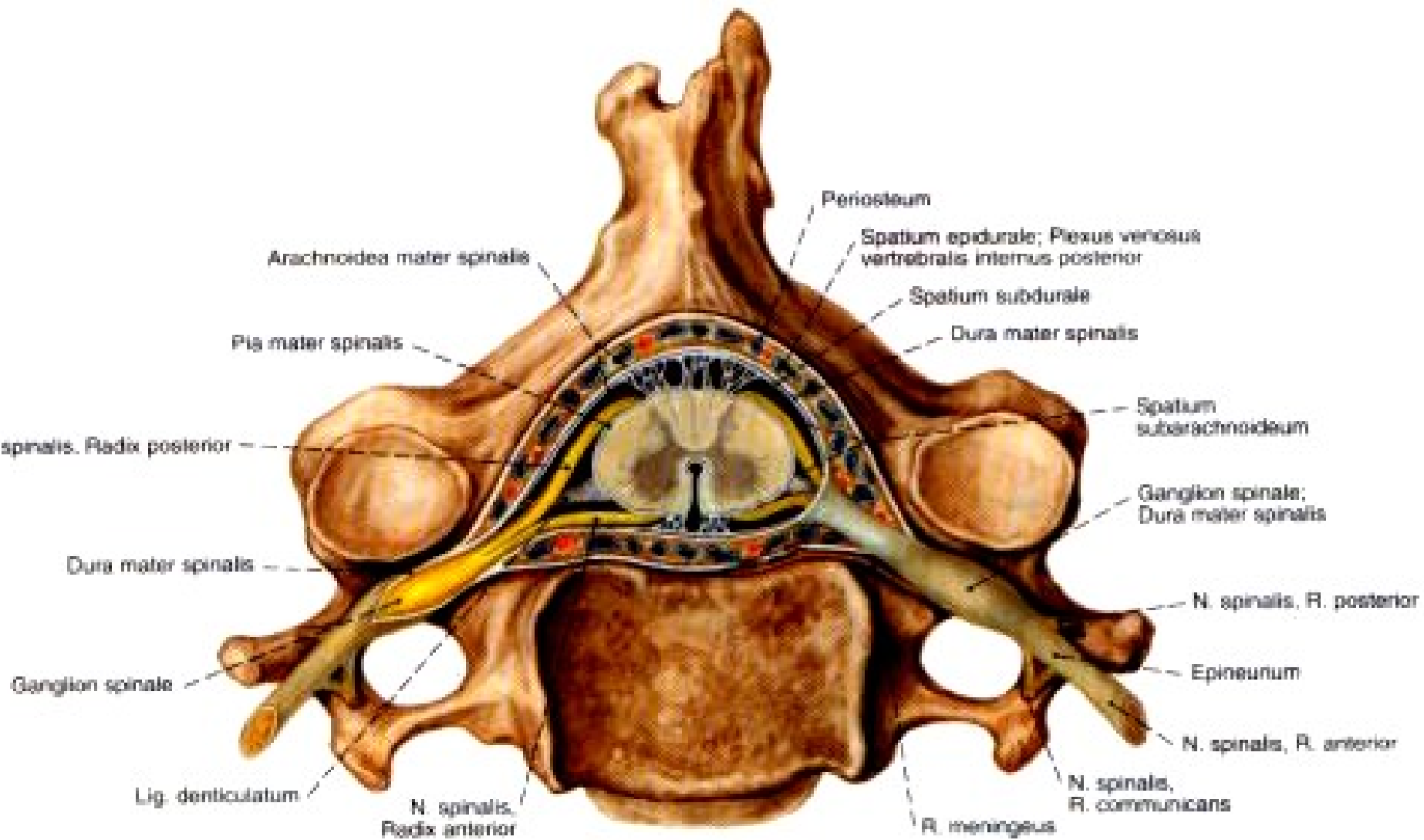
Segment S4

SUBSTANTIA GRISEA – cornu anterius (columna anterior), cornu posterius (columna posterior), cornu laterale (columna lateralis), substantia intermedia, canalis centralis



