Table B. Basic Cell Groups of the Rat CNS

BRAIN [encephalon] (BR)

CEREBRUM [cerebral hemispheres, endbrain, telencephalon] (CH) **[1]**

CEREBRAL CORTEX (CTX) **[2]**

Layers 1-6a [cortical plate] (CTXpl) **[3]**

Somatic motor areas (MO) **[4]**

primary motor area (MOp)

secondary motor areas (MOs)

Auditory areas (AUD) **[5]**

primary auditory area (AUDp) **[5]**

dorsal auditory areas (AUDd) **[6]**

ventral auditory areas (AUDv) **[7]**

Gustatory area (GU) **[8]**

Olfactory areas (OLF) **[9]**

main olfactory bulb (MOB) **[10]**

glomerular layer (MOBgl)

outer plexiform layer (MOBopl)

mitral layer (MOBmi)

inner plexiform layer (MOBipl)

granule cell layer (MOBgr)

accessory olfactory bulb (AOB) **[10]**

glomerular layer (AOBgl)

mitral layer (AOBmi)

granular layer (AOBgr)

anterior olfactory nucleus (AON) **[11]**

dorsal part (AONd)

molecular layer (AONd1)

pyramidal layer (AONd2)

external part (AONe)

molecular layer (AONe1)

pyramidal layer (AONe2)

lateral part (AONl)

molecular layer (AONl1)

pyramidal layer (AONl2)

medial part (AONm)

molecular layer (AONm1)

pyramidal layer (AONm2)

posteroventral part (AONpv)

molecular layer (AONpv1)

pyramidal layer (AONpv2)

taenia tecta (TT) **[12]**

dorsal part (TTd)

layers 1-4 (TTd1-4)

ventral part (TTv)

layers 1-3 (TTv1-3)

piriform area (PIR) **[13]**

molecular layer (PIR1)

pyramidal layer (PIR2)

polymorph layer (PIR3)

postpiriform transition area (TR) **[14]**

piriform-amygdaloid area (PAA) **[15]**

nucleus of the lateral olfactory tract (NLOT) **[16]**

molecular layer (NLOT1)

pyramidal layer (NLOT2)

dorsal cap (NLOT3) **[17]**

cortical nucleus of the amygdala (COA)

anterior part (COAa) **[18]**

posterior part (COAp) **[19]**

lateral zone (COApl)

medial zone (COApm)

Somatosensory areas (SS)

primary somatosensory area (SSp) **[20]**

barrel field (SSp-bfd)

lower limb (SSp-ll)

mouth (SSp-m)

nose (SSp-n)

trunk (SSp-tr)

upper limb (SSp-ul)

supplemental somatosensory area (SSs) **[21]**

Visceral area (VISC) **[22]**

Visual areas (VIS) **[23]**

anterior laterolateral visual area (VISlla)

anterolateral visual area (VISal)

anteromedial visual area (VISam)

intermediolateral visual area (VISli)

laterolateral visual area (VISll)

mediolateral visual area (VISlm)

posterolateral visual area (VISpl)

primary visual area (VISp)

rostrolateral visual area (VISrl)

Agranular insular area (AI) **[24]**

dorsal part (AId) **[25]**

ventral part (AIv) **[25]**

posterior part (AIp) **[25]**

Anterior cingulate area (ACA) **[26]**

dorsal part (ACAd)

ventral part (ACAv)

Ectorhinal area (ECT) **[27]**

Hippocampal formation (HPF) **[28]**

retrohippocampal region (RHP)

entorhinal area (ENT)

lateral part (ENTl)

layers 1-6 (ENTl1-6)

medial part, dorsal zone (ENTm)

layers 1-6 (ENTm1-6)

medial part, ventral zone (ENTmv)

presubiculum (PRE)

layers 1-6 (PRE1-6)

postsubiculum (POST)

layers 1-6 (POST1-6)

parasubiculum (PAR)

layers 1-6 (PAR1-6)

subiculum (SUB)

dorsal part (SUBd)

molecular layer (SUBd-m)

stratum radiatum (SUBd-sr)

pyramidal layer (SUBd-sp)

ventral part (SUBv)

molecular layer (SUBv-m)

stratum radiatum (SUBv-sr)

pyramidal layer (SUBv-sp)

hippocampal region (HIP)

Ammon's horn (CA)

field CA_1 (CA1)

stratum lacunosum-moleculare (CA1slm)

stratum radiatum (CA1sr)

pyramidal layer (CA1sp)

deep (CA1spd)

superficial (CA1sps)

stratum oriens (CA1so)

field CA_2 (CA2)

stratum lacunosum-moleculare (CA2slm)

stratum radiatum (CA2sr)

pyramidal layer (CA2sp)

stratum oriens (CA2so)

field CA_3 (CA3)

stratum lacunosum-moleculare (CA3slm)

stratum radiatum (CA3sr)

stratum lucidum (CA3slu)

pyramidal layer (CA3sp)

stratum oriens (CA3so)

dentate gyrus (DG)

crest (DGcr)

molecular layer (DGcr-mo)

granule cell layer (DGcr-sg)

polymorph layer (DGcr-po)

lateral blade (DGlb)

molecular layer (DGlb-mo)

granule cell layer (DGlb-sg)

polymorph layer (DGlb-po)

medial blade (DGmb)

molecular layer (DGmb-mo)

granule cell layer (DGmb-sg)

polymorph layer (DGmb-po)

induseum griseum (IG) **29**

fasciola cinerea (FC) **[30]**

Infralimbic area (ILA) **[31]**

Orbital area (ORB) **[32]**

lateral part (ORBl)

medial part (ORBm)

ventral part (ORBv)

ventrolateral part (ORBvl)

Perirhinal area (PERI) **[33]**

Posterior parietal association areas (PTLp) **[34]**

Prelimbic area (PL) **[35]**

Retrosplenial area (RSP) **[36]**

dorsal part (RSPd) **[37]**

lateral agranular part (RSPagl) **[38]**

ventral part (RSPv) **[39]**

zone a (RSPv-a)

zone b/c (RSPv-b/c)

Ventral temporal association areas (TEv) **[40]**

Layer 6b [layer 7, subplate, deep cortex, claustral complex] (CTXsp) **[41]**

Layer 6b, isocortex (6b) **[42]**

Claustrum (CLA) **[43]**

Endopiriform nucleus (EP) **[44]**

dorsal part (EPd)

ventral part (EPv)

Lateral nucleus of the amygdala (LA) **[45]**

Basolateral nucleus of the amygdala (BLA) **[45]**

anterior part (BLAa)

posterior part (BLAp)

Basomedial nucleus of the amygdala (BMA) **[46]**

anterior part (BMAa)

posterior part (BMAp)

Posterior nucleus of the amygdala (PA) **[47]**

BASAL NUCLEI [basal ganglia] (BG) **[48]**

Striatum (STR)

dorsal region (STRd)

caudoputamen (CP) **[49]**

ventral region (STRv)

nucleus accumbens (ACB) **[50]**

fundus of the striatum (FS) **[51]**

olfactory tubercle (OT) **[52]**

molecular layer (OT1)

pyramidal layer (OT2)

polymorph layer (OT3)

islands of Calleja (isl) **[53]**

major island of Calleja (islm) **[54]**

medial (septal) region (STRm)

lateral septal complex (LSX) **[55]**

lateral septal nucleus (LS)

caudal (caudodorsal) part (LSc)

dorsal zone (LSc.d)

rostral region (LSc.d.r)

dorsal region (LSc.d.d)

lateral region (LSc.d.l)

ventral region (LSc.d.v)

ventral zone (LSc.v)

medial region (LSc.v.m)

dorsal domain (LSc.v.m.d)

ventral domain (LSc.v.m.v)

intermediate region (LSc.v.i)

lateral region (LSv.v.l)

dorsal domain (LSc.v.l.d)

ventral domain (LSc.v.l.v)

rostral (rostroventral) part (LSr)

medial zone (LSr.m)

dorsal region (LSr.m.d)

ventral region (LSr.m.v)

rostral domain (LSr.m.v.r)

caudal domain (LSr.m.v.c)

ventrolateral zone (LSr.vl)

dorsal region (LSr.vl.d)

medial domain (LSr.vl.d.m)

lateral domain (LSr.vl.d.l)

ventral region (LSr.vl.v)

dorsolateral zone (LSr.dl)

medial region (LSr.dl.m)

dorsal domain (LSr.dl.m.d)

ventral domain (LSr.dl.m.v)

