CORTEX CEREBRI

Ústav anatomie 2. lékařské fakulty UK
R. Druga

CORTEX CEREBRI

Vývoj

Členění – strukturální, funkční

Struktura

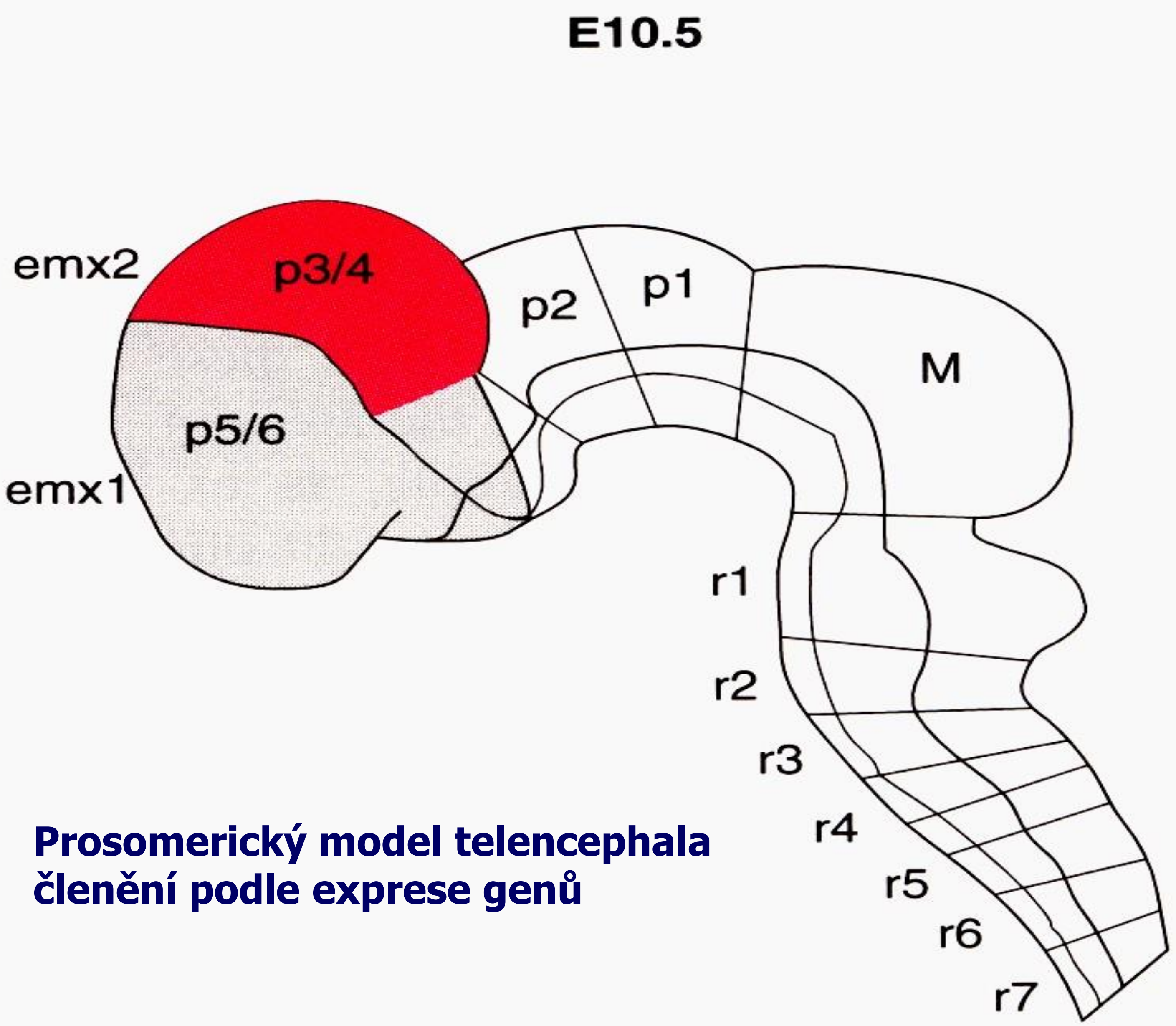
Spoje

Funkce

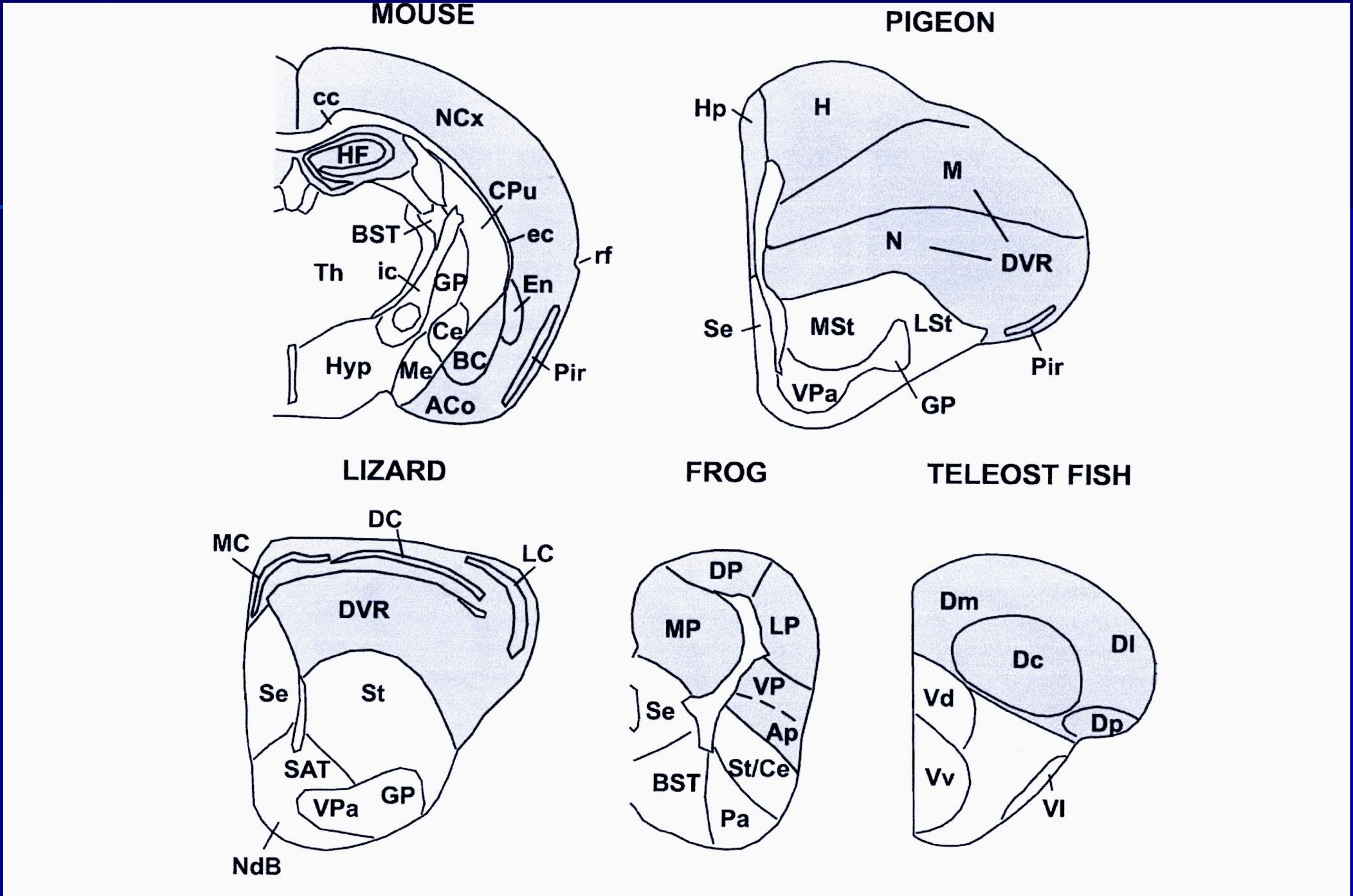
Vývoj hemisféry

Členění na kůru (pallium) a podkorové struktury

Vývoj neokortexu



Prosomerický model telencephala
členění podle exprese genů


MOUSE
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NCx
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M
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DVR
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MSt
LSt
Pir
VPa
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LIZARD
DC
MC
LC
DVR
Se
St
SAT
GP
VPa
NdB
FROG
DP
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Ap
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BST
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TELEOST FISH
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Vd
Dp
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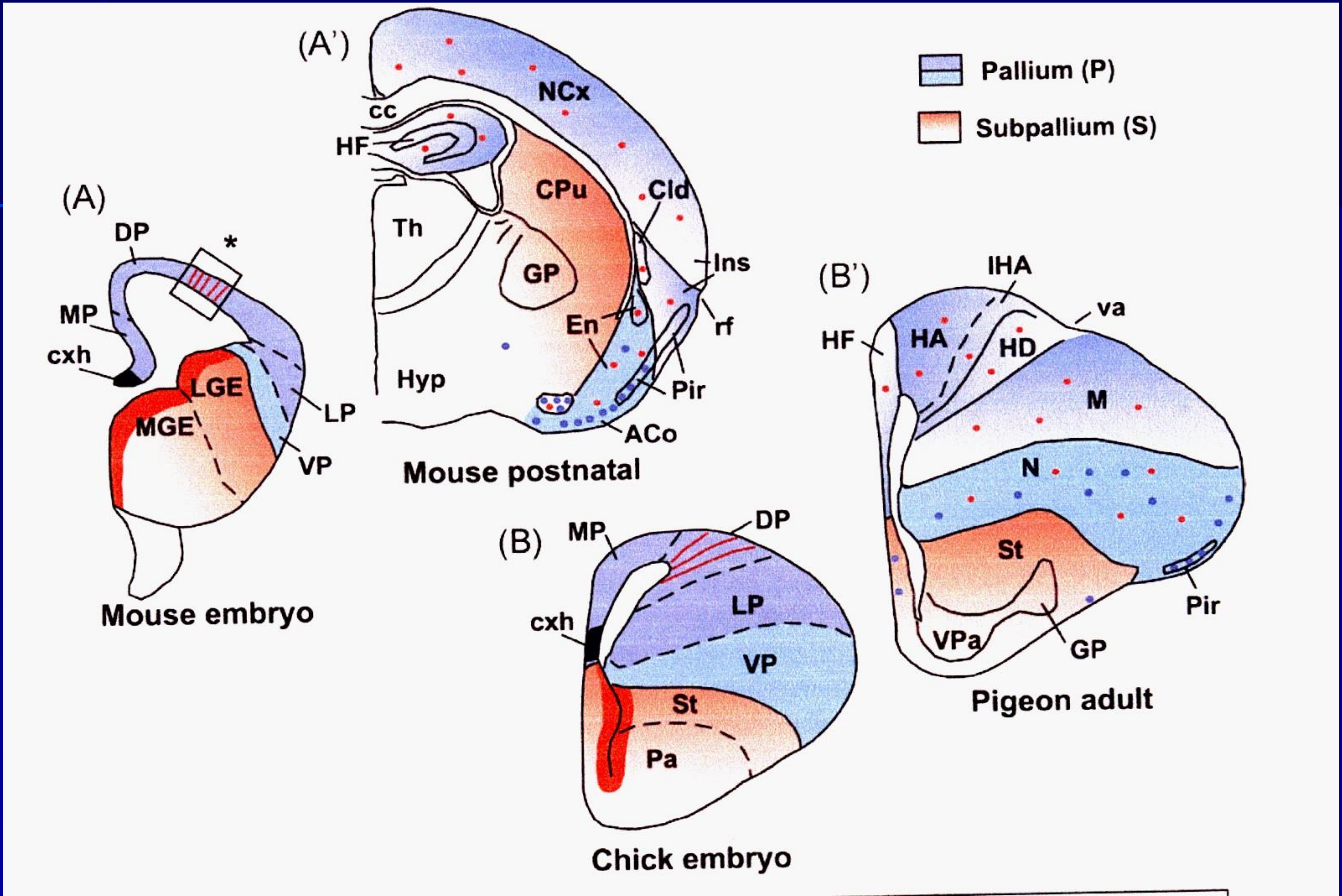

