4 Cranial Nerves

In addition to the 31 pairs of spinal nerves, 12 pairs of cranial nerves arise from the brain, and they are identified both by their names and by **Roman numerals I through XII.** The cranial nerves are somewhat unique and can contain multiple functional components:

- **General:** same general functions as spinal nerves
- **Special:** functions found only in cranial nerves
- **Afferent and efferent:** sensory or motor functions, respectively
- **Somatic and visceral:** related to skin and skeletal muscle (somatic), or to smooth muscle and glands (visceral)

Hence, each cranial nerve may possess multiple functional components, such as general somatic afferents, meaning the nerve contains sensory fibers from the skin, not unlike those of the spinal nerve; general visceral efferents, meaning the nerve contains motor fibers to visceral structures (smooth muscle and/or glands), such as parasympathetic fibers from the sacral spinal cord (S2-S4 gives rise to parasympathetics); or special somatic afferents, meaning the nerve contains special sensory fibers, such as those for vision or hearing.

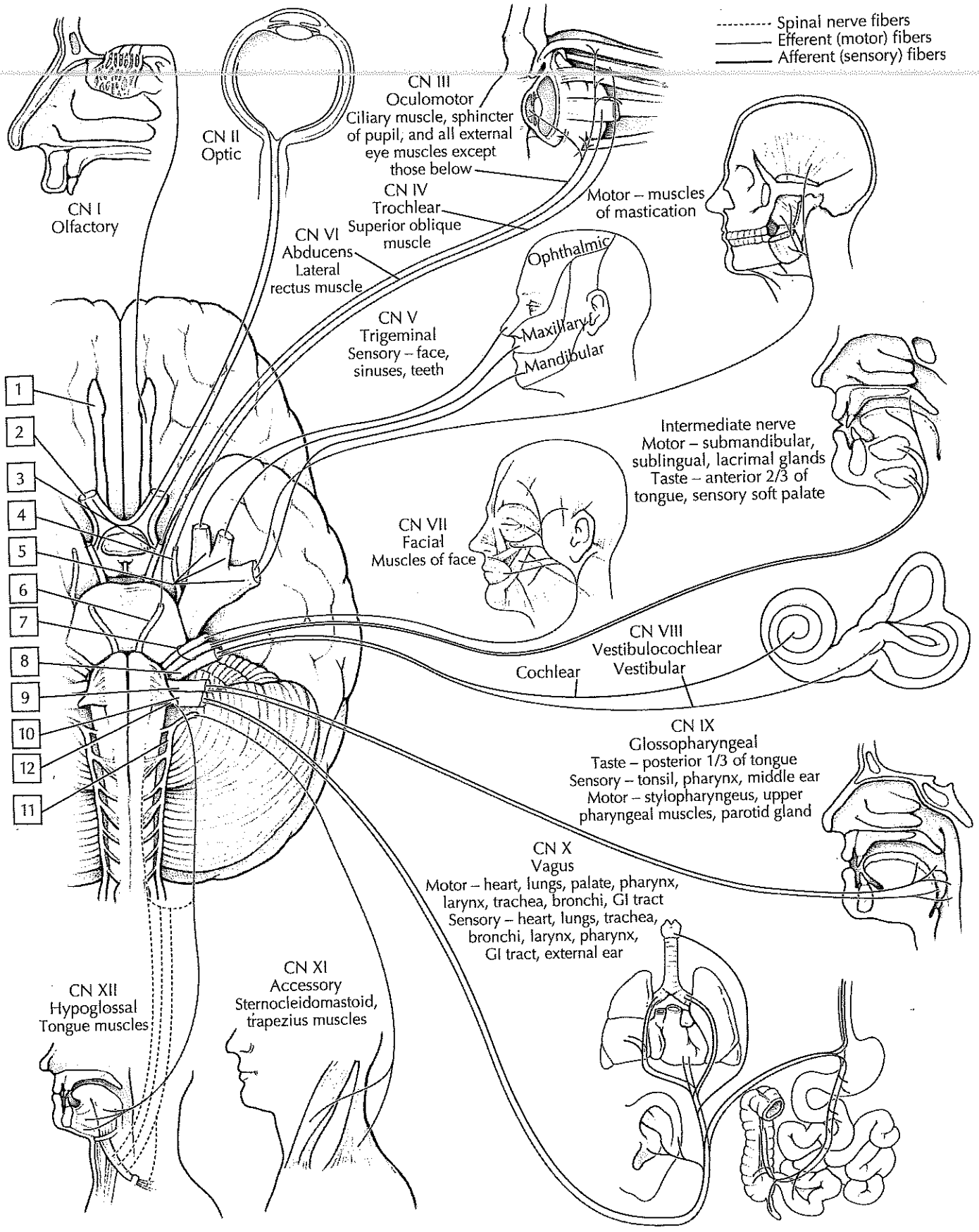
In general, CN I and II arise from the forebrain and are really tracts of the brain for the special senses of smell and sight. CN III, IV, and VI move the extraocular skeletal muscles of the eyeball. CN V has three divisions: V_1 and V_2 are sensory, and V_3 has both motor fibers to skeletal muscle and sensory fibers. CN VII, IX, and X have both motor and sensory fibers. CN VIII is involved in the special sense of hearing and in balance. CN XI and XII have motor fibers that innervate skeletal muscle. CN III, VII, IX, and X also contain parasympathetic fibers of origin (visceral fibers); many of the ANS fibers will "jump" onto the branches of CN V to reach their targets. The following table summarizes the types of fibers in each cranial nerve.

