HEAD/NECK: Cranial Nerves

- **Special Sense Nerves**
  - I, II, VIII

- **Somatic Motor Nerves**
  - Eye—III, IV, VI
  - Tongue—XII

- “Rest of body” nerves
  - IX, X, XI

- Face and jaws
  - VII, V
Overview Head/Neck I-IV

• Head I: Skull—a framework to hang on
  – Overall organization of skull
  – Base of the skull—the hard part
    • Developmental view
    • Cranial nerves out (to “targets”)

• Head II: Throat targets

• Head III: Special Sense targets

• Head IV: Cranial nerves in depth
Nerve “targets” in head

**SENSORY**
- Special
  - Smell
  - Vision
  - Hearing
  - Taste
  - Oral cavity
  - Nasal cavity
  - Middle ear
  - Throat
  - Meninges

- General
  - Skin
  - Teeth
  - Eye

**MOTOR**
- Muscles
  - Eyes
  - Extrinsic sweat
  - Intrinsic lacrimal
  - Jaws
  - Mucous
- Glands
  - Salivary
  - Facial expression
  - Larynx
  - Tongue
  - Throat
  - Ear
Base of the skull—cranial nerves out

- Ethmoid (olfactory)
  I. Olfactory
- Sphenoid (optic)
  II. Optic
  III. Oculomotor
  IV. Trochlear
  VI. Abducens
- Temporal (otic)
  VII. Acoustic/Auditory/Vestibulocochlear
- Face/Jaws
  V. Trigeminal
  VII. Facial
- Throat (rest of body)
  IX Glossopharyngeal
  X. Vagus
  XI. Spinal Accessory
  XII. Hypoglossal
# Special Sense Nerves

<table>
<thead>
<tr>
<th>NERVE</th>
<th>TARGET</th>
<th>EXIT FROM CRANIAL CAVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Olfactory</td>
<td>Olfactory epithelium</td>
<td>Cribiform plate (ethmoid)</td>
</tr>
<tr>
<td>II. Optic</td>
<td>Retina</td>
<td>Optic canal (sphenoid)</td>
</tr>
<tr>
<td>VIII. Auditory</td>
<td>Inner ear</td>
<td>Internal auditory meatus (temporal)</td>
</tr>
</tbody>
</table>
## Somatic Motor Nerves
(eye muscles and tongue)

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<tr>
<th>NERVE</th>
<th>TARGET</th>
<th>EXIT CR. CAVITY</th>
</tr>
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<tbody>
<tr>
<td>IV. Trochlear</td>
<td>Superior oblique m. (with trochlea)</td>
<td>Sup. Orbital fissure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(sphenoid)</td>
</tr>
<tr>
<td>VI. Abducens</td>
<td>Lateral rectus</td>
<td>“</td>
</tr>
<tr>
<td>III. Oculomotor (Also parasympathetic to ciliary mm, constrictor pupillae)</td>
<td>Sup.,med.,inf.rectus • Inferior Oblique • Levator palpebrae superioris</td>
<td>“</td>
</tr>
<tr>
<td>XII. Hypoglossal</td>
<td>Intrinsic, extrinsic mm. of tongue</td>
<td>Hypoglossal canal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(occipital)</td>
</tr>
</tbody>
</table>
Superior oblique muscle
Superior orbital fissure
Trochlear nerve (IV)
Lateral rectus muscle
Superior orbital fissure
Abducens nerve (VI)
"Rest of body" nerves (all exit from jugular foramen)

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| X: Vagus       | • Somatic motor to larynx/pharynx  
                 | • Parasympathetic to most of gut  
                 | • Taste to back posterior pharynx                         |
| XI: (Spinal)   | • Motor to traps, sternocleidomastoid                                  |
| Accessory      |                                                                         |
| IX: Glossopharyngeal | • Sensory to carotid body/sinus  
                        | • Taste to posterior tongue  
                        | • Sensory to ear opening/middle ear  
                        | • Parotid salivary gland               |
VII: Facial Nerve
(exits cranial cavity with VIII--internal auditory meatus)

- Facial muscles (five branches fan out over face from stylomastoid foramen)
  - Temporal
  - Zygomatic
  - Buccal
  - Mandibular
  - Cervical
- “chorda tympani” (crosses interior ear drum to join V₃)
  - Taste to anterior 2/3 of tongue
  - Submandibular, sublingual salivary glands
- Lacrimal glands
(a) Parasympathetic efferents and sensory afferents

(b) Motor branches to muscles of facial expression and scalp muscles

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V: Trigeminal (3 nerves in 1!)

- **V1. Ophthalmic**
  - Exits with eye muscle group (superior orbital fissure, through orbit to superior orbital notch/foramina)
  - Sensory to forehead, nasal cavity

- **V2. Maxillary**
  - Exits foramen rotundum through wall of maxillary sinus to inferior orbital foramina
  - Sensory to cheek, upper lip, teeth, nasal cavity

- **V3. Mandibular**
  - Exits foramen ovale to mandibular foramen to mental foramen
  - Motor to jaw muscles--Masseter, temporalis, pterygoids, digastric
  - Sensory to chin
  - Sensory to tongue
Superior orbital fissure
Ophthalmic division (V₁)
Trigeminal (semitunlar or gasserian) ganglion
Trigeminal nerve (V)
Pons
Maxillary division (V₂)
Mandibular division (V₃)
Foramen ovale
Foramen rotundum
Anterior trunk to chewing muscles

Distribution of sensory fibers of each division

Mandibular division (V₃)

Temporals muscle
Medial pterygoïd muscle
Masseter muscle
Anterior belly of digastric muscle

Inset shows motor branches of the mandibular division (V₃)

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Cranial Nerve Web Sites

Clinical tests for cranial nerves with photos in clinic (New York U)

More detail cranial nerves, but some missing (Yale Medical)

Nice review of cranial nerves—includes clinical tests for nerves and cryptogram puzzle of nerves (Washington U)