ANATOMY III

MUDr. Ivana Hradilová Svíženská, Ph.D.

	Lectures	Seminars
1.	Anatomy of the nervous system, Spinal nerve Structure of the spinal cord	Gross anatomy and structure of the spinal cord
2.	Structure of the brain stem	Gross anatomy and structure of the brain stem
3.	Structure of the cerebellum and diencephalon	Gross anatomy and structure of the cerebellum and diencephalon
4.	Structure of the telencephalon	Gross anatomy and structure of the telencephalon
5.	Meninges, ventricles and vascular system of the CNS Cranial nerves 1	Meninges, ventricles and vascular system of the CNS Cranial nerves 1
6.	Cranial nerves 2, Cervical plexus Intercostal nerves, Dorsal rami	Cranial nerves 2, Cervical plexus Intercostal nerves, Dorsal rami
7.	Autonomic nervous system	Autonomic nervous system
8.	Visual system	Visual system
9.	Regional anatomy of the head and neck	Demonstration of topographical regions (head and neck)
10.	Dissection course (head, neck)	
11.	Auditory system	Auditory system
12.	Regional anatomy of the body (except limbs)	Demonstration of the topographical regions (except limbs)
13.	Regional anatomy of the body (except limbs)	Demonstration of the topographical regions (except limbs)
14.	RTG anatomy	RTG anatomy
15.	Spare lectures	

Recommended literature:

Liebgott, 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

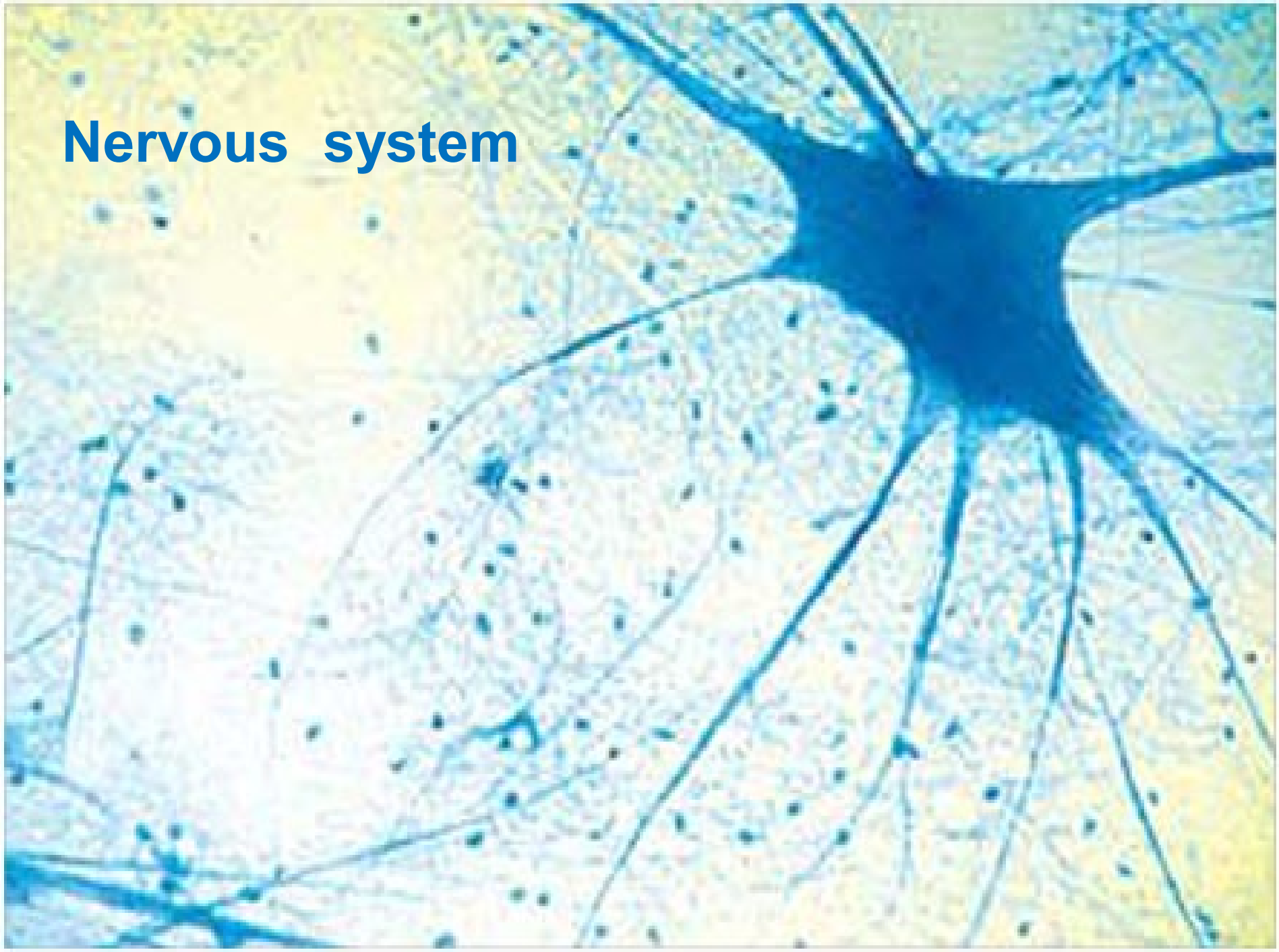
Stingl, J. et al. Regional anatomy.
1st ed. Galén-Karolinum, 2012. 123s. ISBN 9788072628797

Atlas of Anatomy

Equipment:

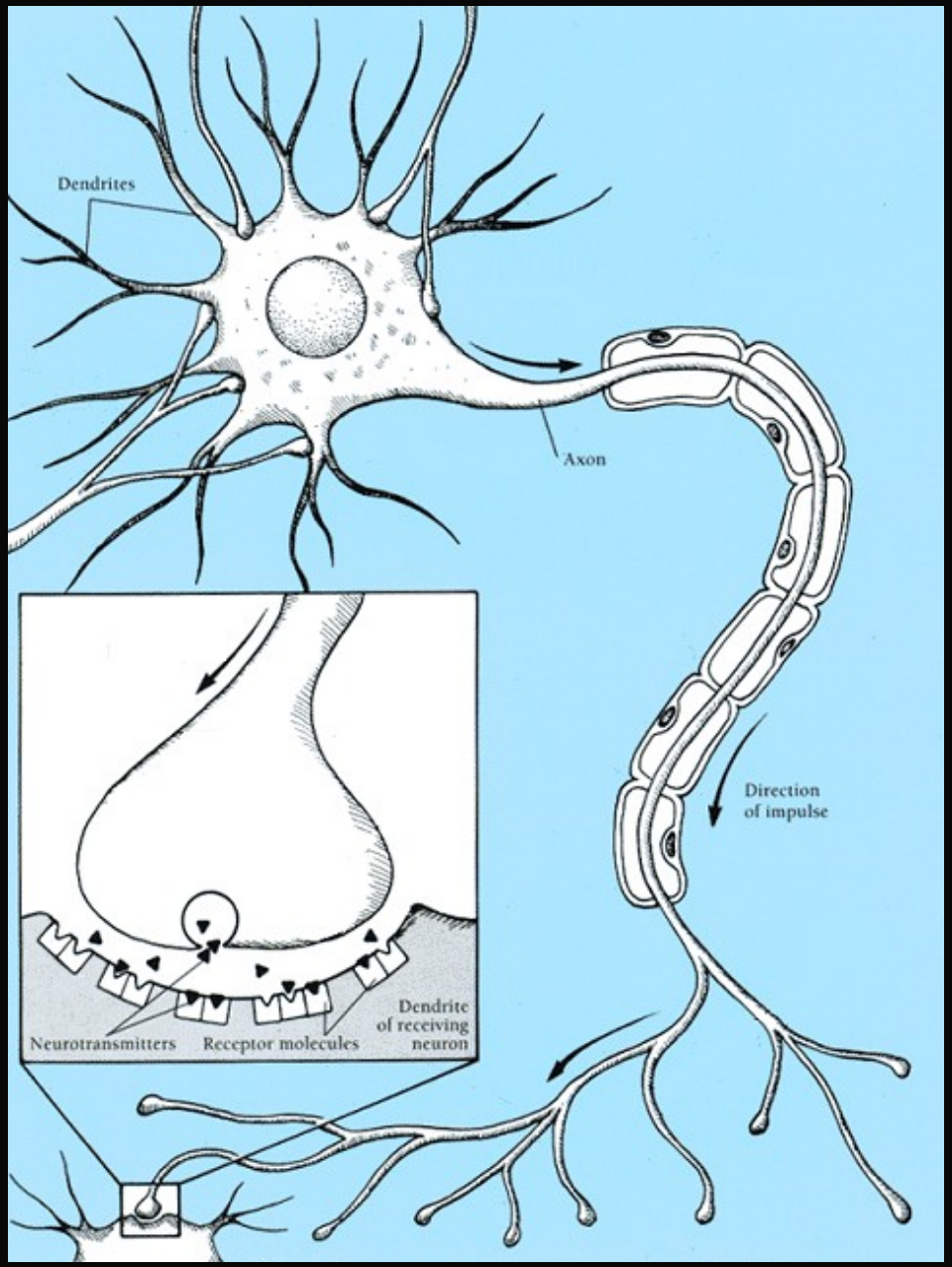
lab coat
dressing forceps
gloves

Nervous system



Nervous system

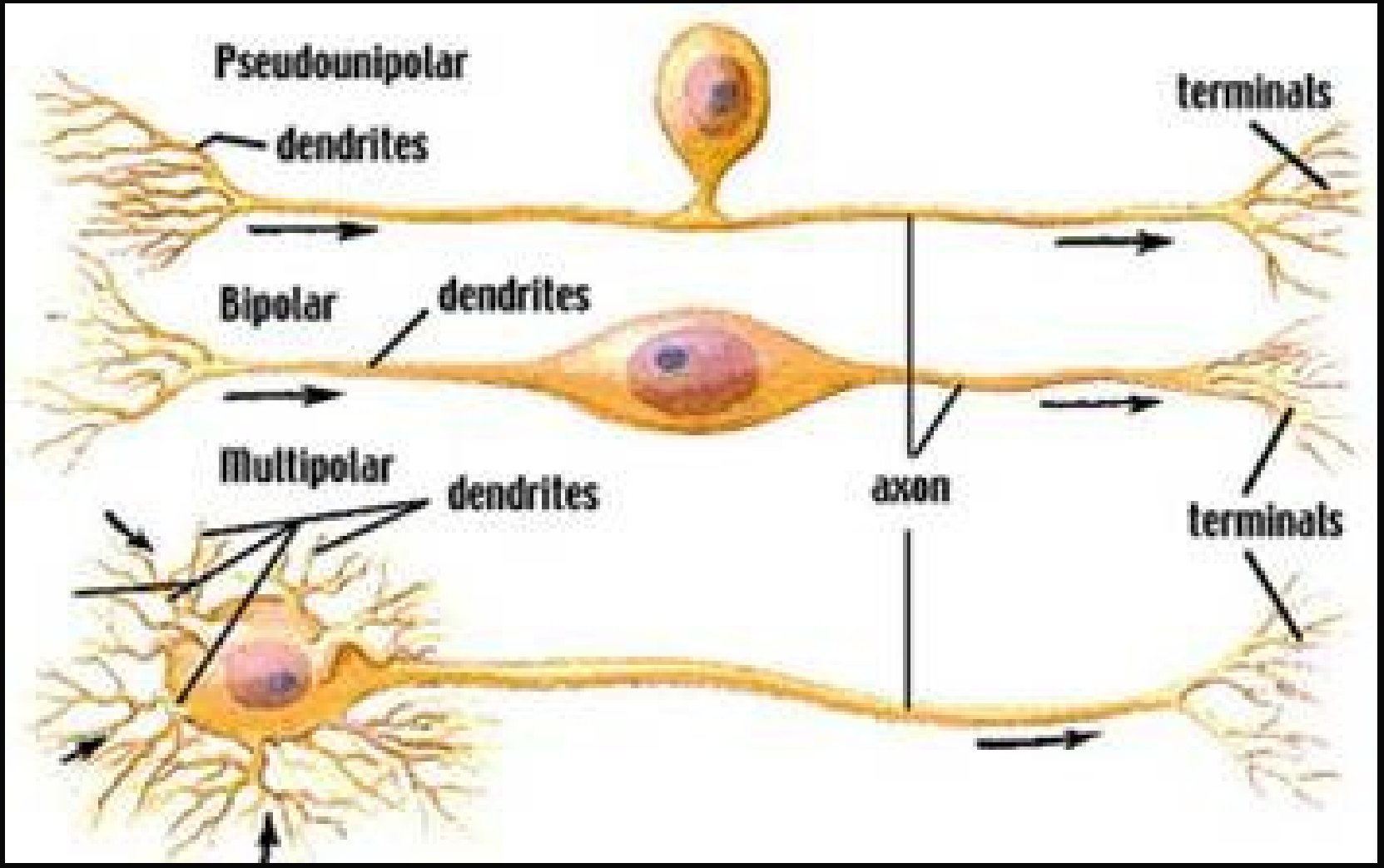
- is a complex, sophisticated system that regulates and coordinates activities of the body
- regulates the body's responses to internal and external stimuli
- has three main functions, sensory input, integration of data and motor output
- is composed of excitable nerve cells
- conducts nerve impulses
- 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**