lateral region (LSr.dl.l)

dorsal domain (LSr.dl.l.d)

ventral domain (LSr.dl.l.v)

ventral part (LSv)

septofimbrial nucleus (SF)

septohippocampal nucleus (SH)

caudal (amygdalar) region (STRc)

anterior amygdaloid area (AAA) **[56]**

central nucleus of the amygdala (CEA) **[57]**

medial part (CEAm)

lateral part (CEAl)

capsular part (CEAc)

medial nucleus of the amygdala (MEA) **[58]**

anterodorsal part (MEAad)

anteroventral part (MEAav)

posterodorsal part (MEApd)

sublayers a-c (MEApd-a,b,c)

posteroventral part (MEApv)

bed nucleus of the accessory olfactory tract (BA) **[59]**

intercalated nuclei of the amygdala (IA) **[60]**

Pallidum (PAL)

dorsal region (PALd)

globus pallidus (GP) **[61]**

lateral segment (GPl)

medial segment (GPm)

ventral region (PALv)

substantia innominata (SI) **[62]**

magnocellular preoptic nucleus (MA) **[63]**

medial septal complex (MSC) **[64]**

medial septal nucleus (MS)

nucleus of the diagonal band (NDB)

triangular nucleus of the septum (TRS) **[65]**

rostral region (PALr)

bed nuclei of the stria terminalis (BST) **[66]**

anterior division (BSTa)

anterodorsal area (BSTad)

anterolateral area (BSTal)

anteroventral area (BSTav)

oval nucleus (BSTov)

juxtacapsular nucleus (BSTju)

rhomboid nucleus (BSTrh)

dorsomedial nucleus (BSTdm)

dorsolateral nucleus (BSTdl)

fusiform nucleus (BSTfu)

ventral nucleus (BSTv)

magnocellular nucleus (BSTmg)

posterior division (BSTp)

principal nucleus (BSTpr)

interfascicular nucleus (BSTif)

transverse nucleus (BSTtr)

premedullary nucleus (BSTpm)

dorsal nucleus (BSTd)

strial extension (BSTse)

cell-sparse zone (BSTsz)

bed nucleus of the anterior commissure (BAC) **[67]**

bed nucleus of the stria medullaris (BSM) **[68]**

CEREBELLUM [parencephalon] (CB **[69]**

CEREBELLAR CORTEX (CBX) **[70]**

Vermal regions (VERM)

lingula (I) (LING)

central lobule (CENT)

lobule II (CENT2)

sublobules a,b (CENT2a,b)

lobule III (CENT3)

sublobules a,b (CENT3a,b)

culmen (CUL)

lobules IV,V (CUL4,5)

declive (VI) (DEC)

sublobules a-d (DECa-d)

folium-tuber vermis (VII) (FOTU)

pyramus (VIII) (PYR)

sublobules a,b (PYRa,b)

uvula (IX) (UVU)

sublobules ab,c (UVUab,c)

nodulus (X) (NOD)

sublobules a,b (NODa,b)

Hemispheric regions (HEM)

simple lobule (SIM)

sublobules a,b (SIMa,b)

ansiform lobule (AN)

crus 1 (ANcr1)

sublobules a-d (ANcr1a-d)

crus 2 (ANcr2)

sublobules a,b (ANcr2a,b)

paramedian lobule (PRM)

copula pyramidis (COPY)

sublobules a,b (COPYa,b)

paraflocculus (PFL)

flocculus (FL)

DEEP CEREBELLAR NUCLEI (DNC) **[71]**

Fastigial nucleus (FN)

Interposed nucleus (IP)

parvicellular part (IPp)

Dentate nucleus (DN)

parvicellular part (DNp)

BRAINSTEM (BS) **[72]**

INTERBRAIN [diencephalon] (DI)

THALAMUS (TH) **[73]**

Dorsal Thalamus (DOR) **[74]**

Anterior group of the dorsal thalamus (ATN) **[75]** anteroventral nucleus of the thalamus (AV) **[76]**

anteromedial nucleus of the thalamus (AM) **[76]**

dorsal part (AMd) **[77]**

ventral part (AMv) **[77]**

anterodorsal nucleus of the thalamus (AD) **[78]**

interanteromedial nucleus of the thalamus (IAM) **[79]**

interanterodorsal nucleus of the thalamus (IAD) **[80]**

lateral dorsal nucleus of the thalamus (LD) **[81]**

Medial group of the dorsal thalamus (MED) **[82]**

mediodorsal nucleus of the thalamus (MD) **[83]**

medial part (MDm)

central part (MDc)

lateral part (MDl)

intermediodorsal nucleus of the thalamus (IMD)

submedial nucleus of the thalamus (SMT) **[84]**

perireuniens nucleus (PR) **[85]**

Midline group of the dorsal thalamus (MTN) **[86]**

paraventricular nucleus of the thalamus (PVT) **[87]**

parataenial nucleus (PT) **[88]**

nucleus reuniens (RE) **[89]**

rostral division

rostral part (REr)

dorsal part (REd)

ventral part (REv)

lateral part (REl)

median part (REm) **[90]**

caudal division

caudal part (REc)

dorsal part (REcd)

median part (REcm)

Intralaminar nuclei of the dorsal thalamus (ILM) **[91]**

rhomboid nucleus (RH) **[92]**

central medial nucleus of the thalamus (CM) **[93]**

paracentral nucleus of the thalamus (PCN) **[93]**

central lateral nucleus of the thalamus (CL) **[94]**

parafascicular nucleus (PF) **[95]**

Lateral group of the dorsal thalamus (LAT) **[96]**

lateral posterior nucleus of the thalamus (LP) **[97]**

posterior complex of the thalamus (PO) **[98]**

suprageniculate nucleus (SGN) **[99]**

posterior limiting nucleus of the thalamus (POL) **[99]**

Ventral group of the dorsal thalamus (VENT) **[100]**

ventral anterior-lateral complex of the thalamus (VAL) **[101]**

ventral medial nucleus of the thalamus (VM) **[102]**

ventral posterior complex of the thalamus (VP)

ventral posterolateral nucleus of the thalamus (VPL) **[103]** parvicellular part (VPLpc) **[104]**

ventral posteromedial nucleus of the thalamus (VPM) **[105]**

parvicellular part (VPMpc) **[106]**

Geniculate group of the dorsal thalamus (GENd) **[107]**

medial geniculate complex (MG) **[108]**

dorsal part (MGd)

ventral part (MGv)

medial part (MGm)

dorsal part of the lateral geniculate complex (LGd) **[109]**

Subfornical organ (SFO) **[110]**

Epithalamus (EPI) **[111]**

Medial habenula (MH) **[112]**

dorsal part (MHd) **[113]**

ventral part (MHv) **[113]**

Lateral habenula (LH) **[114]**

Ventral Thalamus (VNT) **[115]**

Reticular nucleus of the thalamus (RT) **[116]**

Geniculate group of the ventral thalamus (GENv)

intergeniculate leaflet of the lateral geniculate complex (IGL) **[117]**

ventral part of the lateral geniculate complex (LGv) **[118]**

lateral zone (LGvl)

medial zone (LGvm)

Zona incerta (ZI) **[119]**

dopaminergic group (ZIda) **[120]**

fields of Forel (FF) **[121]**

Peripeduncular nucleus (PP) **[122]**

Subparafascicular nucleus (SPF) **[123]**

magnocellular part (SPFm)

parvicellular part (SPFp)