(A)
DP
*
MP
cxh
LGE
MGE
LP
VP
Mouse embryo
(A')
NCx
cc
HF
CPu
Cld
Th
GP
Ins
En
rf
Hyp
Pir
ACo
Mouse postnatal
Pallium (P)
Subpallium (S)
(B')
IHA
va
HF
HA
HD
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Pigeon adult
(B)
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DP
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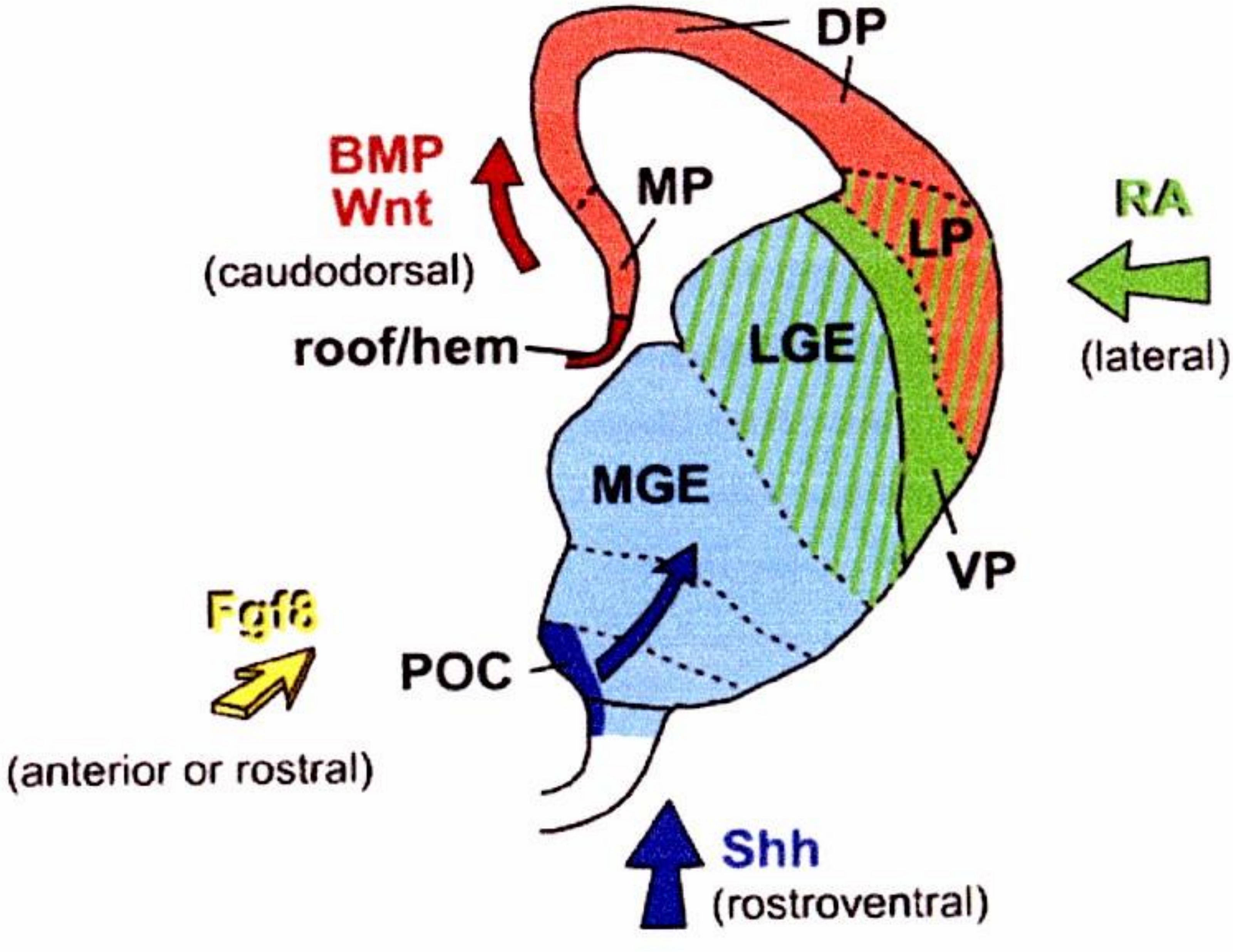
cxh
VP
St
Pa
Chick embryo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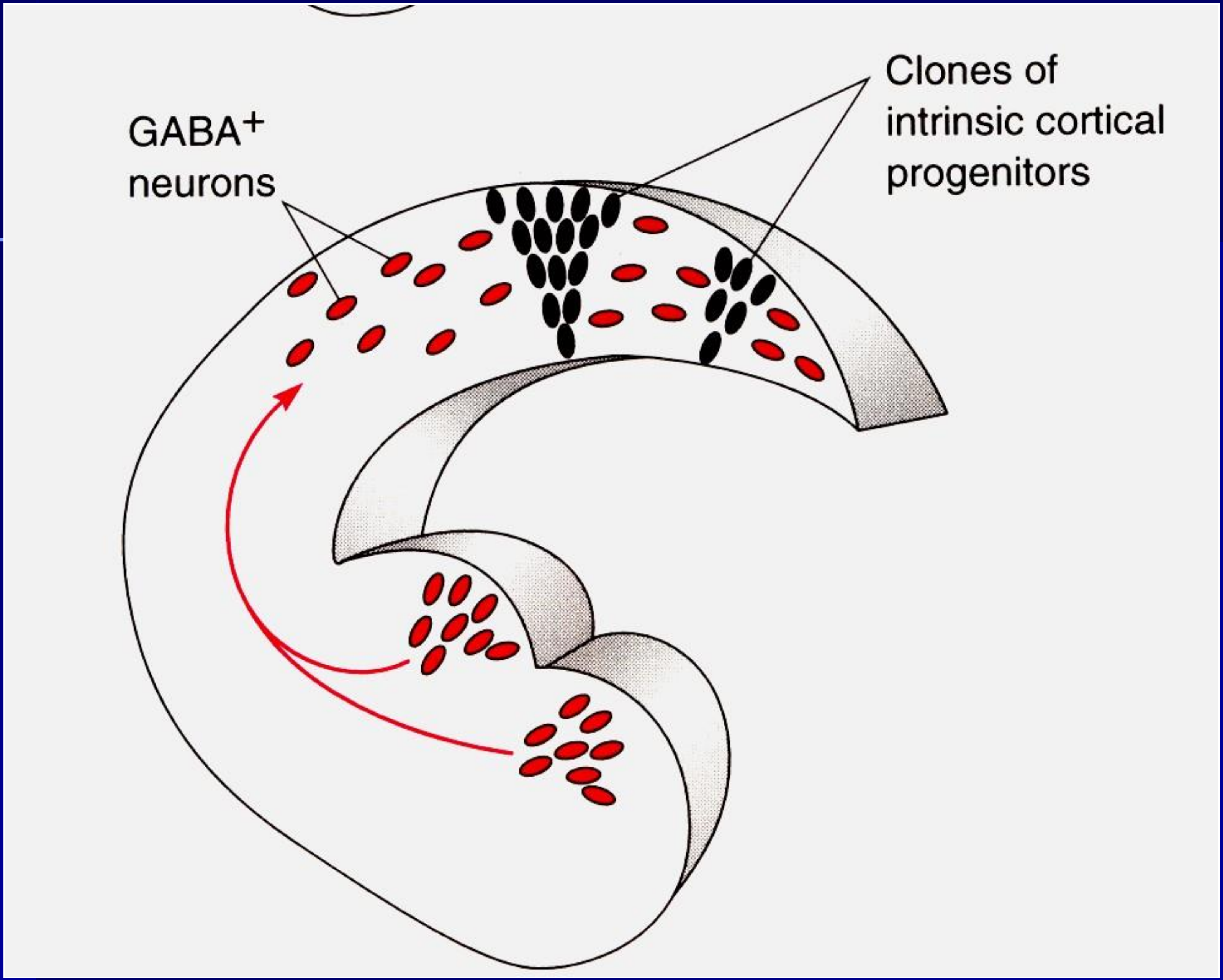
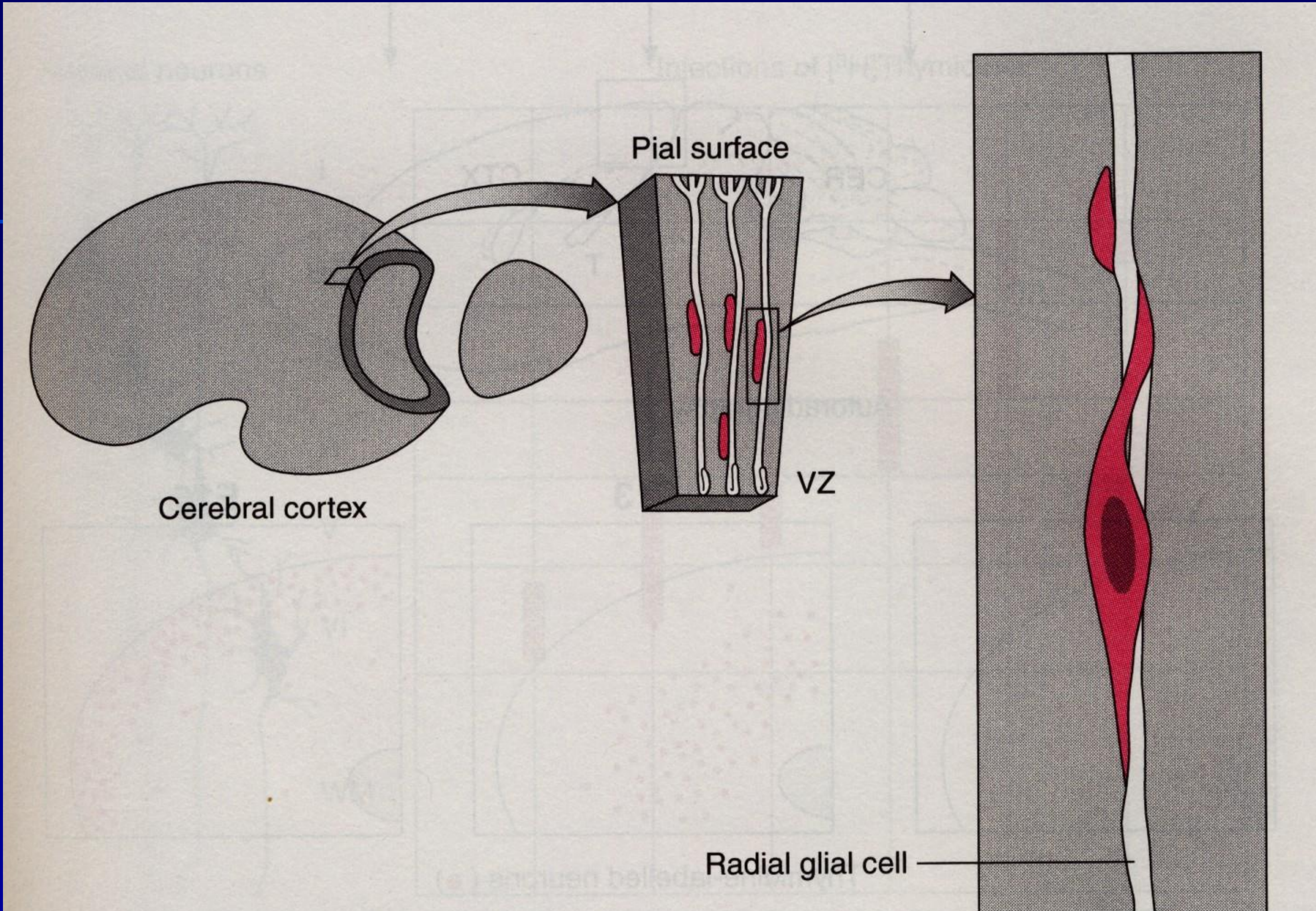
(caudodorsal)
MP
roof/hem
LP
RA
(lateral)
LGE
MGE
VP
Fgf8
POC
(anterior or rostral)
Shh
(rostroventral)