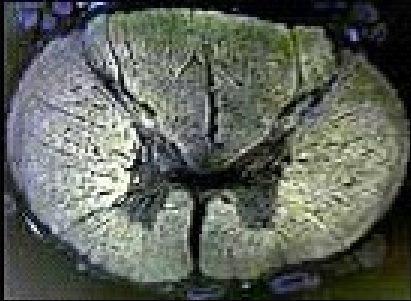
SUBSTANTIA ALBA – funiculus anterior, lateralis, posterior fissura mediana ant., sulcus medianus post., septum medianum posterius, sulcus anterolateralis, posterolateralis



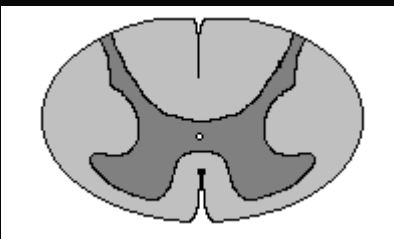




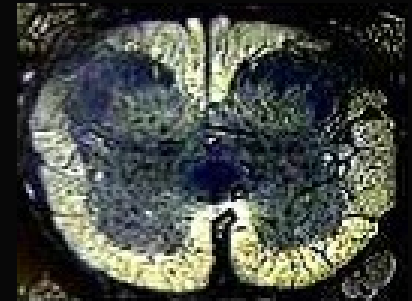
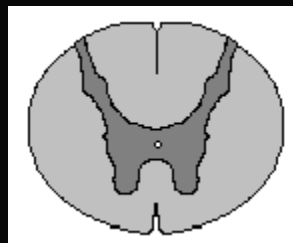
Dorsal horn
Ventral horn