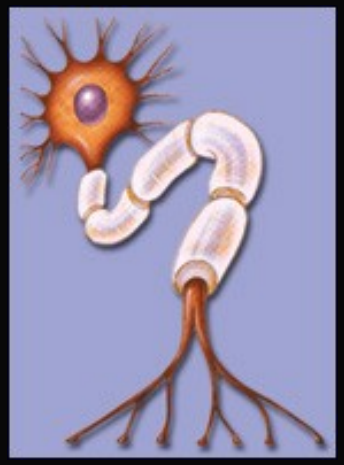


Neuron

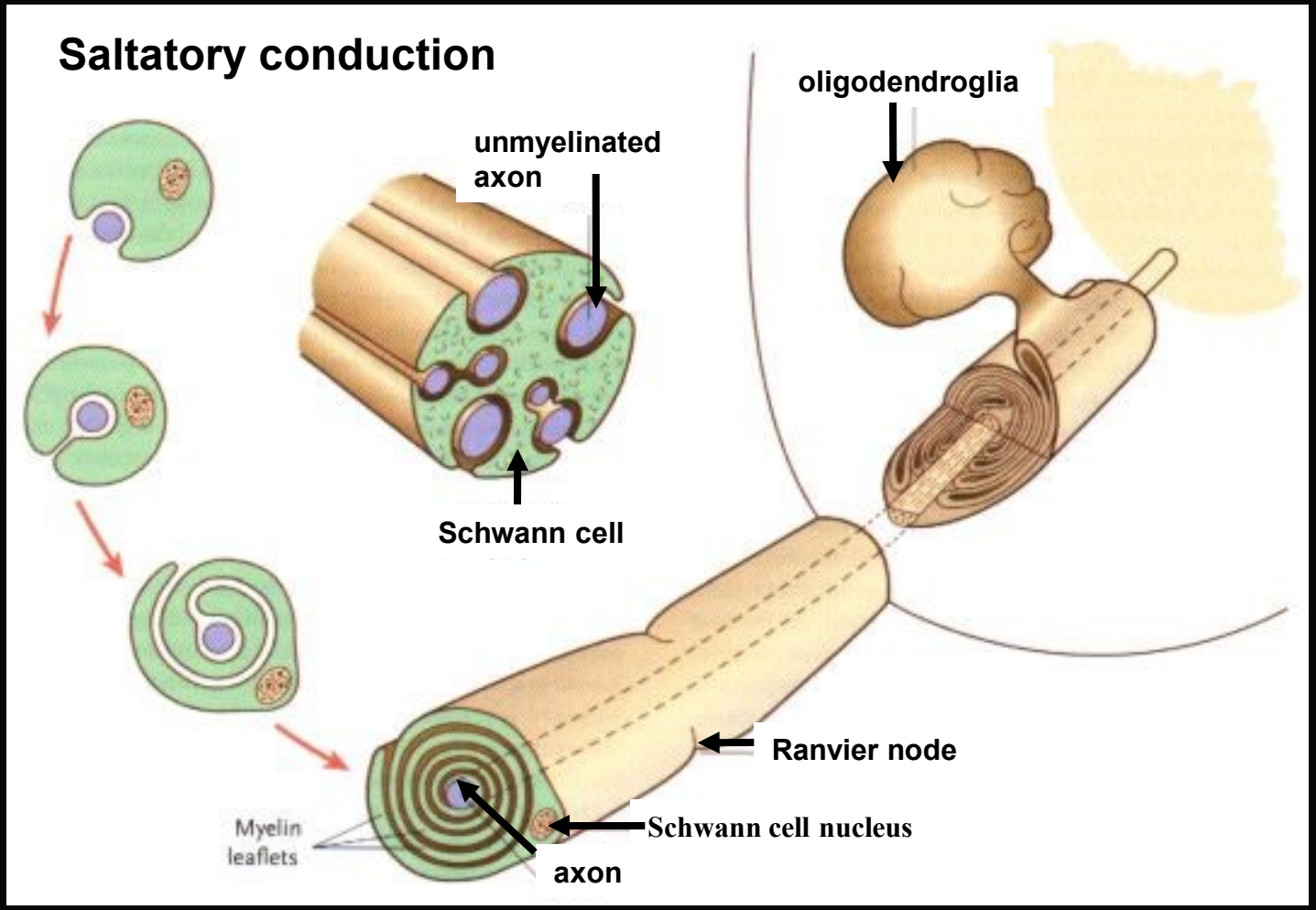
- receives stimuli
- transforms stimuli to nerve impulses
- conducts nerve impulses
- processes information
- transmits the electro-chemical signal across a synapse

TYPES OF NEURONS

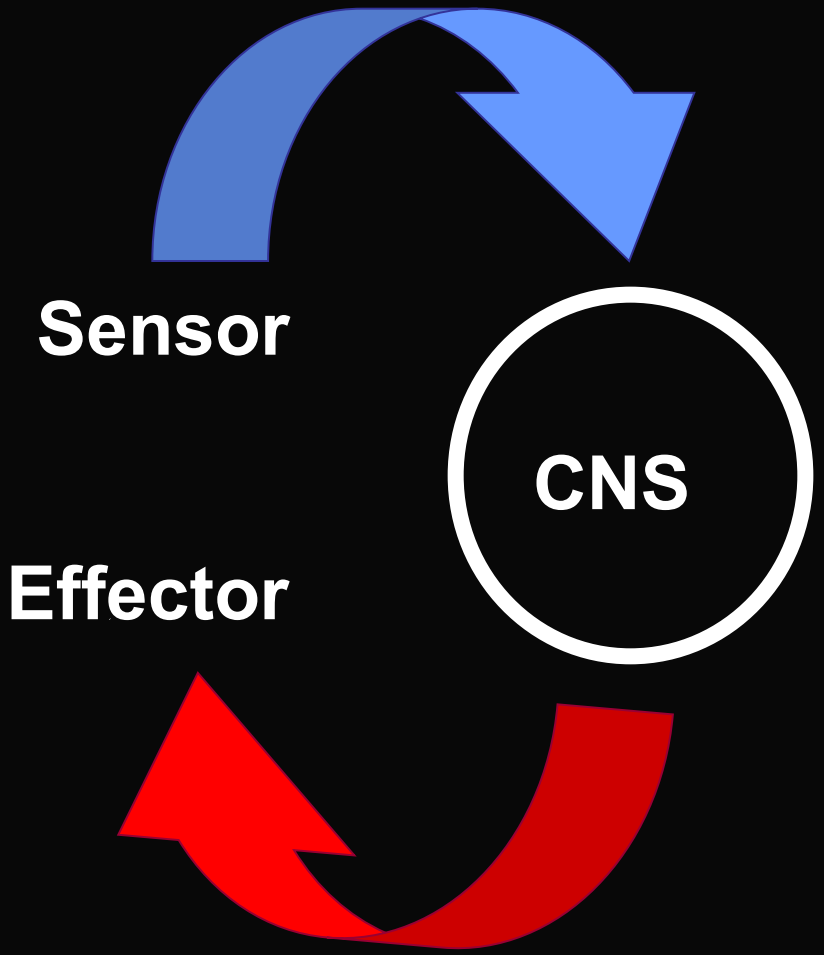




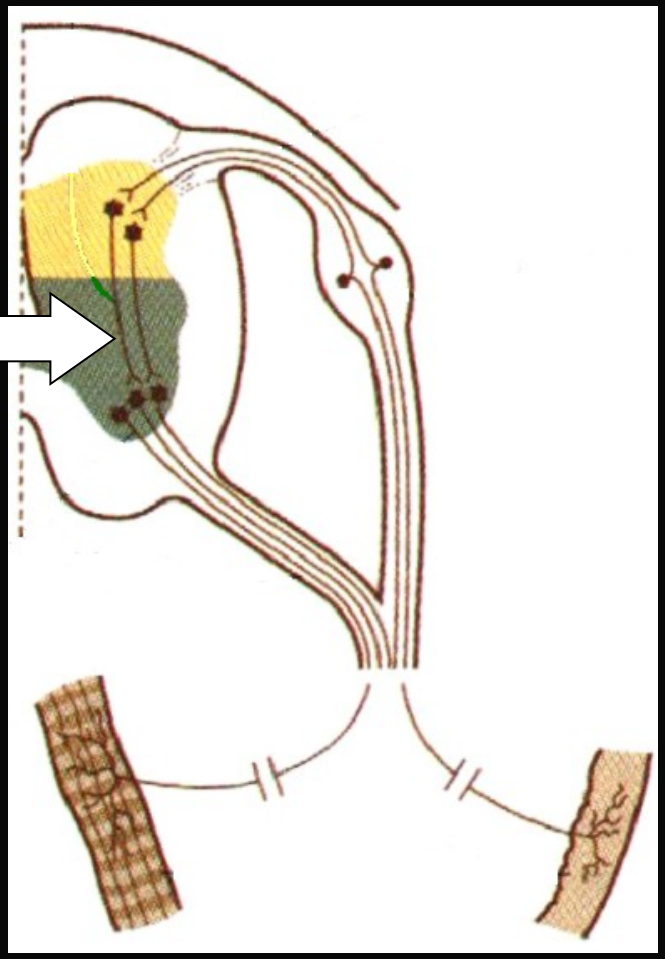
Myelinization – node of Ranvier, internodal segment



Basic function of NS - reflex



Interneuron

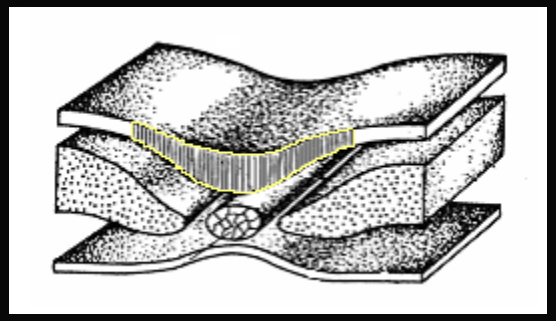


Muscle

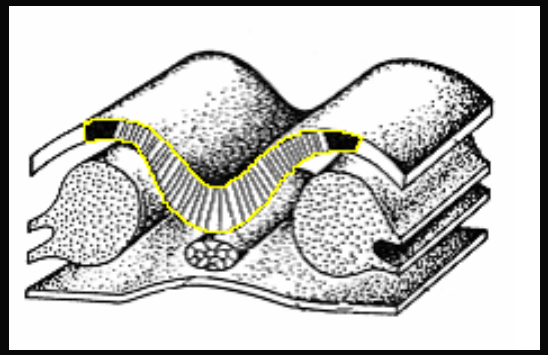
Skin

Development of NS

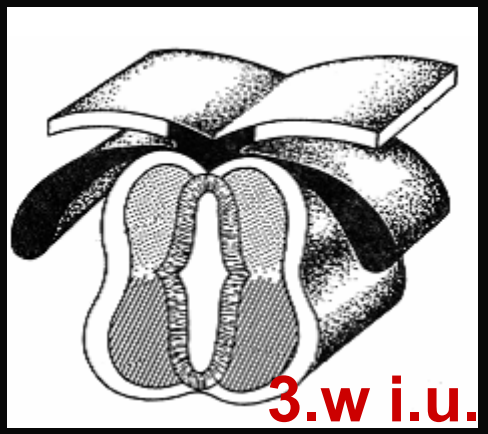
- from ectoderm (under influence of the notochord) arises the neural:



plate



groove



tube
+ neural crest

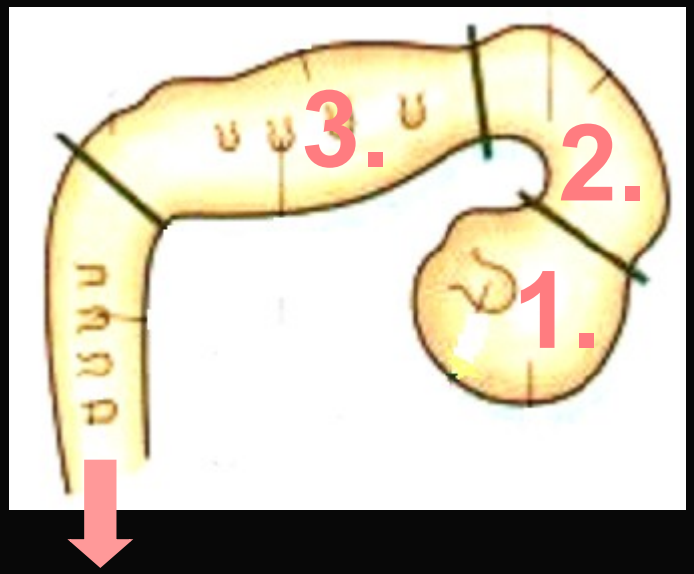
Parts derived from the neural tube

brain
spinal cord

Parts derived from the neural crest

cranial nerve ganglia
dorsal root and autonomic ganglia
medulla of the suprarenal gland
some bones, cartilage and connective tissue of the head
pigment cells ...