HYPOTHALAMUS (HY) **[124]**

Periventricular zone of the hypothalamus (PVZ) **[125]**

vascular organ of the lamina terminalis (OV) **[126]**

suprachiasmatic preoptic nucleus (PSCH) **[127]**

median preoptic nucleus (MEPO) **[128]**

anteroventral periventricular nucleus (AVPV) **[129]**

preoptic periventricular nucleus (PVpo) **[130]**

supraoptic nucleus (SO) **[131]**

retrochiasmatic part (SOr)

accessory supraoptic group (ASO)

nucleus circularis (NC)

paraventricular nucleus of the hypothalamus (PVH) **[132]**

descending division (PVHd)

medial parvicellular part, ventral zone (PVHmpv)

dorsal parvicellular part (PVHdp)

lateral parvicellular part (PVHlp)

forniceal part (PVHf)

magnocellular division (PVHm)

anterior magnocellular part (PVHam)

medial magnocellular part (PVHmm)

posterior magnocellular part (PVHpm)

medial zone (PVHpmm)

lateral zone (PVHpml)

parvicellular division (PVHp)

anterior parvicellular part (PVHap)

medial parvicellular part, dorsal zone (PVHmpd)

periventricular part (PVHpv)

anterior periventricular nucleus of the hypothalamus (PVa) **[133]**

dorsomedial nucleus of the hypothalamus (DMH) **[134]**

anterior part (DMHa) **[135]**

posterior part (DMHp) **[136]**

ventral part (DMHv) **[137]**

intermediate periventricular nucleus of the hypothalamus (PVi) **[138]**

arcuate nucleus of the hypothalamus (ARH) **[139]**

posterior periventricular nucleus of the hypothalamus (PVp) **[140]**

Medial zone of the hypothalamus (MEZ) **[141]**

medial preoptic area (MPO) **[142]**

medial preoptic nucleus (MPN) **[143]**

lateral part (MPNl)

medial part (MPNm)

central part (MPNc)

anterodorsal preoptic nucleus (ADP) **[144]**

anteroventral preoptic nucleus (AVP) **[145]**

posterodorsal preoptic nucleus (PD) **[145]**

parastrial nucleus (PS) **[145]**

anterior hypothalamic area (AHA) **[146]**

anterior hypothalamic nucleus (AHN) **[147]**

anterior part (AHNa) **[148]**

central part (AHNc) **[148]**

posterior part (AHNp) **[148]**

dorsal part (AHNd) **[149]**

suprachiasmatic nucleus (SCH) **[150]**

dorsomedial part (SCHd)

ventrolateral part (SCHv)

subparaventricular zone (SBPV) **[151]**

retrochiasmatic area (RCH) **[152]**

tuberal area of the hypothalamus (TUA) **[153]**

ventromedial nucleus of the hypothalamus (VMH) **[154]**

anterior part (VMHa)

dorsomedial part (VMHdm)

central part (VMHc)

ventrolateral part (VMHvl)

ventral premammillary nucleus (PMv) **[155]** mammillary body (MBO) **[156]**

tuberomammillary nucleus (TM) **[157]**

dorsal part (TMd)

ventral part (TMv)

supramammillary nucleus (SUM) **[158]**

lateral part (SUMl)

medial part (SUMm)

dorsal premammillary nucleus (PMd) **[159]**

medial mammillary nucleus (MM) **[160]**

median part (MMme)

lateral mammillary nucleus (LM) **[160]**

posterior hypothalamic nucleus (PH) **[161]**

Lateral zone of the hypothalamus (LZ) **[162]**

lateral preoptic area (LPO) **[163]**

lateral hypothalamic area (LHA) **[164]**

tuberal nucleus (TU) **[165]**

subthalamic nucleus (STN) **[166]**

RETINA (R) **[167]**

Outer nuclear layer (Ronl)

Outer plexiform layer (Ropl)

Inner nuclear layer (Rinl)

Inner plexiform layer (Ripl)

Ganglion cell layer (Rgcl)

MIDBRAIN-HINDBRAIN [mesencephalon-rhombencephalon] (MB-HB)

SENSORY

Visual

superior colliculus (SC) **[168]**

zonal layer (SCzo)

superficial gray layer (SCsg)

optic layer (SCop)

intermediate gray layer (SCig)

sublayers a-c (SCig-a,b,c)

intermediate white layer (SCiw)

deep gray layer (SCdg)

deep white layer (SCdw)

parabigeminal nucleus (PBG) **[169]**

pretectal region (PRT) **[170]**

olivary pretectal nucleus (OP) **[171]**

nucleus of the optic tract (NOT) **[172]**

posterior pretectal nucleus (PPT) **[173]**

nucleus of the posterior commissure (NPC) **[174]**

anterior pretectal nucleus (APN) **[175]**

medial pretectal area (MPT) **[176]**

medial terminal nucleus of the accessory optic tract (MT) **[177]**

lateral terminal nucleus of the accessory optic tract (LT) **[178]**

dorsal terminal nucleus of the accessory optic tract (DT) **[178]**

Somatosensory

trigeminal ganglion (GV) **[179]**

mesencephalic nucleus of the trigeminal (MEV) **[180]**

principal sensory nucleus of the trigeminal (PSV) **[181]**

spinal nucleus of the trigeminal (SPV) **[182]**

oral part (SPVO) **[183]**

ventrolateral part (SPVOvl)

rostral dorsomedial part (SPVOrdm)

middle dorsomedial part, dorsal zone (SPVOmdmd)

middle dorsomedial part, ventral zone (SPVOmdmv)

caudal dorsomedial part (SPVOcdm)

interpolar part (SPVI) **[184]**

caudal part (SPVC) **[185]**

paratrigeminal nucleus (PAT) **[186]**

dorsal column nuclei (DCN) **[187]**

gracile nucleus (GR) **[188]**

median part (GRm) **[189]**

cuneate nucleus (CU) **[190]**

nucleus z (z) **[191]**

external cuneate nucleus (ECU) **[192]**

Auditory

cochlear nuclei (CN) **[193]**

dorsal nucleus (DCO) **[193]**

ventral nucleus (VCO) **[193]**

anterior part (VCOa)

posterior part (VCOp)

subpeduncular granular region of the cochlear nuclei (CNspg) **[194]**

granular lamina of the cochlear nuclei (CNlam) **[194]**

interstitial nucleus of the auditory nerve (IAN) **[195]**

nucleus of the trapezoid body (NTB) **[196]**

superior olivary complex (SOC) **[197]**

medial part (SOCm) **[198]**

lateral part (SOCl) **[199]**

periolivary region (POR) **[200]**

nucleus of the lateral lemniscus (NLL) **[201]**

inferior colliculus (IC) **[202]**

external nucleus (ICe)

dorsal nucleus (ICd)

central nucleus (ICc) **[203]**

nucleus of the brachium of the inferior colliculus (NB) **[204]**

nucleus sagulum (SAG)**[205]**

Vestibular

vestibular nuclei (VNC) **[206]**

medial vestibular nucleus (MV)

lateral vestibular nucleus (LAV)

superior vestibular nucleus (SUV)

spinal vestibular nucleus (SPIV)

perihypoglossal nuclei (PHY) **[207]**

nucleus intercalatus (NIS) **[208]**

nucleus prepositus (PRP) **[209]**

nucleus of Roller (NR) **[210]**

interstitial nucleus of the vestibular nerve (INV) **[211]**

nucleus x (x) **[211]**

nucleus y (y) **[212]**

infracerebellar nucleus (ICB) **[212]**

Gustatory

nucleus of the solitary tract, rostral zone of medial part (NTSm) **[213]**

Visceral

nucleus of the solitary tract (NTS) **[214]**

central part (NTSce) **[215]**

commissural part (NTSco) **[216]**

gelatinous part (NTSge) **[217]**

lateral part (NTSl) **[218]**

medial part, caudal zone (NTSm) **[219]**

area postrema (AP) **[220]**

parabrachial nucleus (PB) **[221]**

lateral division (PBl)

central lateral part (PBlc)

dorsal lateral part (PBld)

external lateral part (PBle)

extreme lateral part (PBlex)

internal lateral part (PBli)

superior lateral part (PBls)

ventral lateral part (PBlv)

Kölliker-Fuse subnucleus (KF)

medial division (PBm)

medial medial part (PBmm)

external medial part (PBme)

ventral medial part (PBmv) **[222]**

MOTOR

Eye

oculomotor nucleus (III) **[223]**

medial accessory nucleus (MAN) **[224]**

trochlear nucleus (IV) **[225]**

abducens nucleus (VI) **[225]**

accessory abducens nucleus (ACVI) **[226]**

Jaw

motor nucleus of the trigeminal (V) **[227]**

parvicellular part (Vpc) **[228]**

Face

facial nucleus (VII) **[229]**

accessory facial nucleus (ACVII) **[230]**

Labyrinth

efferent cochlear group (ECO) **[231]**

efferent vestibular nucleus (EV) **[232]**

Pharynx/Larynx/Esophagus

nucleus ambiguus, dorsal division (AMBd) **[233]**

stylopharyngeal motoneurons **[234]**

Neck

nucleus of the spinal accessory nerve (XI) **[235]**

Tongue

hypoglossal nucleus (XII) **[236]**

Viscera

Edinger-Westphal nucleus (EW) **[237]**

superior salivatory nucleus (SSN) **[238]**

inferior salivatory nucleus (ISN) **[239]**

dorsal motor nucleus of the vagus nerve (DMX) **[240]**

nucleus ambiguus, ventral division (AMBv) **[241]**

Extrapyramidal

substantia nigra (SN) **[242]**

compact part (SNc) **[243]**

reticular part (SNr) **[244]**

ventral tegmental area (VTA) **[245]**

PRE- & POSTCEREBELLAR NUCLEI

Pontine gray (PG) **[246]**

tegmental reticular nucleus (TRN) **[247]**

Inferior olivary complex (IO) **[248]**

dorsal accessory olive (IOda)

medial accessory olive (IOma)

principal olive (IOpr)

