

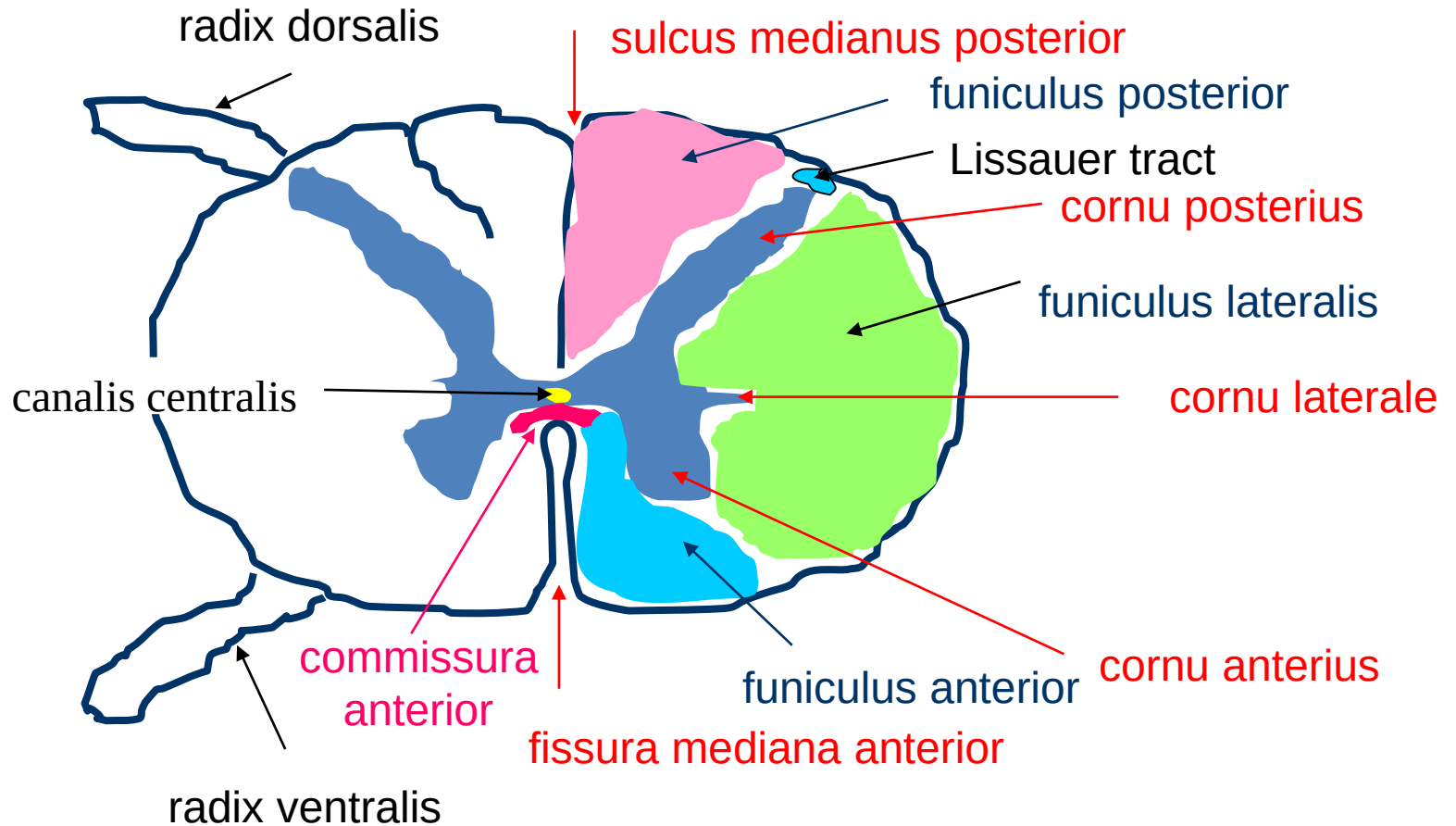
BASICS OF NEUROBIOLOGY

TRACTS OF SPINAL CORD

ZSOLT LIPOSITS

Basics of Neurobiology: Internal structure of spinal cord

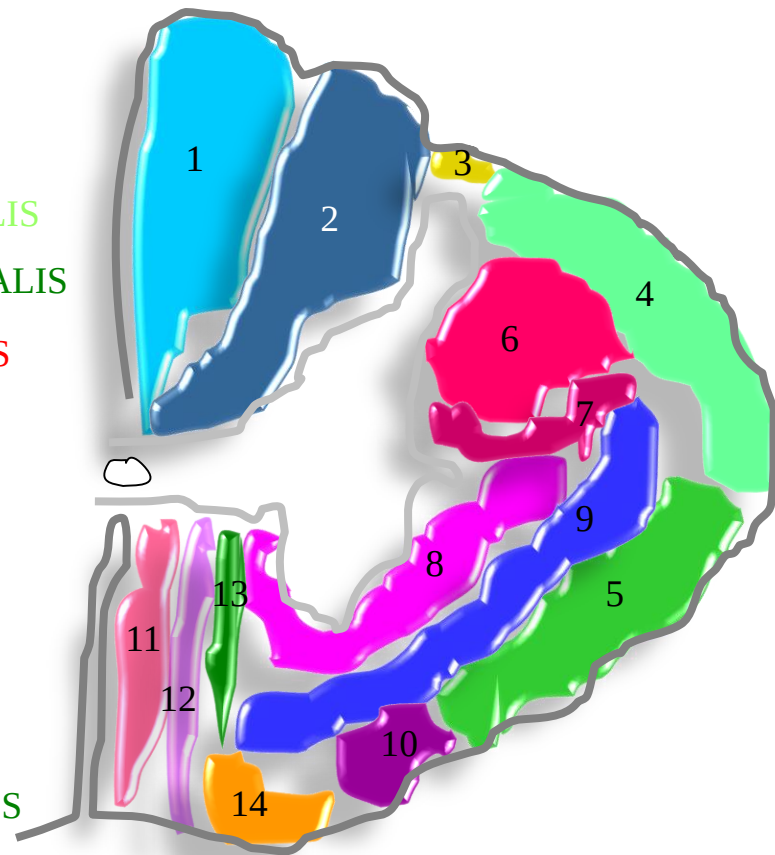
ORGANIZATION OF THE WHITE MATTER



Basics of Neurobiology: Tracts of spinal cord

TRACTS OF THE SPINAL CORD

1. FASCICULUS GRACILIS
2. FASCICULUS CUNEATUS
3. LISSAUER TRACT
4. TR. SPINOCEREBELLARIS DORSALIS
5. TR. SPINOCEREBELLARIS VENTRALIS
6. TR. CORTICOSPINALIS CRUCIATUS
7. TR. RUBROSPINALIS
8. TR. RETICULOSPINALIS
9. TR. SPINOTHALAMICUS
10. TR. OLIVOSPINALIS
11. TR. CORTICOSPINALIS DIRECTUS
12. TR. TECTOSPINALIS
13. FASC. LONGITUDINALIS MEDIALIS
14. TR. VESTIBULOSPINALIS

