| Order in slides | Tract title | System / type | Main modality or function | Receptor / major input | 1st-order neuron / origin | 2nd-order neuron / origin | Decussation | Course / exact location mentioned | Higher relay | Termination | High-yield details explicitly mentioned in the slides |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Posterior White Column–Medial Lemniscal Pathway** | Ascending sensory | **Discriminative touch** (includes vibration) and **conscious proprioception** | Most receptors **except free nerve endings** | **Dorsal root ganglion**; fibers ascend in the spinal cord **ipsilaterally** | **Dorsal column nuclei**: nucleus gracilis + nucleus cuneatus, in the **first part / lower part of medulla oblongata** | Via **internal arcuate fibers** at the **lemniscal decussation** in the medulla | After crossing, fibers form the **medial lemniscus** and ascend through brainstem toward thalamus; then pass through **internal capsule** and **corona radiata** | **Thalamus (VPL)** | **Primary somesthetic / somatosensory area (SI)** in the **postcentral gyrus** of parietal lobe | Thalamus was described as the "secretary of the cortex"; nearly all sensory fibers relay there before cortex. Body is represented somatotopically on cortex as a homunculus. |
| 2 | **Fasciculus gracilis** | Component of posterior column system | Fine touch, vibration, conscious muscle-joint sense from **lower body** | Same as DCML | DRG | Nucleus gracilis | In medulla as part of DCML | **Near the midline / more medial** in posterior column | VPL via medial lemniscus | SI cortex | Carries fibers from **areas inferior to T6**. "The lower comes first": lower-body fibers enter earlier and occupy the **most medial** part. At **L4**, only gracilis is present because cuneatus is not yet formed. |
| 3 | **Fasciculus cuneatus** | Component of posterior column system | Fine touch, vibration, conscious muscle-joint sense from **upper body** | Same as DCML | DRG | Nucleus cuneatus | In medulla as part of DCML | **Away from the midline / more lateral** than gracilis in posterior column | VPL via medial lemniscus | SI cortex | Carries fibers from **areas superior to T6**. Borderline between gracilis and cuneatus is **T6**. Upper fibers are added laterally. |
| 4 | **Lateral spinothalamic tract** | Ascending sensory; part of **anterolateral system** | **Pain and temperature** | **Free nerve endings** | **Dorsal root ganglion** | **Posterior gray column / substantia gelatinosa** in dorsal horn | Crosses **early** through the **anterior white commissure**; notes also say anterior gray and white commissures | Ascends in the **contralateral white column** as LST; lower-body fibers lie **more lateral** in the tract | **Thalamus (VPL / ventral nuclei in thalamus)** | **Primary somesthetic area (SI)** plus **widespread cortical region** | Fast pain: **Aδ fibers** synapse mainly in **laminae I and V**; slow pain: **C fibers** synapse mainly in **laminae I and II**. This tract also sends collateral/additional projections to **reticular formation**, **cingulate gyrus**, |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | and **insular cortex** for pain awareness, emotional aspect of pain, and visceral/autonomic interpretation. Referred pain was explained by **convergence theory**. |
| 5 | **Posterolateral tract of Lissauer (Lissauer's tract)** | Short ascending/descending sensory tract related to pain pathway | Carries primary afferent pain fibers for short distance before synapse | Pain afferents | DRG afferents enter dorsally | Fibers then synapse mainly in substantia gelatinosa / dorsal horn | No major long decussation here; it is a short local tract before synapse | Located **between the posterior white column and lateral white column** | — | Dorsal horn interneuronal region | A fiber entering at a segment, such as **T4**, may synapse in the **same segment** or **1–2 segments above or below** according to the notes/figure explanation. |
| 6 | **Anterior spinothalamic tract** | Ascending sensory; part of **anterolateral system** | **Crude touch and pressure** | **Free nerve endings** | **Dorsal root ganglion** | **Posterior gray column – nucleus proprius (laminae III & IV)** | Crosses obliquely in the **anterior gray and white commissures** | Ascends in the **contralateral white column** as AST; ascends together with LST in the **anterolateral system**, partially overlapping | **Thalamus (VPL)** via internal capsule and corona radiata | **Primary somesthetic area (SI)** | The notes state AST projections are **more limited and less widespread** than LST, fitting its role in crude touch/pressure rather than pain. |
| 7 | **Spinotectal tract** | Ascending sensory reflex tract | Provides afferent limb for **spinovisual reflexes** | Not specifically stated | Not specifically stated | Not specifically stated | Not specifically stated in the slide text shown | Ascends in the **anterolateral white column**, close to the **lateral spinothalamic tract** | — | **Superior colliculus** | Tectum is dorsal midbrain; superior colliculus handles visual reflexes. In medulla, **anterior spinothalamic + spinotectal + lateral spinothalamic = spinal lemniscus**. The related reflex helps orient **head, neck, and eyes** toward the affected area after a painful stimulus. |
| 8 | **Posterior spinocerebellar tract** | Ascending sensory | **Unconscious proprioception**; muscle and joint sensation | Same receptor types as posterior column; notes | DRG afferents | **Nucleus dorsalis / Clarke's nucleus** at | **No crossing**; remains ipsilateral | 2nd-order axons enter **posterolateral part of lateral** | — | **Cerebellar cortex** through **inferior** | Cerebellar representation is **ipsilateral**: right cerebellum |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | also summarize spinocerebellar input from **Golgi tendon organs, muscle spindles, and joint capsules** | | base of posterior gray column, part of **lamina VII** | | **white matter** on the **same side** and ascend to medulla | | **cerebellar peduncle** | coordinates right body side. Below **L3–L4**, Clarke's nucleus is absent, so first-order fibers from lower lumbar and sacral levels ascend in posterior column until they reach **L3/L4** to synapse. |