Lateral reticular nucleus (LRN) **[249]**

magnocellular part (LRNm)

parvicellular part (LRNp)

Linear nucleus of the medulla (LIN) **[250]**

Paramedian reticular nucleus (PMR) **[251]**

Parasolitary nucleus (PAS) **[252]**

Red nucleus (RN) **[253]**

RETICULAR CORE **[254]**

Central gray of the brain (CGB) **[255]**

periaqueductal gray (PAG) **[256]**

precommissural nucleus (PRC) **[257]**

commissural nucleus (COM) **[258]**

rostromedial division (PAGrm) **[259]**

rostrolateral division (PAGrl) **[260]**

medial division (PAGm) **[261]**

dorsal division (PAGd) **[261]**

dorsolateral division (PAGdl) **[262]**

ventrolateral division (PAGvl) **[263]** interstitial nucleus of Cajal (INC) **[264]**

nucleus of Darkschewitsch (ND) **[265]**

dorsal tegmental nucleus (DTN) **[266]**

ventral tegmental nucleus (VTN) **[266]**

anterior tegmental nucleus (AT) **[267]**

lateral tegmental nucleus (LTN) **[268]**

laterodorsal tegmental nucleus (LDT) **[269]**

sublaterodorsal nucleus (SLD) **[270]**

locus coeruleus (LC) **[271]**

subcoeruleus nucleus (SLC) **[272]**

Barrington’s nucleus (B) **[273]**

supragenual nucleus (SG) **[274]**

pontine central gray (PCG) **[275]**

Raphé nuclei (RA)**[276]**

interfascicular nucleus raphé (IF) **[277]**

rostral linear nucleus raphé (RL) **[278]**

central linear nucleus raphé (CLI) **[279]**

superior central nucleus raphé (CS) **[280]**

medial part (CSm)

lateral part (CSl)

dorsal nucleus raphé (DR) **[281]**

nucleus incertus (NI) **[282]**

compact part (NIc)

diffuse part (NId)

nucleus raphé pontis (RPO) **[283]**

nucleus raphé magnus (RM) **[284]**

nucleus raphé pallidus (RPA) **[285]**

nucleus raphé obscurus (RO) **[286]**

Interpeduncular nucleus (IPN) **[287]**

rostral subnucleus (IPNr)

apical subnucleus (IPNa)

dorsomedial subnucleus (IPNd)

lateral subnucleus (IPNl)

dorsal part (IPNld)

intermediate part (IPNli) **[288]**

ventral part (IPNlv) **[288]**

rostral part (IPNlr)

intermediate subnucleus (IPNi)

central subnucleus (IPNc)

Reticular formation (RET) **[289]**

mesencephalic reticular nucleus (MRN) **[290]**

retrorubral area (RR) **[291]**

pedunculopontine nucleus (PPN) **[292]**

cuneiform nucleus (CUN) **[293]**

pontine reticular nucleus (PRN) **[294]**

caudal part (RPNc) **[295]**

rostral part (RPNr) **[296]**

gigantocellular reticular nucleus (GRN) **[297]**

paragigantocellular reticular nucleus (PGRN) **[298]**

dorsal part (PGRNd) **[299]**

lateral part (PGRNl) **[300]**

parapyramidal nucleus (PPY) **[301]**

deep part (PPYd) **[302]**

superficial part (PPYs) **[303]**

magnocellular reticular nucleus (MARN) **[304]**

supratrigeminal nucleus (SUT) **[305]**

parvicellular reticular nucleus (PARN) **[306]**

medullary reticular nucleus (MDRN) **[307]**

dorsal part (MDRNd) **[308]**

ventral part (MDRNv)

SPINAL CORD [medulla spinalis] (SP) **[309]**

Dorsal Horn of the Spinal Cord (DH) **[310]**

Marginal zone of the spinal cord (MZ) **[311]**

Substantia gelatinosa of the spinal cord (SGE) **[312]**

Nucleus proprius of the spinal cord (NP) **[313]**

Reticular nucleus of the spinal cord (RS) **[314]**

Basal nucleus of the dorsal horn (BN) **[315]**

lateral cervical nucleus (LCN) **[316]**

lateral spinal nucleus (LSN) **[317]**

Intermediate Gray of the Spinal Cord (IH) **[318]**

Central cervical nucleus (CEC) **[319]**

Dorsal nucleus of the spinal cord (DSN) **[320]**

caudal part (DSNc) **[321]**

Intermediomedial column of the spinal cord (IMM) **[322]**

Intermediolateral column of the spinal cord (IML) **[323]**

dorsal commissural nucleus (DOL) **[324]**

intercalated nucleus of the spinal cord (ICS) **[325]**

sympathetic column (IMLs)

parasympathetic column (IMLp)

Central Gray of the Spinal Cord (CGS) **[326]**

Ventral Horn of the Spinal Cord (VH) **[327]**

Nucleus of the bulbocavernosus (NBC) **[328]**

Onuf's nucleus (ON) **[329]**

Phrenic nucleus (PN) **[330]**

Table B Annotations

1 Definitions of the cerebrum have changed over the years; at one time it referred to the entire brain (that part of the CNS within the cranium). The term now commonly (though not universally) refers to the cerebral hemispheres or endbrain, that part of the neural tube derived from lateral ventricular neuroepithelium. Based on embryological data reviewed in Alvarez-Bolado et al. (1995) and

Alvarez-Bolado and Swanson (1996), the cerebrum contains two major divisions, cortex and basal nuclei or ganglia. Note that the terms amygdala and septal region no longer appear as major divisions of the endbrain; they are arbitrarily defined regions that contain heterogeneous nuclei and/or cortical areas.

2 The cerebral cortex has been divided into areas that may (isocortical) or may not (allocortical) be fitted into a basic six-layered scheme (Vogt and Vogt 1919), numbered 1-6 here. These terms are preferred to the equivalent homotypical and heterotypical of the Vogt's pupil, Brodmann (1909), and to the terms neocortical, archicortical, and paleocortical (Ariëns Kappers 1909), all of which imply unsubstantiated phylogenetic and ontogenetic attributes (see Lorente de Nó 1934; Ebbeson 1980). The olfactory cortex (including superficial parts of the amygdala) and hippocampal formation form the allocortex, as interpreted here. A traditional approach to naming cortical areas, based on Brodmann's work and ultimately general for all mammals, has been adapted here. For another scheme, idiosyncratic to the rat, see Zilles and Wree (1995). Names of the 6 isocortical layers, from superficial to deep, would include: 1, molecular layer; 2, superficial supragranular pyramidal layer; 3, deep supragranular pyramidal layer; 4, granular layer; 5, infragranular pyramidal layer; and 6, polymorph layer.

3 As discussed below (see note 44), certain regions including the claustrum lie deep to the traditional cortex, although they appear to be derived from cortical rather than basal neuroepithelium. For convenience, traditional cortex refers to layers 1-6a, although layer 1 (which contains scattered neurons) is derived embryologically from the preplate, which is quickly divided into layer 1 and the subplate by the cortical plate (see Alvarez-Bolado and Swanson 1996).

4 Donoghue and Wise 1982; Neafsey et al. 1986.

5 Sally and Kelly 1988; Kelly and Sally 1988; Arnault and Roger 1990.

6 Azizi et al. 1985; Sally and Kelly 1988; Kelly and Sally 1988.

7 Clear cytoarchitectonic differences between areas Te3 and Te2 (see Arnault and Roger 1990) were not observed.

8 Kosar et al. 1986; Cechetto and Saper 1987.

9 Defined here as regions of the cortical mantle that receive a direct input from the olfactory nerve (primary; see Brodmann 1909), or from the main and accessory olfactory bulbs (unimodal association; see Price 1987). The latter also includes superficial regions of the amygdala (the NLOT, COA, PAA, and TR), and it is important to point out that the entorhinal area of the hippocampal formation also receives direct olfactory input (Kosel et al. 1981), although it receives many other types of sensory information and thus not usually included in the olfactory region.