Cerebral vesicles from the rostral part of the neural tube



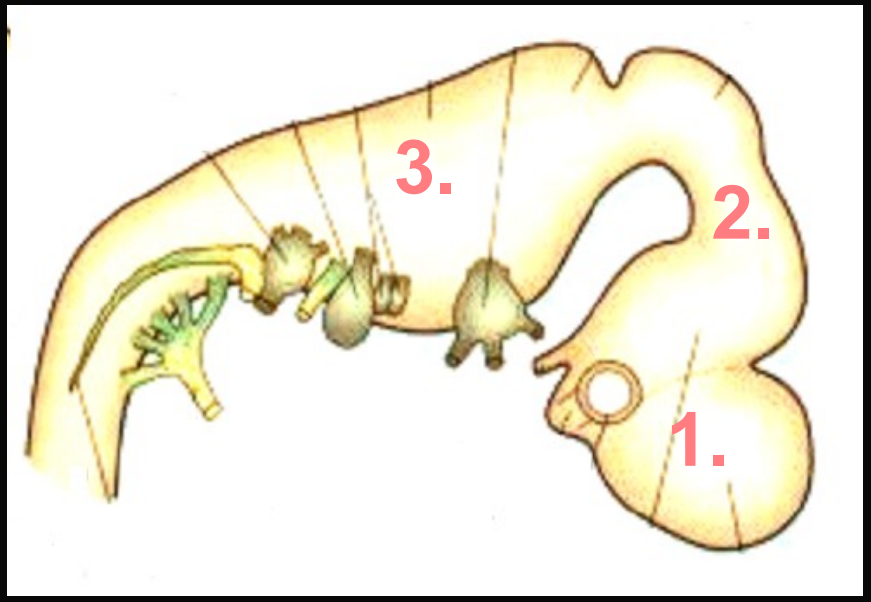
Spinal cord
medulla spinalis

3. rhombencephalon
(hindbrain)

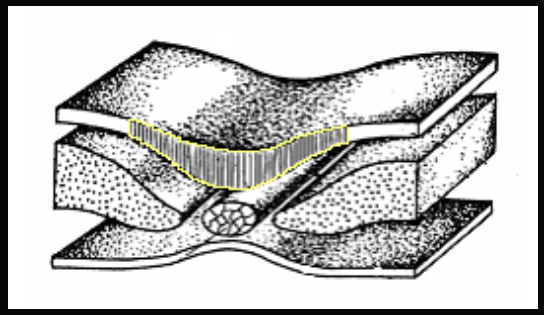
2. mesencephalon
(midbrain)

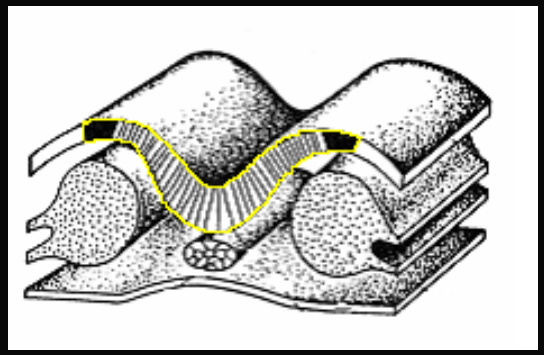
1. prosencephalon
(forebrain)

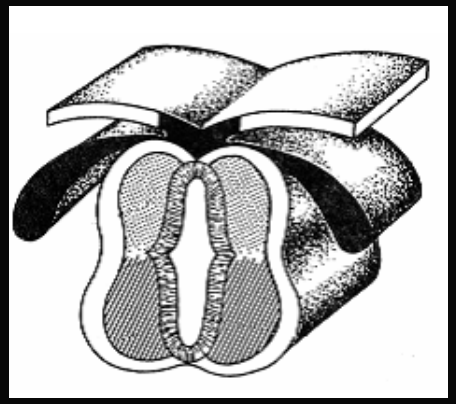
Secondary vesicles

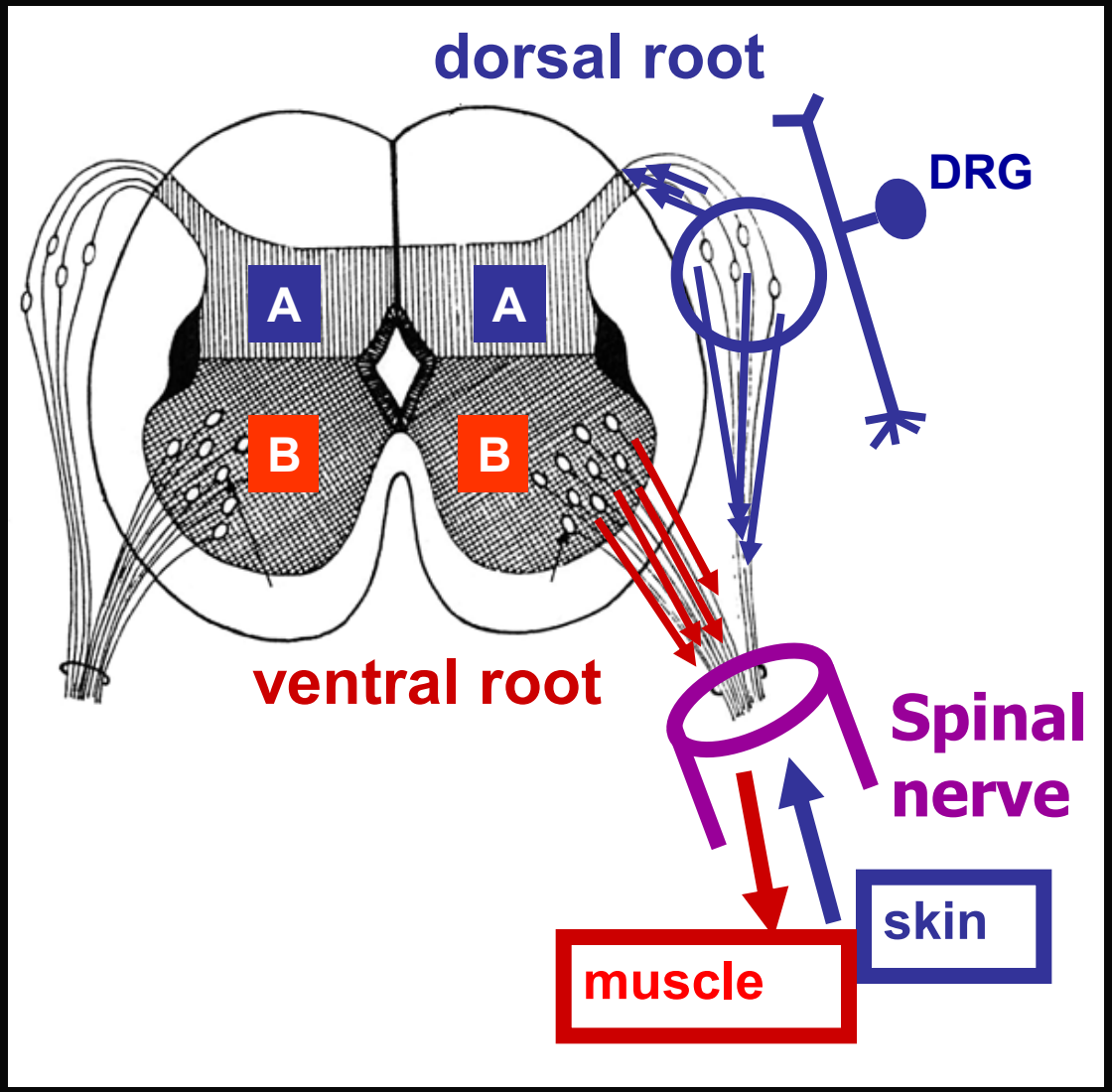


3.	myelencephalon	medulla oblongata
	metencephalon	pons, cerebellum
2.	mesencephalon	midbrain
1.	diencephalon	diencephalon
	telencephalon	telencephalon