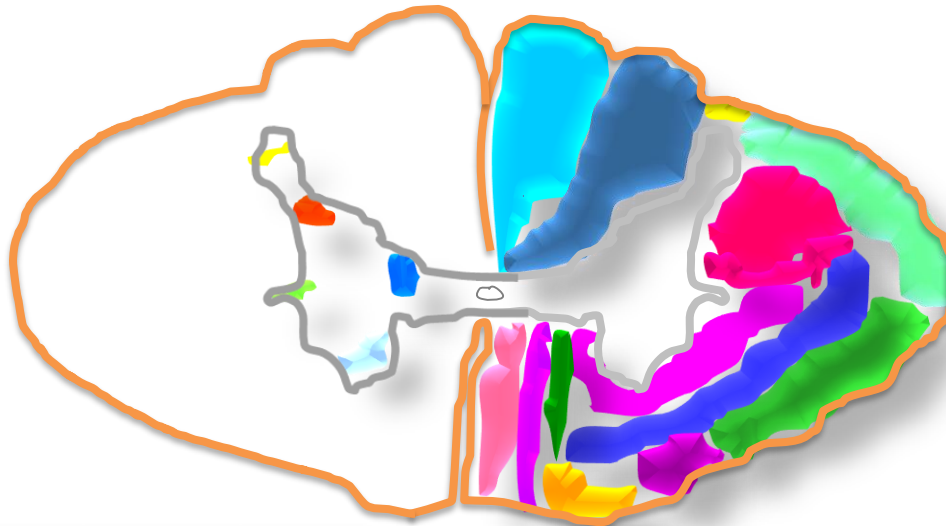


Basics of Neurobiology: Tracts of spinal cord

NUCLEI AND TRACTS OF THE SPINAL CORD

SPINAL NUCLEI

SPINAL TRACTS



SUBSTANTIA GELATINOSA

NUCLEUS PROPRIUS

NUCLEUS INTERMEDIO-LATERALIS

NUCLEUS DORSALIS

NUCLEUS MOTORIUS

FASCICULUS GRACILIS

FASCICULUS CUNEATUS

LISSAUER TRACT

TR. SPINOCEREBELLARIS DORSALIS

TR. SPINOCEREBELLARIS VENTRALIS

TR. CORTICOSPINALIS CRUCIATUS

TR. RUBROSPINALIS

TR. RETICULOSPINALIS

TR. SPINOTHALAMICUS

TR. OLIVOSPINALIS

TR. CORTICOSPINALIS DIRECTUS

TR. TECTOSPINALIS

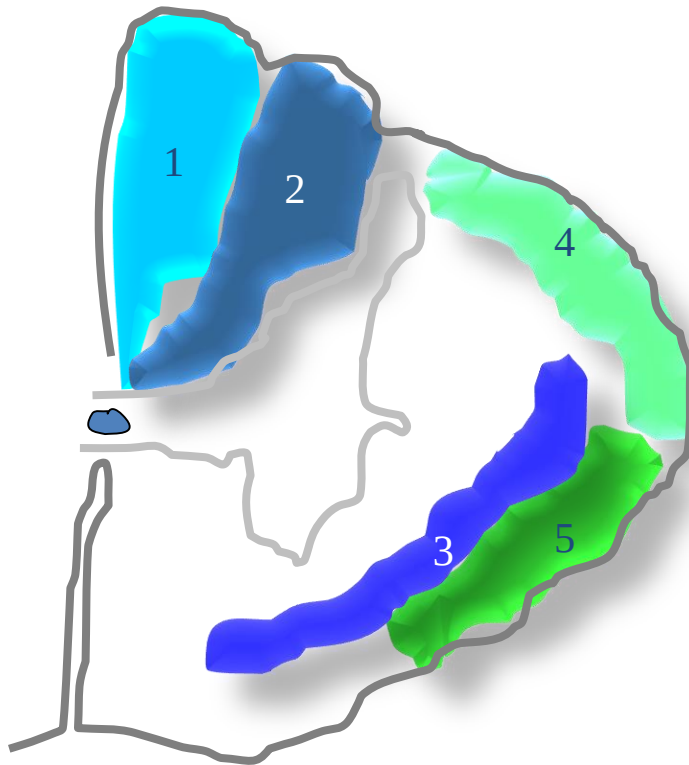
FASC. LONGITUDINALIS MEDIALIS

TR. VESTIBULOSPINALIS

Ascending tracts

Basics of Neurobiology: Tracts of spinal cord

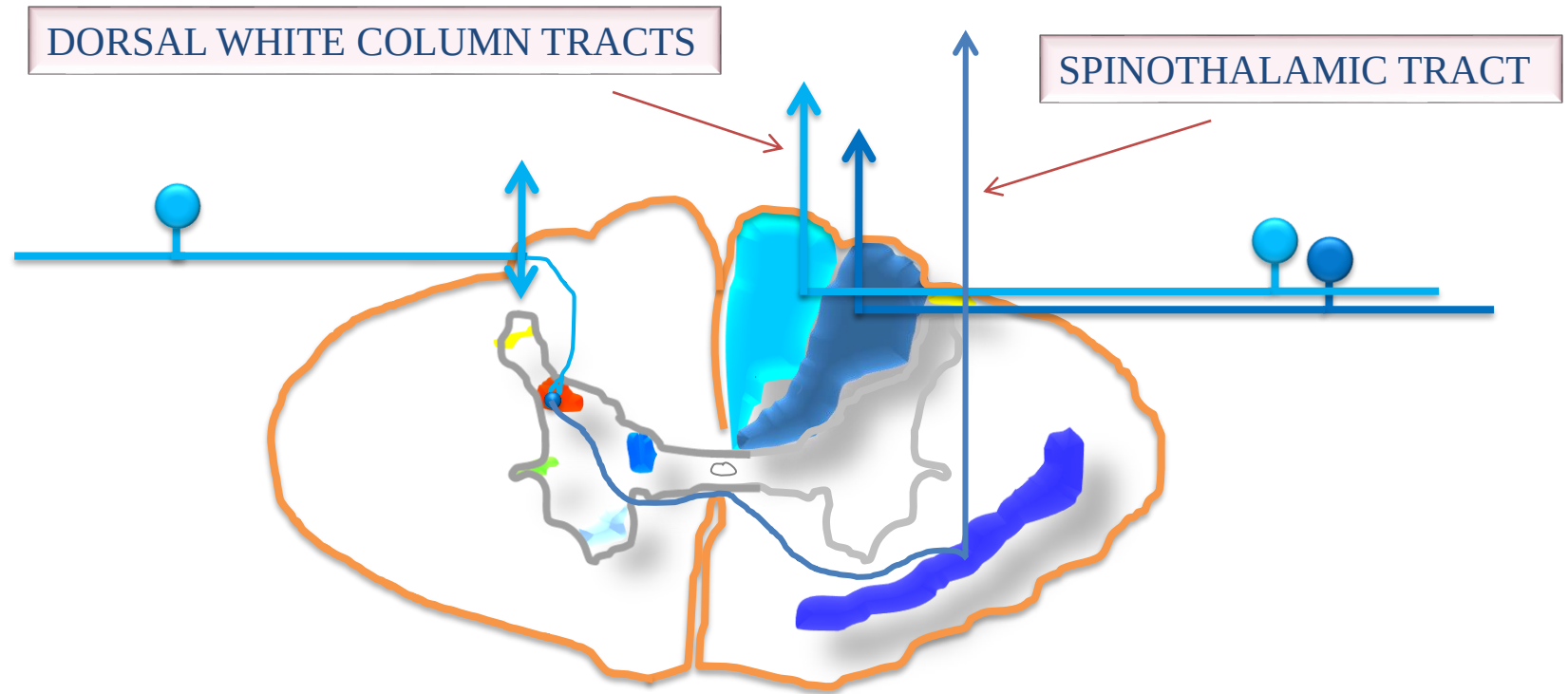
THE ASCENDING TRACTS



1. **FASCICULUS GRACILIS.** THICK MYELINATED FIBERS FROM S, L, T6-12 SEGMENTS. ORIGIN: SPINAL GANGLIA. TERMINATION: NUCLEUS GRACILIS IN MEDULLA. FUNCTION: SENSORY, LIGHT TOUCH, VIBRATION, 2-POINT DISCRIMINATION, POSITION SENSE
