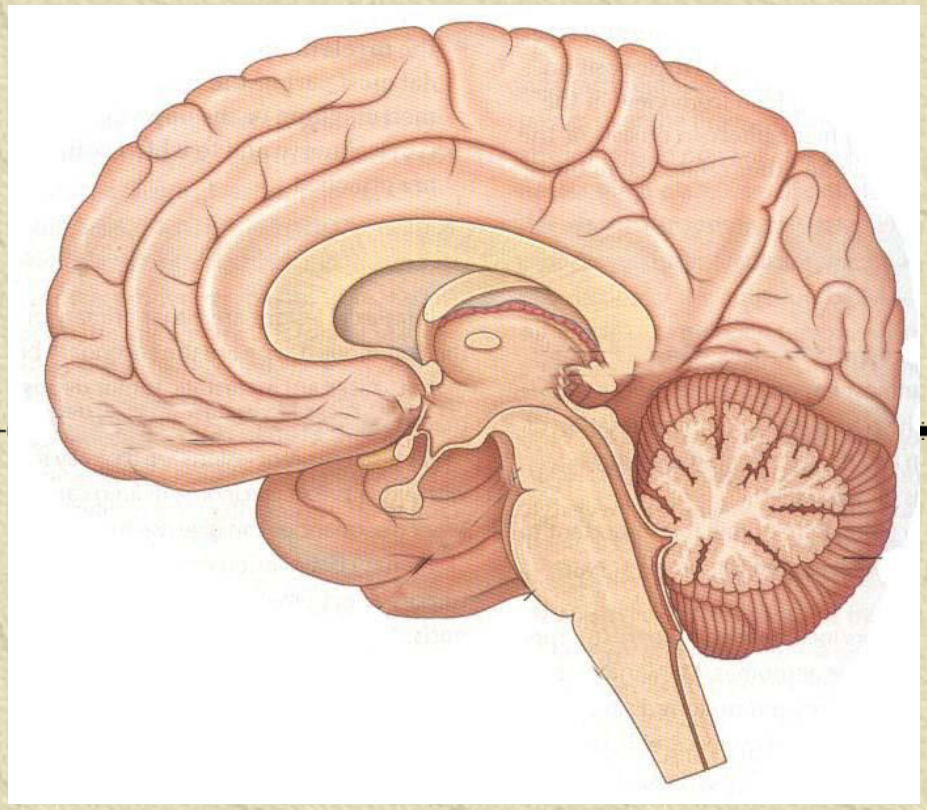
Anatomy of the Hypothalamus



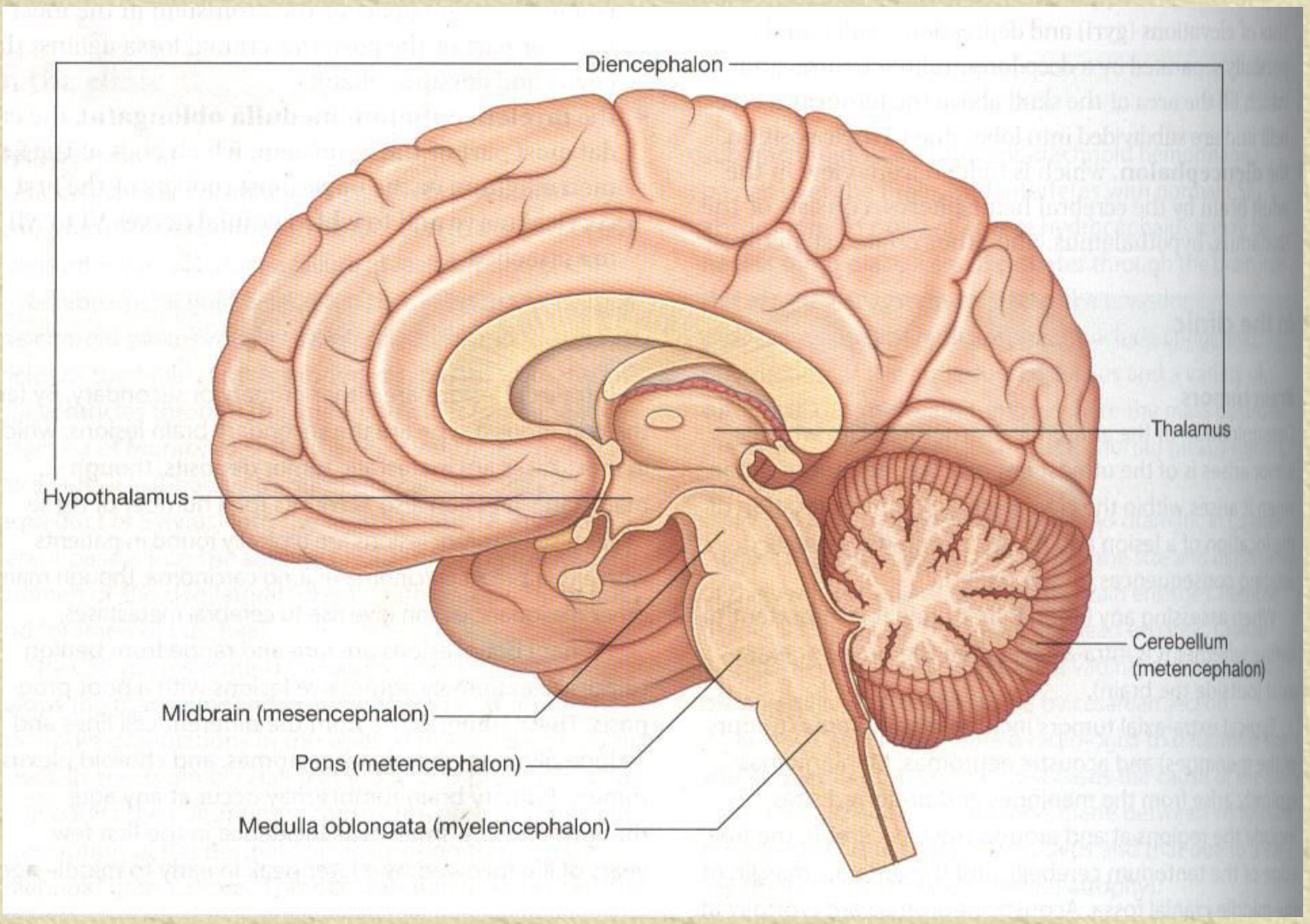
- It is surprising that a minuscule part of your brain known as “hypothalamus” takes control of your body.
- It not only controls vital functions in the body to maintain the homeostasis, gives you the sense of day and night,
- But also controls your emotions and drives, including your sexual desires!
- So it is worth learning about it.