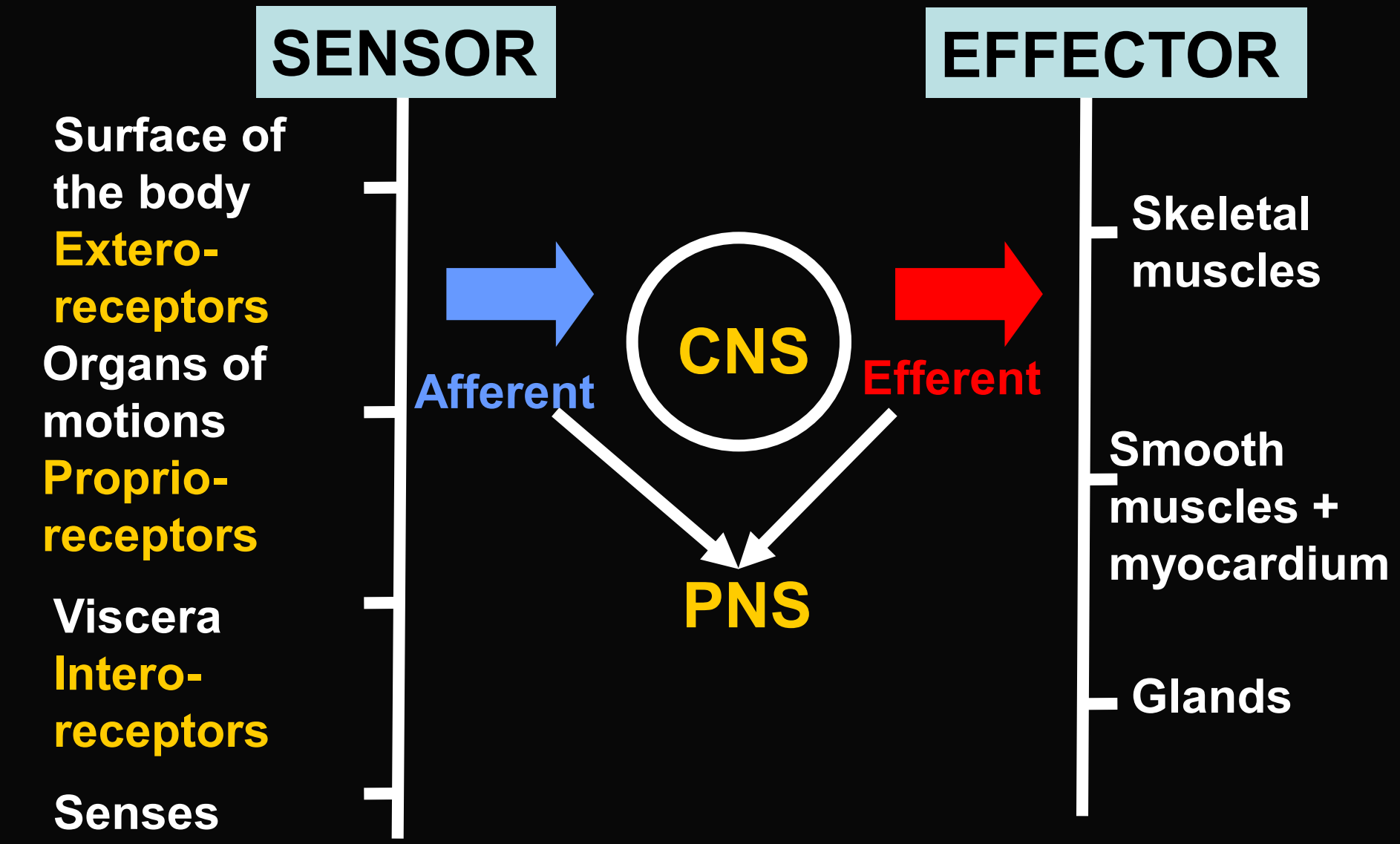




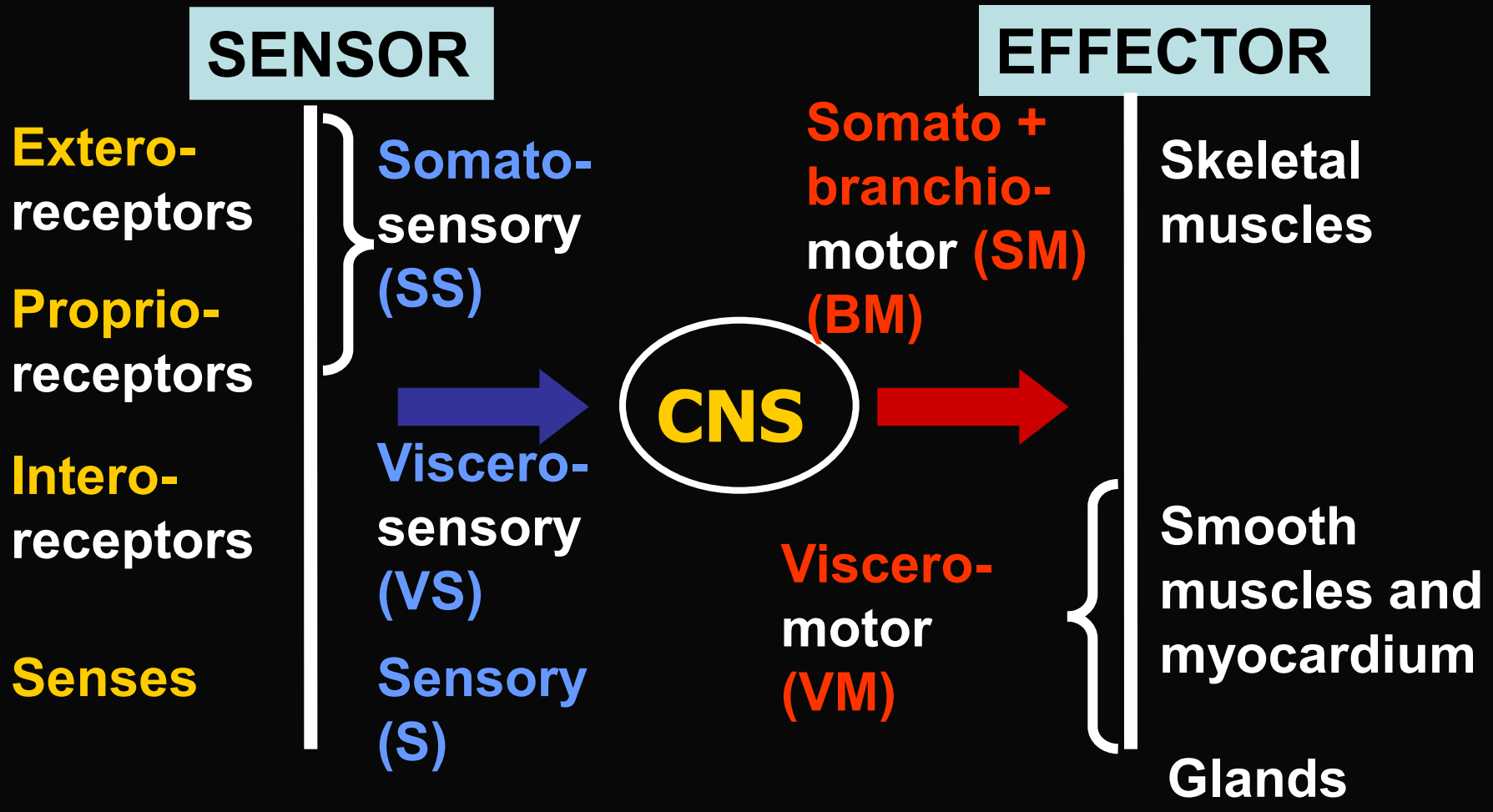




sulcus limitans


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

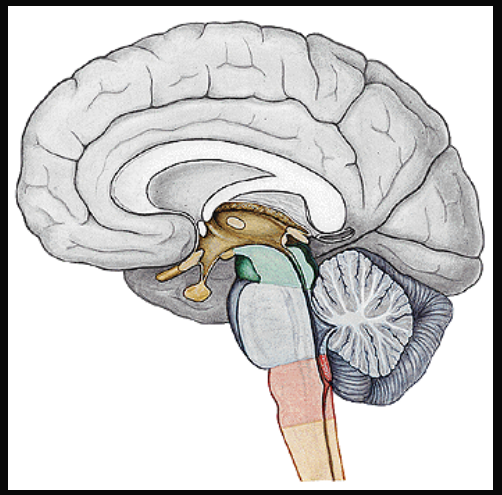
pass through the intervertebral foramina

CNS

I. Brain

- medulla oblongata
- pons
- mesencephalon

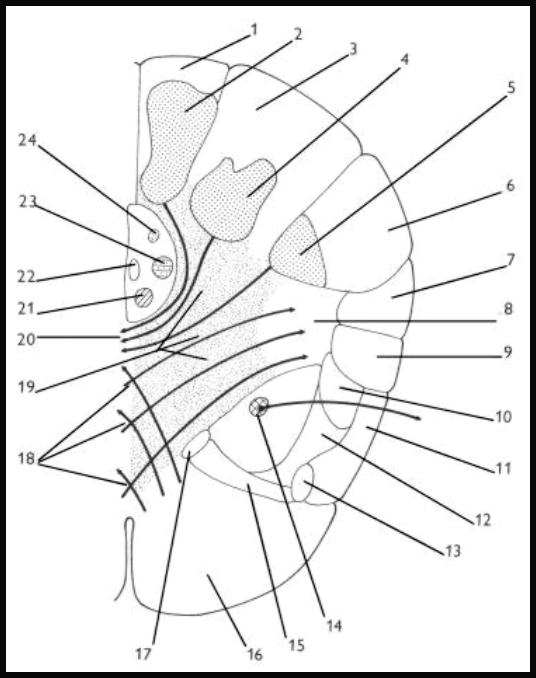
- cerebellum
- diencephalon
- telencephalon

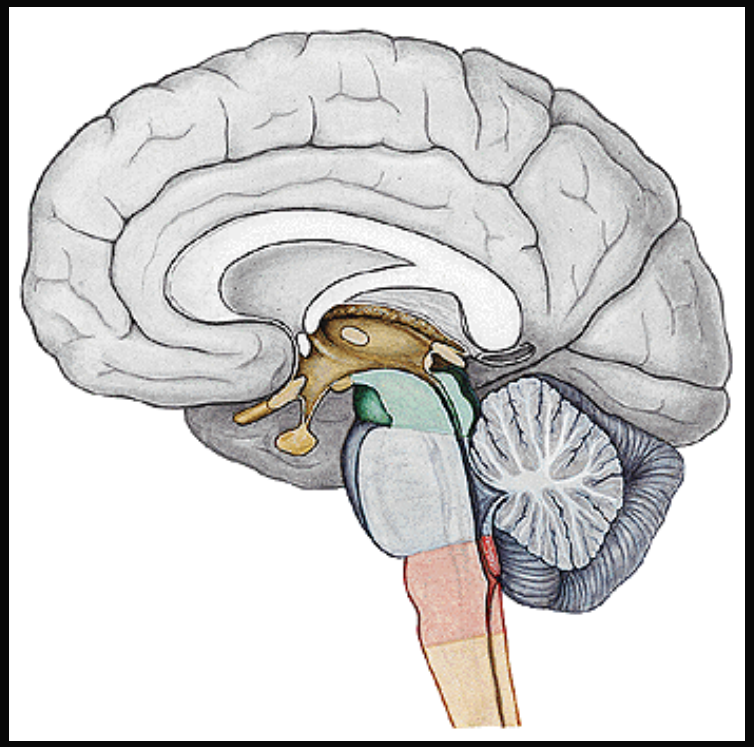


II. Spinal cord

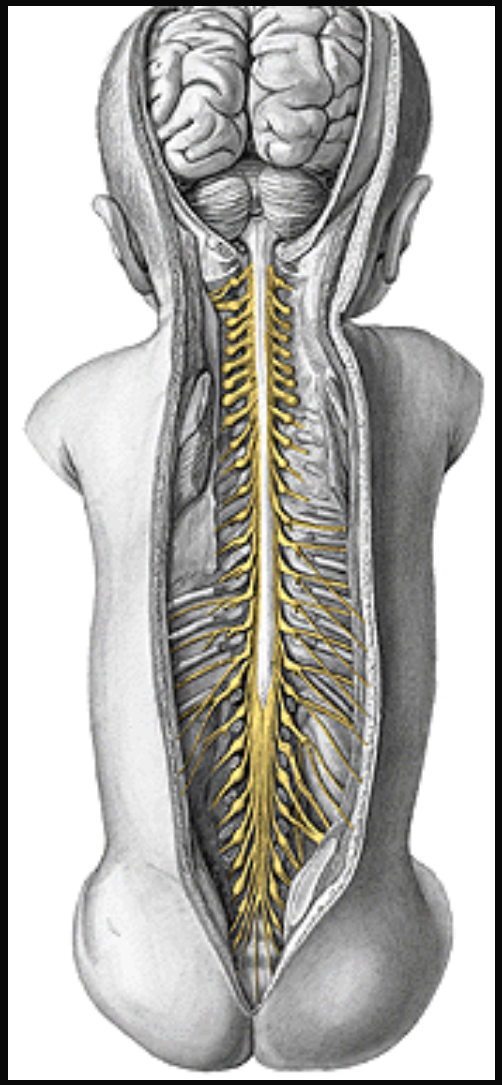
Structure of the CNS

Gray matter - **nuclei**
White matter – **nerve tracts:**
- tractus
- fasciculus (lemniscus)





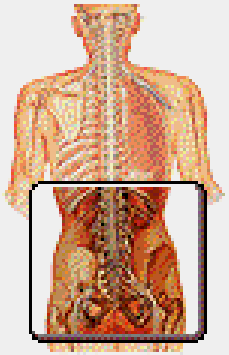
Spinal cord

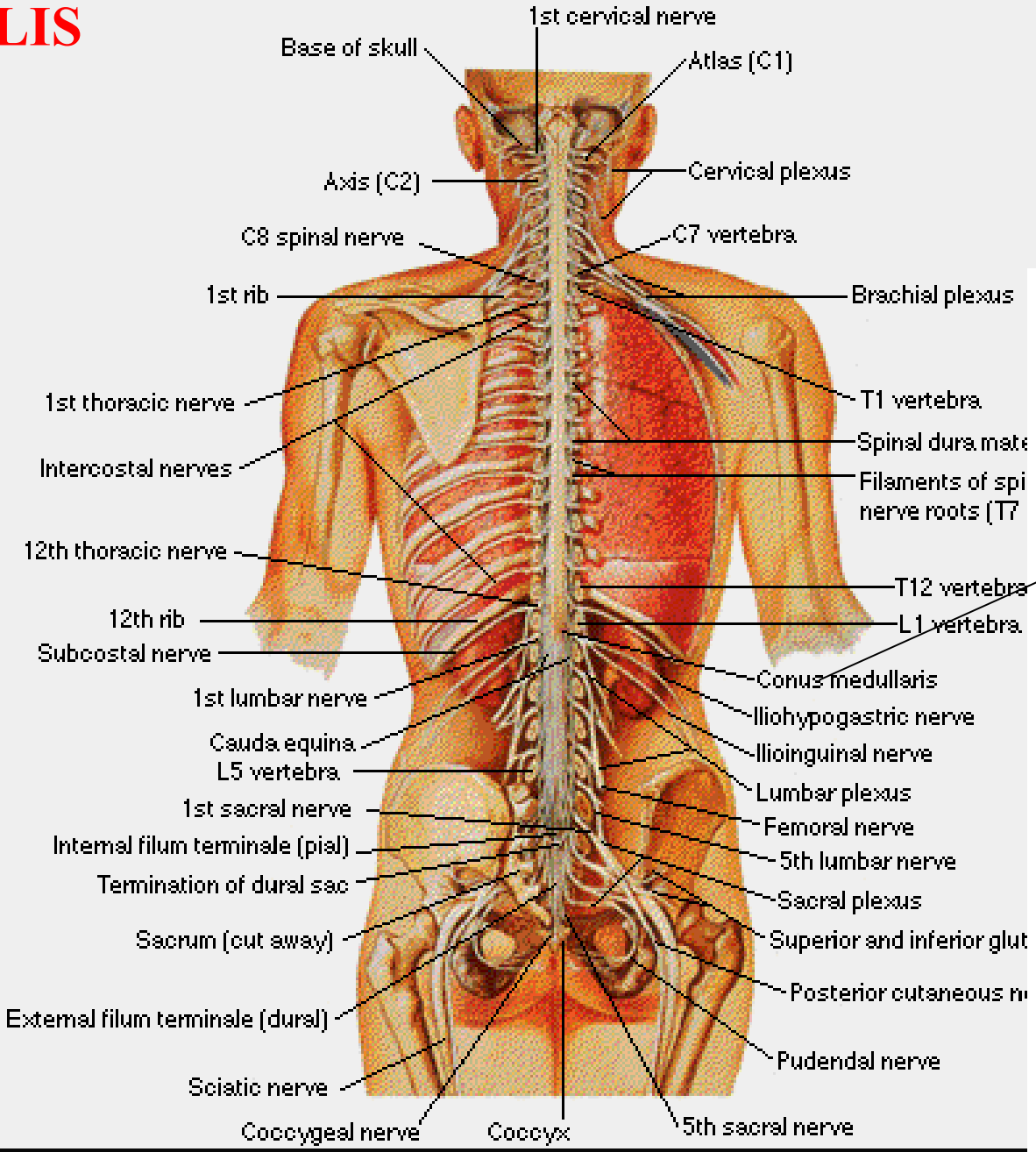


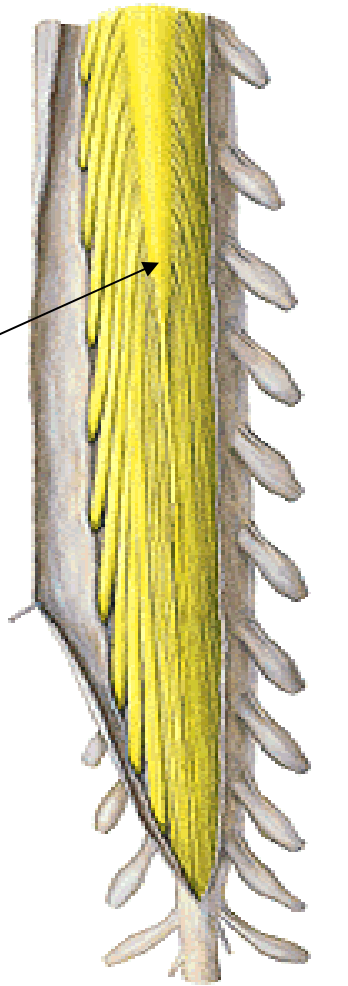
- transmission of neural signals between the brain and the periphery
- contains neural circuits that can control numerous reflexes and central pattern generators independently on the cortex

