DIAGRAMATIC SUMMARY OF COURSES OF CRANIAL NERVES FROM BRAIN TO END ORGAN

A= Nose
B= Orbit
C= Lower orbit
D= Cavernous sinus
E= Pterygopalatine fossa
F= Middle ear
G= Base of skull
H= Hypoglossal canal
J= Stylomastoid foramen

The purpose of this figure is to show how some cranial nerves pass directly to their end organ (1,2,5c,8,9,10,11,12) whilst others pass through well defined cavities such as the cavernous sinus (3,4,5a,5b,6) or the pterygopalatine fossa (5b). For purposes of remembering the likely exit from the skull of cranial nerves, they can be grouped into those that pass to the nose (1), to the orbit (2,3,4,5a,6), to the front of the face (5b) and through the base of the skull (5c,7,9,10,11,12).
INTERNAL VIEW OF BASE OF SKULL
TO SHOW SINUSES AND FORAMINA

FORAMINA AND AIR SINUSES

1. Frontal air sinuses
2. Anterior ethmoidal air sinuses
3. Middle ethmoidal air sinuses
4. Posterior ethmoidal air sinuses
5. Foramen caecum (single midline)
6. Cribriform plate of ethmoid
7. Optic canal
8. Superior orbital fissure
9. Foramen rotundum
10. Foramen ovale
11. Foramen spinosum
12. Foramen lacerum
13. Sphenoid air sinuses
14. Internal acoustic (auditory) meatus
15. Jugular foramen
16. Hypoglossal canal
17. Foramen magnum (single midline)
CRANIAL NERVES THAT SUPPLY SOMATIC FIBRES TO SKELETAL MUSCLES

III  Nucleus: Oculomotor  
     Recti (sup, med, inf), inferior oblique,  
     levator palpebrae superioris

IV  Nucleus: Trochlear  
    Superior oblique

VI  Nucleus: Abducent  
    Lateral rectus

XI  Nucleus: Lateral spinal roots C1-5  
    Sternocleidomastoid & trapezius

XII Nucleus: Hypoglossal  
    Muscles of tongue except palatoglossus

Cranial nerves III, IV, VI, XI & XII carry somatic nerve fibres to head & neck muscles that have NOT originated from branchial arches
## CRANIAL NERVES WITH MOTOR SUPPLY TO MUSCLES OF BRANCHIAL ORIGIN

<table>
<thead>
<tr>
<th>BRANCHIOMOTOR (MUSCLES OF BRANCHIAL ORIGIN)</th>
</tr>
</thead>
</table>
| V  | **Nucleus**: Motor of trigeminal  
M of mastication, mylohyoid, ant digastric,  
tensors palati & tympani |
| VII | **Nucleus**: Facial  
M of facial expression, buccinator, post  
digastric, stylohyoid, stapedius, occipitalis |
| IX | **Nucleus**: Ambiguus  
Stylopharyngeus |
| X  | **Nucleus**: Ambiguus  
M of pharynx, upper oesophagus, palate,  
larynx (from cranial XI) |
| XI | **Nucleus**: Ambiguus  
M of palate & pharynx via vagus |

Cranial nerves V, VII, IX, X are the nerves to the branchial (pharyngeal) arches 1, 2, 3, 4/6 respectively. In addition the cranial part of XI dumps its fibres on the vagus to be distributed with it.

**ARCH 1**
Mandibular div of V  
(M of mastication)

**ARCH 2**
Facial N  
(M of facial expression)

**ARCH 3**
Glossopharyngeal N  
(Stylopharyngeus)

**ARCHES 4 & 6**
Vagus N  
(M of palate, pharynx, larynx)
CRANIAL NERVES THAT CARRY PARASYMPATHETIC FIBRES

III  Nucleus: Edinger - Westphal
     Ganglion: Ciliary
     Ciliary body & muscle
     Sphincter pupillae

VII Nucleus: Superior salivary
     Ganglia: Pterygopalatine & submandibular
     Lacrimal, submandibular, sublingual
     & palatine glands

IX  Nucleus: Inferior salivary
     Ganglion: Otic
     Parotid, glands in posterior third of
tongue & oropharynx