Objectives

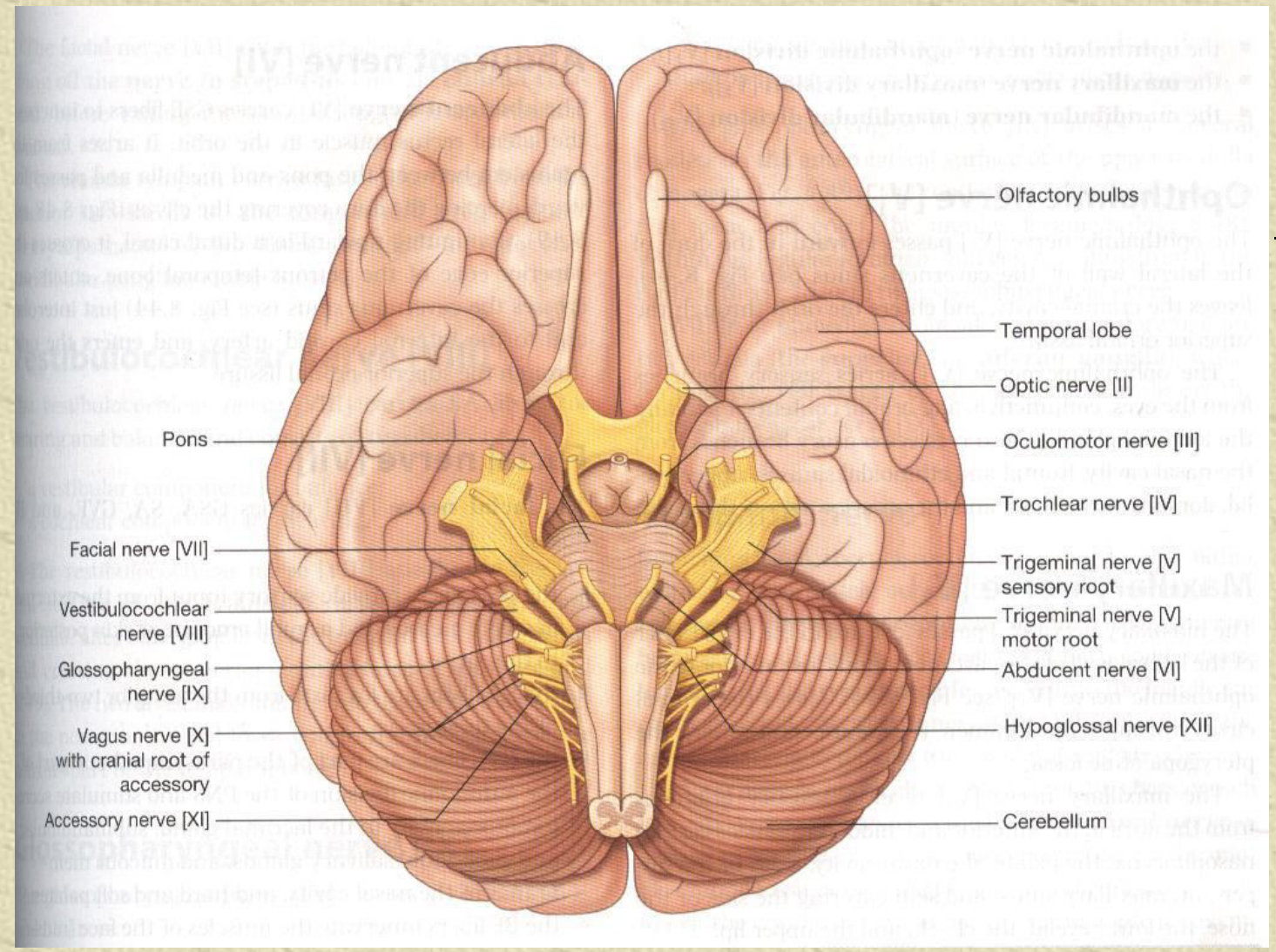
- Development of the CNS
- Anatomical features, component parts and connections of the hypothalamus
- Its control over the other endocrine glands
- Functions of the hypothalamus
- Clinical features of hypothalamic disease