| 9 | **Anterior spinocerebellar tract** | Ascending sensory | **Unconscious proprioception**; muscle and joint sensation | Summarized spinocerebellar input from **Golgi tendon organs, muscle spindles, and joint capsules** | 1st-order axons terminate at base of posterior gray column / nucleus dorsalis according to the notes shown | 2nd-order neurons in spinal gray matter | **Majority cross** in spinal cord; many then **cross back within the cerebellum** → functional ipsilateral ending. A minority remain uncrossed in cord. | Majority ascend in **contralateral white column**; minority ascend in **lateral white column of same side**; tract ascends to **medulla and pons** | — | **Cerebellar cortex** through **superior cerebellar peduncle** | This is the classic **double-crossing** tract in the lecture. Final cerebellar influence is therefore still effectively on the **same side of the body**. |
| 10 | **Lateral corticospinal tract (LCST)** | Descending motor; **pyramidal** | **Conscious voluntary control**, especially **fine, skilled movements** | Cortical motor output | **Upper motor neurons** originate in **precentral gyrus**; pyramidal system arises mainly from **area 4**, with contributions from **area 6** and **areas 3,1,2** | Synapses mainly on interneurons, sometimes directly on LMNs | **85%** decussate at **pyramidal decussation** in lower medulla | Corona radiata → internal capsule → **middle three-fifths of basis pedunculi** in midbrain → scattered in pons → **pyramids** in medulla → **lateral funiculus** of spinal cord | — | Mainly lateral part of anterior horn; via interneurons to **alpha and gamma motor neurons** | Descends the **full length** of the cord. Segmental distribution noted: **cervical 55%**, **thoracic 20%**, **lumbar/sacral 25%**. Main interneuronal synapses in **laminae IV, V, VI, VII, VIII**. About **3%** from **Betz cells** in layer V of area 4 synapse directly for very accurate movements. |
| 11 | **Anterior corticospinal tract (ACST)** | Descending motor; **pyramidal** | Voluntary control, especially **proximal muscles of upper limb (shoulder)** and | Cortical motor output | Same corticospinal origin as above | Interneuronal targets in anterior horn | Fibers are the **15%** that do **not decussate in medulla**; they descend ipsilaterally and then | Descends in anterior column / anterior white matter | — | Medial anterior horn interneuronal region | Lecture states it acts on proximal muscles of the upper limb on **both ipsilateral and contralateral sides** because segmental |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | axial/postural components | | | | cross near their segment through the **anterior white commissure** | | | | crossing occurs at different levels. |
| 12 | **Rubrospinal tract** | Descending motor; **extrapyramidal** | Facilitates **flexors**, inhibits **extensors**; especially distal flexor control | Inputs to red nucleus from cortex and cerebellum | **Red nucleus** in midbrain at level of **superior colliculus** | Interneuronal spinal targets | **Crossed** at level of the red nucleus | Descends in **lateral white column** very close to LCST; together they form the **lateral motor system** | — | Synapses with alpha and gamma neurons through interneurons | Mainly supplies **distal flexors**, especially hand flexors, with little effect on proximal muscles; lecture links it to skilled acts like writing/typing. |
| 13 | **Pontine reticulospinal tract (medial reticulospinal tract, MRST)** | Descending motor; **extrapyramidal** | Activates **axial and proximal limb extensors**; posture / antigravity tone | Reticular formation output | **Pontine reticular formation** | Spinal interneuronal targets | **Uncrossed** | Descends in **anterior white column** | — | Spinal cord motor networks | It is **tonically active** and normally under **inhibition from cortex**. If cortical inhibition is lost, the tract becomes overactive, contributing to exaggerated **extensor tone**. |
| 14 | **Medullary reticulospinal tract (lateral reticulospinal tract, LRST)** | Descending motor; **extrapyramidal** | **Inhibits axial and proximal extensors** to permit flexion and coordinated movement | Reticular formation output | Medullary reticular formation | Notes differ slightly: summary paragraph says **uncrossed**, while slide bullet says **crossed and uncrossed**. I am keeping both because both appear in the uploaded material. | Descends in **lateral white column** | — | Spinal cord motor networks | **Not tonically active**; slide says "normally under stimulation." It functionally opposes the pontine tract and helps smooth coordinated flexion-extension patterns. The lecture also notes descending **autonomic fibers**, mostly from the lateral reticulospinal tract, giving a pathway by which | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | hypothalamus modulates sympathetic and sacral parasympathetic outflow. | |
| 15 | **Vestibulospinal tract** | Descending motor; **extrapyramidal** | Balance; facilitates **extensors** and inhibits **flexors** in support of posture | Afferents from **inner ear via vestibular nerve** and from **cerebellum** | **Vestibular nuclei** in pons and medulla, beneath floor of 4th ventricle | **Uncrossed** | Descends in **anterior white column**; some notes add through medulla and along the **length of the spinal cord** | — | Synapses with neurons in **anterior gray column** of spinal cord | High-yield function phrase from the slide: balance is maintained by **facilitating extensor muscle activity**. | |
| 16 | **Tectospinal tract** | Descending motor; **extrapyramidal** | Reflex movement of **head and neck in response to visual stimuli** | Collicular visual reflex input | **Superior colliculus** of midbrain | Spinal interneuronal / anterior horn targets | **Crossed** | Descends in **anterior white column close to the anterior median fissure** | — | Majority terminate in **anterior gray column of upper cervical segments** | This is the descending partner conceptually related to visual orienting reflexes; upper cervical termination explains its dominance over **head/neck** movement rather than limb movement. |