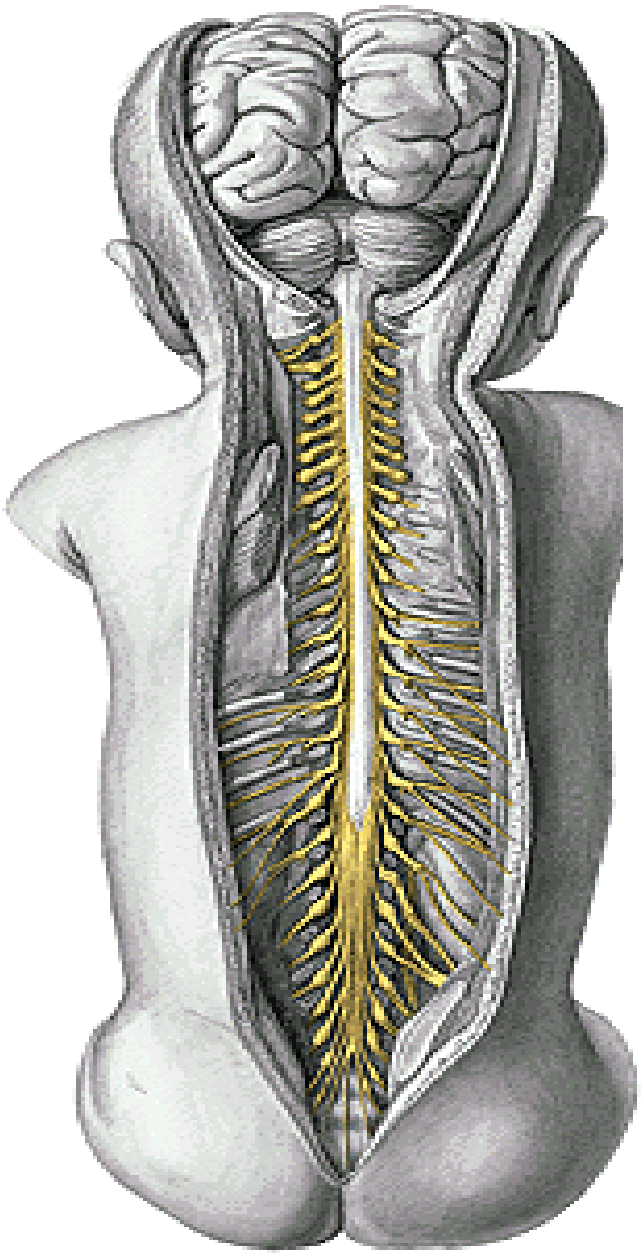
MEDULLA SPINALIS

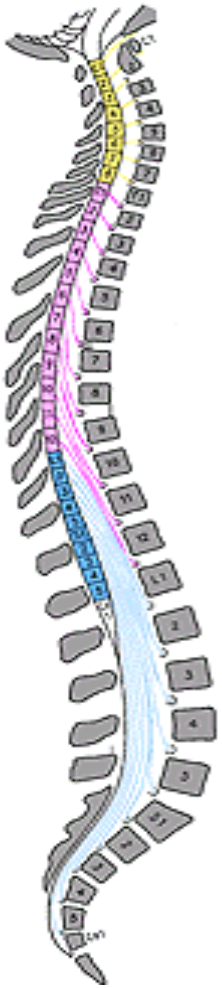
Spinal Cord in Situ





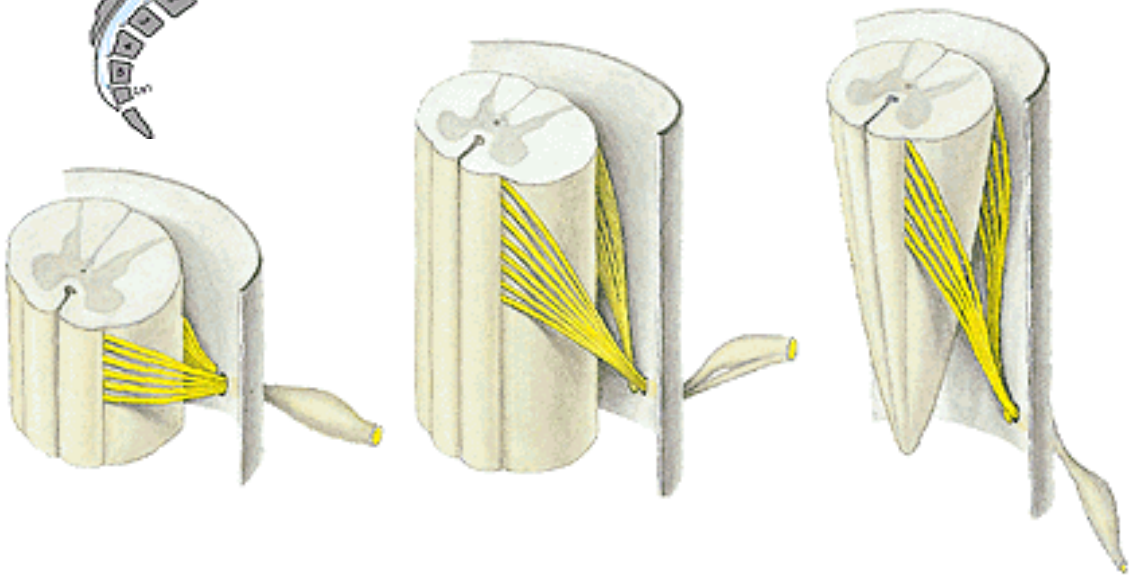


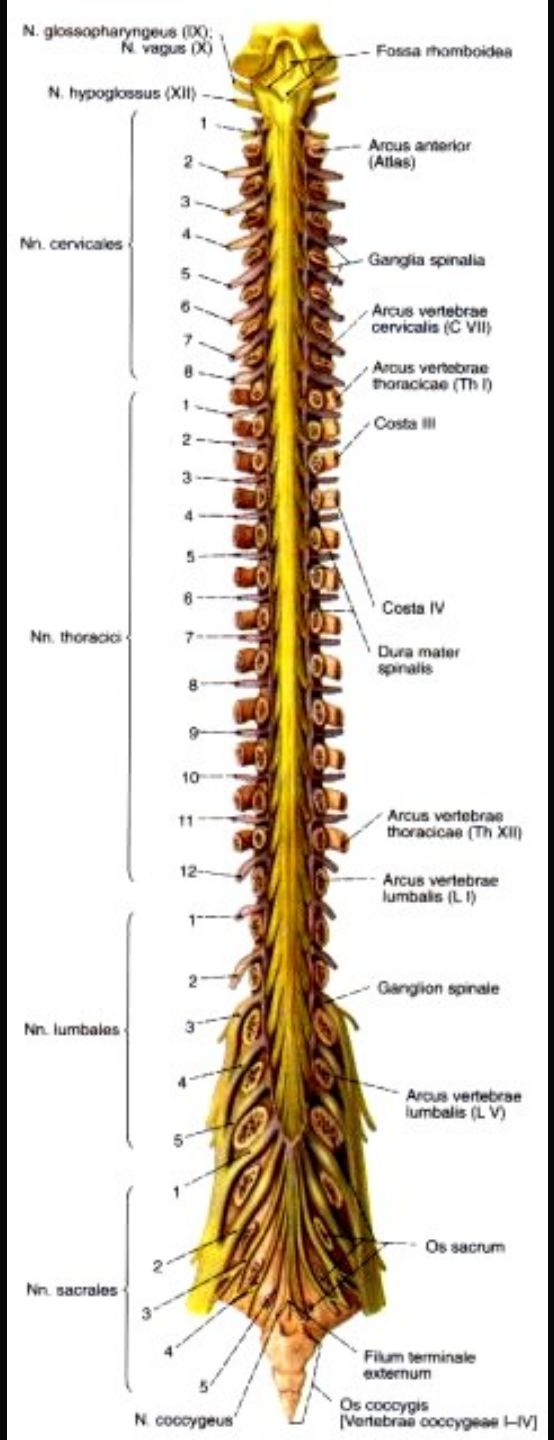




Cauda equina

Fila radicularia



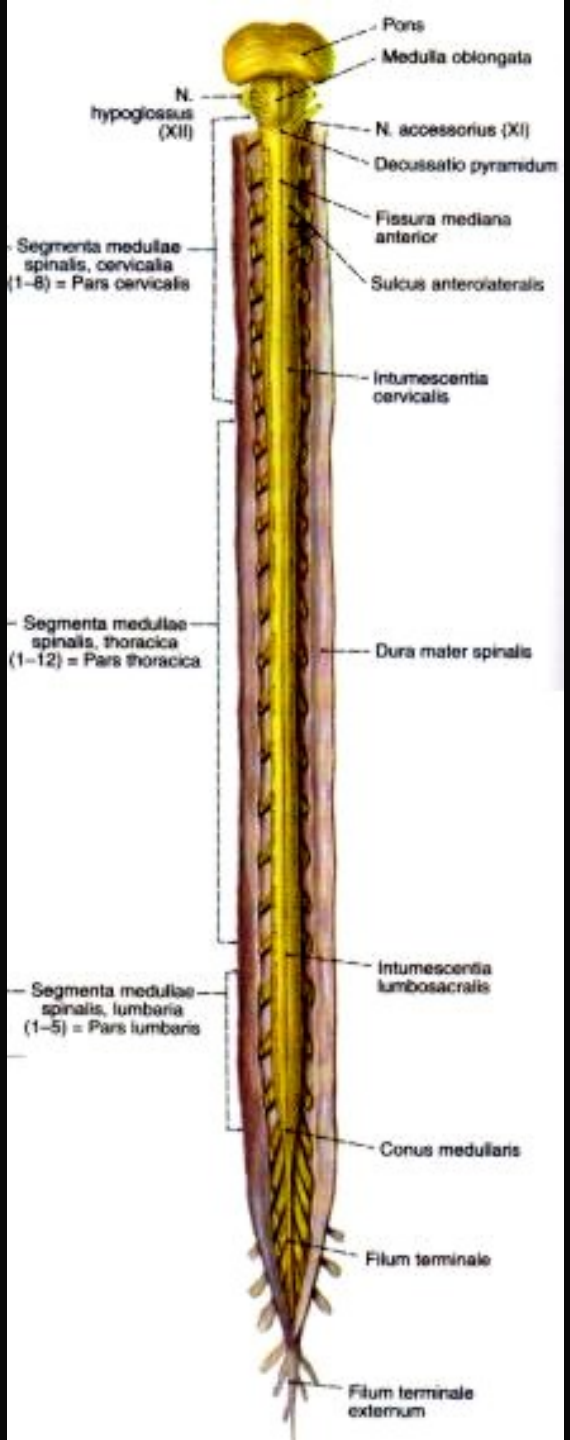


Intumescentia cervicalis

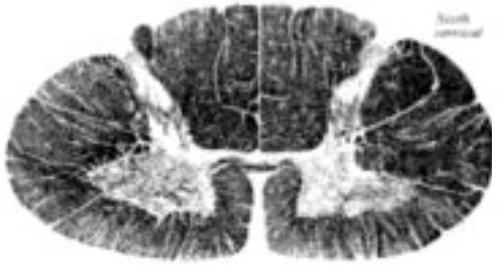
C5 – T1 segments
C4 – T1 vertebrae

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

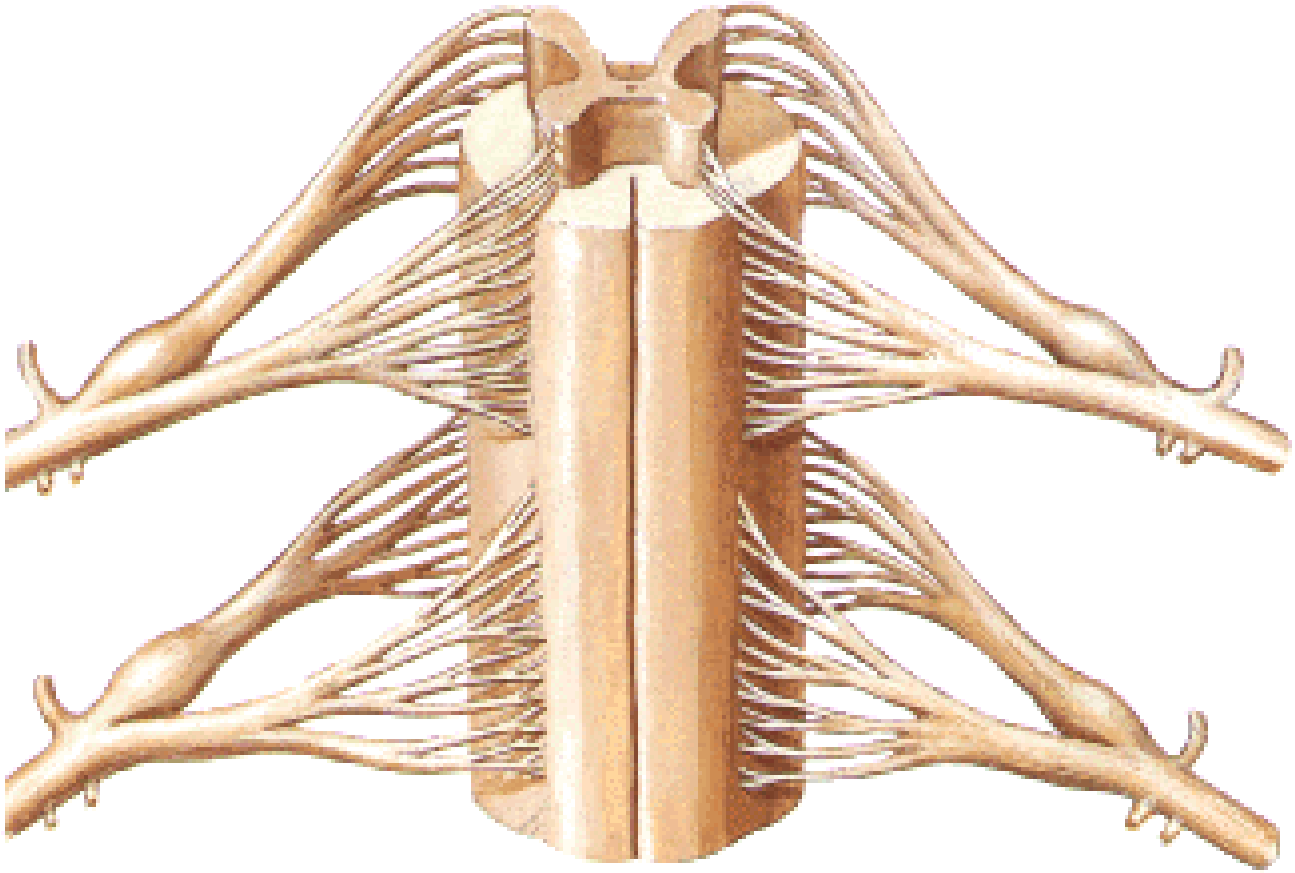
Segment Th10

Segment L1

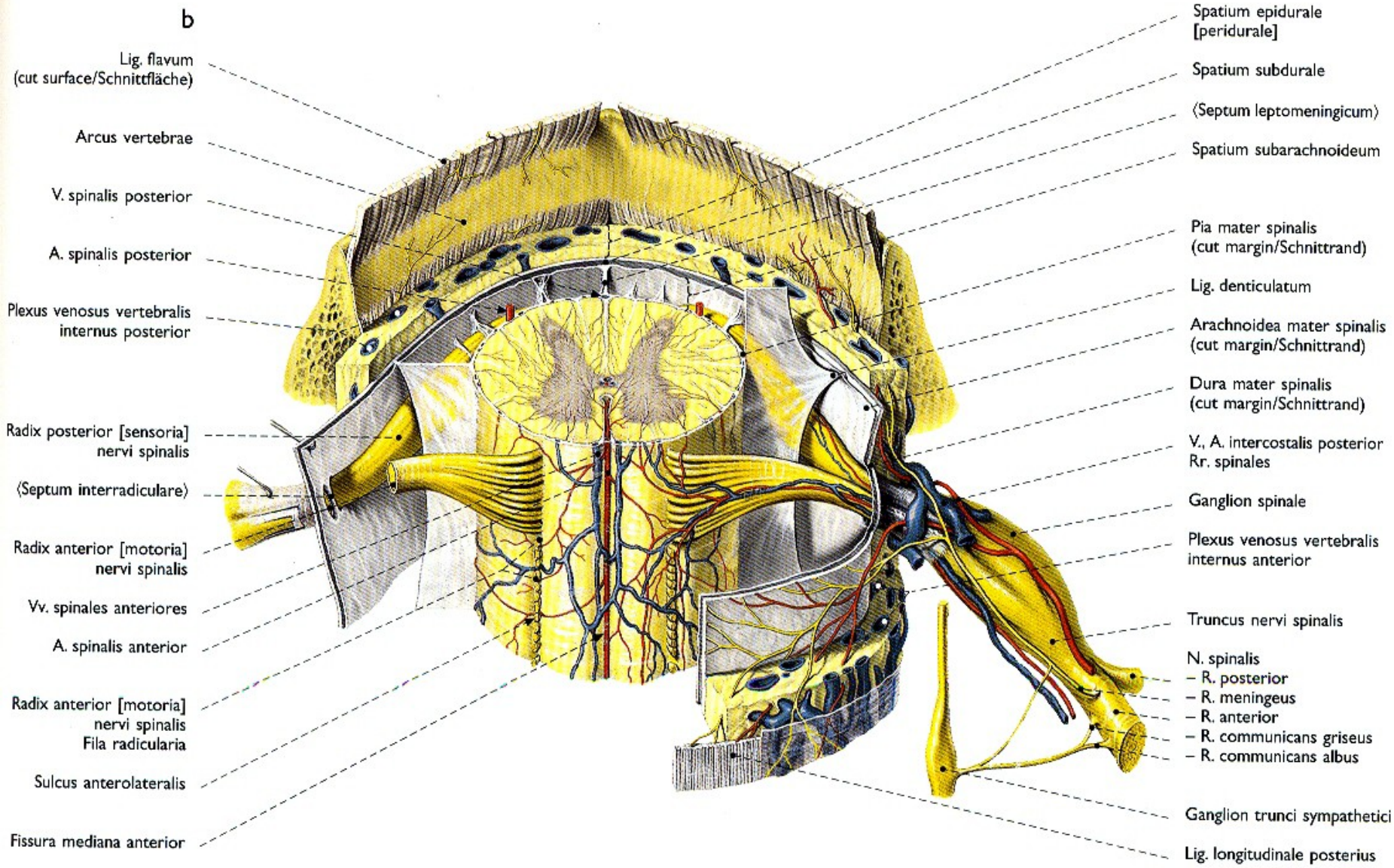
Segment L4

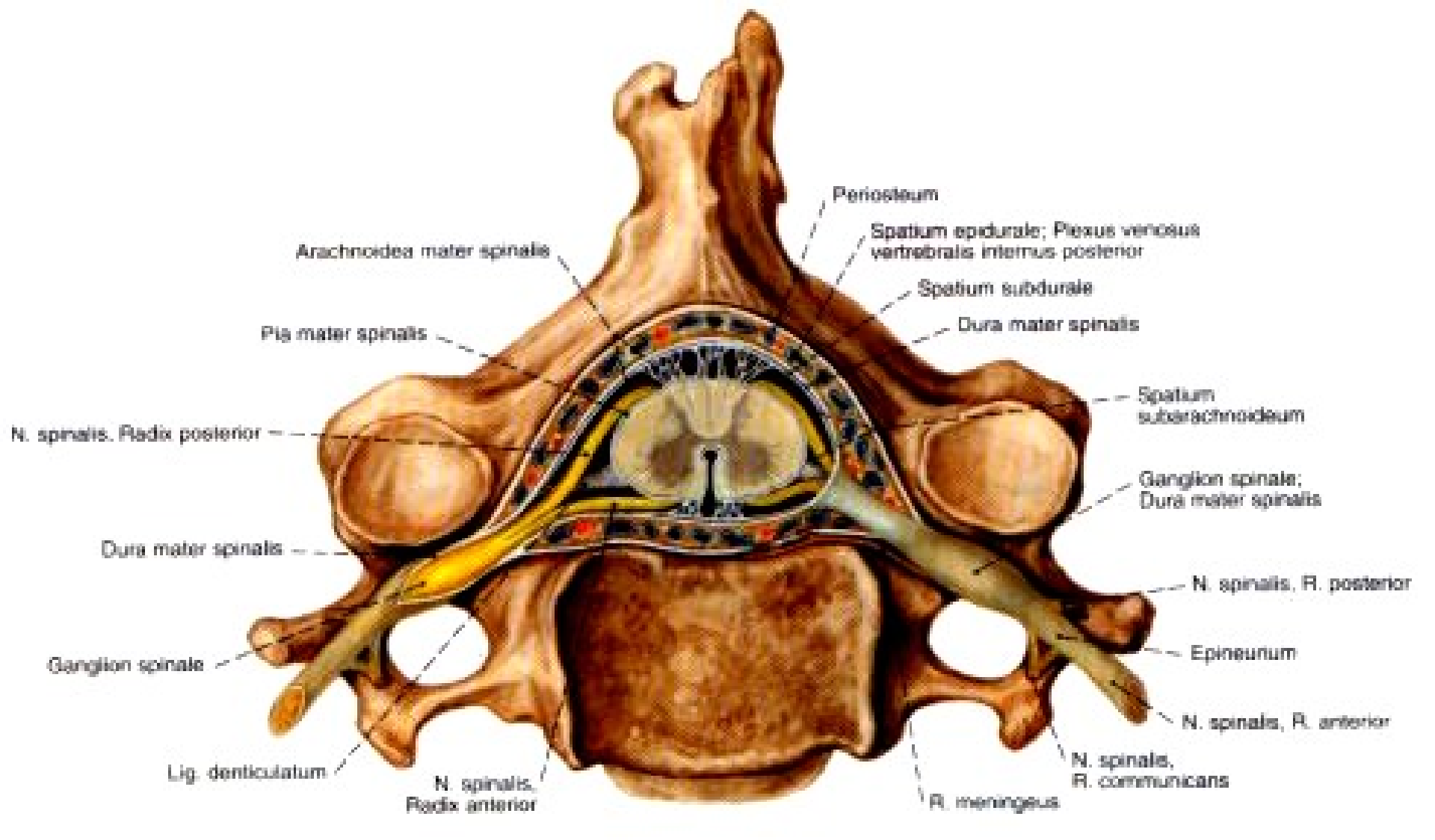
Segment S4

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