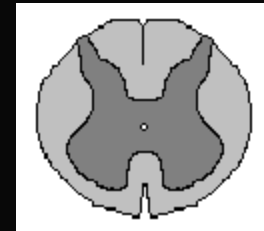
p. cervicalis



p. thoracica

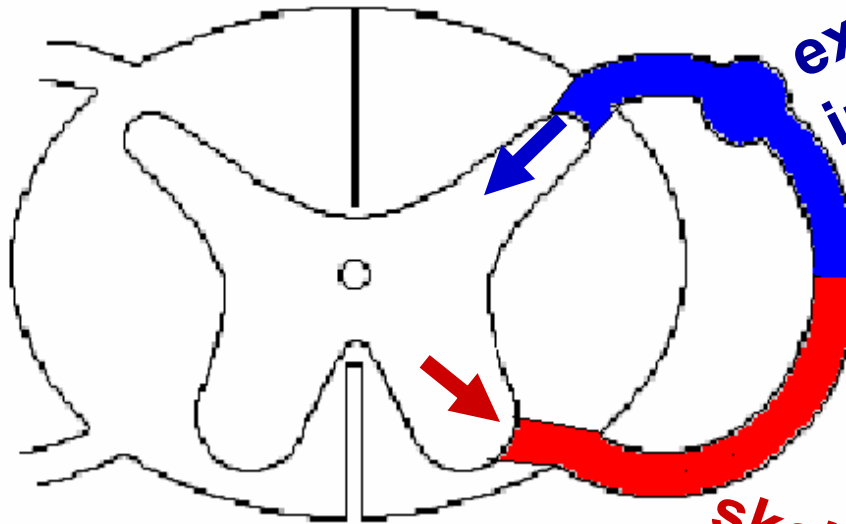


p. sacralis



Dorsal root

**extero + proprio +
intero- receptors**

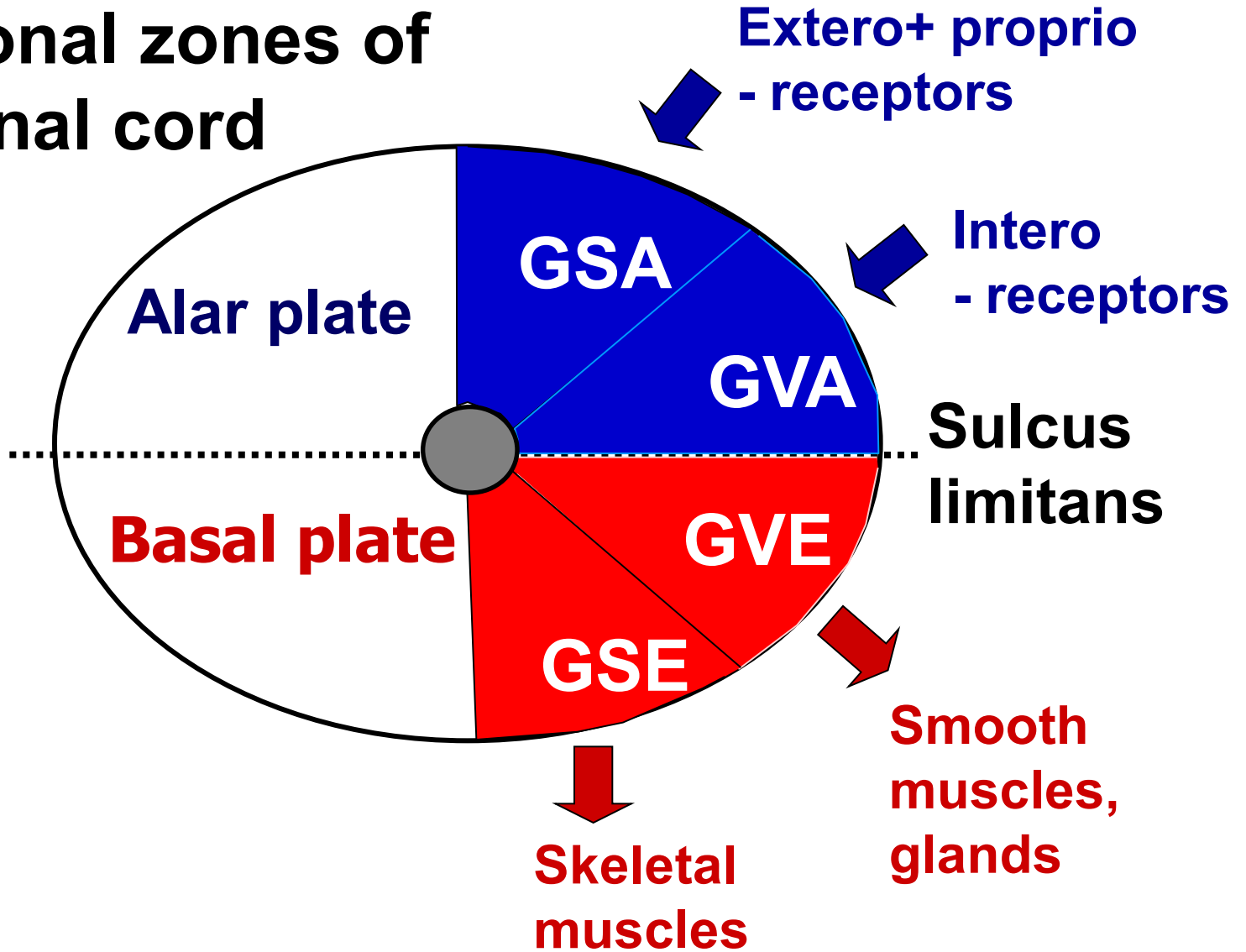


**Spinal
nerve**

Ventral root

**skeletal + smooth
muscles + glands**