10 Gurdjian 1925; Shipley et al. 1996.

11 This "nucleus" is an area of the olfactory cortex, with a molecular layer (1) and a pyramidal layer (2); except for the external part, the divisions are based on position, not architecture (see Haberly and Price 1978b).

12 There is little agreement in the literature about the parcellation and nomenclature associated with the taenia tecta and induseum griseum. From examining sections in the three standard planes, it seems clear to us that the induseum griseum continues uninterrupted around the genu of the corpus callosum to the septohippocampal nucleus (Atlas Levels 11-13; also see Wyss and Sripanidkulchai 1983); the part of the induseum griseum rostral and ventral to the genu was called the dorsal part of the taenia tecta by Haberly and Price (1978b). The ventral taenia tecta of Haberly and Price (1978b) has a very different structure. They divided it into superior and inferior parts, which we refer to here as the dorsal and ventral parts of the taenia tecta proper, respectively. The taenia tecta reminds one of differentiated parts of the adjacent anterior olfactory nucleus (see Davis et al. 1978). We

recognize three layers in the TTv (as Haberly and Price 1978b) and four layers in the TTd.

13 Craigie 1925; Haberly and Price 1978a.

14 Haug 1976; Canteras et al. 1992a.

15 Canteras et al. 1992a.

16 McDonald 1983; Millhouse and Uemura-Sumi 1985. Like the NLOT and CoA, this is an area of the olfactory cortex, usually grouped with the amygdala.

17 Gurdjian 1928.

18 de Olmos et al. 1985.

19 Canteras et al. 1992a.

20 Chapin and Lin 1984; Sanderson et al. 1984.

21 Welker and Sinha 1972; see also Chapin and Lin 1984.

22 Cechetto and Saper 1987.

23 Sefton and Dreher 1985; Thomas and Espinosa 1987; Reid and Juraska 1991. Also see Coogan and Burkhalter 1993.

24 Cechetto and Saper 1987.

25 Krettek and Price 1977.

26 Krettek and Price 1977; Vogt and Peters 1981.

27 Krieg 1946a,b; Miller and Vogt 1984; see note 40.

28 Blackstad 1956; Swanson et al. 1987. See Canteras et al. (1992a) for a discussion of the ventral region of the medial entorhinal area.

29 Wyss and Sripanidkulchai 1983 (see note 12).

30 Hjorth-Simonsen 1972.

31 Krettek and Price 1977; Vogt and Peters 1981.

32 Krettek and Price 1977; our parcellation of these topologically difficult areas was greatly aided by examining sections cut in the three standard planes.

33 Krieg 1946a,b; Deacon et al. 1983.

34 This region appears to lie between unimodal somatosensory and visual areas and receives inputs from the lateral posterior nucleus; to this extent it may correspond to posterior parietal association areas in primates and other mammals; see Hughes 1977; Miller and Vogt 1984.

35 Krettek and Price 1977; Vogt and Peters 1981.

36 Vogt and Miller 1983.

37 This is the so-called agranular region of the retrosplenial area; see Krettek and Price 1977; Vogt and Miller 1983.

38 Risold et al. 1997.

39 This is the so-called granular region of the retrosplenial area; we could not distinguish clearly zones b and c of Miller and Vogt 1983; also see Sripanidkulchai and Wyss 1987 for information about lamination.

40 We have recognized two distinct fields in the temporal region between the visual and auditory cortices dorsally and the perirhinal area ventrally. Krieg (1946a) appears to have regarded this entire area as ECT; more in keeping with Brodmann (1909), we suggest that the dorsal part of this region (where layer 4 is still recognizable) may correspond to temporal association cortex (perhaps in the dorsal, middle, and inferior temporal gyri of humans), and have labeled it TEv; we have retained ECT for the distinct ventral area, just dorsal to the perirhinal area, where layers 2 and 4 are quite indistinct. The architecture and connections of this region require much more analysis.

41 The structures listed here develop dorsal to the basal nuclei, and apparently deep to the cortical plate (although this remains controversial). Their projection neurons appear to use excitatory amino acids

rather than GABA (which is used by most basal nuclear projection neurons). Many suggestions in the older and more recent literature indicate that the deep amygdalar nuclei listed here are related to the claustrum, and the endopiriform nucleus was often included in the claustrum in the older literature. Fiber tracts perhaps analogous to the extreme capsule lie superficial to layer 6b (Vandevelde et al. 1996) and the endopiriform nucleus. The embryological origin of isocortical layer 6b in the rat is unclear (subplate or deep cortical plate; see next note).

42 Divak et al. 1987; Valverde et al. 1989, 1995; Vandevelde et al. 1996 (but see Price et al. 1997). Layer 6b in the rat may be a rather unique structure.

43 Krettek and Price 1977, 1978.

44 Krettek and Price 1978. This "nucleus" appears to form the olfactory component of the claustrum, deep to the piriform area (see also Gurdjian 1928).

45 Krettek and Price 1978. The basolateral complex of the amygdala is included here because it develops just superficial to the external capsule, which has often been misidentified in the region of the amygdala (see atlas levels 24-31). What we have called the amygdalar capsule is a fiber tract along the lateral border of this complex, and we suggest it is part of a fiber system within, and lateral to (for example, the extreme capsule) the subplate or deep cortex.

46 DeOlmos et al. 1985; Canteras et al. 1992a; Petrovich et al. 1996.

47 Canteras et al. 1992a.

48 In mammals, lateral and medial ventricular ridges develop into the classical striatum and pallidum, respectively (see Alvarez-Bolado and Swanson 1996 for review). To simplify endbrain organization, we have placed all regions that appear to develop from the ventricular ridges into either the pallidum or striatum, broadly defined. In general, cortex projects to striatum (and sometimes pallidum) via excitatory inputs, striatum projects to pallidum via inhibitory inputs, and

both striatum and pallidum generate inhibitory descending projections. Justification for the organization scheme presented here, based on connections, is in preparation.

49 Graybiel and Ragsdale 1979.

50 There is no morphologically distinct boundary between this ventromedial region of the striatum and the caudoputamen; Gurdjian (1928) first defined the nucleus accumbens in the rat as that part of the ventromedial striatum lacking massive bundles of ascending and descending fibers, which is still a useful working criterion.

51 The cytoarchitecture of this ventrolateral region of the striatum just deep to the substantia innominata is more heterogeneous than that of the nucleus accumbens and especially the caudoputamen. While the term “fundus of the striatum” (fundus striati of Heimer 1972) has been used here and there in the recent literature, its borders have not been clearly defined; it is used here to refer to the region identified as the substriatal gray by Crosby and Humphrey (1941).

52 Price 1973; Millhouse and Heimer 1984.

53 Meyer et al. 1989.

54 Gurdjian 1928.

55 Risold and Swanson 1997a, b.

56 This term was introduced by Gurdjian (1928) to describe an ill-defined region that essentially all later workers have defined somewhat differently, depending on how better-differentiated neighboring cell groups have been defined; we have followed in this tradition here.

57 We have followed McDonald's (1982) parcellation into medial, lateral, and capsular parts, although it is clear that the nucleus is much more complex than this. McDonald's intermediate part was not recognized; it appears to fall within the lateral part as outlined here. The central and medial amygdalar nuclei receive cortical inputs and generate descending GABAergic projections, like the

rest of the striatum. They also project to the BST, which we regard as pallidal.

58 DeOlmos et al. 1985.

59 Scalia and Winans 1975. This tiny cell group may simply be a part of the medial nucleus of the amygdala.

60 Millhouse 1986.

61 Gurdjian 1928; Graybiel and Ragsdale 1979; Van der Kooy and Carter 1981; Rajakumar et al. 1993. In the rat, the lateral segment is often referred to as “the globus pallidus”, whereas the medial segment is often referred to as the entopeduncular nucleus. This anomalous nomenclature will probably gradually disappear.

62 Jones et al. 1976. This region has been renamed the ventral pallidum (see Alheid and Heimer 1988), and contains a characteristic subpopulation of scattered, cortically projecting cholinergic neurons (Rye et al. 1984) that in some animals (especially primates) form distinct cell clusters within the substantia innominata, known as the basal nuclei of Meynert (see Gorry 1963). These cholinergic cells extend into the medial septal complex, magnocellular preoptic nucleus, and perhaps lateral preoptic area. The term magnocellular basal “nucleus” has been introduced to refer to the basal forebrain cholinergic neurons that project to the cerebral cortex (Saper 1984).

