Vestibulocochlear nerve (CN VIII)

- Function: special sensory – hearing, equilibrium, and motion (acceleration/deceleration)
- Nuclei: vestibular nuclei located at pons-medulla junction; cochlear nuclei are in the medulla
- Emerges from pons-medulla junction and enters internal acoustic meatus, where it separates into the vestibular and cochlear nerves
- Within the internal acoustic meatus, the nerve is accompanied by facial nerve (CN VII) and labyrinthine artery
- Vestibular nerves go via vestibular ganglion to innervate
  - Maculae of utricle and saccule (sensitive to acceleration and pull of gravity relative to position of the head)
  - Cristae of ampullae of semicircular ducts (sensitive to rotational acceleration)
- Cochlear nerve goes via spinal ganglions, extending to spiral organ for sense of hearing

Taken from mskanatomy.blogspot.co.uk, Cranial Nerves Anatomy, available at http://msk-anatomy.blogspot.co.uk/2014/12/cranial-nerves-anatomy.html
Vagus nerve (CN X)

- **Function:** somatic sensory, special sensory (taste), visceral sensory, somatic (brachial) motor, and visceral (parasympathetic) motor
  - Somatic sensory from inferior pharynx and larynx
  - Visceral sensory from thoracic and abdominal organs
  - Taste and somatic sensory from tongue and epiglottis
    - Branches of internal laryngeal (a branch of vagus) supply a small area – mostly somatic sensory and some special sensory (taste)
  - Somatic motor to soft palate, pharynx, intrinsic laryngeal muscles (phonation), palatoglossus (external tongue muscle)
  - Proprioception to muscles above
  - Visceral (parasympathetic) motor to thoracic and abdominal viscera

- **Nuclei**
  - Sensory
    - Sensory nucleus of trigeminal nerve (somatic sensory)
    - Nuclei of solitary tract (taste and visceral sensory)
  - Motor
    - Nucleus ambiguus (somatic brachial motor)
    - Dorsal vagal nucleus (visceral parasympathetic motor)

- Vagus nerve has longest course and most extensive distribution of all the cranial nerves
- Arises from series of rootlets from medulla; merge to leave via jugular foramen
- Has a superior and inferior ganglions
- Course of vagi are asymmetric in the thorax
- Branches supplied to heart, lungs, bronchi
- Anterior and posterior vagal trunks are formed, that are continuous with the oesophageal plexus
- Pass with the oesophagus through the diaphragm into the abdomen; breaks up into branches to innervate stomach and intestinal tract
Can be caused by inflammatory, degenerative, demyelinating, or toxic disorders, and damage by toxic substances (methyl and ethyl alcohol, tobacco, lead, mercury)

Optic disc is smaller and paler than normal

**Visual field defects**

- There are nasal and temporal parts of the retina
  - Nasal part provides temporal visual field
  - Temporal part provides nasal visual field
- Nasal parts cross over (decussate) in the optic chiasm, while the temporal parts do not
- Optic chiasm located on top of the pituitary
- Result from lesions affecting different parts of the visual pathway
- Type of defect depends on where the pathway is interrupted


- Complete section of an optic nerve will result in blindness of the temporal and nasal fields of the ipsilateral eye
- Complete section of an of the optic chiasm will section the nasal parts of each eye, resulting in loss of the temporal visual field – known as bipolar hemianopia
- Complete section of an optic tract will lead to loss of the temporal part of one eye and nasal part of the other; will be contralateral to the lesion; known as homonymous hemianopia
Motor paralysis of facial muscles involves the superior and inferior parts of the face on the ipsilateral side.

- Central lesion:
  - Paralysis of muscles in the inferior face on the contralateral side
  - Forehead wrinkling is not visibly impaired as it is innervated bilaterally

- Lesions between the geniculate ganglion and the origin of the chorda tympani produce some affects as to the ganglion, but lacrimal secretion is not impaired.

- As the facial nerve passes through the facial canal in the temporal bone, it is vulnerable to compression when viral infection (neuritis) occurs.

- Branches of CN VII are superficial they are subject to injury e.g. knifes, gunshot wounds, cuts, birth injury, fracture of the temporal bone, tumours, aneurysms, meningeal infections.

- Injuries cause paralysis of facial muscles, but sensation around the auricle and opening of internal acoustic meatus is usually spared.

- Hearing not usually impaired, but ear may become more sensitive to low tones if the stapedius is impaired (normally dampens vibrations of the stapes).

- Bell palsy is unilateral facial paralysis due to lesion in CN VII; no forehead sparing.

Vestibulocochlear nerve

Injuries to vestibulocochlear nerve

- Although vestibular and cochlear nerves are essentially independent, peripheral lesions often affect both due to close proximity.

- Peripheral lesions cause tinnitus, vertigo, and impairment or loss of hearing.

- Central lesions may involve either vestibular or cochlear division.

Deafness

- Two kinds of deafness:
  - Conductive – involves external or middle ear (otitis media, inflammation in inner ear)
  - Sensorineural – disease in the cochlea or pathway from cochlea to brain.

Acoustic neuroma

- Slow growing benign tumour of neurolemma
- Begins in vestibular nerve while inside the internal acoustic meatus
- Usually loss of hearing
- Disequilibrium and tinnitus also common

Trauma and vertigo

- Head trauma can cause headache, dizziness, vertigo etc.
- Vertigo is sensation of spinning, swaying back and forth or falling.