Functional zones of the spinal cord



Gray matter

DORSAL HORN – afferent neurons

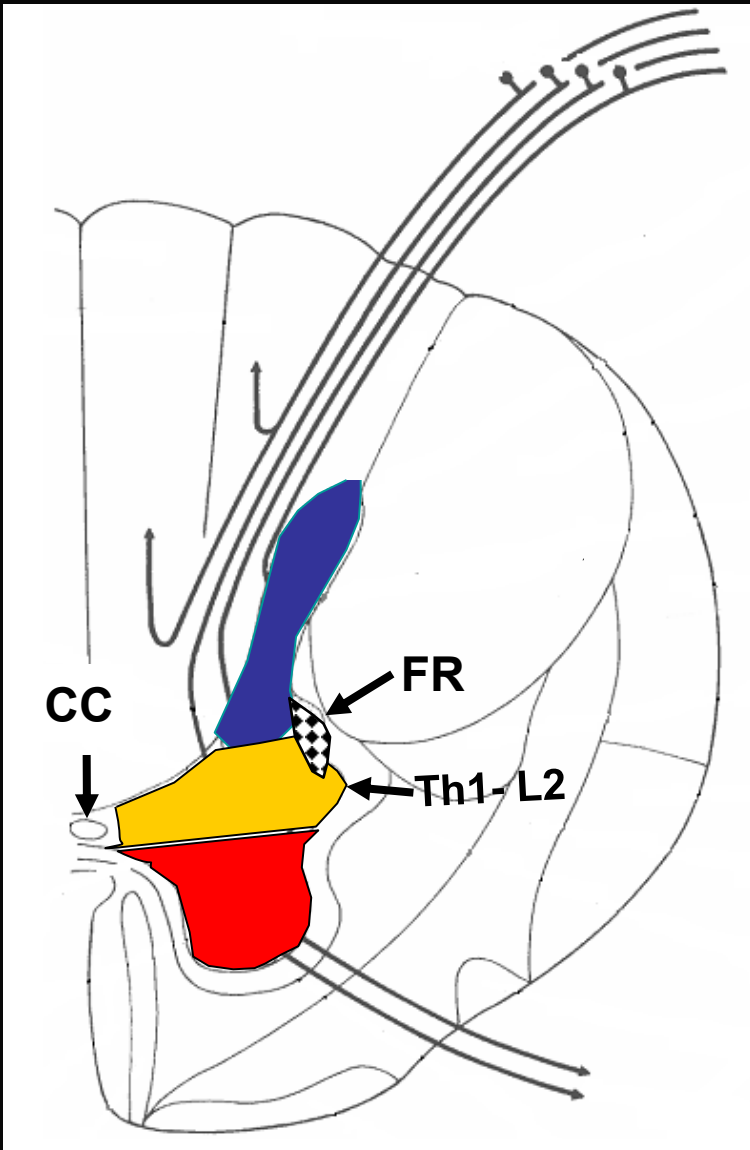
SUBST. INTERMEDIA (lateral horn)
motoneurons of the ANS

VENTRAL HORN - motoneurons

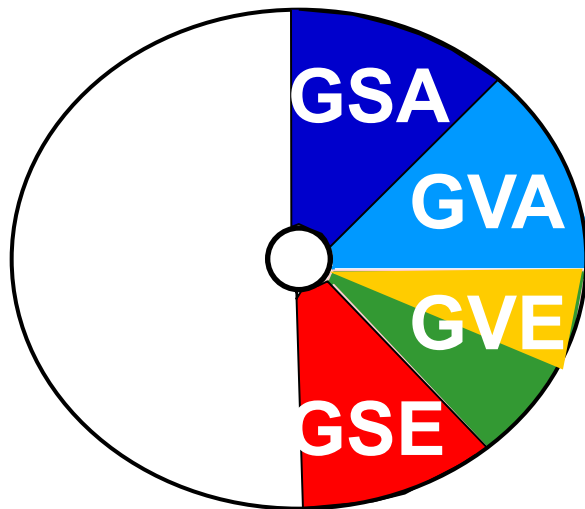
White matter

Funiculus post.
(fasc. gracilis et cuneatus)