63 This nucleus comes as close to a basal nucleus of Meynert as anything in the rat; cholinergic neurons here innervate preferentially the olfactory bulb. Whether it is in fact part of the preoptic hypothalamus, derived from third ventricular neuroepithelium, is doubtful. See Swanson 1976a; Rye et al. 1984; and notes 62 and 64.

64 Swanson and Cowan 1979. There is no morphologically distinct border between the medial septal nucleus and nucleus of the diagonal band, although an arbitrary border is often drawn at the widest point in this complex (see Atlas Level 16). This level also shows that it is often convenient to

describe horizontal and vertical limbs of the nucleus of the diagonal band (Raisman 1966). Unfortunately, Price and Powell (1970) applied the term "nucleus of the horizontal limb of the diagonal band" to a laterally adjacent cell group that had been widely referred to as the magnocellular preoptic nucleus since the time of Loo (1931), and that projects to the olfactory bulb rather than the hippocampal formation (see note 62).

65 Swanson and Cowan 1979.

66 Ju and Swanson 1989.

67 Gurdjian 1925; Swanson and Cowan 1979.

68 Risold and Swanson 1995b.

69 Larsell 1952; Voogd et al. 1996.

70 Larsell 1952, 1970; Palay and Chan-Palay 1974; Voogd et al. 1985. The cerebellar cortex has three layers: molecular (CBXm), Purkinje (CBXp), and granule cell (CBXg). The surface map provided by Campbell and Armstrong (1983) was particularly useful in constructing the flatmap. Note that the brain used for this atlas had one apparently unusual feature in the cerebellum (not illustrated in the above references): a very large fissure that we have called the pyramidal fissure (Atlas Levels 64-70).

71 Korneliussen 1968; Voogd et al. 1985.

72 Brainstem means different things to different authors. Here we include the interbrain, midbrain, and hindbrain. The neuroendocrine motor system is centered in the interbrain, whereas autonomic and somatic motoneuron pools are found in the midbrain and hindbrain (and of course spinal cord).

73 Berman and Jones 1982; Jones 1985; Price 1995.

74 These nuclei project in a topographically organized way to virtually all parts of the cortical mantle.

75 Gurdjian 1927. These nuclei preferentially innervate the cingulate region and hippocampal

formation.

76 Krieg 1944.

77 Canteras and Swanson 1992a.

78 Krieg 1944; Rose 1942.

79 Gurdjian 1927.

80 Gurdjian 1927; Rose 1942.

81 Gurdjian 1927; Thompson and Robertson 1987.

82 These nuclei preferentially innervate the prefrontal region.

83 Gurdjian 1927; Krieg 1944; Krettek and Price 1977.

84 Krieg 1944; Price and Slotnick 1983.

85 Brittain 1988.

86 Macchi and Bentivoglio 1986; Berendse and Groenewegen 1991. These nuclei preferentially innervate the cingulate region, hippocampal formation and amygdala.

87 Krieg 1944.

88 Gurdjian 1927.

89 Gurdjian 1927; Risold et al. 1997.

90 Gurdjian 1927.

91 Macchi and Bentivoglio 1986; Berendse and Groenewegen 1991. These “nonspecific” nuclei have somewhat wider projections to the cortex than many other thalamic nuclei.

92 Gurdjian 1927; Krieg 1944.

93 Gurdjian 1927; Jones and Leavitt 1974.

94 Jones and Leavitt 1974.

95 Gurdjian 1927. A closely related centre médian nucleus is now commonly identified in primates but

not rodents. However, Krieg (1944) pointed out what he regarded as the equivalent of a centre médian nucleus in the rat, as did Kruger et al. 1995.

96 These nuclei preferentially innervate association areas in the parietal, temporal, and occipital regions.

97 Gurdjian 1927; Price 1995. This cell group, which includes the pulvinar complex of many other species, has been little studied in the rat.

98 Feldman and Kruger 1980; Price 1995; Fabri and Burton 1991; Diamond et al. 1992.

99 LeDoux et al. 1987; Clerici and Coleman 1990.

100 These nuclei innervate preferentially somatic sensory and motor cortical areas.

101 Sawyer et al. 1989.

102 Herkenham 1979.

103 Lund and Webster 1967b; Faull and Mehler 1985; Emmers 1988.

104 Cechetto and Saper 1987.

105 Lund and Webster 1967a; Faull and Mehler 1985; Emmers 1988.

106 Cechetto and Saper 1987.

107 These nuclei innervate preferentially auditory and visual cortical areas.

108 Winer and Laurue 1987; Clerici and Coleman 1990.

109 Reese 1988.

110 Shaver et al. 1990. It is difficult to classify the SFO. It develops in the roof plate, at the junction between interbrain and endbrain, and is essentially a humoral sensory nucleus.

111 These nuclei do not project to the endbrain.

112 Gurdjian 1925; Herkenham and Nauta 1979.

113 Wada et al. 1989.

114 Gurdjian 1925; Herkenham and Nauta 1979.

115 It is usually said that these nuclei do not project to the endbrain; however, a population of neurons in the zona incerta projects to the cerebral cortex (Lin et al. 1990).

116 Gurdjian 1927; Spreafico et al. 1991.

117 Hickey and Spear 1976; Moore and Card 1994.

118 Swanson et al. 1974.

119 Gurdjian 1927.

120 Björklund and Lindvall 1984.

121 Kuzemensky 1977; Berman and Jones 1982.

122 Saper et al. 1976a.

123 Faull and Mehler 1985. LeDoux et al. (1987) have divided the parvicellular part of the subparafascicular nucleus as defined here into a posterodorsal part (which they called the posterior intralaminar nucleus—although it is not continuous with the intralaminar nuclei of the thalamus), and a ventral part (which they called the parvicellular part of the subparafascicular nucleus). This distinction was difficult to make in our Nissl-stained material.

124 Rioch et al. 1940; Swanson 1987.

125 This zone is characterized by pools of neuroendocrine motoneurons (Markakis and Swanson 1997).

126 Weindl 1973.

127 Simerly et al. 1984.

128 Swanson 1976a.

129 Simerly et al. 1984.

130 Gurdjian 1927.

131 Peterson 1966; Palkovits et al. 1974.

132 Swanson 1991, 1992b; Swanson and Simmons 1989.

133 Gurdjian 1927.

134 Gurdjian 1927; Krieg 1932; Thompson and Swanson 1998.

135 Gurdjian (1927) referred to this poorly defined cell group as the dorsal part of the DMH.

136 Gurdjian (1927) referred to this dense group of cells as the ventral part of the DMH.

137 A variety of features indicate that this region differs from the anterior and posterior parts (Thompson and Swanson 1998).

138 For the sake of consistency (see notes 129, 130, 133, and 140) we have applied this name to what Gurdjian (1927) referred to as the dorsal part of the posterior periventricular nucleus.

139 Krieg 1932; Everitt et al. 1986.

140 Ingram et al. 1932; Christ 1969.

141 This zone contains a series of well-defined nuclei that divide the hypothalamus into preoptic, anterior (supraoptic), tuberal, and mammillary levels.

142 Simerly et al. 1984. The MPO contains a number of distinct cell groups, which are embedded in a relatively undifferentiated area of scattered neurons (the "undifferentiated" part of the MPO).

143 Simerly et al. 1984.

144 Simerly et al. 1984. The septohypothalamic nucleus of Bleier et al. (1979) includes the ADP and the LSv (see note 55); however, these two cell groups do not merge, and are cytoarchitectonically distinct.

145 Simerly et al. 1984.

146 Krieg 1932. The AHA includes scattered neurons around the more condensed AHN and SCH. Recent evidence suggests that these scattered neurons are regionally organized (for example, some form the subparaventricular zone and others the retrochiasmatic area).

147 Gurdjian 1927; Krieg 1932; Risold et al 1994.

148 Saper et al. 1978.

149 This cell group, which Bleier et al. (1979) called the dorsal tuberal nucleus and Paxinos and Watson (1986) called the stigmoid hypothalamic nucleus, is clearly part of the AHN.

150 Krieg 1932; Watts et al. 1987.

151 Watts and Swanson 1987; Watts 1991.

152 Swanson and Kuypers 1980. These scattered neurons lie among the fibers of the supraoptic commissures; they were called the nucleus supraopticus diffusus by Gurdjian (1927).