2. **FASCICULUS CUNEATUS.** THICK MYELINATED FIBERS FROM T1-6 AND ALL C SEGMENTS. ORIGIN: SPINAL GANGLIA. TERMINATION: NUCLEUS CUNEATUS . FUNCTION: SENSORY. LIGHT TOUCH, VIBRATION, 2-POINT DISCRIMINATION, POSITION SENSE
3. **SPINOTHALAMIC TRACT.** ORIGIN: CONTRALATERAL GREY MATTER, LAMINAE I, IV AND V. TERMINATION: THALAMUS. FUNCTION: SENSORY, NOXIOUS PAIN AND THERMAL STIMULI, CRUDE TOUCH
4. **DORSAL SPINOCEREBELLAR TRACT.** ORIGIN: IPSILATERAL CLARKE COLUMN. TERMINATION: CEREBELLAR CORTEX. FUNCTION: COORDINATION OF MOVEMENTS AND POSTURE
5. **VENTRAL SPINOCEREBELLAR TRACT.** ORIGIN: LAMINAE V, VI AND VII. CONTRALATERALLY. TERMINATION: CEREBELLAR CORTEX. FUNCTION: COORDINATION OF MOVEMENTS

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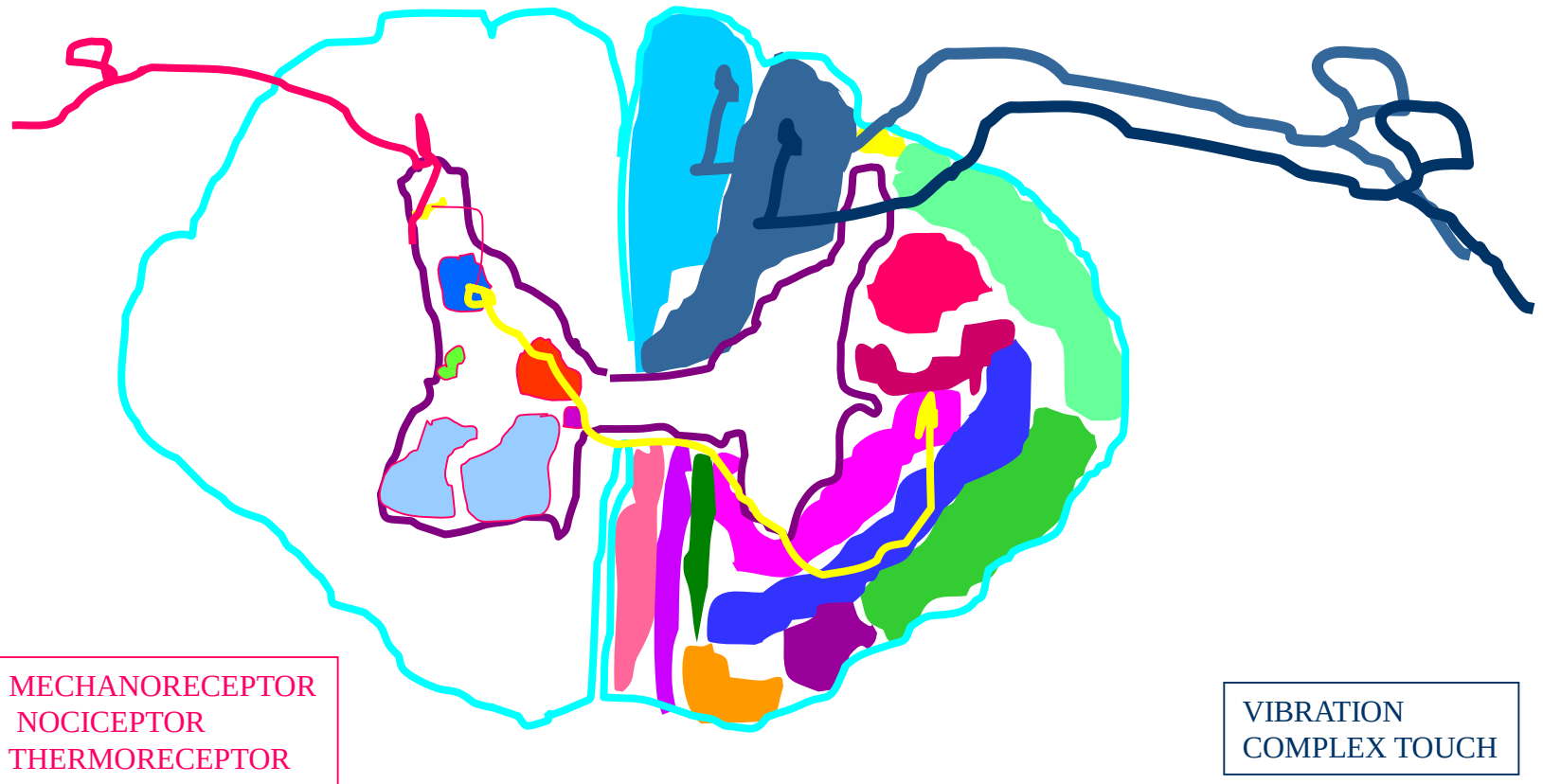
SCHEMATIC ILLUSTRATION OF THE SPINOTHALAMIC AND DORSAL WHITE COLUMN SENSORY TRACTS