GABA+
neurons
Clones of
intrinsic cortical
progenitors

Migrace neuronů z ventrikulární zony



F.K. Studnička, 1896

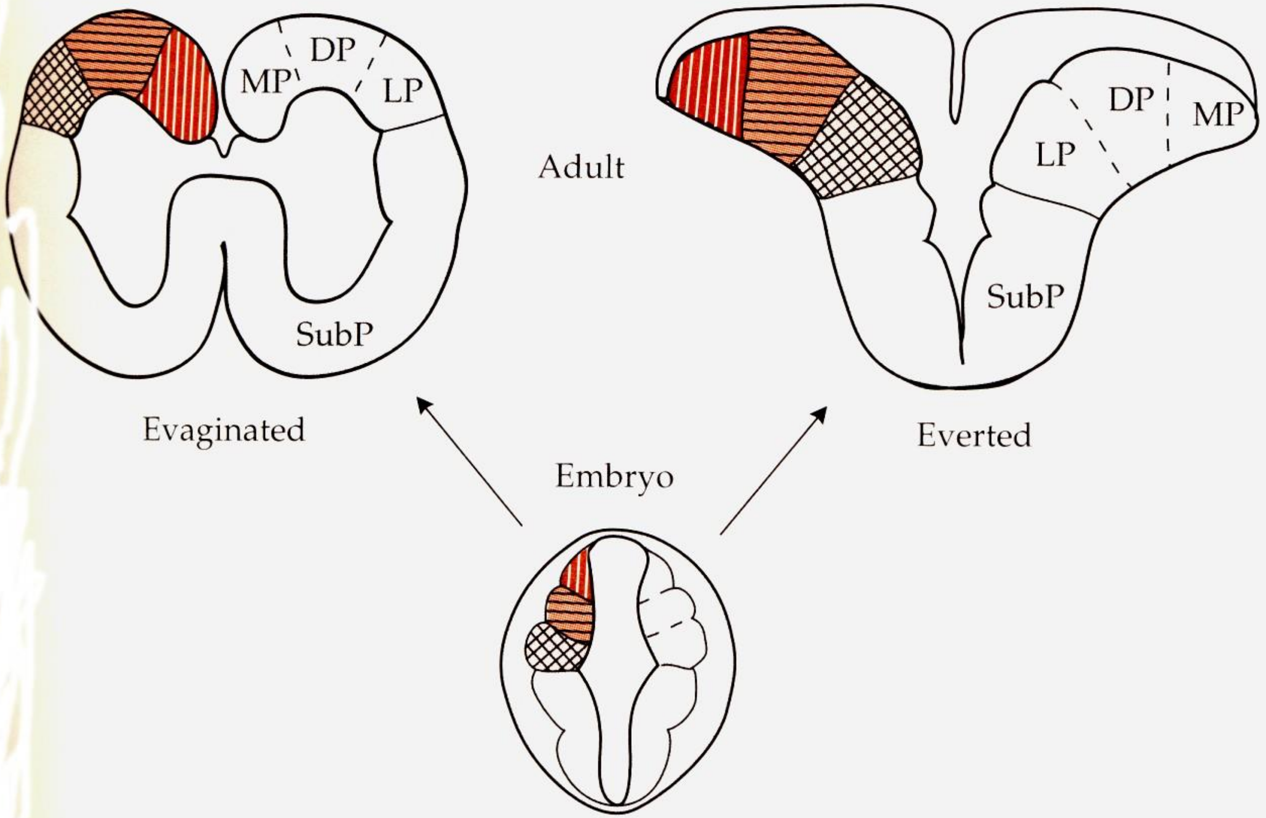
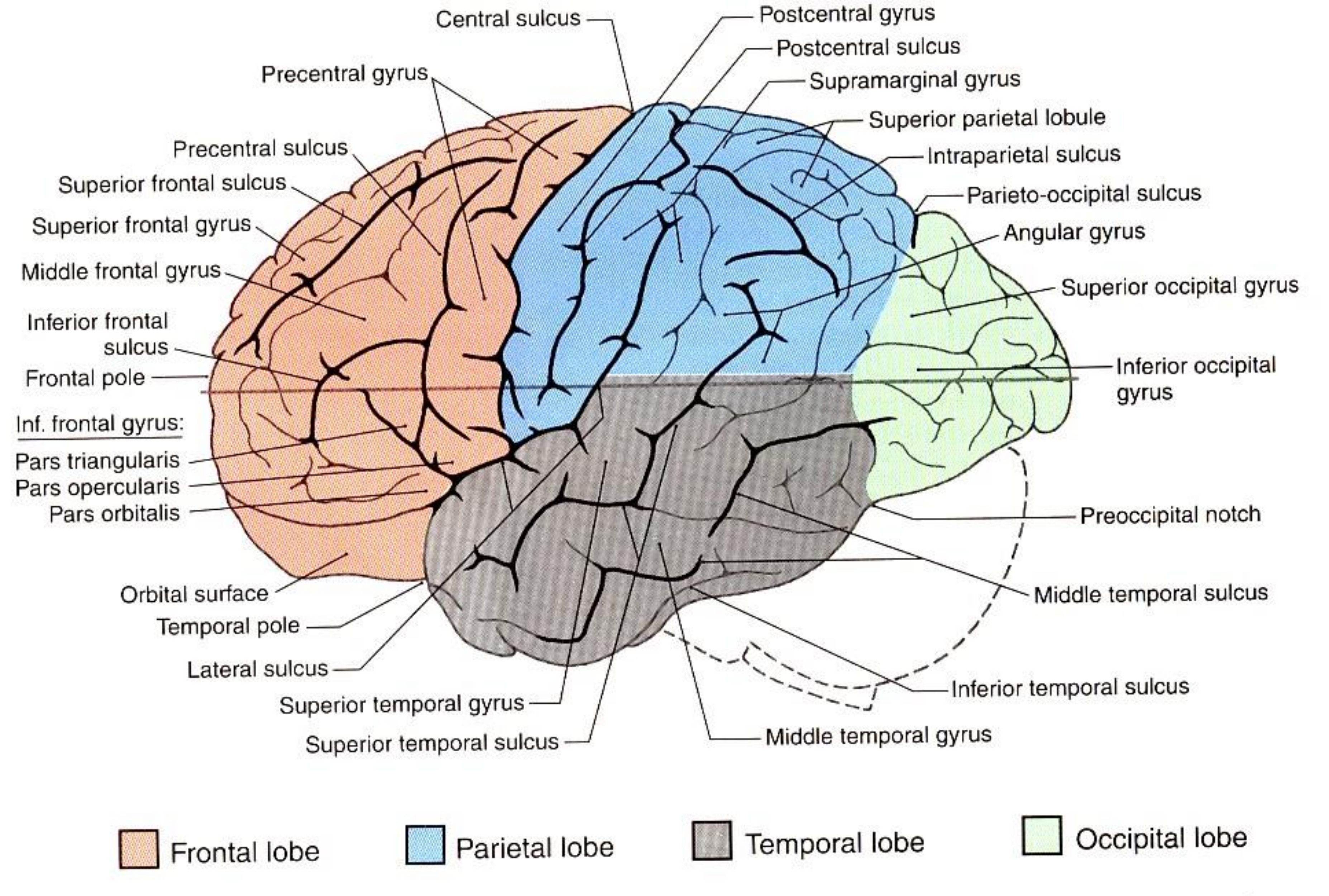


Figure 2.16 Telencephalic Evagination versus Eversion In most vertebrates, the telencephalon evaginates during development to form the cerebral hemispheres (top left). In ray-finned fishes, however, the telencephalon does not evaginate. Instead, its dorsal portion folds outward in what is called an eversion process. In such an everted telencephalon, the mediolateral positions of the dorsal telencephalic (pallial) areas are reversed relative to what they are in an evaginated telencephalon. Abbreviations: DP = dorsal pallium; LP = lateral pallium; MP = medial pallium; SubP = subpallium. (After Holmgren, 1922.)

Neocortex - definice

- 6 vrstev
- 10–20 miliard neuronů
- 95 % povrchu hemisféry

- **Allocortex - definice**
- 3 vrstvy , 5 % povrchu hemisféry
- Paleocortex 1,5 %
- Archicortex 3,5 %



Členění hemisféry na laloky

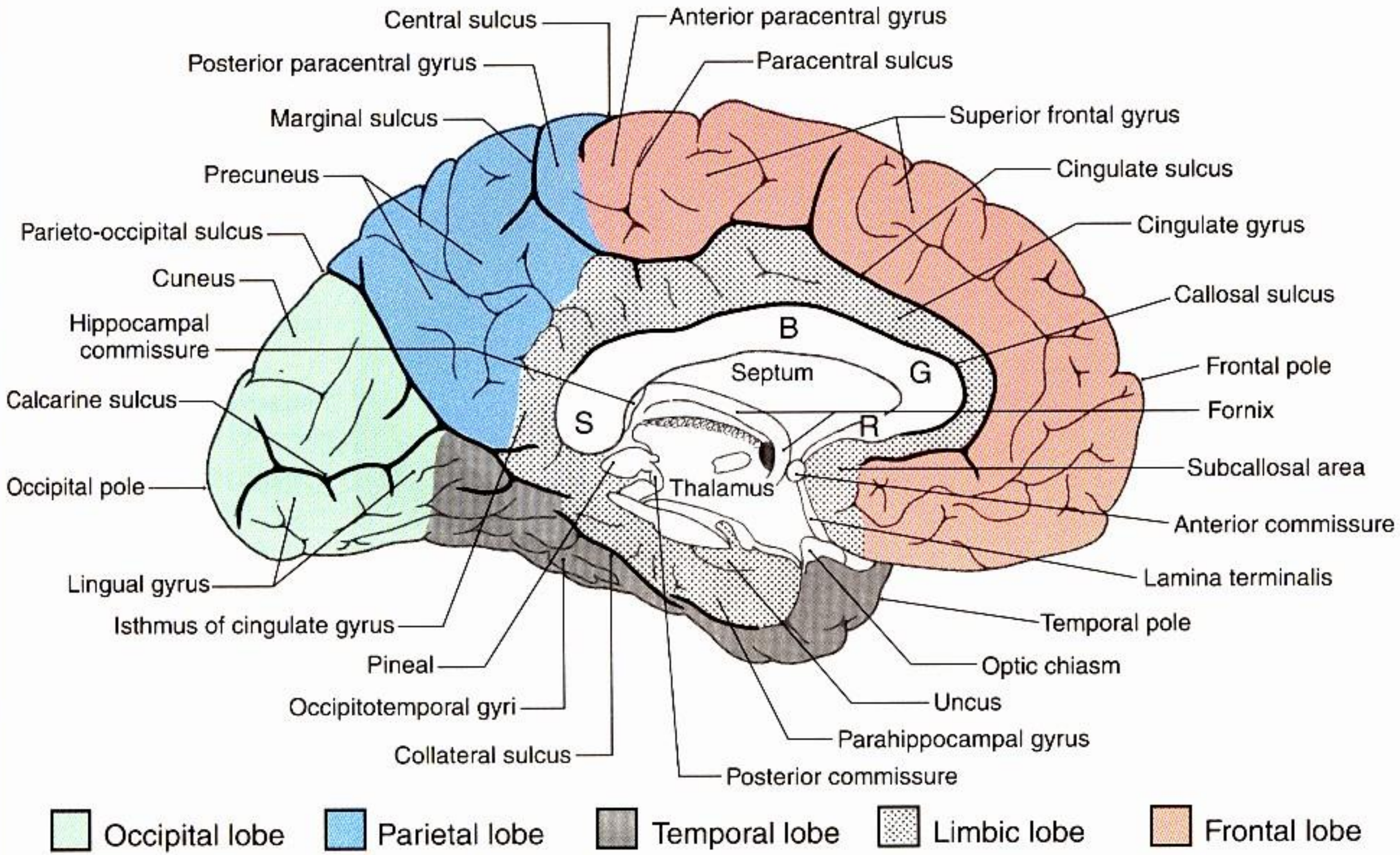
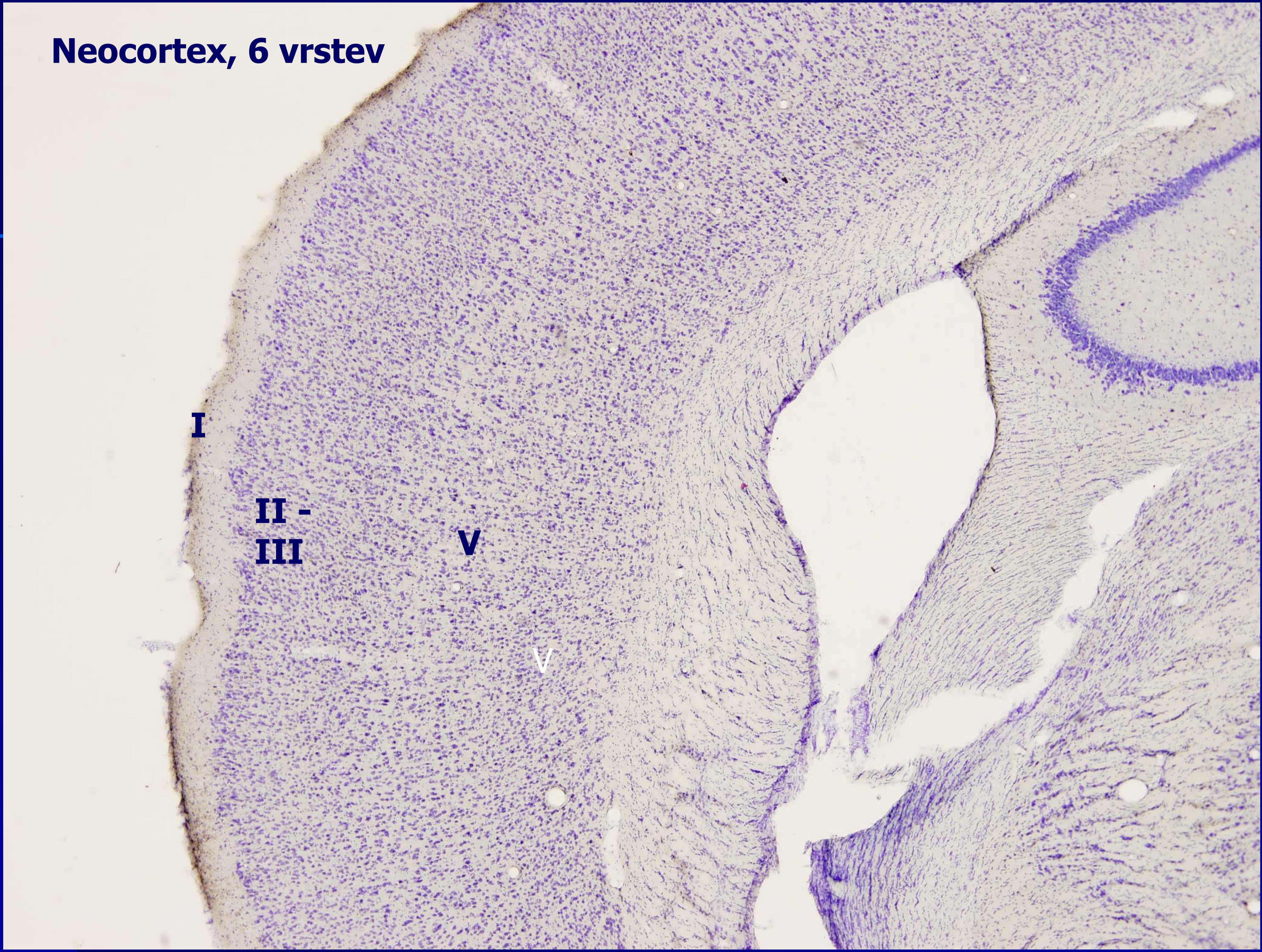