153 Swanson 1987. This area includes the undifferentiated, cell-sparse zone or “shell” around the ventromedial nucleus.

154 Gurdjian (1927) and Saper et al. (1976a) recognized dorsomedial and ventrolateral cell condensations separated by a relatively cell-sparse central region; Van Houten and Brawer (1978) also recognized a distinct anterior component. Also see Canteras et al. 1994.

155 Gurdjian 1927; Krieg 1932; Canteras et al. 1992b.

156 There is no standard definition of the mammillary body—sometimes it just refers to the MM and LM. The TM could just as well be placed in the lateral zone because of its widespread, diffuse projections.

157 Köhler et al. 1985.

158 Swanson 1982.

159 Canteras and Swanson 1992a.

160 Gurdjian 1927; Krieg 1932; Allen and Hopkins 1988.

161 Gurdjian 1927; Krieg 1932.

162 This very heterogeneous, poorly understood region is often thought of as an interstitial nucleus of

the medial forebrain bundle, and the rostral extension of the brainstem reticular formation.

163 Gurdjian 1927; Swanson 1976a.

164 Gurdjian 1927; Krieg 1932. Several attempts have been made to parcellate this area, but there is little agreement among authors, and parcellations based on histochemistry combined with pathway tracing methods are needed. A perifornical region can often be distinguished from a more lateral region.

165 Canteras et al. 1994.

166 Gurdjian 1927; Afsharpour 1985; Canteras et al. 1990.

167 Braekevelt and Hollenberg 1970; Morest 1970; Perry 1981; Ehinger and Dowling 1987.

168 Kanaseki and Sprague 1974; Bickford and Hall 1989.

169 Tokunaga and Otani 1978; Harting et al. 1991b.

170 Scalia 1972.

171 Campbell and Lieberman 1985; Gregory 1985.

172 Giolli et al. 1985; Gregory 1985.

173 Gregory 1985.

174 Kanaseki and Sprague 1974.

175 Scalia 1972.

176 Siminoff et al. 1968; Kanaseki and Sprague 1974.

177 Hayhow et al. 1960; Giolli et al. 1989.

178 Hayhow et al. 1960; Terubayashi and Fujisawa 1984; Giolli et al. 1985.

179 Gregg and Dixon 1973; Schneider et al. 1981; Hirsch (1765) named this ganglion after his professor, J.L. Gasser.

180 Rokx et al. 1986a; Luo et al. 1991. This is a ‘displaced’ dorsal root ganglion.

181 Torvik 1957; Emmers 1988.

182 Olszewski 1950.

183 Falls et al. 1985; Jacquin and Rhoades 1990.

184 Phelan and Falls 1989a.

185 Nord 1967; Gobel et al. 1977; Kruger 1979.

186 Chan-Palay 1978; Phelan and Falls 1989b.

187 Torvik 1956; Nord 1967.

188 Gulley 1973; Cliffer and Giesler 1989; Maslany et al. 1991.

189 Kemplay and Webster 1989.

190 Cliffer and Giesler 1989; Maslany et al. 1991.

191 Low et al. 1986.

192 Campbell et al. 1974.

193 Harrison and Feldman 1970; Osen et al. 1984; Webster 1985.

194 Mugnaini et al. 1980.

195 Harrison and Feldman 1970; Merchan et al. 1988.

196 Harrison and Feldman 1970; Osen et al. 1984; Fay-Lund 1986; Bledsoe et al. 1990. This cell group is sometimes referred to as the medial nucleus of the trapezoid body (see note 200).

197 Harrison and Feldman 1970; Osen et al. 1984; Webster 1985; Fay-Lund 1986.

198 Osen et al. 1984; Webster 1985; Fay-Lund 1986.

199 Harrison and Feldman 1970; Osen et al. 1984; Webster 1985; Fay-Lund 1986.

200 There is general agreement that the medial and lateral parts of the superior olive are surrounded by a ring of periolivary gray matter, with a superior (e.g., Harrison and Feldman 1970) or dorsomedial (e.g., Morest 1973) periolivary "nucleus" that is particularly obvious. There is, however, little

agreement about parcellating this ring of gray matter (some parts have been referred to as components of the nucleus of the trapezoid body). Because we could not distinguish clearly separate cell groups in this region, it has been referred to simply as the periolivary region (see Osen et al. 1984).

201 While it is common to divide this nucleus into dorsal and ventral parts, or into dorsal, intermediate, and ventral parts, the architecture and connections of this cell group have not been examined in any detail in the rat; where this has been done, it is obvious that the NLL is an extremely complex region (see Covey and Casseday 1986). We have not attempted to parcellate the NLL.

202 Fay-Lund and Osen 1985.

203 Malmierca et al. 1993.

204 Berman 1968.

205 Berman 1968; Andrezik and Beitz 1985; Henkel and Shneiderman 1988.

206 Rubbertone et al. 1995.

207 Brodal 1952, 1983; McCrea and Baker 1985.

208 Meessen and Olszewski 1949; Brodal 1952.

209 Torvik 1956.

210 Meessen and Olszewski 1949; Torvik 1956; Valverde 1962.

211 Mehler and Rubertone 1985.

212 Fredrickson and Trune 1986.

213 Travers and Norgren 1995.

214 Torvik 1956; Contreras et al. 1982.

215 Ross et al. 1985; Cunningham et al. 1991.

216 Torvik 1956.

217 Leslie et al. 1982; Shapiro and Miselis 1985b.

218 Berman 1968.

219 Berman 1968; Contreras et al. 1982.

220 Shapiro and Miselis 1985a.

221 Fulwiler and Saper 1984.

222 This region appears to us to be a ventral extension of the PBmm (of Fulwiler and Saper 1984).

223 Glicksman 1980.

224 Leichnetz 1982; Gonzalo-Ruiz et al. 1990.

225 Glicksman 1980.

226 Székely and Matesz 1982.

227 Mizuno et al. 1975; Jacquin et al. 1983.

228 Spangler et al. 1982.

229 Martin et al. 1977; Watson et al. 1982; Friauf and Herbert 1985; Friauf 1986.

230 Székely and Matesz 1982.

231 White and Warr 1983; Vetter et al. 1991; Vetter and Mugnaini 1992.

232 Strutz 1982.

233 Bieger and Hopkins 1987; Patrickson et al. 1991.

234 Fukuda et al. 1995.

235 Brichta et al. 1987.

236 Krammer et al. 1979; Jacquin et al. 1983; Kitamura et al. 1983.

237 Loewy et al. 1978; Martin and Dolivo 1983.

238 Contreras et al. 1980; Senba et al. 1987; Spencer et al. 1990.

239 Contreras et al. 1980.

240 Fox and Powley 1985; Norgren and Smith 1988; Altschuler et al. 1991.

241 Bieger and Hopkins 1987. This region is characterized by preganglionic neurons that contribute to thoracic branches of the vagus nerve, although other cell types may be present.

242 While a lateral part of the SN has been mentioned in the literature (see Gillilan 1943; Hanaway et al. 1970), more recent work has provided little reason to separate it from the compact part (see Björklund and Lindvall 1984).

243 Danner and Pfister 1982; Björklund and Lindvall 1984.

244 Grofova et al. 1982.

245 Phillipson 1979; Swanson 1982; Björklund and Lindvall 1984.

246 Mihailoff et al. 1981, 1989; Wiesendanger and Wiesendanger 1982.

247 Torigoe et al. 1986.

248 Azizi and Woodward 1987; Nelson and Mugnaini 1988; Bourrat and Sotelo 1991.

249 Kapogianis et al. 1982a,b.

250 Watson and Switzer, 1978. Based on connections (Watson and Switzer 1978), cytology, and topology, these cells are reminiscent of a bridge of LRN cells over the rostral end of the nucleus ambiguus.

251 Mehler 1969; Somana and Walberg 1978; Andrezik and Beitz 1985.

252 Allen 1923; Walberg et al. 1962; Low et al. 1986.

253 While small neurons predominate rostrally and large neurons caudally (Reid et al. 1975; Strominger et al. 1987), it is difficult to draw a boundary between parvicellular and magnocellular parts in the rat.

254 There is no generally accepted definition of the reticular core, which essentially consists of those regions that have not been assigned to particular sensory and motor systems. We consider that the

reticular core extends into the forebrain to include the lateral zone of the hypothalamus, ventral thalamus, and epithalamus. It plays a major role in controlling behavioral state, and in polymodal integration.

255 It is often thought that this region is continuous with periventricular parts of the interbrain (see Krieg 1932; Sutin 1966).