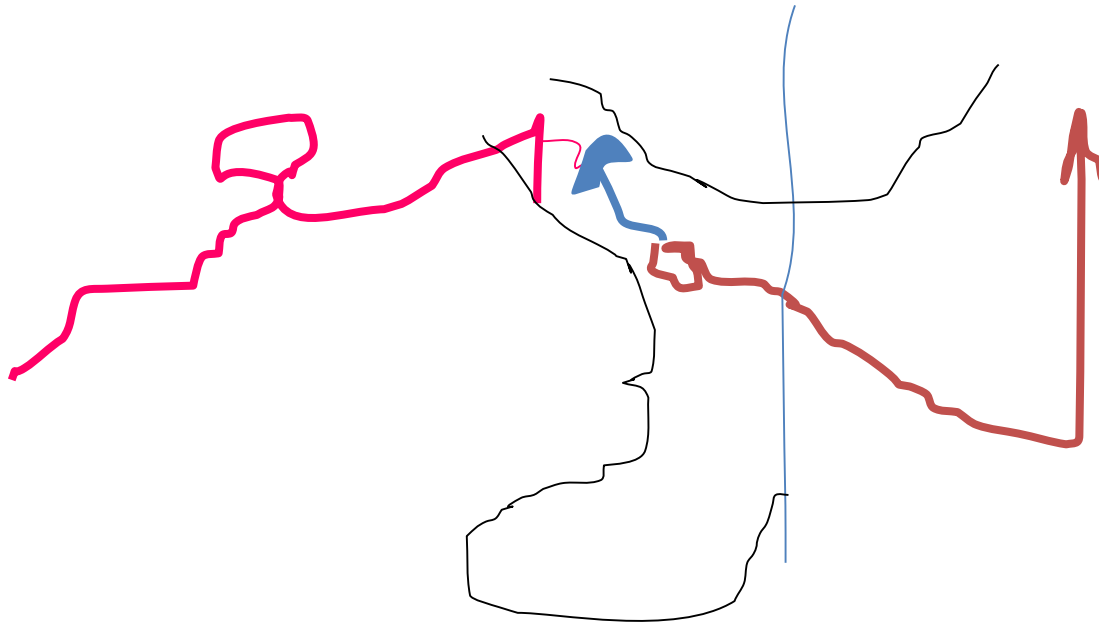
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Thin myelinated and unmyelinated fibers

Thin and thick myelinated fibers



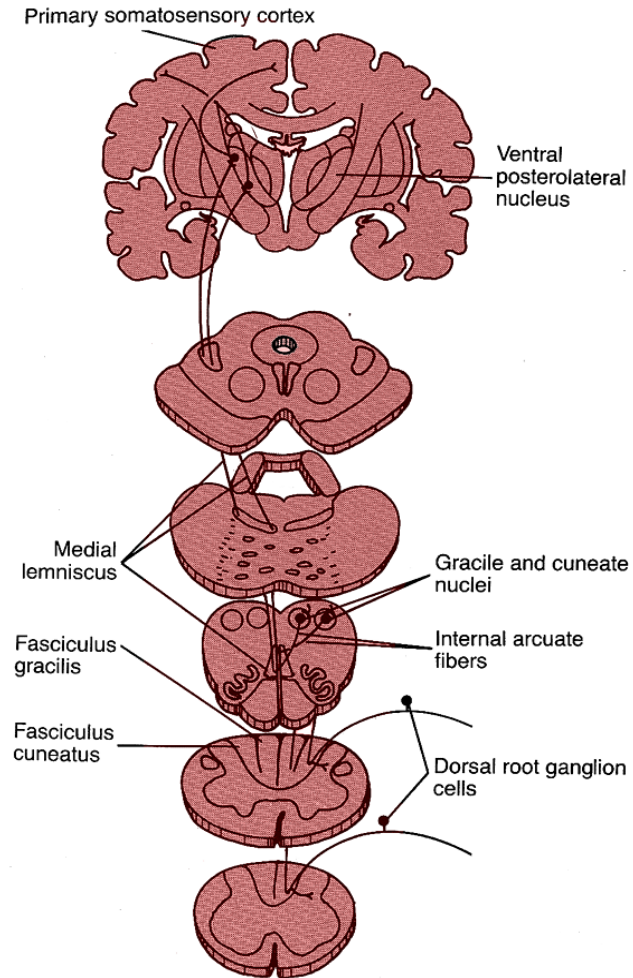
SPINOTHALAMIC SYSTEM



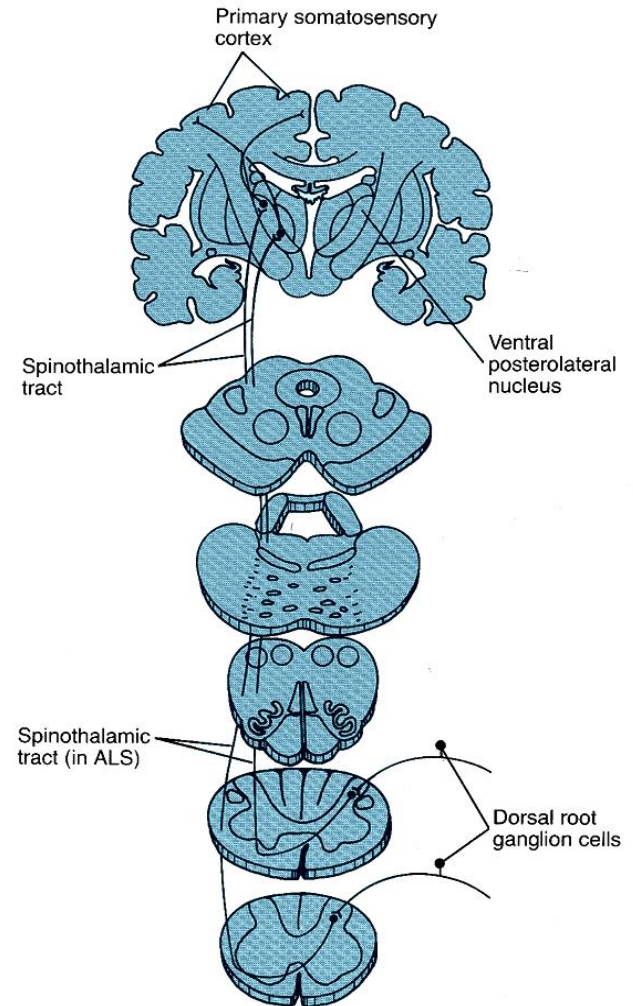
<http://www.bayareapainmedical.com/wspinecrd.html>

