HYPOTHALAMUS

I. FUNCTIONS

- A. Direct control of autonomic nervous system \rightarrow visceromotor behaviors
 - i. Anterior/medial regions → parasympathetic effects
 - ii. Posterior/lateral regions → sympathetic effects
 - iii. Thermodetectors, chemoreceptors
 - iv. Regulation of micturition, defecation (motor centers in medullary reticular formation)
- B. Hormonal control of <u>pituitary system</u> → regulate endocrine levels
 - i. Release/release-inhibiting factors in arcuate nucleus, receptors for many circulating hormones → homeostatic control of pituitary hormones (LH, FSH, ACTH, TSH)
 - ii. Osmoreceptors → vasopressin (ADH); oxytocin to mammary gland
 - iii. Gonadal hormones → in utero morphological differentiation (anatomy, behavior, hormones, *brain organization)
 - *MPN larger in males, VMN in females → regulates sexual behavior
- C. Communication with <u>limbic system, midbrain</u> → emotional experience and expression, species-preserving behaviors
 - i. Hunger and satiety centers (neurons sensitive to blood glucose), drinking center
 - ii. Circadian rhythms sleep/wake, arousal, biological clocks
 - iii. Emotions: fear, rage, aversion, pleasure, reward

II. ORGANIZATION

- A. Anterior-Posterior levels
 - i. Preoptic region medial/lateral preoptic, suprachiasmatic nuclei
 - ii. Anterior region paraventricular, anterior, supraoptic nuclei
 - iii. Tuberal region dorsomedial, ventromedial, arcuate nuclei
 - iv. Posterior region posterior nucleus, mamillary body
- B. Medial-Lateral zones
 - i. Periventricular zone periventricular, paraventricular, arcuate nuclei
 - ii. Medial zone MPN, SCN; AN; DM, VM; PN, MMB
 - iii. Lateral zone lateral hypothalamic area, LPN, SON

^{*}also reports back to neocortex via limbic system \rightarrow conveys homeostatic state

III. PATHWAYS AND NUCLEI

Function	Pathway	Afferents	Nuclei	Efferents
Autonomic nervous	Dorsal Longitudinal	Nucleus of tractus solitarius →	Periventricular	Midbrain central gray
system	fasciculus	parabrachial nucleus	Posterior	Ventral tegmental area (DA)
		(taste, pain, general visceral		Medulla, autonomic centers
		sensation)		Brainstem
				Sympathetic and paras of spinal
				cord = hypothalamo-spinal tract
Pituitary Endocrine	Supraoptico-	Receptors responsive to	Paraventricular	Supraoptico-hypophyseal tract
function	hypophyseal tract	physiological state – feedback	Supraoptic	→ post. pituitary capillaries (rel
			(magnocellular)	ADH, OXT)
	Tuberoinfundibular		Arcuate	Tuberoinfundibular tract →
	tract		(parvocellular)	Median eminence → hypophys
				portal vein (release/rel-inhib
				factors to anterior pituitary)
Circadian Rhythms	Retinohypothalamic	Retinal ganglion cells	Suprachiasmatic	Endogenous oscillator in SCN →
	fibers	(melanopsin – respons to light)		normal circadian rhythms, reset
		→ optic tract fibers		by retinal input (normal24.5 hrs)
Species-preserving	Medial forebrain bundle	LMA incl VTA (info on species-	LHA	Basal forebrain area, picks up
behaviors	(MFB)	preserving behaviors,	Ventromedial	fibers from LHA → limbic
*Hypothal motivates,		rewarding properties of behav)		midbrain areas
limbic system selects	Mammillary peduncle	Periaqueductal gray of LMA	Mammillary	Midbrain reticular formation
among them	(MP)	(info abt pain, aversive stimuli)	bodies	
Connections with	1)Fornix	Hippocampus	MMB and LHA	Significance of events
higher cortex – limbic	2)Ventral amygdalofug	Amygdala → basal forebrain	LHA	Amgydala - signif of visc-sens
system and prefrontal	3)Stria terminalis	Amygdala	Periventricular	Amygdala
cortex	4) diffuse fibers		Periventricular	MD, intralam nuc (thal) -> ant
				cing cx, prefrontal
	5)mammilothal tract		Mammillary bodies	Ant thal nuc→ entire cing cx
	6)MFB	Basal forebrain	Entire hypothal	Telencephalic , midbrain limbic