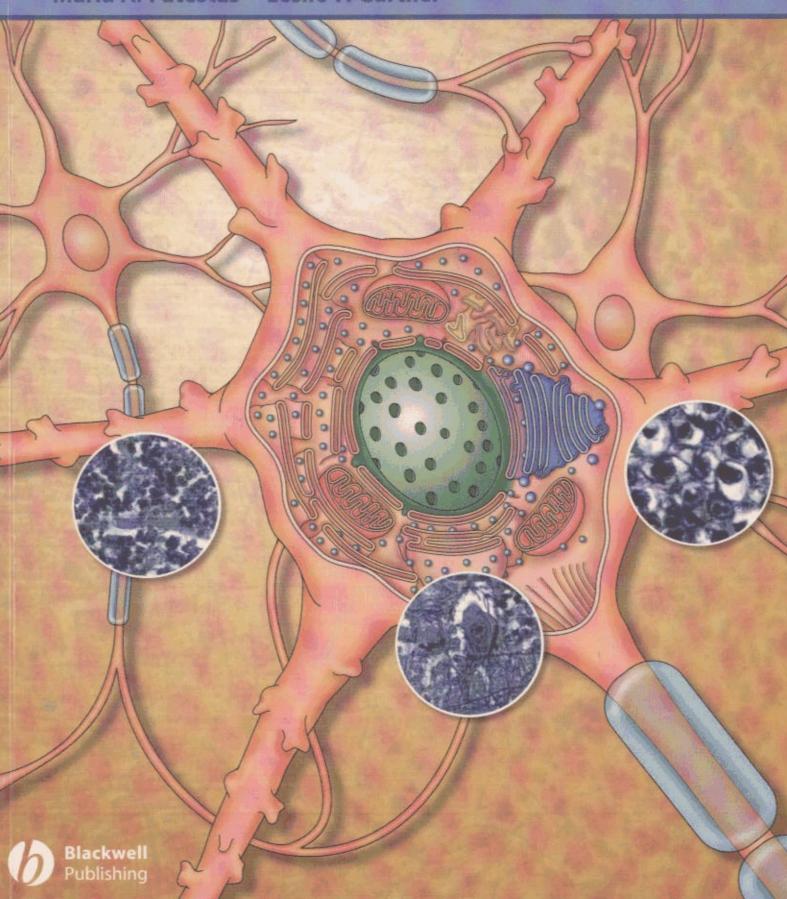
a textbook of

## NEUROANATOMY



Maria A. Patestas · Leslie P. Gartner



## Contents

Preface	viii	Follow-up to clinical case	67
***		Questions to ponder	67
Part 1 General Principles of the		Chapter 6 Gross Anatomy of the Brain	68
Nervous System	1	Clinical case	68
Mervous system	•	Cerebrum	69
at 1 1 Industrian to the Newyone System	3	Diencephalon	77
Chapter 1 Introduction to the Nervous System	3	Cerebellum	77
Cells of the nervous system	5	Brainstem	80
Central nervous system	7	Clinical considerations	82
Peripheral nervous system	9	Synonyms and eponyms	82
Questions to ponder	,	Follow-up to clinical case	82
Cl. (2 Decelerated the Newsons Crystom	10	Questions to ponder	83
Chapter 2 Development of the Nervous System	10	Questions to permit	
Clinical case	11	Chapter 7 Meninges and Cerebrospinal Fluid	84
Early development	12	Clinical case	84
Neurulation	18	Cranial meninges	85
Early development of the spinal cord and brain	19	Spinal meninges	92
Development of the spinal cord	21	Venous sinuses of the cranial dura mater	93
Development of the brain	26	Cerebrospinal fluid	95
Clinical considerations	20 27	Ventricles of the brain	95
Synonyms and eponyms	27	Clinical considerations	97
Follow-up to clinical case	27	Synonyms and eponyms	97
Questions to ponder	27	Follow-up to clinical case	97
	••	Questions to ponder	98
Chapter 3 Histophysiology of the Nervous System	28	~	
Clinical case	28	Chapter 8 Vascular Supply of the Central	
Neurons	29	Nervous System	99
Neuroglia	35	Clinical case	99
Generation and conduction of nerve impulses	38	Vascular supply of the spinal cord	100
Clinical considerations	42	Arterial supply of the brain	101
Synonyms and eponyms	43	Venous drainage of the brain	112
Follow-up to clinical case	43	Clinical considerations	116
Questions to ponder	43	Synonyms and eponyms	117
		Follow-up to clinical case	117
Chapter 4 Neurotransmitter Substances	44	Questions to ponder	117
Clinical case	44	•	
Classification of neurotransmitter substances	47	Chapter 9 Autonomic Nervous System	118
Clinical considerations	52	Clinical case	118
Follow-up to clinical case	53	Sympathetic nervous system	119
Questions to ponder	53	Parasympathetic nervous system	120
•		Enteric nervous system	129
Chapter 5 Spinal Cord	54	Neurotransmitters and receptors of the	
Clinical case	54	autonomic nervous system	13
Morphology of the spinal cord	55	Pelvic autonomic functions	13
Internal morphology of the spinal cord	60	Clinical considerations	13
Vascular supply of the spinal cord	63	Synonyms and eponyms	13
Clinical considerations	66	Follow-up to clinical case	13
Synonyms and eponyms	67	Questions to ponder	13