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MEDIAL LEMNISCUS

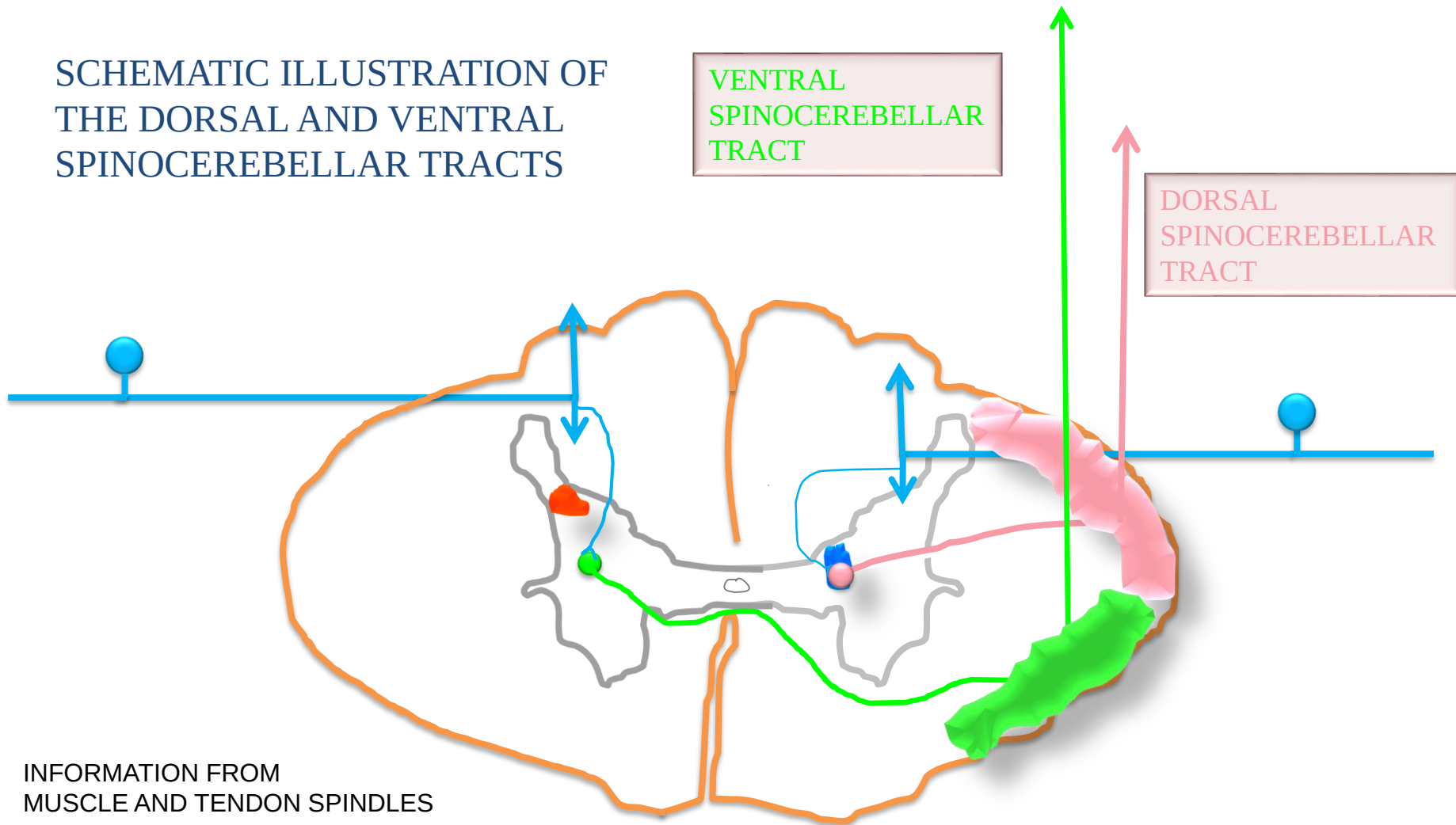


SPINOTHALAMIC



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SCHEMATIC ILLUSTRATION OF THE DORSAL AND VENTRAL SPINOCEREBELLAR TRACTS



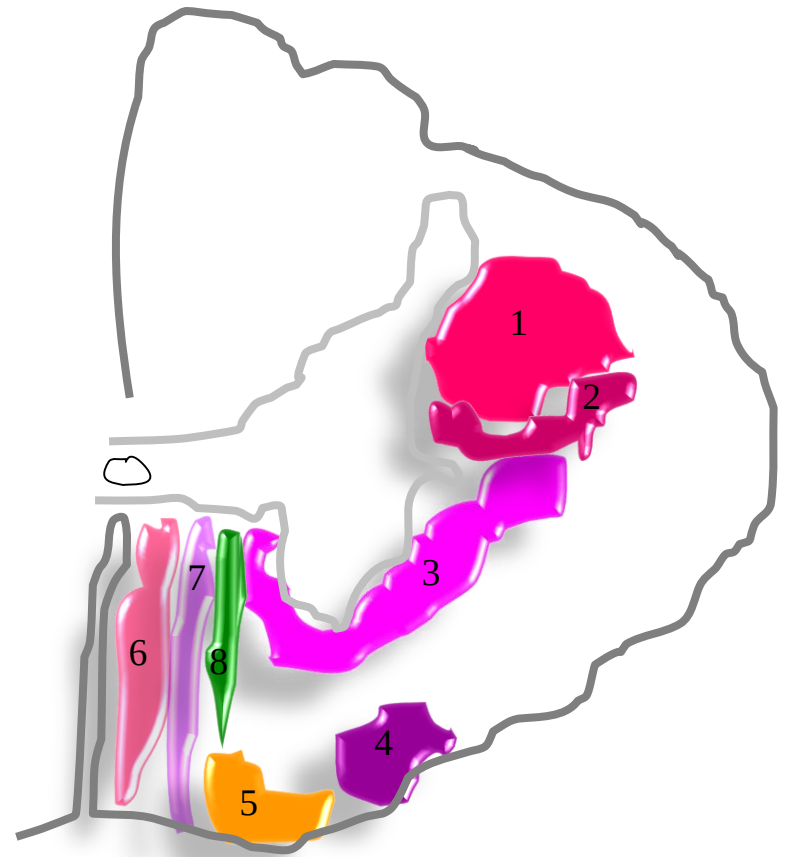
INFORMATION FROM
MUSCLE AND TENDON SPINDLES

DESCENDING PATHWAYS

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MAIN DESCENDING TRACTS OF THE SPINAL CORD

1. TR. CORTICOSPINALIS CRUCIATUS
2. TR. RUBROSPINALIS
3. TR. RETICULOSPINALIS
4. TR. OLIVOSPINALIS
5. TR. VESTIBULOSPINALIS
6. TR. CORTICOSPINALIS DIRECTUS
7. TR. TECTOSPINALIS
8. FASCICULUS LONGITUDINALIS MEDIALIS



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THE MAIN DESCENDING TRACTS OF SPINAL CORD

TR. CORTICOSPINALIS CRUCIATUS. THE MAIN REGULATORY TRACT OF LOWER MOTONEURONS. ORIGINATES FROM THE CEREBRAL CORTEX. IT RUNS THROUGH THE INTERNAL CAPSULE, DECUSSATES IN THE MEDULLA OBLONGATA AND TERMINATES ON INTERNEURONS OF THE VENTRAL HORN THAT ARE ASSOCIATED WITH MOTONEURONS

TR. RUBROSPINALIS. ORIGINATES FROM THE RED NUCLEUS OF THE BRAIN STEM. TERMINATES ON VENTRAL HORN INTERNEURONS. IT CONVEYS INFORMATION FROM THE CORTEX AND CEREBELLUM MAINLY TO MOTOR NEURONS INNERVATING FLEXOR AND EXTENSOR MUSCLES