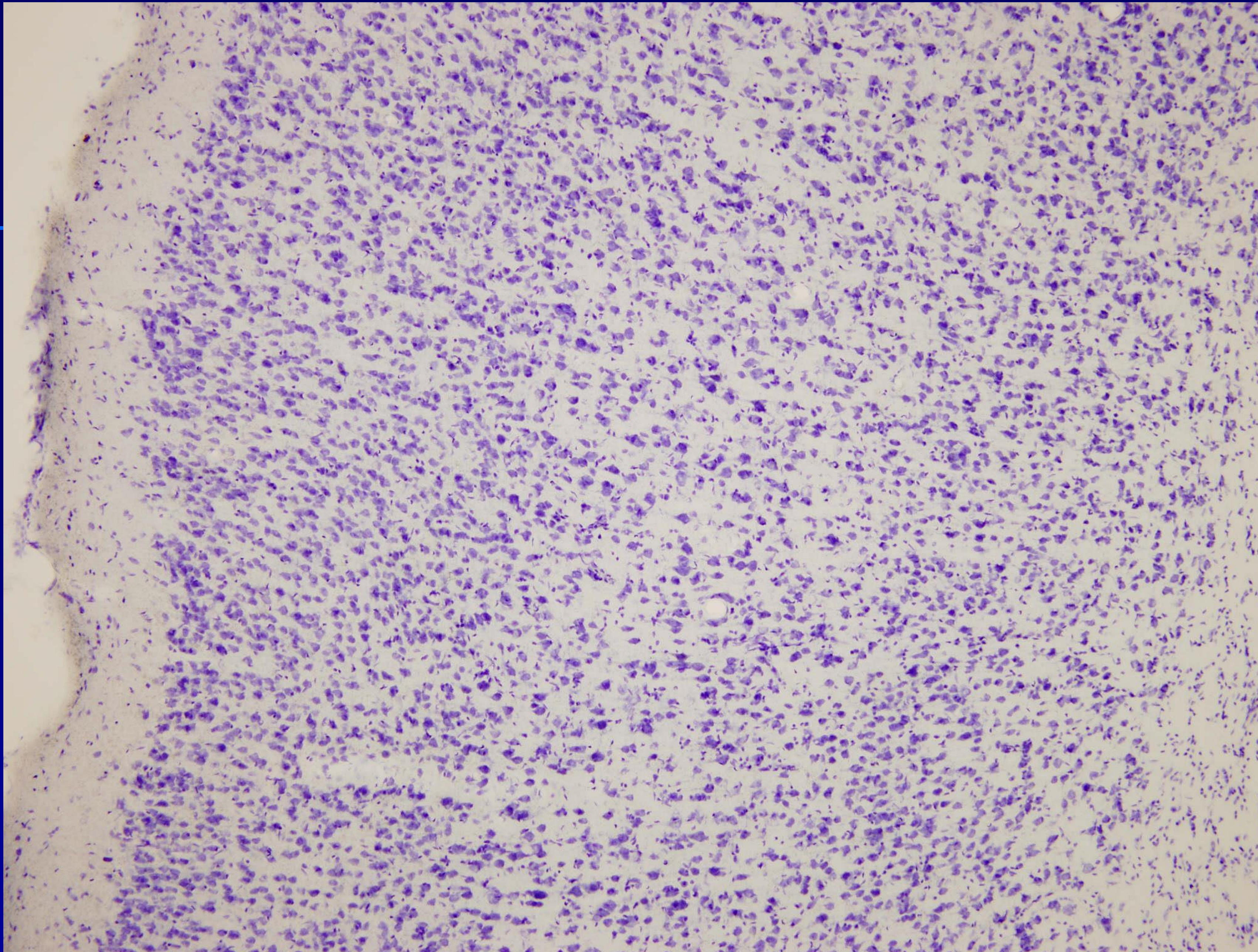
Figure 16–4. Medial aspect of the left cerebral hemisphere showing lobes and their associated gyri and sulci. The parts of the corpus callosum are R, rostrum; G, genu; B, body (or trunk); and S, splenium.

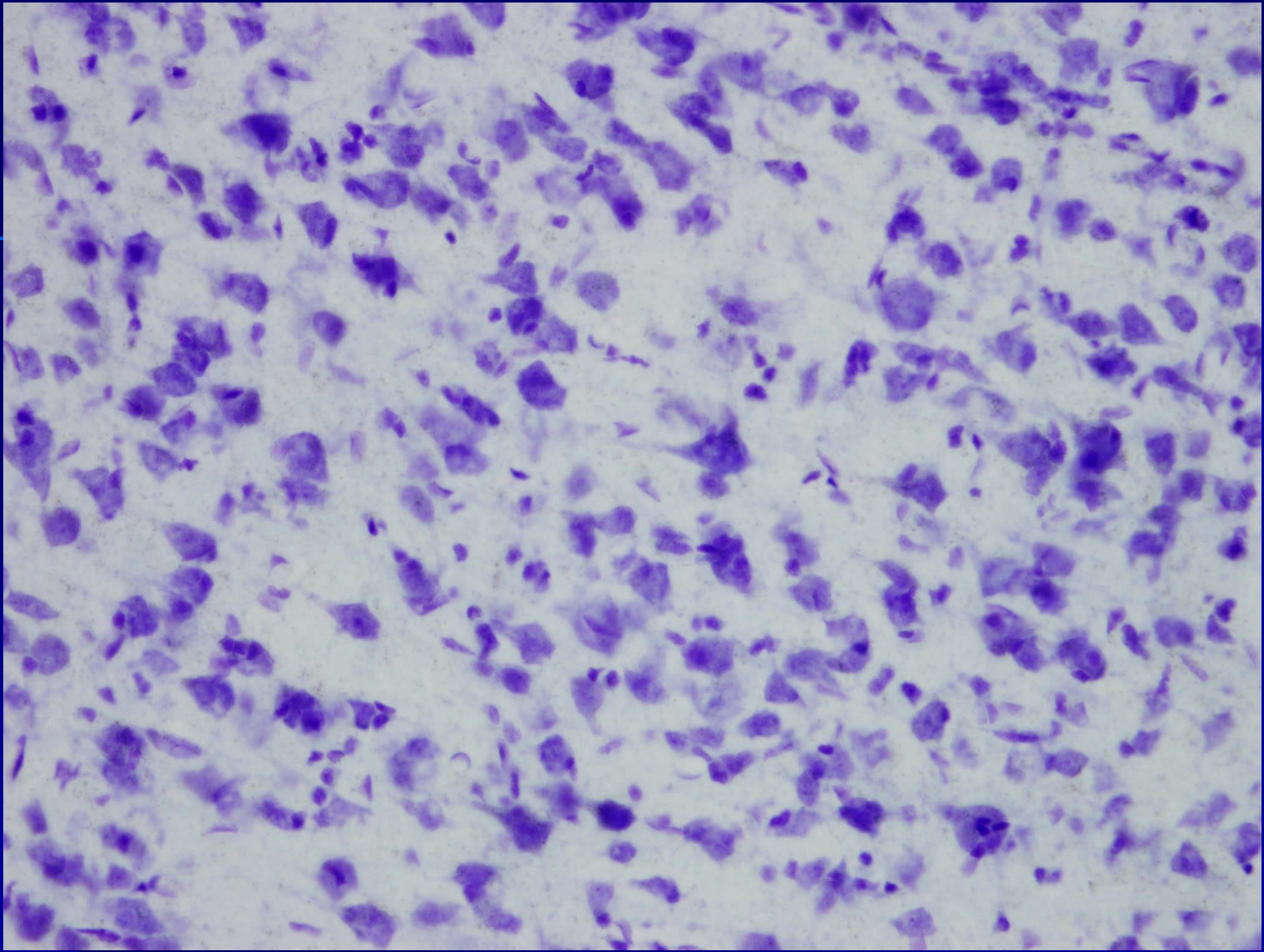
NEOCORTEX

- Laminární uspořádání– 6 vrstev
- 10–20 miliard neuronů
- 95 % povrchu hemisféry