Funiculus ant. }
Funiculus lat. } **F. anterolateralis**



Functional zones in the spinal cord

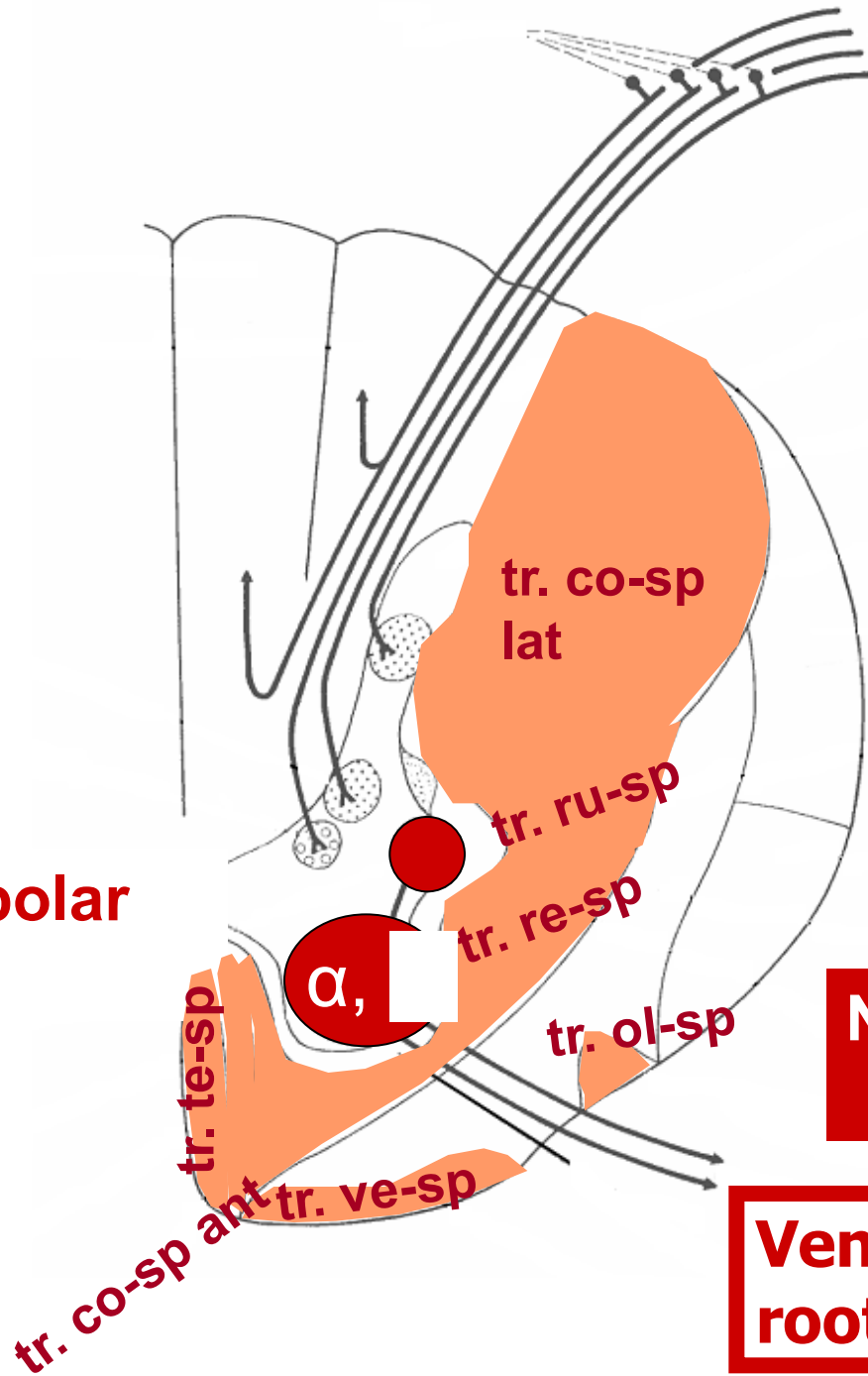


GVE zone

T1 - L2 - preganglionic
sympathetic neurons

below L2 - preganglionic
parasympathetic neurons

Multipolar cells



Ncl. intermedio-lat.

Ncll. motorii

Ventral root

Pseudounipol. neurons of the DRG

Radix dorsalis

Tr. spino-bulbaris

Fasc. gracilis

Fasc. cuneatus

Ncl. posteromarginalis + Subst. gelatinosa Rolandi

Ncl. proprius

Ncl. thoracicus (Stilling-Clark.)