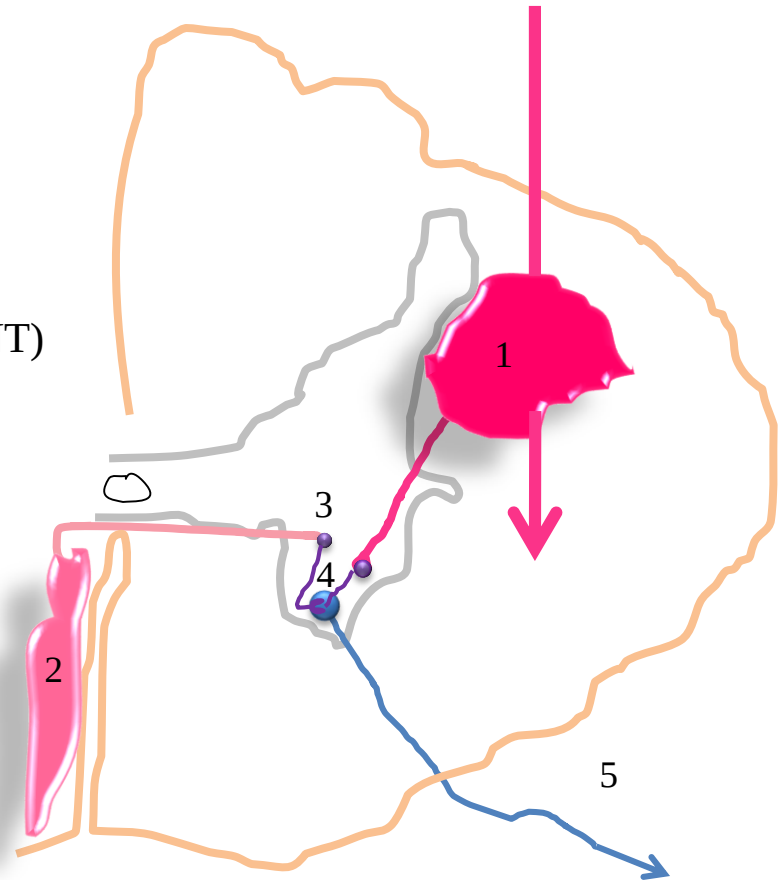
TR. RETICULOSPINALIS. IT CARRIES INFORMATION FROM PONTINE AND MEDULLARY UNITS OF THE RETICULAR FORMATION TO THE DORSAL AND VENTRAL HORNS. CONTROLS VOLUNTARY MOVEMENTS, MUSCLE TONE, CENTRAL SENSORY TRANSMISSION, REGULATES RESPIRATORY AND CIRCULATORY ACTIVITIES

TR. OLIVOSPINALIS. PATHWAY ORIGINATING FROM THE INFERIOR OLIVE STRUCTURE OF THE MEDULLA. IT INNERVATES CERVICAL SEGMENTS

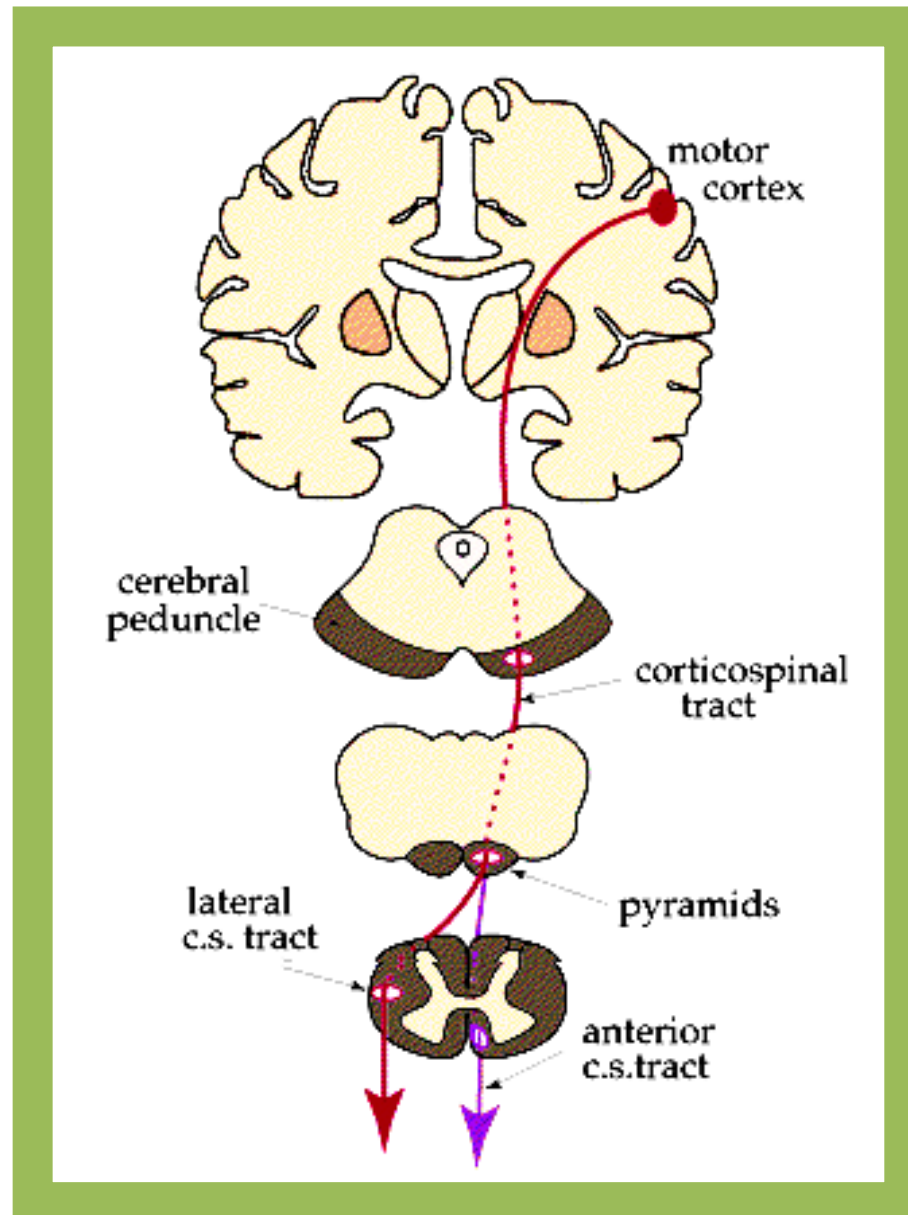
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SCHEME OF THE DESCENDING CORTICOSPINAL TRACTS

1. **TR. CORTICOSPINALIS CRUCIATUS**
(CROSSED IN MEDULLA)
2. **TR. CORTICOSPINALIS DIRECTUS**
(CROSSING AT LEVEL OF TARGET SEGMENT)
3. **INTERNEURONS**
4. **SOMATOMOTOR NEURON**
5. **MOTOR OUTFLOW TO STRIATED MUSCLE**