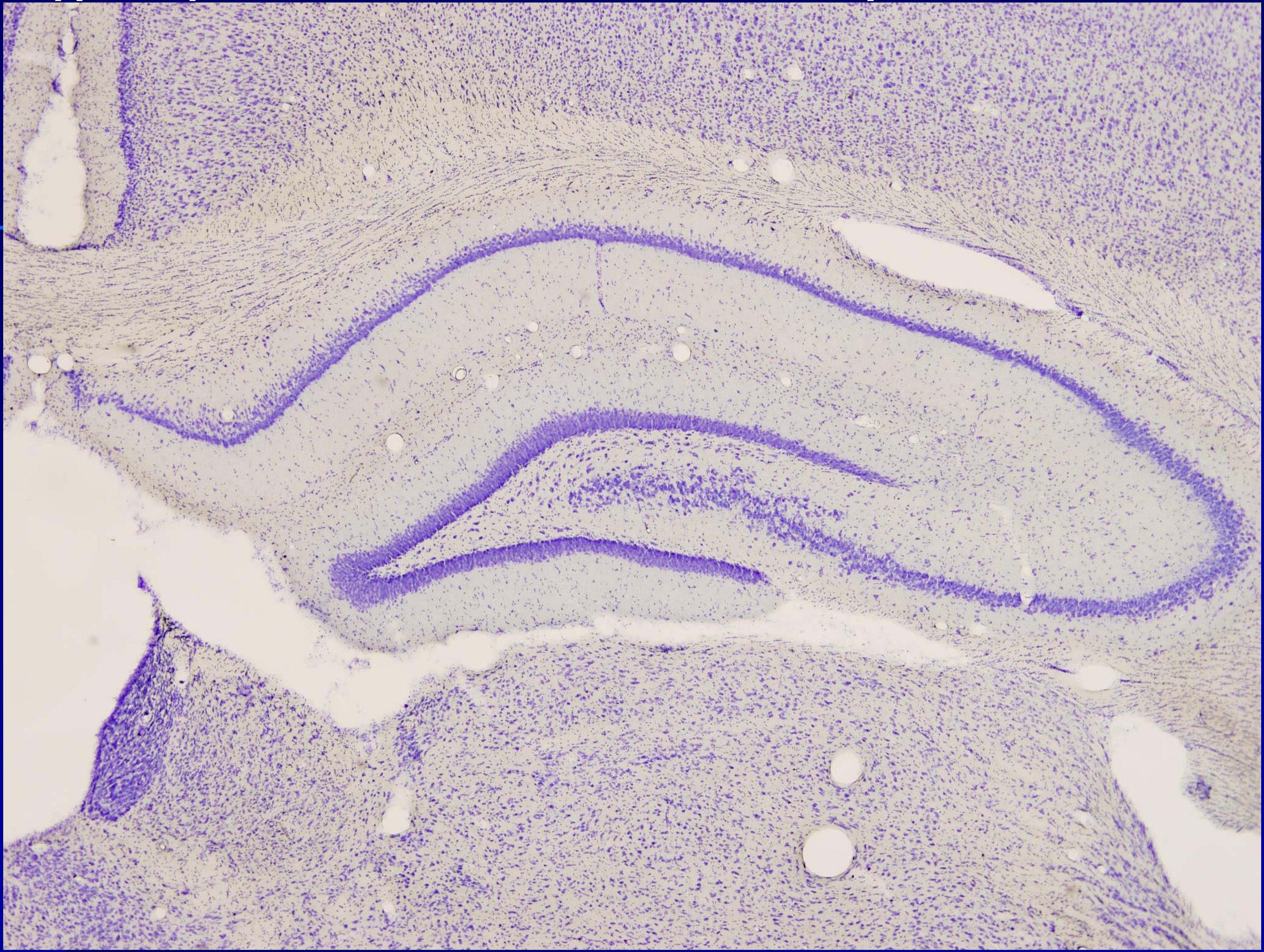
Neocortex, 6 vrstev

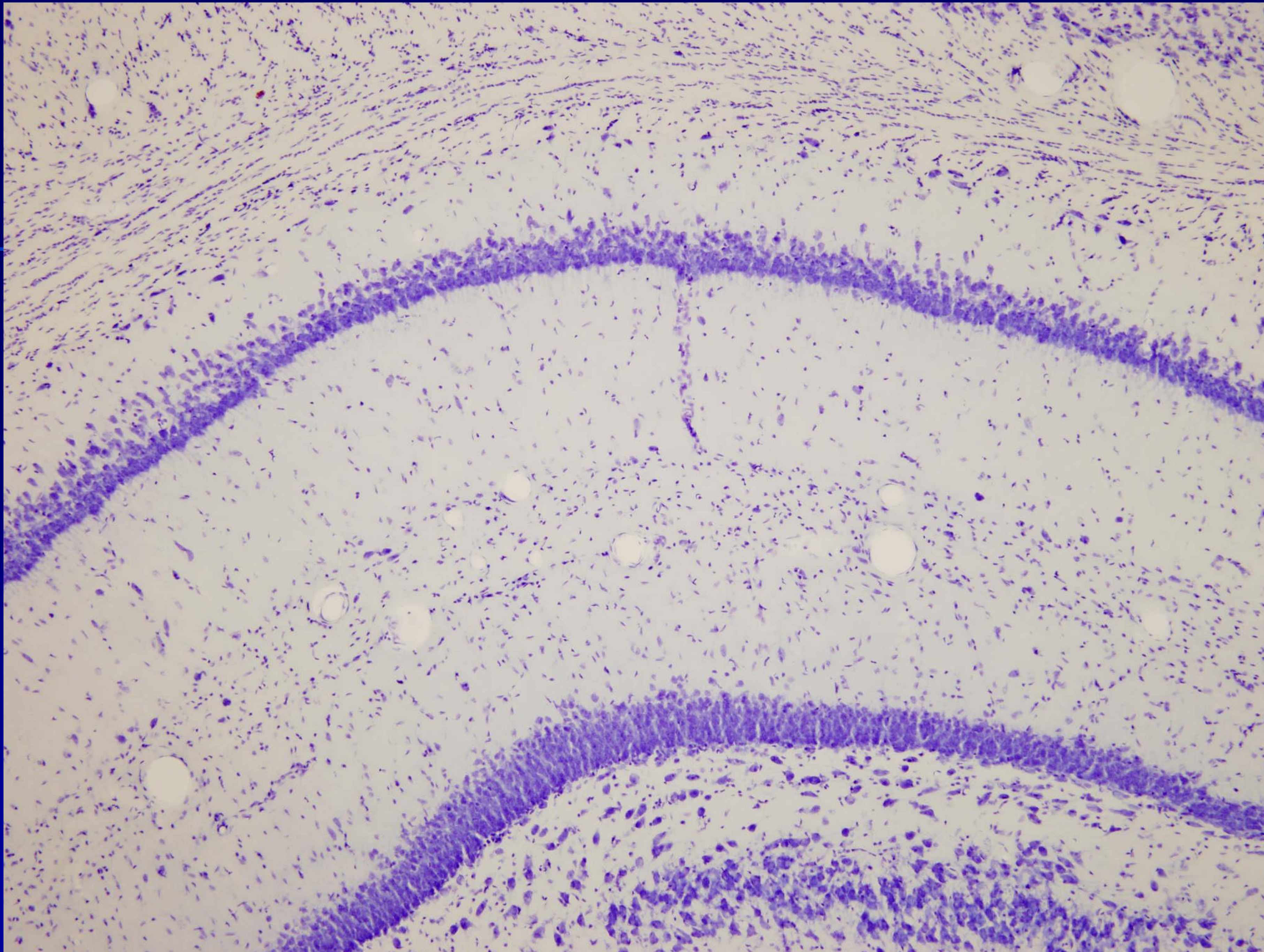


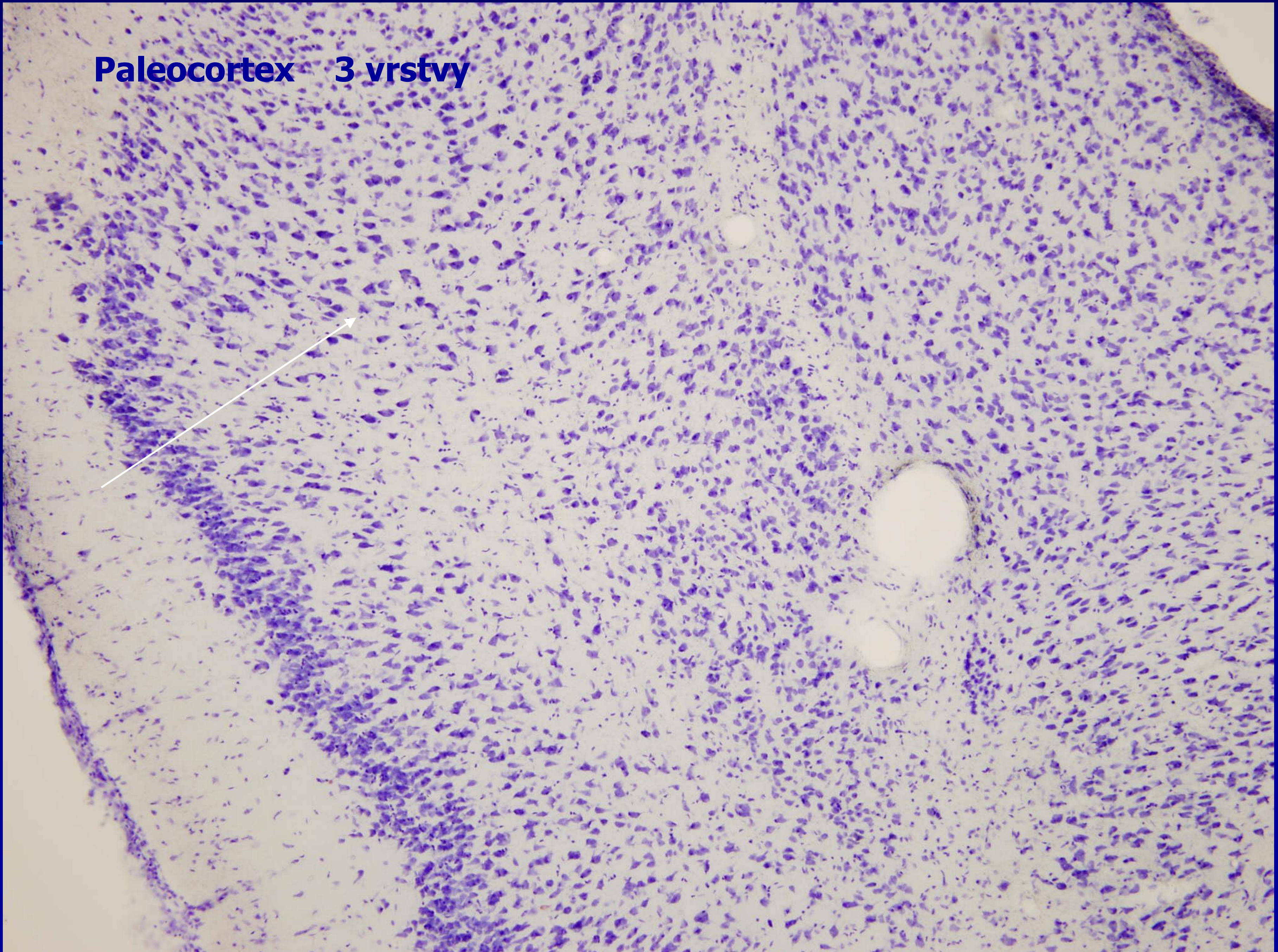


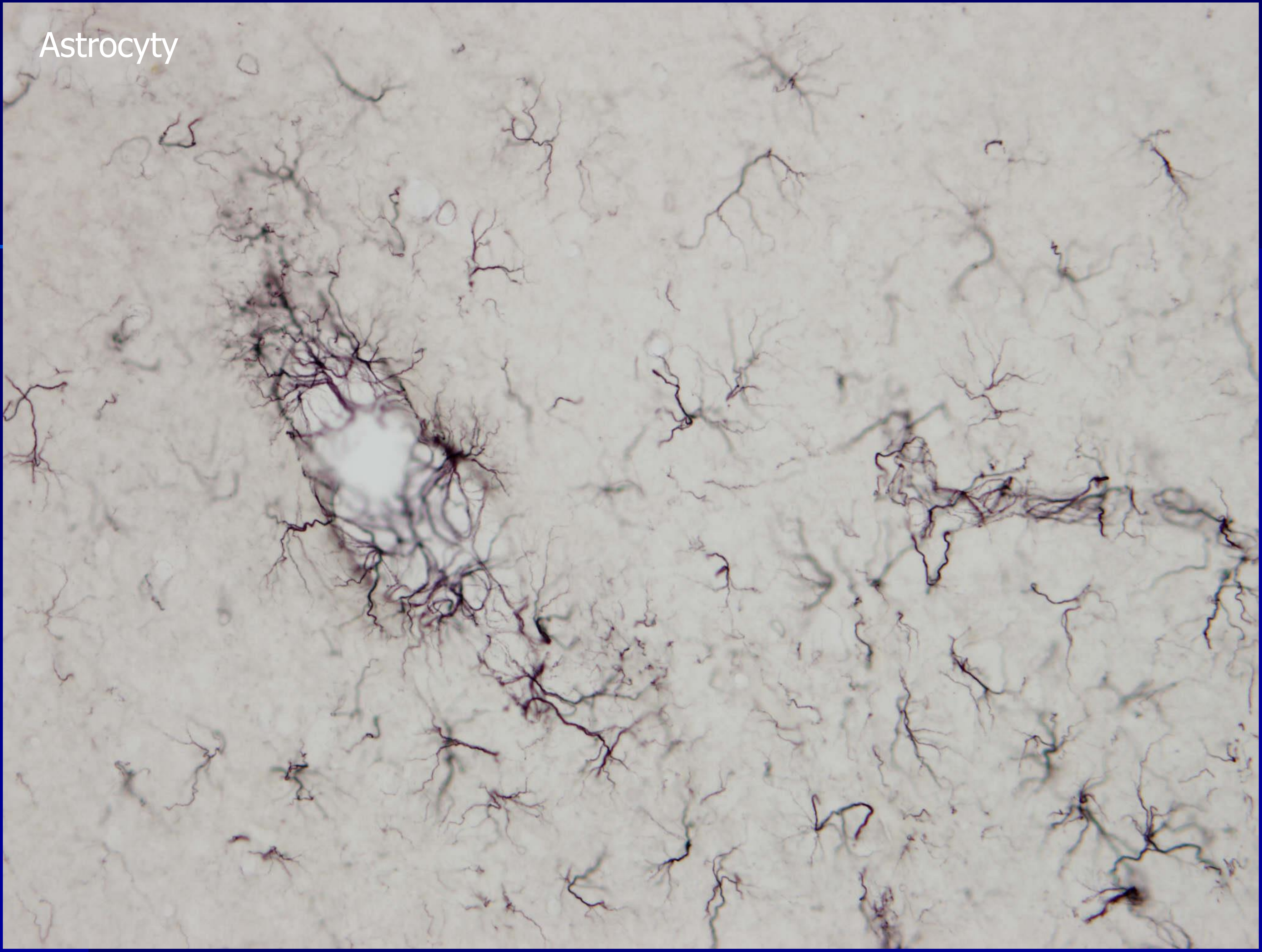


Hippocampus = Archikortikální struktura   3 vrstvy






Paleocortex 3 vrstvy


Astrocyty

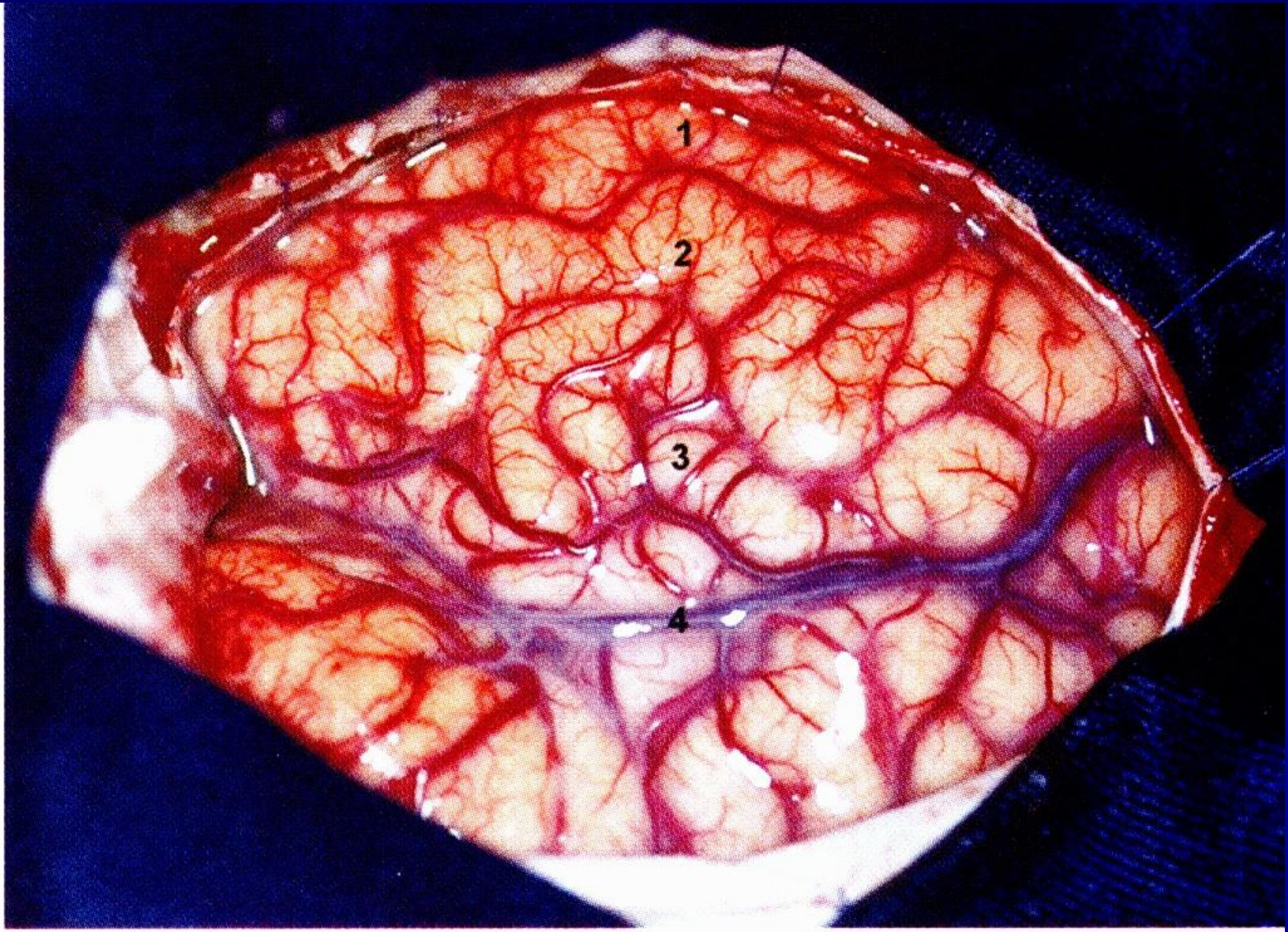


FIGURE 69. Right temporal lobe exposure for standard anatomic temporal lobectomy and amygdalohippocampectomy. *1*, inferior temporal gyrus; *2*, middle temporal gyrus; *3*, superior temporal gyrus; *4*, sylvian fissure.