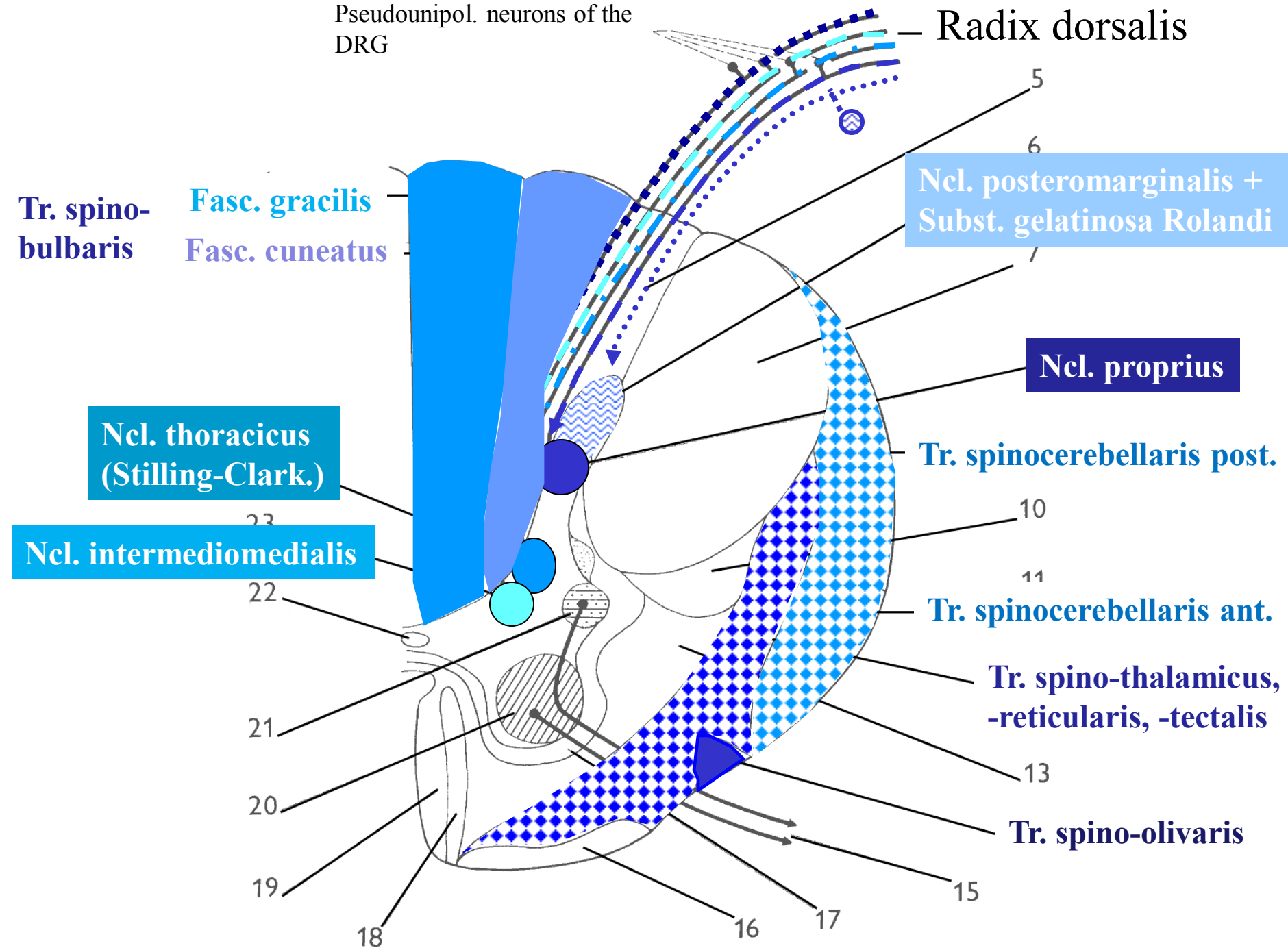
Tr. spinocerebellaris post.

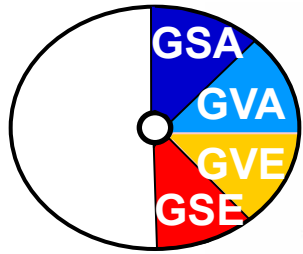
Ncl. intermediomedialis

Tr. spinocerebellaris ant.