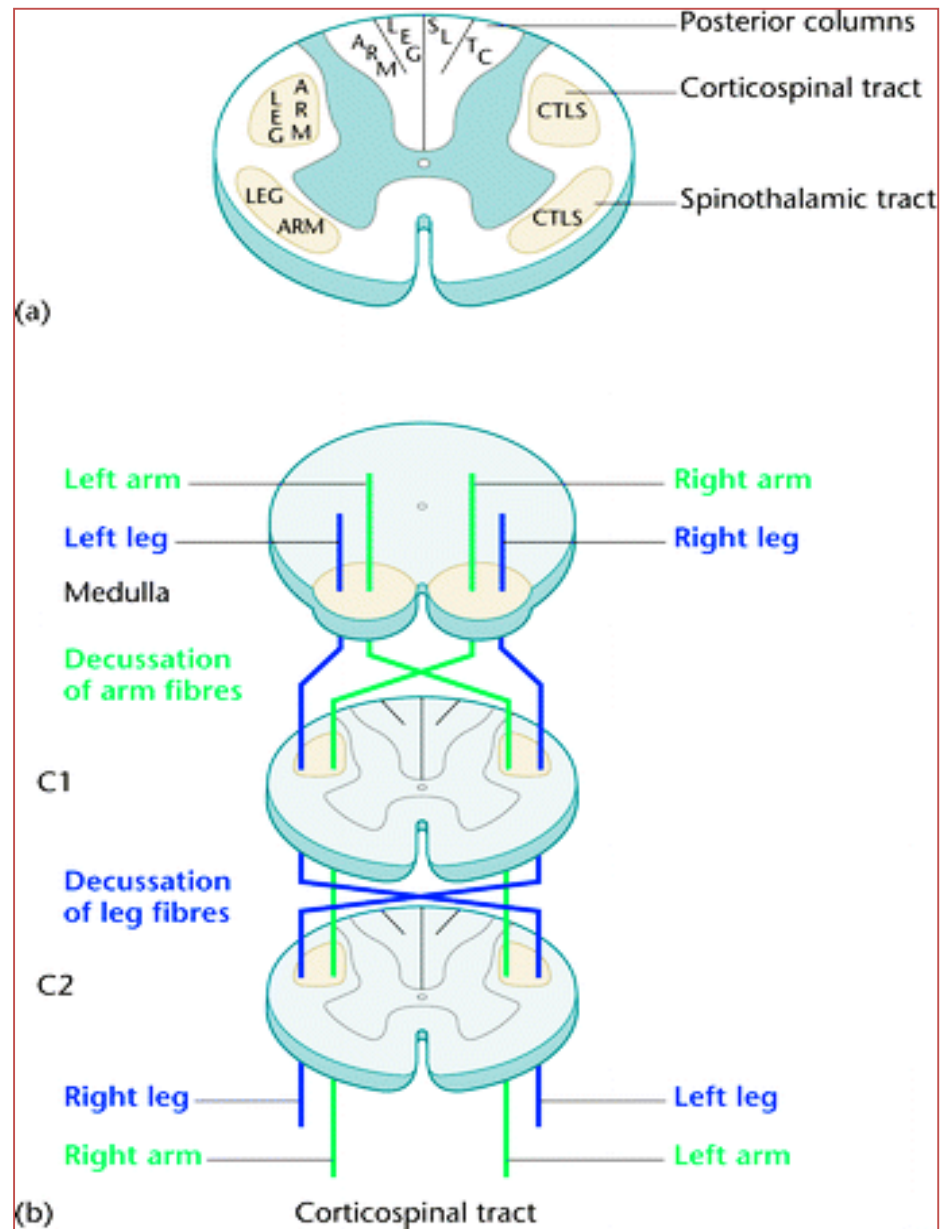
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THE MAIN DESCENDING TRACTS OF SPINAL CORD

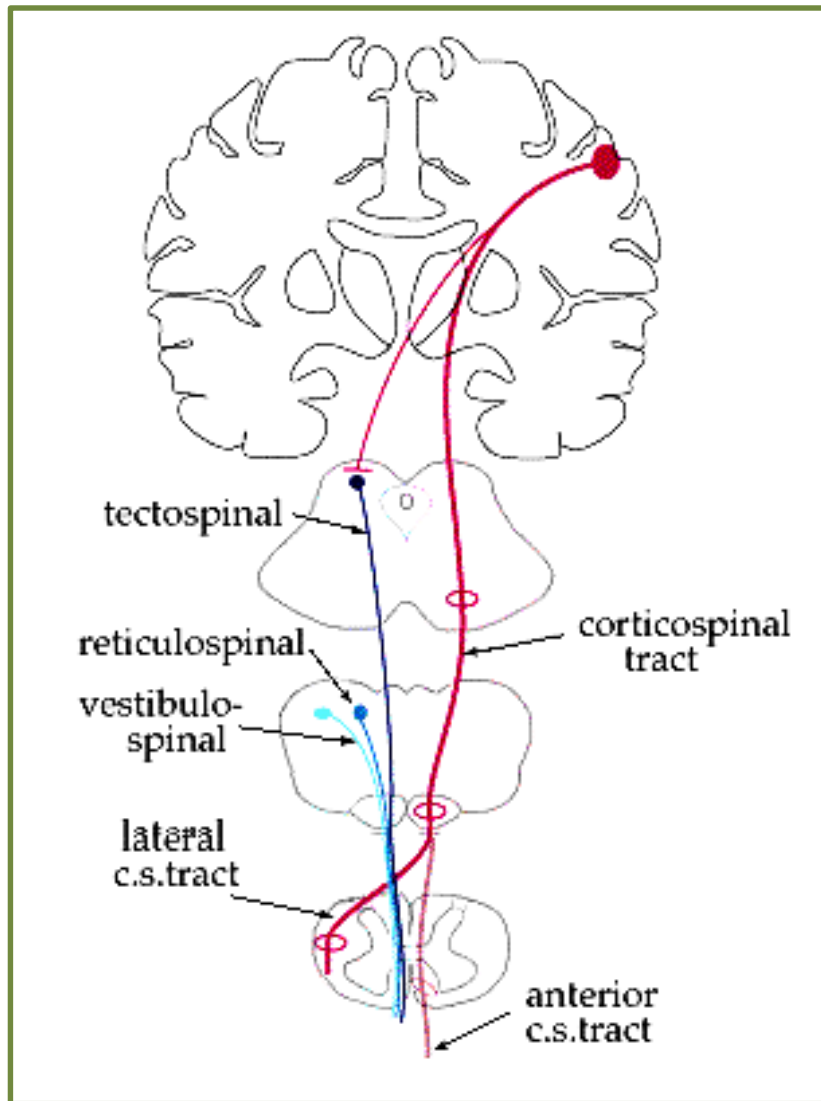
TR. VESTIBULOSPINALIS. IT ARISES FROM THE LATERAL VESTIBULAR NUCLEUS. IT SHOWS SOMATOTOPIC PROJECTION. IT MEDIATES CEREBELLAR AND VESTIBULAR INFORMATION TOWARD THE SPINAL CORD. IT EXERTS FACILITATORY INFLUENCE ON SPINAL REFLEXES AND CONTROLS MUSCLE TONE

TR. CORTICOSPINALIS DIRECTUS. ORIGINATES FROM THE CEREBRAL CORTEX AND CARRIES MOTOR COMMANDS TO NEURONS. UNLIKE THE CROSSED CORTICOSPINAL PROJECTION, IT DOES NOT DECUSSATE IN THE MEDULLA. TERMINATES IN THE INTERMEDIATE ZONE OF THE GREY MATTER

TR. TECTOSPINALIS. NEURONS RESIDING IN THE COLLICULUS SUPERIOR OF THE MIDBRAIN TECTUM PROJECT TO THE SPINAL CORD. THE SYSTEM CONTROLS THE MOVEMENTS OF THE HEAD.