CRANIAL NERVE	FUNCTIONAL COMPONENT*
CN I Olfactory nerve	SSA (special sense of smell)
CN II Optic nerve	SSA (special sense of sight)
CN III Oculomotor nerve	GSE (motor to extraocular muscles)
	GVE (parasympathetic to smooth muscle in eye)
CN IV Trochlear nerve	GSE (motor to one extraocular muscle)
CN V Trigeminal nerve	GSA (sensory to face, orbit, nose, anterior tongue)
	SVE (motor to skeletal muscles)
CN VI Abducens nerve	GSE (motor to one extraocular muscle)
CN VII Facial nerve	GSA (sensory to skin of ear)
	SVA (special sense of taste to anterior tongue)
	GVE (motor to glands—salivary, nasal, lacrimal)
	SVE (motor to facial muscles)
CN VIII Vestibulocochlear nerve	SSA (special sense of hearing and balance)
CN IX Glossopharyngeal nerve	GSA (sensory to posterior tongue)
	SVA (special sense of taste—posterior tongue)
	GVA (sensory from middle ear, pharynx, carotid body, and sinus)
	GVE (motor to parotid gland)
	SVE (motor to one muscle of pharynx)
CN X Vagus nerve	GSA (sensory to external ear)
	SVA (special sense of taste—epiglottis)
	GVA (sensory from pharynx, larynx, and thoracic and abdominal organs)
	GVE (motor to thoracic and abdominal organs)
	SVE (motor to muscles of pharynx/larynx)
CN XI Accessory nerve	GSE (motor to two muscles)
CN XII Hypoglossal nerve	GSE (motor to tongue muscles)

*GSA, general somatic afferents; GSE, general somatic efferents; GVA, general visceral afferents; GVE, general visceral efferents; SSA, special somatic afferents; SVA, special visceral afferents; SVE, special visceral efferents.

COLOR each cranial nerve as it arises from the brain or brainstem:

- ☐ 1. **CN I, olfactory nerve**
- ☐ 2. **CN II, optic nerve**
- ☐ 3. **CN III, oculomotor nerve**
- ☐ 4. **CN IV, trochlear nerve**
- ☐ 5. **CN V, trigeminal nerve**
- ☐ 6. **CN VI, abducens nerve**
- ☐ 7. **CN VII, facial nerve**
- ☐ 8. **CN VIII, vestibulocochlear nerve**
- ☐ 9. **CN IX, glossopharyngeal nerve**
- ☐ 10. **CN X, vagus nerve**
- ☐ 11. **CN XI, accessory nerve**
- ☐ 12. **CN XII, hypoglossal nerve**


Spinal nerve fibers
Efferent (motor) fibers
Afferent (sensory) fibers
CN I
Olfactory
CN II
Optic
CN III
Oculomotor
Ciliary muscle, sphincter of pupil, and all external eye muscles except those below
CN IV
Trochlear
Superior oblique muscle
CN VI
Abducens
Lateral rectus muscle
CN V
Trigeminal
Sensory – face, sinuses, teeth
Ophthalmic
Maxillary
Mandibular
Motor – muscles of mastication
Intermediate nerve
Motor – submandibular, sublingual, lacrimal glands
Taste – anterior 2/3 of tongue, sensory soft palate
CN VII
Facial
Muscles of face
CN VIII
Vestibulocochlear
Cochlear
Vestibular
CN IX
Glossopharyngeal
Taste – posterior 1/3 of tongue
Sensory – tonsil, pharynx, middle ear
Motor – stylopharyngeus, upper pharyngeal muscles, parotid gland
CN X
Vagus
Motor – heart, lungs, palate, pharynx, larynx, trachea, bronchi, GI tract
Sensory – heart, lungs, trachea, bronchi, larynx, pharynx, GI tract, external ear
CN XI
Accessory
Sternocleidomastoid, trapezius muscles
CN XII
Hypoglossal
Tongue muscles
1
2
3
4
5
6
7
8
9
10
12
11