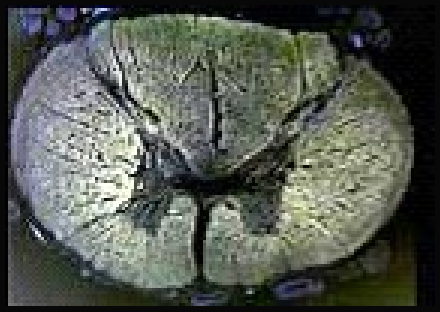
SUBSTANTIA ALBA – funiculus anterior, lateralis, posterior fissura mediana ant., sulcus medianus post., septum medianum posterius, sulcus anterolateralis, posterolateralis

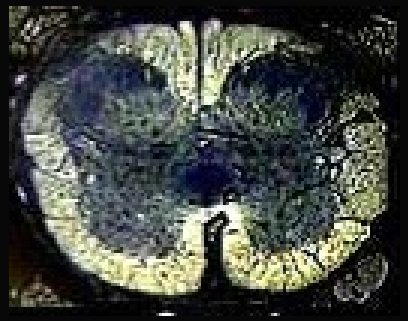



Periosteum
Spatium epidurale; Plexus venosus vertebralis internus posterior
Arachnoidea mater spinalis
Spatium subdurale
Pia mater spinalis
Dura mater spinalis
Spatium subarachnoideum
N. spinalis, Radix posterior
Ganglion spinale; Dura mater spinalis
Dura mater spinalis
N. spinalis, R. posterior
Epineurium
Ganglion spinale
N. spinalis, R. anterior
N. spinalis, R. communicans
Lig. denticulatum
N. spinalis, Radix anterior
R. meningeus