Korové vrstvy

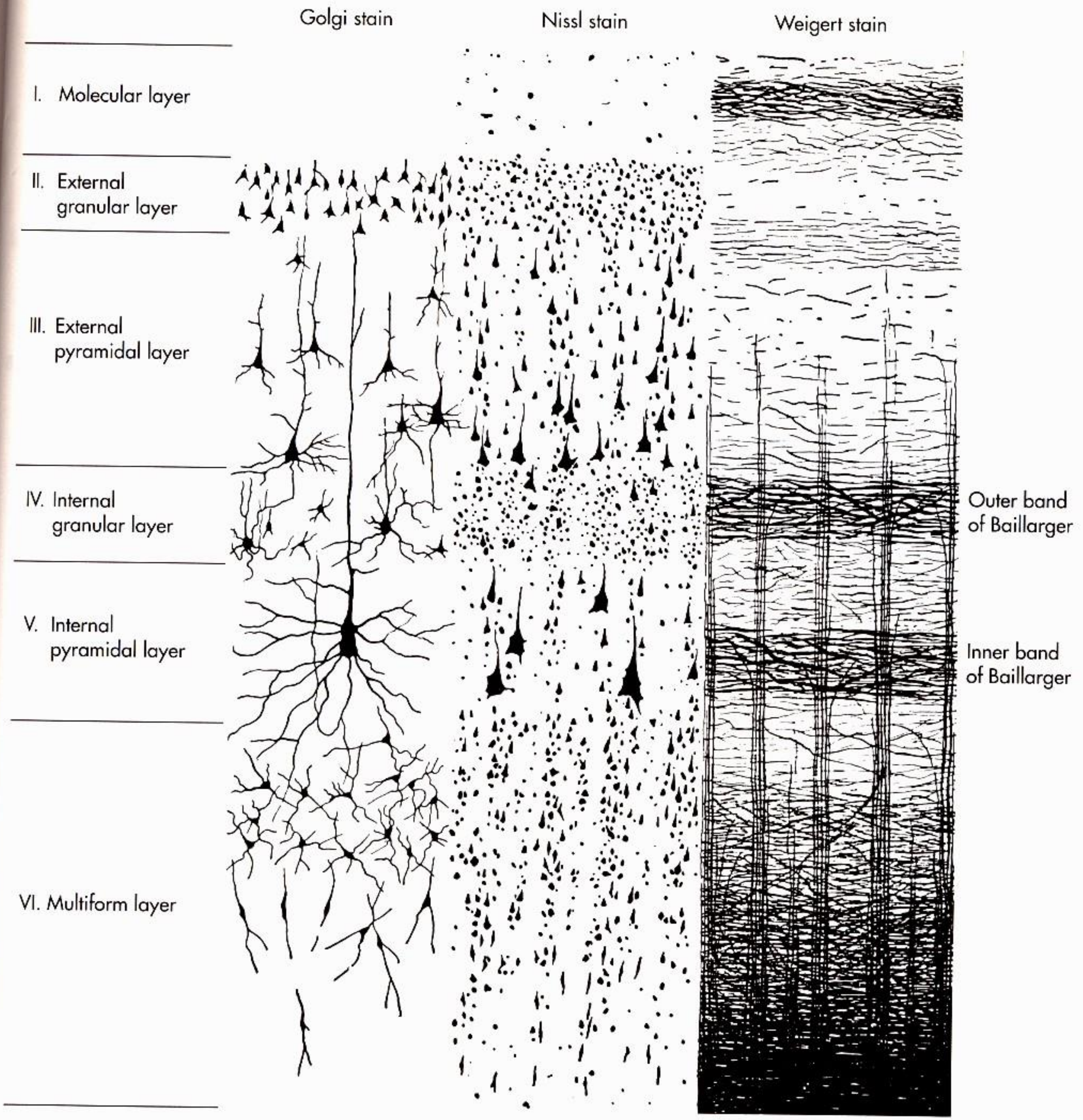


FIGURE 22-6

Cross section of neocortex stained by three different methods; the six cortical layers are indicated. The Golgi stain reveals the shapes of the arborizations of cortical neurons by completely staining a small percentage of them. The Nissl method stains the cell bodies of all neurons, showing their shapes and packing densities. The Weigert method stains myelin, revealing the horizontally oriented bands of Baillarger and the vertically oriented collections of cortical afferents and efferents. [From Brodmann K: *Vergleichende Lokalisation lehre der Grosshirnrinde in ihren Prinzipien dargestellt auf Grund des Zellenbaues,* Leipzig, 1909, JA Barth.]

Neokortex - charakteristika korových vrstev

- **I. Lamina molecularis – inhibiční interneurony**
- **II. L. granularis externa – asociační neurony**
- **III. L. pyramidalis externa – komisurální neurony**
- **IV. L. granularis interna – přijímá talamokortikální vlákna**
- **V. L. pyramidalis interna – projekční neurony (bazální ganglia, mozkový kmen, mícha)**
- **VI. L. multiformis – kortikotalamické neurony**

NEOCORTEX - typy neuronů

- **Pyramidové neurony**
- Apikální a bazální dendrity
- Dendritické trny
- Excitační (glutamát)
- Homogenní skupina
- 60–70 %

- **Nepyramidové neurony**
- Bez trnů
- Heterogenní skupina
- Inhibiční (GABA)
- 30–40 %

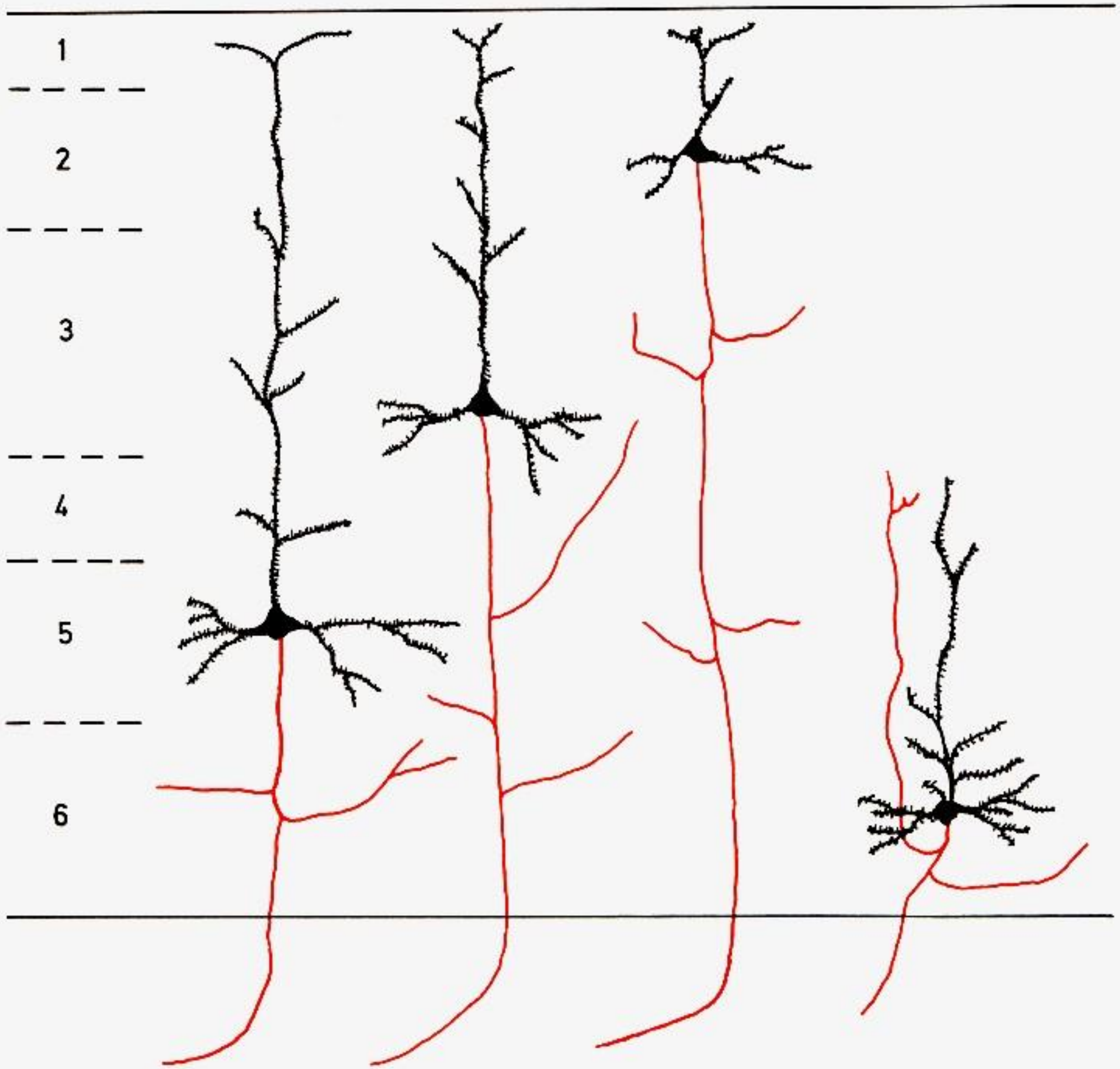


Fig. 17.5. *Cortical projection neurons.* Schematic drawing. The axons, shown in red, give off several recurrent collaterals on their way to the white matter. The dendrites have numerous spines. The larges neurons, with the largest perikarya and the thickest axons, are located in layer 5. Schematic drawing based on studies by Jones (1988) of the central region of the monkey with the Golgi method.

Pyramidové neurony

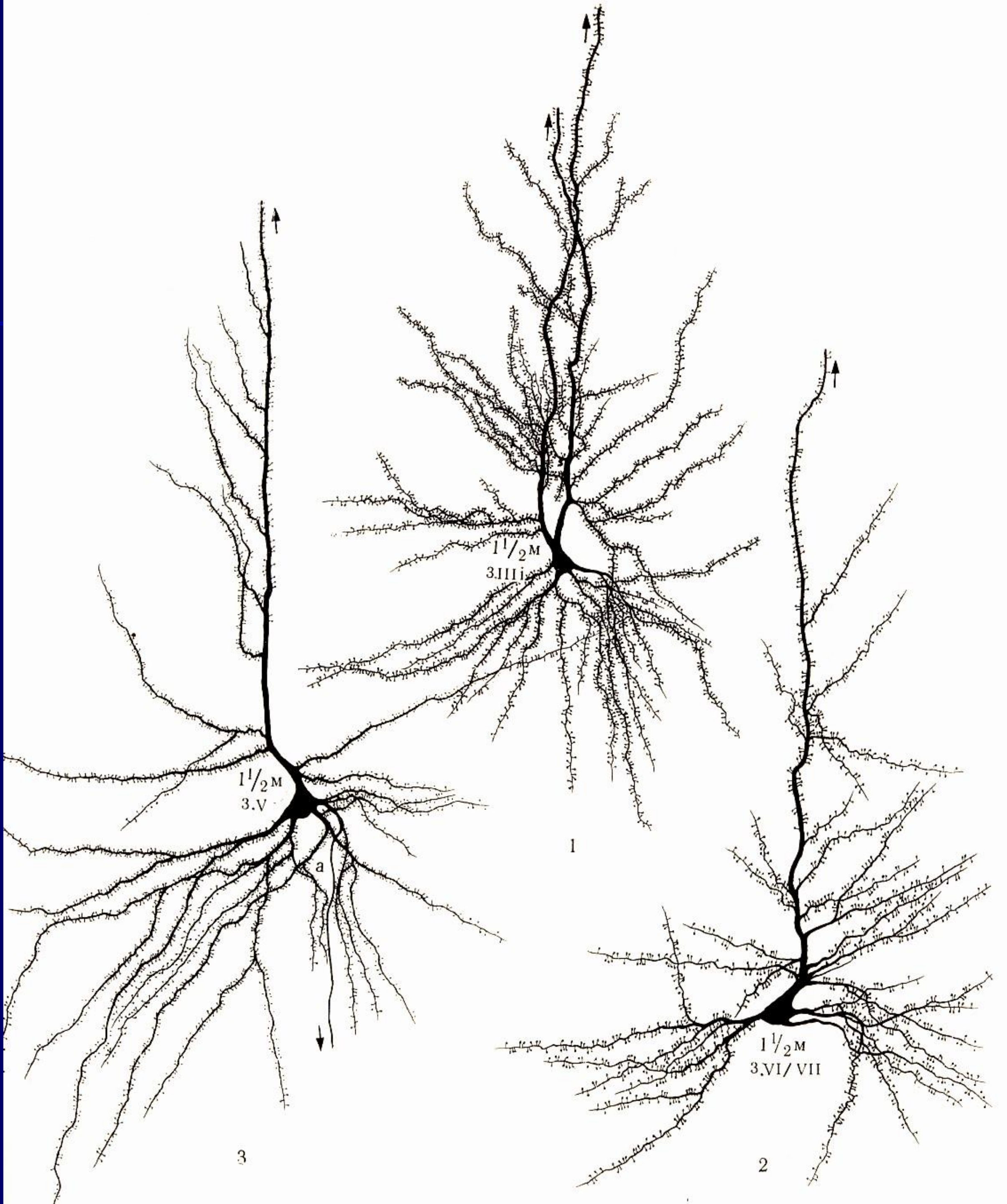
Vrstva V.