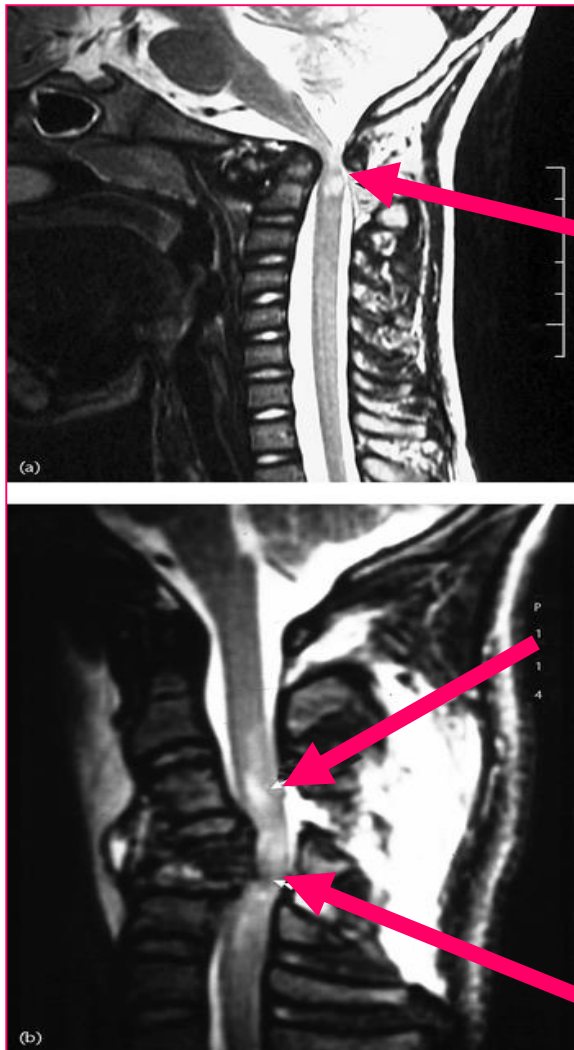
FASCICULUS LONGITUDINALIS MEDIALIS. IT ORIGINATES FROM THE CAUDAL PART OF THE BRAINSTEM. CARRIES INFORMATION FROM SECONDARY VESTIBULAR NEURONS TO CERVICAL SEGMENTS. CONTROLS THE MOVEMENTS OF THE HEAD

Basics of Neurobiology: Tracts of spinal cord



**TECTO-, RETICULO- AND
VESTIBULO-
SPINAL TRACTS**

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LESIONS OF THE SPINAL CORD

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COMPLETE HEMISECTION OF THE SPINAL CORD BROWN-SEQUARD SYNDROME

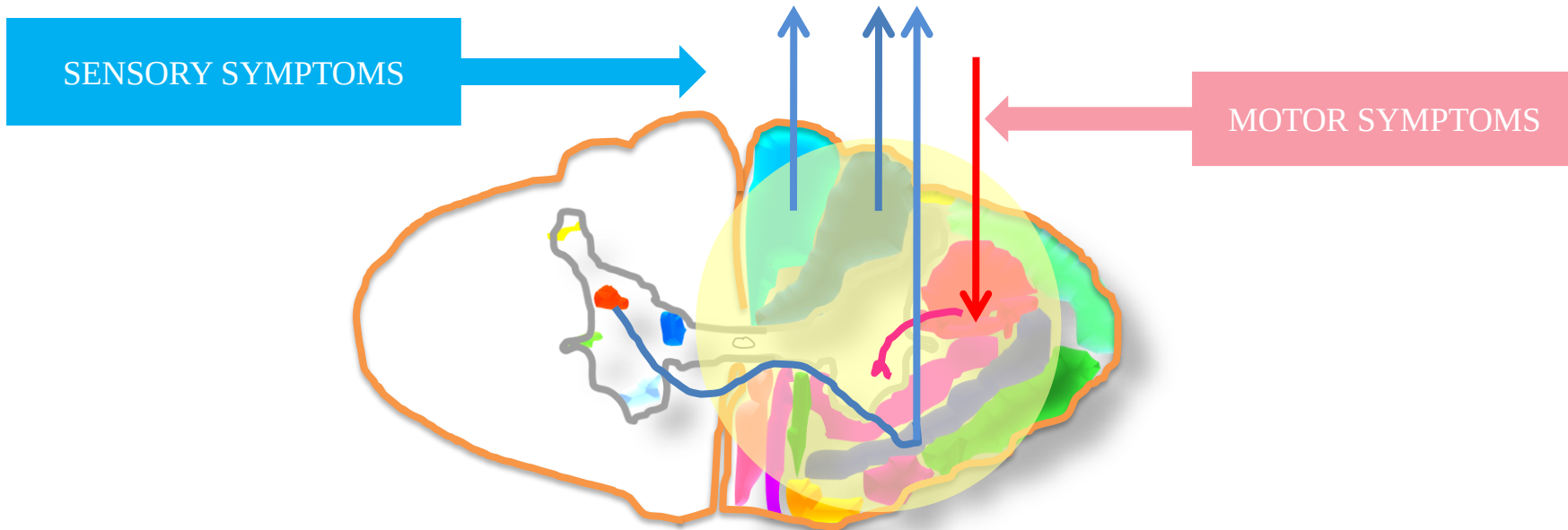


ILLUSTRATION (YELLOW CIRCLE) OF THE HEMISECTION OF THE SPINAL CORD. THE SYMPTOMS INCLUDE:

1. IPSILATERAL LOWER MOTONEURON PARALYSIS IN THE SEGMENT OF LESION
2. IPSILATERAL UPPER MOTONEURON PARALYSIS BELOW THE SEGMENT OF LESION
3. IPSILATERAL CUTANEOUS ANESTHESIA IN SEGMENT OF LESION
4. IPSILATERAL LOSS OF VIBRATION AND PROPRIOCEPTION BELOW THE SEGMENT OF LESION
5. CONTRALATERAL LOSS OF PAIN AND TEMPERATURE SENSE BELOW THE LESIONED SEGMENT