Tr. spino-thalamicus, -reticularis, -tectalis

Tr. spino-olivaris





dorsal root

**ncl apicalis
subst gel Rolandi**

ncl proprius

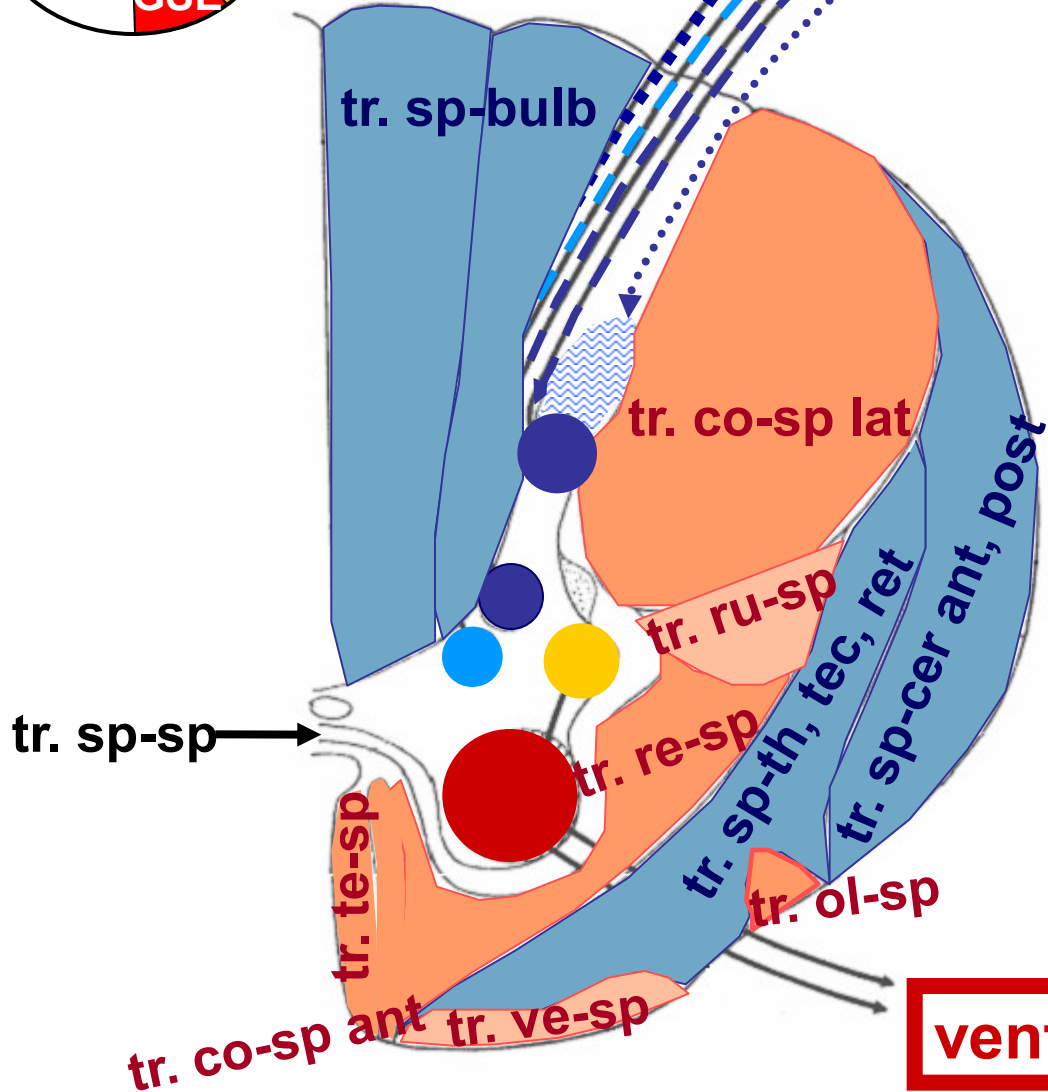
ncl thoracicus

ncl intermed-med

ncl intermedio-lat

ncll motorii

ventral root



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Atlas der Anatomie des Menschen/Sobotta.
Putz,R., und Pabst,R. 20. Auflage. München:
Urban & Schwarzenberg, 1993)