M I

Golgiho impregnace

Dendritické

trny



Korove interneurony

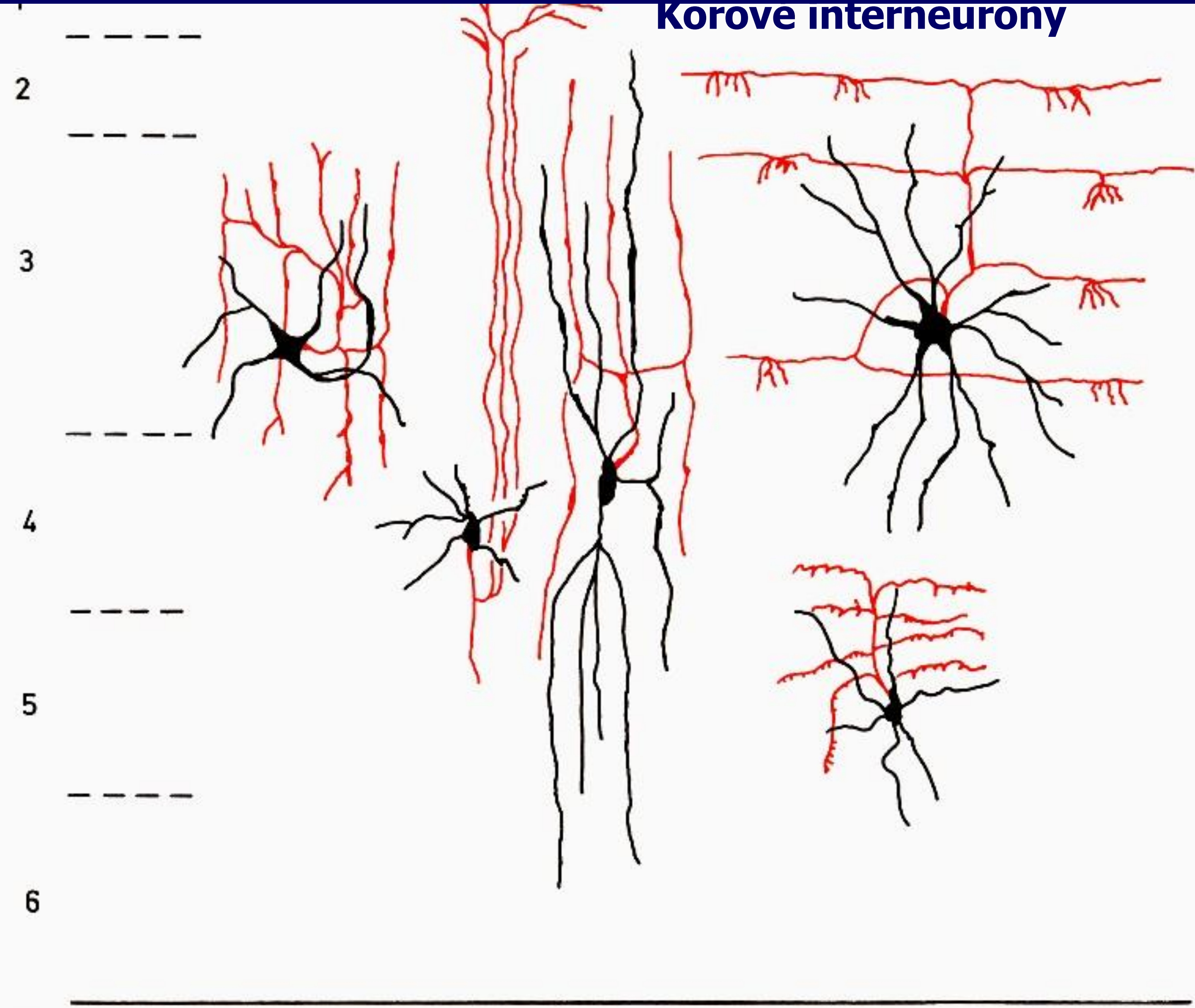


Fig. 17.6. *Main kinds of cortical interneurons.* Note three patterns of axonal distribution (in red): in the immediate vicinity of the perikaryon, horizontally in the layer of the perikaryon, and vertically spanning several layers. Based on Jones (1988).

Projekční neurony, excitatační, glutamát

Dlouhé axony

Interneurony, inhibiční, GABA, krátké axony

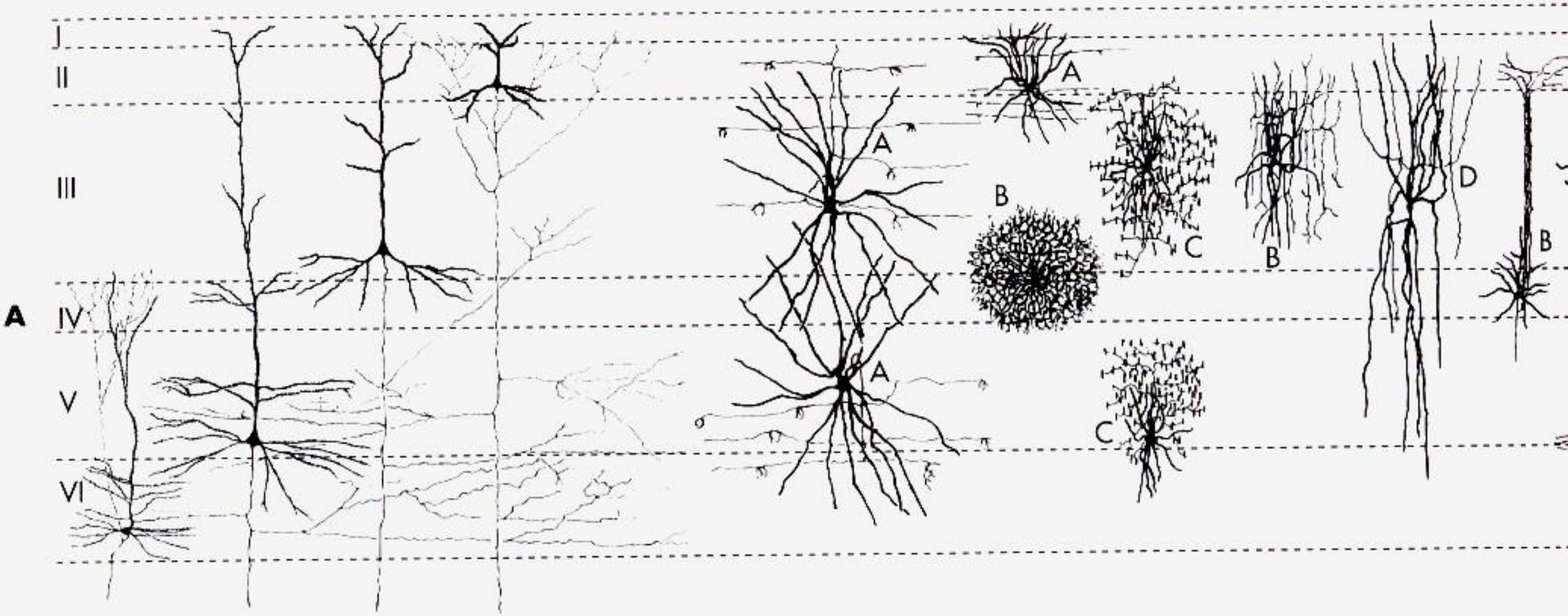
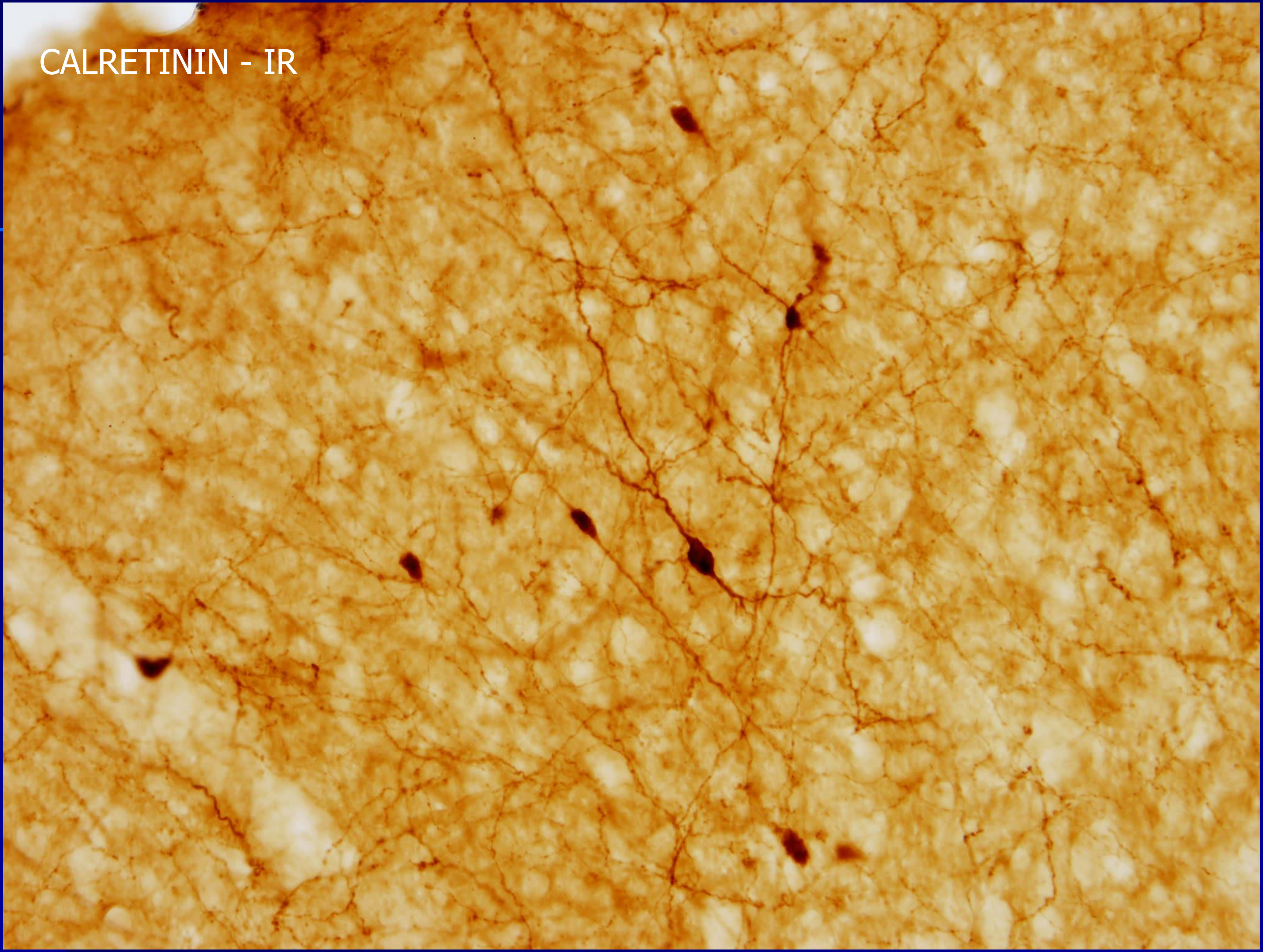
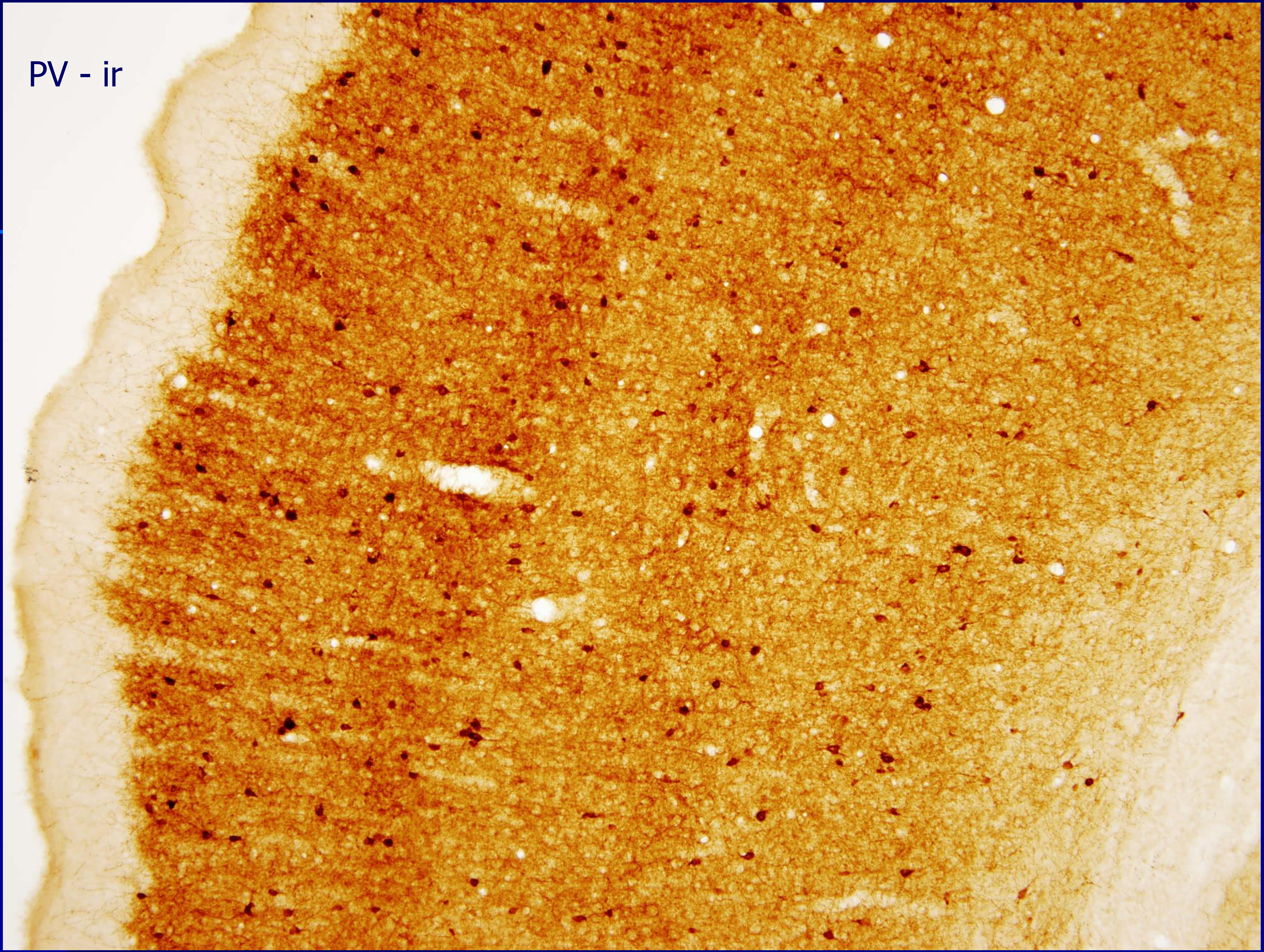