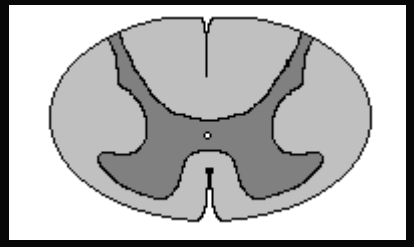
Dorsal horn

Ventral horn

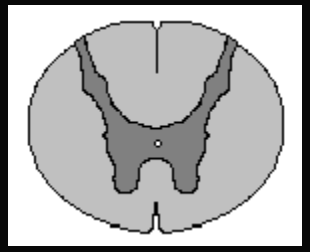




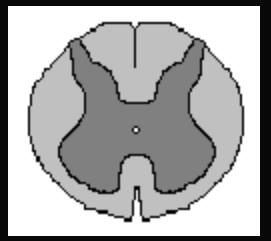
p. cervicalis

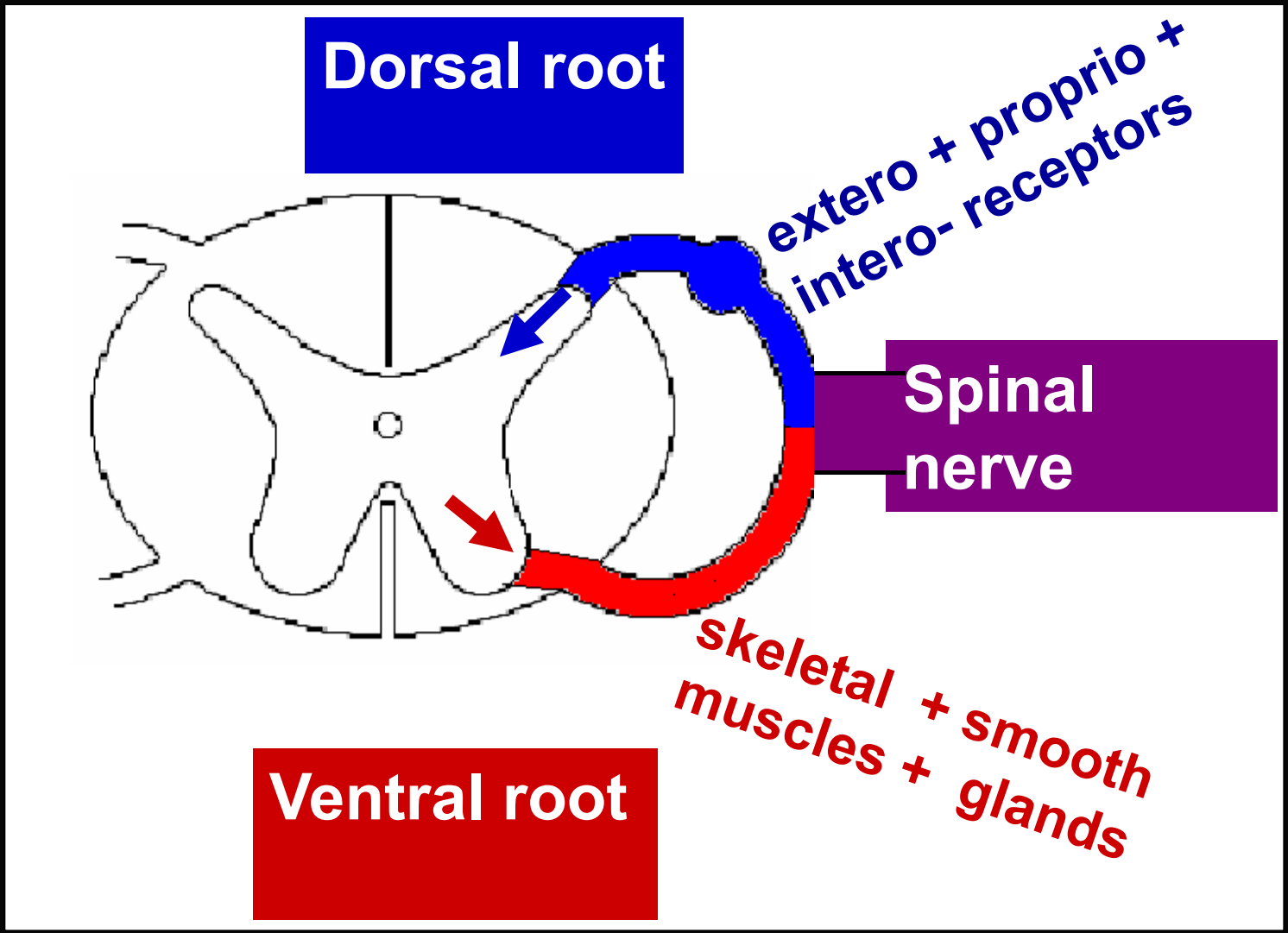


p. thoracica

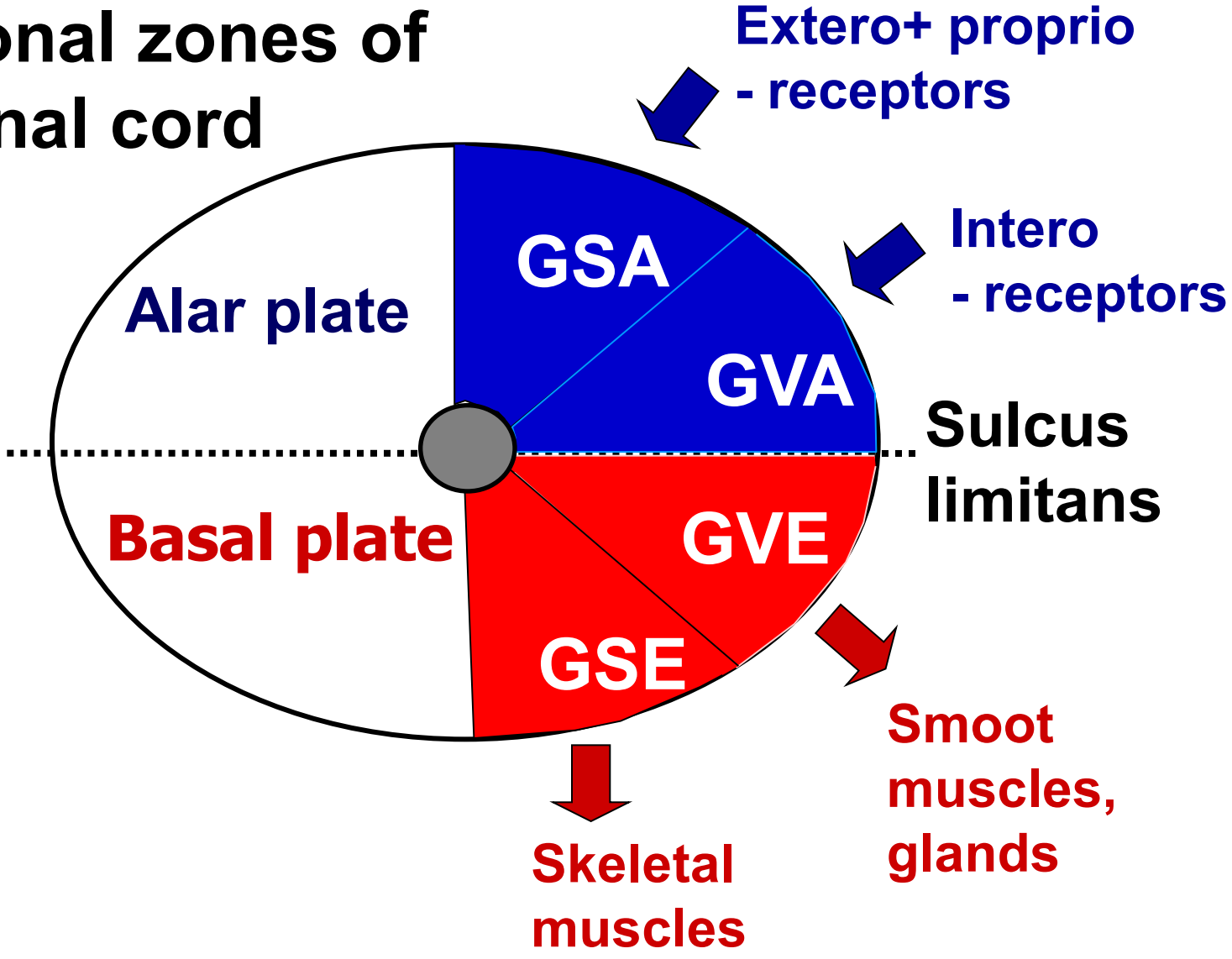


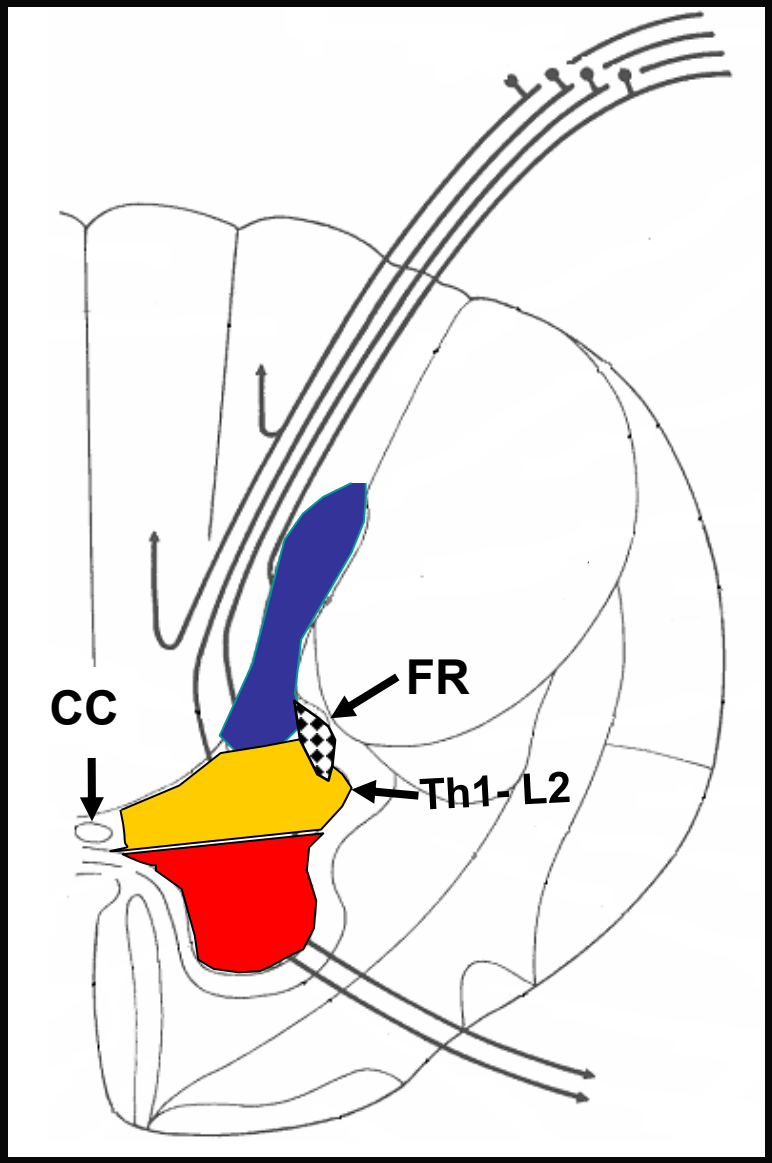
p. sacralis




Dorsal root
extero + proprio +
intero- receptors
Spinal
nerve
skeletal + smooth
muscles + glands
Ventral root

Functional zones of the spinal cord





Gray matter

DORSAL HORN – afferent neurons

SUBST. INTERMEDIA (lateral horn)
motoneurons of the ANS

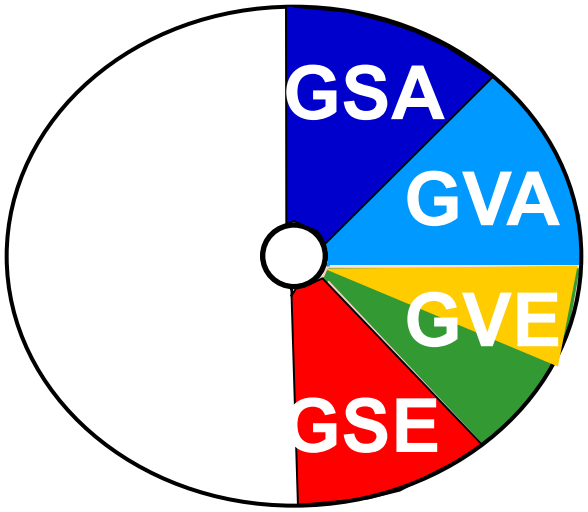
VENTRAL HORN - motoneurons

White matter

Funiculus post.
(fasc. gracilis et cuneatus)