HYPOTHALAMUS

- A part of the diencephalon
- Head Ganglion of ANS
- Anatomically made up of
  - the floor of the third ventricle (interpeduncular fossa)
  - the lateral wall of the third ventricle below the hypothalamic sulcus



Sagittal section through the 3rd Ventricle



Structures in the floor of the 3rd ventricle (Interpeduncular fossa)

Boundaries of the hypothalamus

- As seen in a sagittal section of the brain
  - Anteriorly – lamina terminalis
  - Inferiorly – floor of third ventricle
  - Posterosuperiorly – hypothalamic sulcus
- As seen on the base of the brain
  - From before backward,
    - Optic chiasma, tuber cinereum, infundibular stalk, mamillary bodies, posterior perforated substance
  - Each side – optic tract, crus cerebri

Parts of the Hypothalamus

- There are 3 subdivisions of the hypothalamus.
- Optic part, tuberal part and mamillary part
- The nuclei in each part are as follows.

- Optic part - Supraoptic nucleus (SON)
  - Paraventricular nucleus (PON)

- Tuberal part - Ventromedial nucleus
  - Dorsomedial nucleus
  - Tuberal nucleus

- Mamillary part - Posterior nucleus
  - Lateral nucleus

Connections of the Hypothalamus

- Afferents
  - from spinal cord and brainstem (reticular formation)
  - Olfactory pathways
  - Cerebellum
  - Retina
  - SON
  - Frontal lobe
  - Hippocampus
  - Corpus striatum

Efferents

- Supraoptic hypophyseal tract
  - from Optic nuclei to pars posterior, pars tuberalis and pars intermedia of Pituitary
- Mamillo thalamic tract
- Mamillo Tegmental tract

Functions of the Hypothalamus

- Hypothalamus is a complex neuro glandular organ
- Concerned with visceral and vasomotor activities of the body.

Endocrine control

- Secretes releasing hormones
  - TRH
  - CRH
  - GHRH
  - GnRH
  - PRH
- Secretes release inhibiting hormones
  - GHRIH
  - PRIH
- Also produces
  - Oxytocin
  - Vasopressin

Neurosecretion

- SON secretes Oxytocin
- PVN secretes Vasopressin(ADH)
- And transported to the posterior lobe of the pituitary

General Autonomic Effects of the Hypothalamus

- Thermoregulation
  - Balance between heat production and heat loss
- Regulation of food/fluid intake
  - Via feeding centre, satiety centre and thirst centre

- Sexual behaviour and reproduction
  - Control gametogenesis, reproductive cycles, maturation and maintenance of secondary sexual characteristics
- Biological clock
  - Maintain the cyclic variations
  - Eg. Sleep – via hypnogenic zones
- Emotional control
  - fear, rage, aversion, pleasure, reward

Clinical features of Hypothalamic disease

- Obesity –(Frolich syndrome / Laurence-Moon-Biedl syndrome) – due to hyperphagia
- Diabetes insipidus
- Hyperglycaemia & Glycosuria
- Sleep disturbances – somnolence or narcolepsy
- Sexual disturbances – precocity or impotence
- Emotional disturbances
- Diencephalic autonomic epilepsy