X   Nucleus: Dorsal motor of vagus
     Cardiac & visceral muscle in thorax &
     abdomen

Cranial nerves III, VII, IX & X all carry parasympathetic fibres from the various central parasympathetic nuclei and they take these fibres to their respective parasympathetic ganglia where they synapse and then are distributed via a branch of the trigeminal nerve to the end organ.
# CRANIAL NERVES CARRYING GENERAL AND SPECIAL SENSORY FIBRES

<table>
<thead>
<tr>
<th>GENERAL VISCERAL SENSORY</th>
<th>SPECIAL VISCERAL SENSORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII</td>
<td>Nucleus: Solitarius</td>
</tr>
<tr>
<td></td>
<td>Chorda tympani</td>
</tr>
<tr>
<td></td>
<td>Taste: Ant 2/3 tongue</td>
</tr>
<tr>
<td>IX</td>
<td>Nucleus: Solitarius</td>
</tr>
<tr>
<td></td>
<td>Taste: Post 1/3 tongue,</td>
</tr>
<tr>
<td></td>
<td>vallate papillae, oropharynx,</td>
</tr>
<tr>
<td></td>
<td>baro-, chemoreceptors</td>
</tr>
<tr>
<td>X</td>
<td>Nucleus: Solitarius or</td>
</tr>
<tr>
<td></td>
<td>dorsal sensory of vagus</td>
</tr>
<tr>
<td></td>
<td>From heart, lungs &amp;</td>
</tr>
<tr>
<td></td>
<td>abdominal viscera</td>
</tr>
<tr>
<td></td>
<td>Nucleus: Solitarius</td>
</tr>
<tr>
<td></td>
<td>Taste: Valleculea &amp; epiglottis,</td>
</tr>
<tr>
<td></td>
<td>baro-, chemoreceptors</td>
</tr>
<tr>
<td>NB</td>
<td>From heart, lungs &amp;</td>
</tr>
<tr>
<td></td>
<td>gut</td>
</tr>
<tr>
<td></td>
<td>Taste &amp; baroreception</td>
</tr>
</tbody>
</table>

Note that in the case of the vagus the sensation travels with this parasympathetic nerve but the fibres are really general visceral sensory and not parasympathetic. Special visceral sensory comprises taste and baroreception.
CRANIAL NERVES THAT CARRY
SOMATIC SENSORY FIBRES

V  Nucleus: Sensory of trigeminal
   Mesencephalic: Proprioception
   Main: Touch
   Spinal: Pain & temperature
   For trigeminal supplying face, orbit, tongue

VII Nucleus: Sensory of trigeminal
   Some skin of external auditory meatus
   & tympanic membrane

IX  Nucleus: Sensory of trigeminal
    Posterior 1/3 of tongue, palate, pharynx
tonsil, middle ear

X   Nucleus: Sensory of trigeminal
    Skin of posterior/inferior auricle, external
    auditory meatus, pharynx, larynx

NB Cell bodies are all outside the central nervous
system except for mesencephalic nucleus where
they are inside

Thus, the trigeminal nerve is the main sensory nerve for the head.
Note that whichever nerve carries the sensation, the fibres
eventually reach the sensory nucleus of the trigeminal nerve.
Note also that the facial nerve (VII) is essentially a motor nerve
even though it does have a small sensory component
CRANIAL NERVES FOR SPECIAL SENSES

I  Smell
   Limbic system

II  Sight
   Lateral geniculate body

VIII Hearing
   2 nuclei
   Equilibrium
   4 nuclei
CRANIAL NERVE NUCLEI IN BRAIN STEM

Trigeminal (V)
- mesencephalic (proprioception)
- chief (touch)
- spinal (pain & temperature)

Vestibular & cochlear (VIII)

Nucleus (tractus) solitarius

Edinger-Westphal
Oculomotor (III)
Trochlear (IV)
Trigeminal motor (Vc)
Abducent (VI)
Facial (VII)
Superior salivary
Inferior salivary
Nucleus ambiguus (branchiomotor)
Dorsal motor of vagus (X)
Hypoglossal (XII)

Somatic 
Taste & baroreceptors
Hearing/balance

SENSORY

MOTOR

- Somatic
- Parasympathetic
- Branchiomotor