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

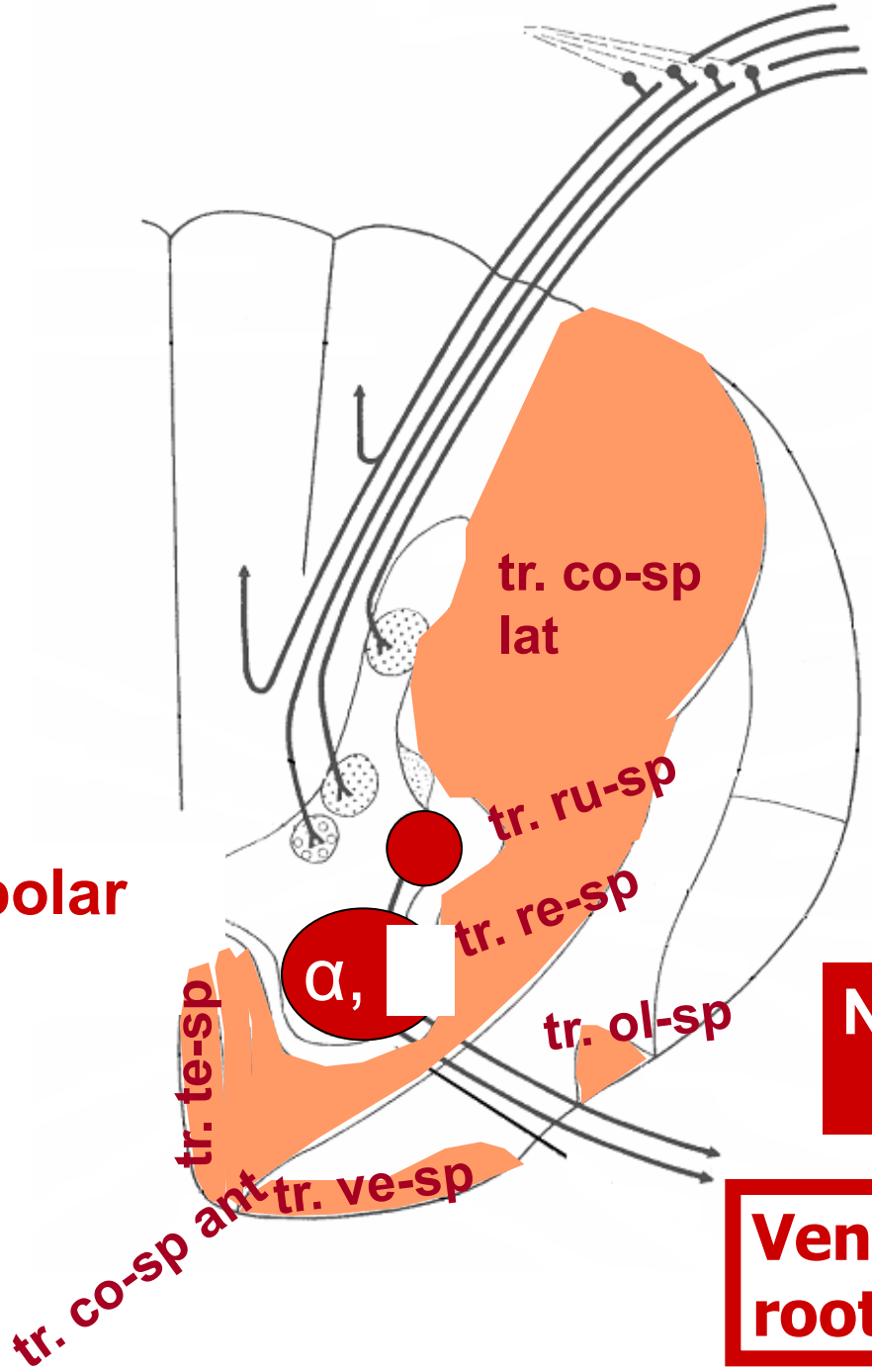
Functional zones in the spinal cord



GVE zone

T1 - L2 - preganglionic
sympathetic neurons

below L2 - preganglionic
parasympathetic neurons

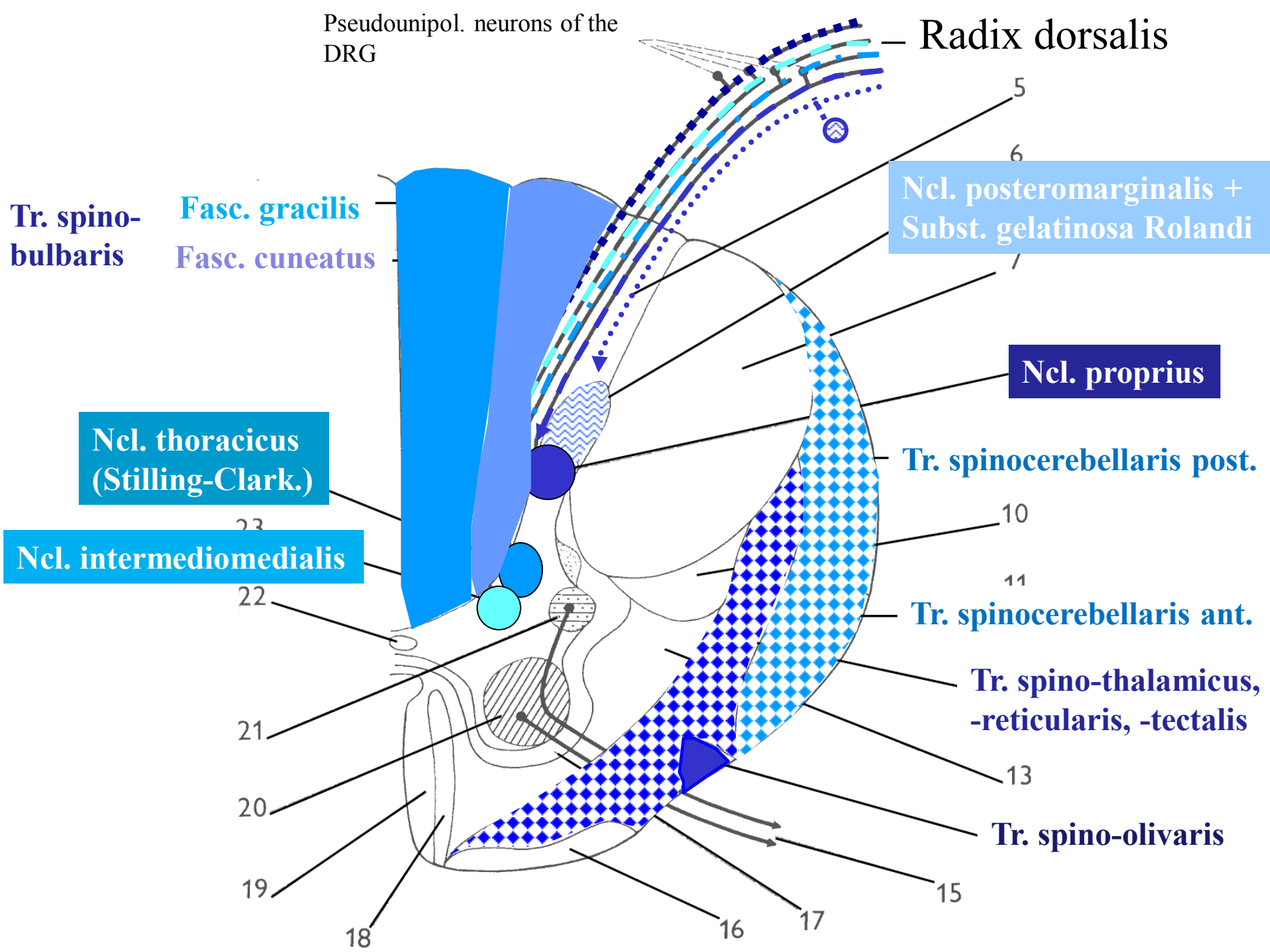


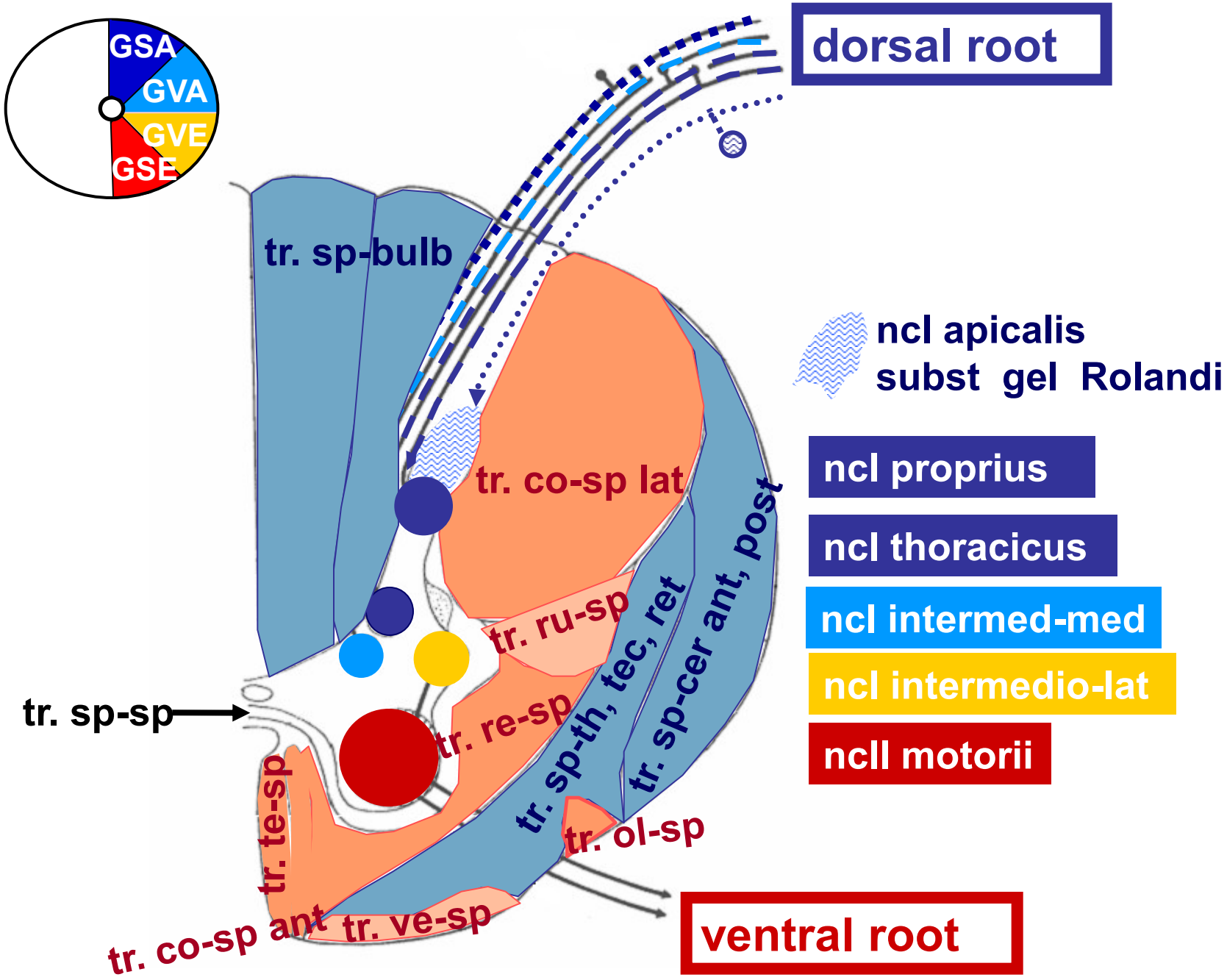
Multipolar cells

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.)
Ncl. intermediomedialis
Tr. spinocerebellaris post.
Tr. spinocerebellaris ant.
Tr. spino-thalamicus, -reticularis, -tectalis
Tr. spino-olivaris
5
6
7
10
11
13
15
16
17
18
19
20
21
22
23


GSA
GVA
GVE
GSE
dorsal root
tr. sp-bulb
ncl apicalis
subst gel Rolandi
tr. co-sp lat
ncl proprius
ncl thoracicus
ncl intermed-med
ncl intermedio-lat
ncll motorii
tr. ru-sp
tr. sp-cer ant, post
tr. sp-th, tec, ret
tr. sp-sp
tr. re-sp
tr. te-sp
tr. ol-sp
tr. co-sp ant
tr. ve-sp
ventral root

Illustrations and photographs were copied from:
Atlas der Anatomie des Menschen/Sobotta. Putz,R., und Pabst,R. 20. Auflage. München: Urban & Schwarzenberg, 1993)