## vi • • • CONTENTS

Part 2 Integrative Components of the		Chapter 14 Reticular Formation	241
Nervous System	135	Clinical case	241
,		Morphology of the reticular formation	241
Chapter 10 Ascending Sensory Pathways	137	Zones of the reticular formation	242
Clinical case	137	Nuclei associated with the reticular formation	245
Sensory receptors	138	Input to and output from the reticular formation	245
Anterolateral system	146	Functions of the reticular formation	245
	154	Clinical considerations	250
Tactile sensation and proprioception	157	Synonyms and eponyms	251
Sensory pathways to the cerebellum Clinical considerations	161	Follow-up to clinical case	251
	166	Questions to ponder	252
Modulation of nociception	168	~ 1	
Neuroplasticity	169	Chapter 15 Cranial Nerves	253
Synonyms and eponyms	170	Clinical case	253
Follow-up to clinical case	170 1 <b>7</b> 0	Olfactory nerve (CN I)	256
Questions to ponder	170	Optic nerve (CN II)	256
		Oculomotor nerve (CN III)	258
Chapter 11 Motor Cortex and Descending		Trochlear nerve (CN IV)	260
Motor Pathways	171	Trigeminal nerve (CN V)	261
Clinical case	171	Abducent nerve (CN VI)	266
Cortical areas controlling motor activity	172	Facial nerve (CN VII)	268
Descending motor pathways	174	Vestibulocochlear nerve (CN VIII)	272
Clinical considerations	187	Glossopharyngeal nerve (CN IX)	272
Synonyms and eponyms	188	Vagus nerve (CN X)	274
Follow-up to clinical case	189	Spinal accessory nerve (CN XI)	277
Questions to ponder	189	Hypoglossal nerve (CN XII)	277
-		Synonyms and eponyms	280
Chapter 12 Basal Ganglia	190	Follow-up to clinical case	280
Clinical case	190	Questions to ponder	281
Components of the basal ganglia	191	Questions to portue	201
Nuclei associated with the basal ganglia	196	Chapter 16 Visual System	282
Input, intrinsic, and output nuclei of the basal ganglia	196	Clinical case	282
Connections of the basal ganglia	198	Eye	282
Circuits connecting the basal ganglia, thalamus,		Central visual pathways	287
and cerebral cortex	205	Visual reflexes	291
Other circuits of the basal ganglia	207	Clinical considerations	298
Neurotransmitters of the basal ganglia	208		302
"Direct" and "indirect" loops (pathways) of the		Synonyms and eponyms	302
basal ganglia	209	Follow-up to clinical case Questions to ponder	303
Circuits that modulate activity of the basal ganglia	210	Questions to ponder	303
Clinical considerations	212	Chanton 17 Auditour Greatom	304
Synonyms and eponyms	217	Chapter 17 Auditory System Clinical case	304 304
Follow-up to clinical case	218	Ear	
Questions to ponder	218		304
Questions to policie		Auditory transmission	308
Chamber 12 Comballium	210	Central auditory pathways	309
Chapter 13 Cerebellum	<b>219</b>	Clinical considerations	315
Clinical case	219	Synonyms and eponyms	316
Morphology of the cerebellum	220	Follow-up to clinical case	316
Cerebellar peduncles	227	Questions to ponder	317
Deep cerebellar nuclei	229	01 ( 40 % (1 1 0 )	240
Afferents (input) to the cerebellum	231	Chapter 18 Vestibular System	318
Efferents (output) from the cerebellum	235	Clinical case	318
Functional organization of the cerebellum:	201	Vestibular apparatus	319
intrinsic circuitry	236	Vestibular nerve (CN VIII)	325
Clinical considerations	238	Central pathways of the vestibular system	326
Synonyms and eponyms	240	Control of ocular movements	329
Follow-up to clinical case	240	Vestibular nystagmus	332
Questions to ponder	240	Caloric nystagmus	334

Synonyms and eponyms	334	Clinical considerations	382
Follow-up to clinical case	334	Synonyms and eponyms	383
Questions to ponder	335	Follow-up to clinical case	383
Question 1		Questions to ponder	384
Chapter 19 Olfactory System	336		
Clinical case	336	Chapter 22 Thalamus	385
Olfactory receptor cells	336	Clinical case	385
Olfactory transduction	338	Borders	385
Olfactory nerve (CN I)	338	Anatomy	385
Central connections of the olfactory system	339	Internal and external medullary laminae	388
Clinical considerations	342	Thalamic nuclei	389
Synonyms and eponyms	342	Clinical considerations	395
Follow-up to clinical case	342	Synonyms and eponyms	396
Questions to ponder	343	Follow-up to clinical case	396
1		Questions to ponder	397
Chapter 20 Limbic System	344		
Clinical case	344	Chapter 23 Cerebral Cortex	398
Limbic lobe	345	Clinical case	398
Brainstem centers associated with limbic		Cells of the cerebral cortex	400
system function	355	Types of cortex	402
Pathways of the limbic system	356	Cell layers of the neocortex	402
Clinical considerations	358	Vertical columnar organization of the cerebral cortex	404
Synonyms and eponyms	359	Afferents (input) to the cerebral cortex	404
Follow-up to clinical case	359	Efferents (output) from the cerebral cortex	404
Questions to ponder	360	Internal capsule and corona radiata	406
<b>Q.1.0</b>		Lobes of the cerebral cortex	408
Chapter 21 Hypothalamus	361	Functional areas of the cerebral cortex	408
Clinical case	361	Cerebral dominance	417
Borders	362	Clinical considerations	417
Hypothalamic zones and component nuclei	362	Synonyms and eponyms	421
Hypothalamic regions (areas) and component nuclei	368	Follow-up to clinical case	422
	370	Questions to ponder	423
Connections of the hypothalamus		-	
Pathways of the hypothalamus	370 274	Questions to ponder: answers to odd questions	425
Functions of the hypothalamus	374	A	
Hypothalamohypophyseal connections	376	Index	435