256 Recent work has clarified the structural organization of the rat PAG, which is that part of the brain central gray within the midbrain. The basic parcellation of the caudal three-quarters of the PAG follows Beitz (1985).

257 Paxinos and Watson 1986.

258 This relatively clear cell group lies caudal to the precommissural nucleus, as indicated by the name we have given it.

259 This relatively homogeneous cell group lies between the caudal end of the interbrain and the caudal three-quarters of the PAG subdivided by Beitz (1985), exclusive of the PRC, COM and PAGrl. It forms the rostroventromedial part of the PAG.

260 This relatively small, distinct group of neurons lies lateral to the PAGrm. We have assigned the names PAGrm and PAGrl simply on the basis of their location in the PAG.

261 Beitz 1985.

262 Beitz 1985; Herbert and Saper 1992. This is perhaps the clearest division of the caudal PAG cytoarchitectonically (small, densely packed neurons), and because of this the dorsal division is also very easy to distinguish.

263 Beitz (1985). This large division is undoubtedly heterogeneous (Keay et al. 1994), and requires further structural characterization. For example, there is a supraoculomotor region ventrally (Herbert and Saper 1992).

264 Rutherford and Gwyn 1982.

265 Gillilan 1943; Rutherford et al. 1989.

266 Cowan et al. 1964; Hayakawa and Zyo 1983.

267 Paxinos and Butcher 1985.

268 We have applied this name to a distinguishable cell group between the locus coeruleus and Barrington's nucleus that receives circumscribed inputs from the lateral hypothalamic area (Kelly 1995) and central nucleus of the amygdala (Petrovich and Swanson 1997).

269 Gillilan 1943; Cornwall et al. 1990.

270 Swanson et al. 1984 (see also Gillilan 1943).

271 Swanson 1976b.

272 This term has assumed a variety of connotations since the introduction of histochemical methods for localizing biogenic amines; it is used here as the equivalent of Meessen and Olszewski's (1949) nucleus subcoerulus α.

273 Imaki et al. 1991.

274 Meessen and Olszewski 1949; Andrezik and Beitz 1985.

275 This is simply the caudal extension of the periaqueductal gray.

276 Olszewski and Baxter 1954; Taber et al. 1960; Steinbusch and Nieuwenhuys 1983.

277 Berman 1968; Phillipson 1979.

278 Castaldi 1923; Brown 1943; Swanson 1982.

279 Castaldi 1923; Brown 1943 (intermediate linear nucleus); Swanson 1982.

280 Bechterew 1899; Taber et al. 1960; Valverde 1962. A superior central nucleus with medial and lateral zones has long been recognized. König and Klippel (1963) referred to the nucleus medianus raphés, which may correspond to the medial part, where serotonergic neurons are apparently

concentrated (Dahlström and Fuxe 1964).

281 Brown 1943; Valverde 1962; Descarries et al. 1982; Park 1987.

282 The correspondence between what Streeter (1903), Castaldi (1923), and Berman (1968) identified as the NI in human, guinea pig, and cat, and what Wyss et al. (1979) called NI in the rat is unclear. Based on connectional and histochemical evidence (N.S. Canteras, personal communication) the NI of Wyss et al. and the central gray matter, pars α of Meesen and Olszewski (1949) appear to form parts of a single nucleus, which we have divided into compact (medial) and diffuse (lateral) parts, the latter corresponding to the pars α.

283 Brown 1943; Valverde 1962.

284 Meessen and Olszewski 1949; Valverde 1962; Mason et al. 1990.

285 Olszewski and Baxter 1954; Valverde 1962.

286 Olszewski and Baxter 1954; Valverde 1962; Bowker and Abbott 1990.

287 Groenewegen et al. 1986.

288 Wada et al. 1989.

289 While there is some confusion in the literature about the various parts of the reticular formation, virtually all modern accounts are based on the pioneering work of Olszewski and his colleagues (Meessen and Olszewski 1949; Olszewski and Baxter 1954), which was modified by Brodal (1957) for the cat and by Valverde (1962) for the rat.

290 Brodal 1957.

291 Berman 1968. This region is characterized by scattered dopamine cells, caudal and dorsal to the ventral tegmental area (see Swanson 1982; Björklund and Lindvall 1984).

292 Jacobsohn 1909; Olszewski and Baxter 1954; Rye et al. 1987. Rye et al. (1987) regard the subpopulation of cholinergic neurons in this region as the pedunculopontine "nucleus" (see note

62); the region outlined here contains all of the cells identified earlier in the PPN (Jacobsohn 1909; Olszewski and Baxter 1954), although cholinergic neurons provide a very useful guide to its borders and seem to predominate numerically.

293 Castaldi 1926; Olszewski and Baxter 1954; Swanson et al. 1984.

294 Meessen and Olszewski 1949.

295 The A5 noradrenergic group (Dahlström and Fuxe 1964) and associated depressor region (see Loewy et al. 1986) appear to be centered in ventrolateral regions of the PRNc, including the region of the rubrospinal tract, although a few cells also appear to extend into the periolivary region (see Westlund et al. 1983; Byrum et al. 1984). Most of the cells appear to lie adjacent to the superior salivatory nucleus (see note 300).

296 Often referred to as the oral part (Meessen and Olszewski 1949).

297 Meessen and Olszewski 1949.

298 Olszewski and Baxter 1954.

299 Taber 1961; Newman 1985a.

300 Andrezik et al. 1981. Although this problem has not been addressed in detail, it seems likely from published maps (see Dahlström and Fuxe 1964; Hökfelt et al. 1984; Sawchenko et al. 1985; Giuliano et al. 1989; Ellenberger et al. 1990) that the C1 adrenergic group, the A1 noradrenergic group, the ventrolateral medulla, and the rostral ventrolateral medulla are centered in (though not necessarily confined strictly to) the PGRNl, with relatively minor possible involvement of the ventral division of the nucleus ambiguus (see note 295).

301 We use this term in referring to the dorsal and ventral cell groups identified recently.

302 Niura et al. 1996.

303 Fukuda et al. 1993.

304 Berman 1968; Newman 1985a,b. This appears to be a ventromedial extension of the gigantocellular reticular nucleus.

305 Lorente de Nó 1922; Torvik 1956; Rokx et al. 1986b.

306 Meessen and Olszewski 1949; Mehler 1983; ter Horst et al. 1991.

307 Meessen and Olszewski 1949; Valverde 1962.

308 Villanueva et al. 1988.

309 Because the Atlas does not extend into the spinal cord, the following is not an exhaustive account of cell groups within this division of the CNS. For a general account of the rat spinal cord, see Waibl (1973) and Altman and Bayer (1984); for attempts to impose a laminar organization on the spinal cord, see Rexed (1952, 1954) and Brichta and Grant (1985).

310 The basic division of the dorsal horn used by Cajal (1995) has been adopted here. He divided the base of the dorsal horn into medial and lateral basal nuclei (together called the BDG here), whereas his head and neck (center) of the dorsal horn has come to be referred to as the nucleus proprius (see Carpenter and Sutin 1983); the reticular nucleus (process) is found lateral to the nucleus proprius (see Rexed 1952).

311 Lima and Coimbra 1986; Holstege 1988.

312 Willis and Coggeshall 1991; Light and Kavookjian 1988; Rustioni and Weinberg 1989; Cruz et al. 1991.

313 Todd 1989.

314 Rexed 1952.

315 Cajal 1995.

316 Baker and Giesler 1984; Giesler et al. 1988; Broman and Blomqvist 1989.

317 Giesler and Elde 1985; Burstein et al. 1987; Broman and Blomqvist 1989.

318 Cajal (1995) essentially divided the intermediate gray into medial, intermediate, and lateral parts (the commissural nucleus, intermediate nucleus, and nucleus of the lateral funiculus, respectively).

319 Matsushita and Hosoya 1979; Matsushita et al. 1991.

320 Matsushita and Hosoya 1979.

321 Edgley and Grant 1991.

322 Petras and Cummings 1972; Molander et al. 1984; Brichta and Grant 1985; Molander et al. 1989.

323 Rubin and Purves 1980; Mawe et al. 1986; Strack et al. 1988; Anderson et al. 1989; Barber et al. 1991; Hosoya et al. 1991.

324 Hancock and Peveto 1979.

325 Petras and Cummings 1972; Barber et al. 1991.

326 Nahin et al. 1983.

327 Brichta and Grant 1985.

328 Sasaki and Arnold 1991.

329 Kuzuhara et al. 1980.

330 Kuzuhara and Chou 1980.