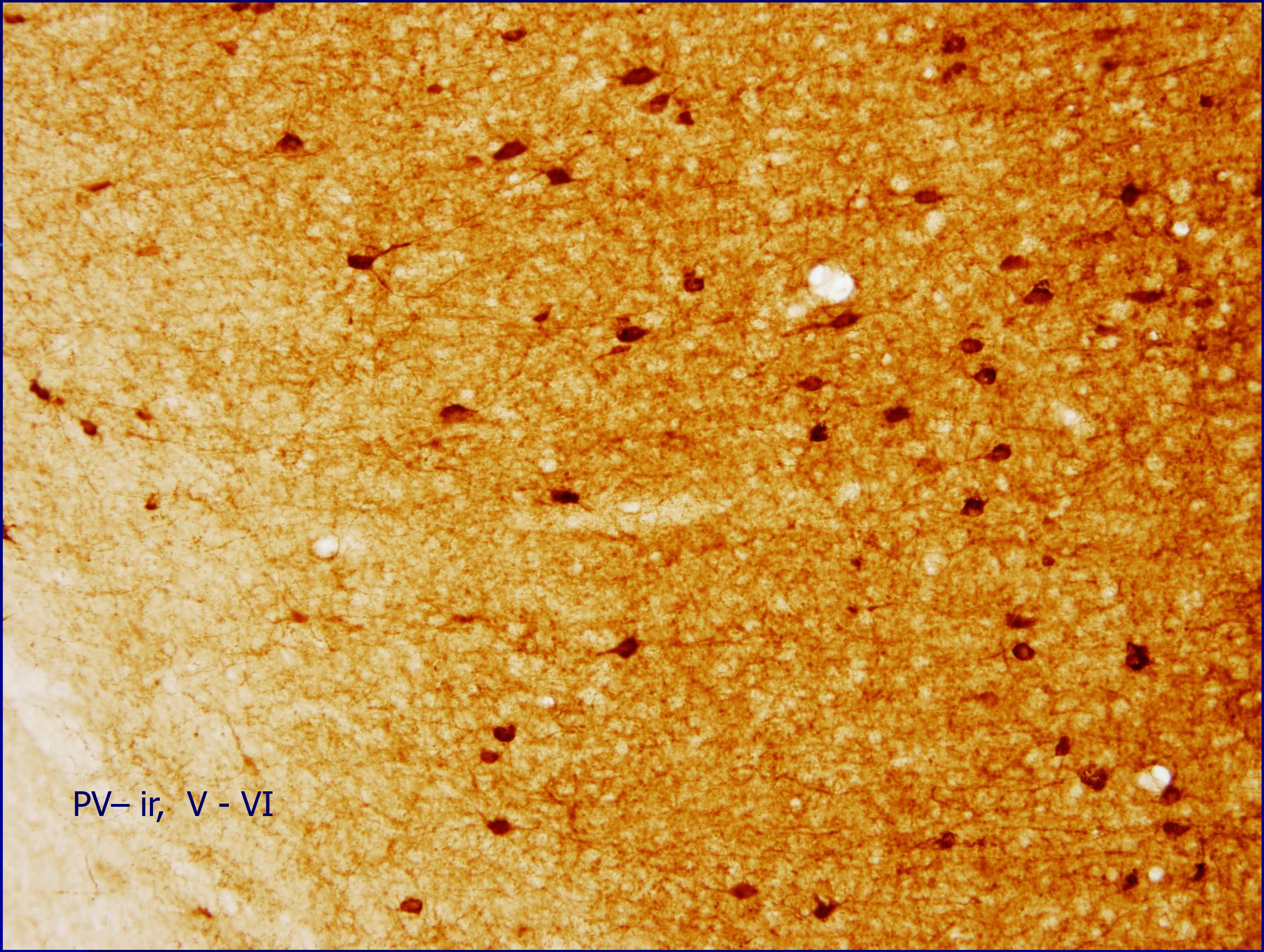
FIGURE 22-4

Neocortical neurons. **A**, Pyramidal neurons in different layers have characteristically different soma sizes and patterns of distribution of a
collaterals. **B**, Nonpyramidal neurons come in a variety of sizes and shapes; many have names attributable to their shapes. Basket cells *(A)*
usually large and make basket-shaped endings that partially surround the cell bodies of pyramidal cells. Other kinds of smaller multipolar c
(B) may have elaborate dendritic and axonal arborizations. Chandelier cells *(C)* have vertically oriented synaptic "candles" that end on the
tial segments of pyramidal cell axons. Bipolar cells *(D)* have dendrites that both ascend and descend, and double bouquet cells *(E)* have ax
that both ascend and descend. [**A** from Jones EG: Identification and classification of intrinsic circuit elements in the neocortex. In Edelman G
Gall WE, Cowan WM, editors: *Dynamic aspects of neocortical function*, New York, 1984, John Wiley and Sons. **B** from Hendry SHC, Jones E
Neurosci 1:390, 1991.]

Interneurony, krátké axony


CALRETININ - IR


PV - ir


PV– ir, V - VI

„**My investigations showed that the functional superiority of the human brain is intimately bound up with the prodigious abundance and unusual wealth of forms of the so-called neurons with the short axons**.“

S. R. y Cajal: Recuerdos de mi vida. 1917.

Interneurons are butterflies of the soul.

S.R. y Cajal 1923

Petilla de Aragon (Navarra) 2005

„ Petilla Convention „

Inhibiční neurony

– GABA + neuropeptid

Inhibice –

Axo-dendritická

Axo- somatická

Axo-axonální

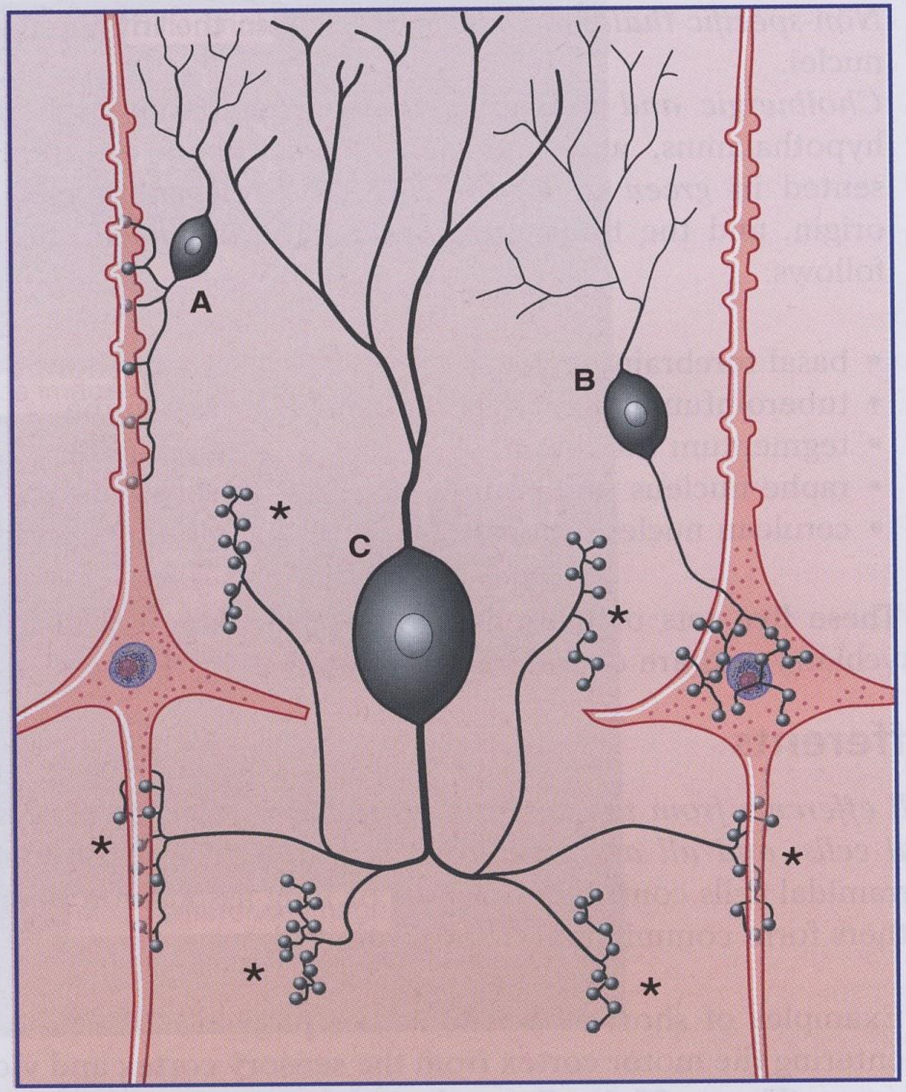


Figure 29.3 Three morphological types of GABAergic inhibitory neuron. **A**, axodendritic cell, synapsing upon the shaft of the apical dendrite of a pyramidal cell. **B**, basket cell, forming axosomatic synapses on a pyramidal cell; **C**, chandelier cell, forming axoaxonic synapses (*) upon the initial segments of the two pyramidal cell axons shown, and upon four other initial segments not shown. (Based on DeFelipe 1999 with permission.)

Pokles hustoty korových GABAergních neuronů

- Epilepsie
- Schizofrenie
- Maniodepresivní sy

K.Brodmann, 1907, 1911

11 regiones

52 areae

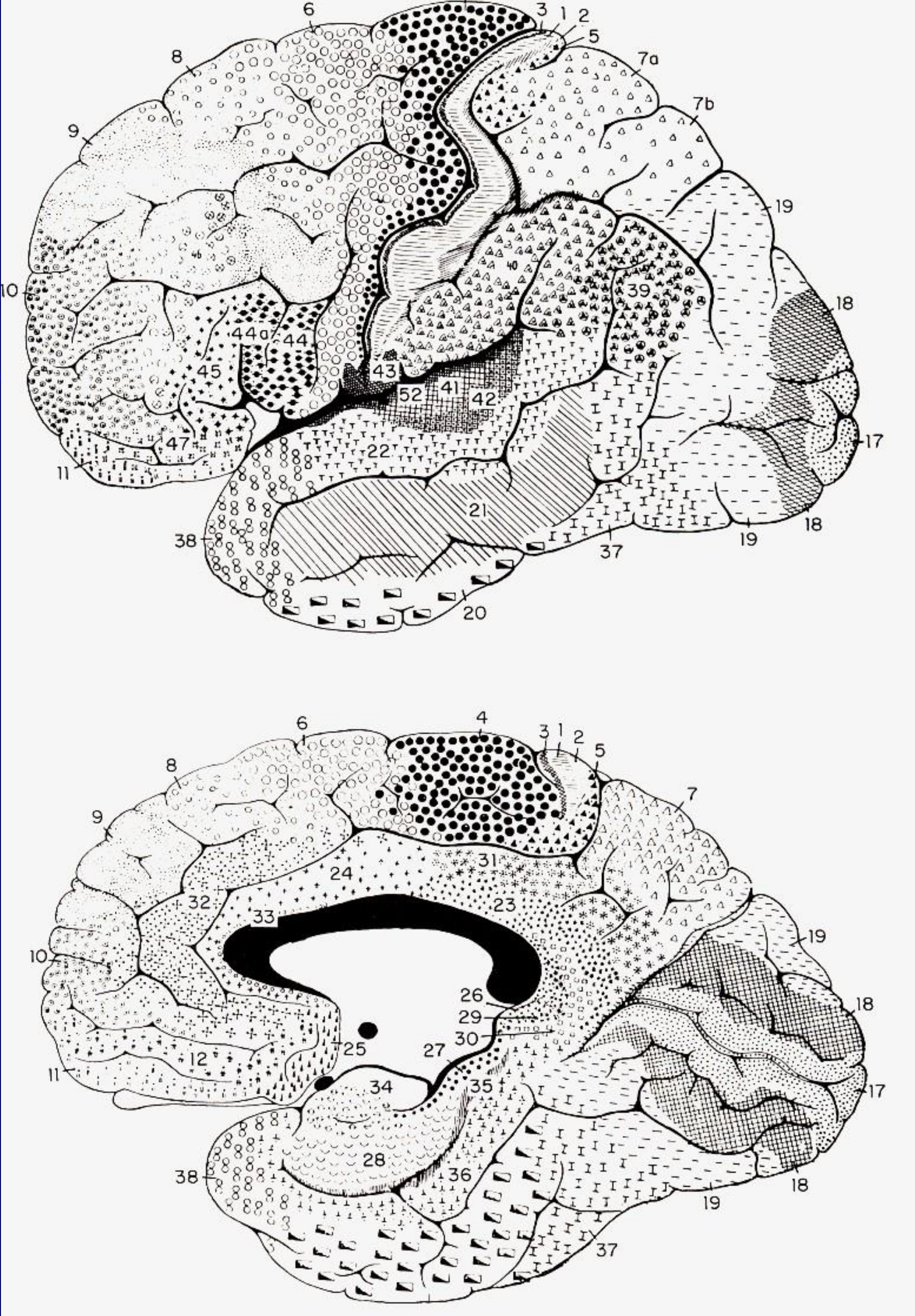
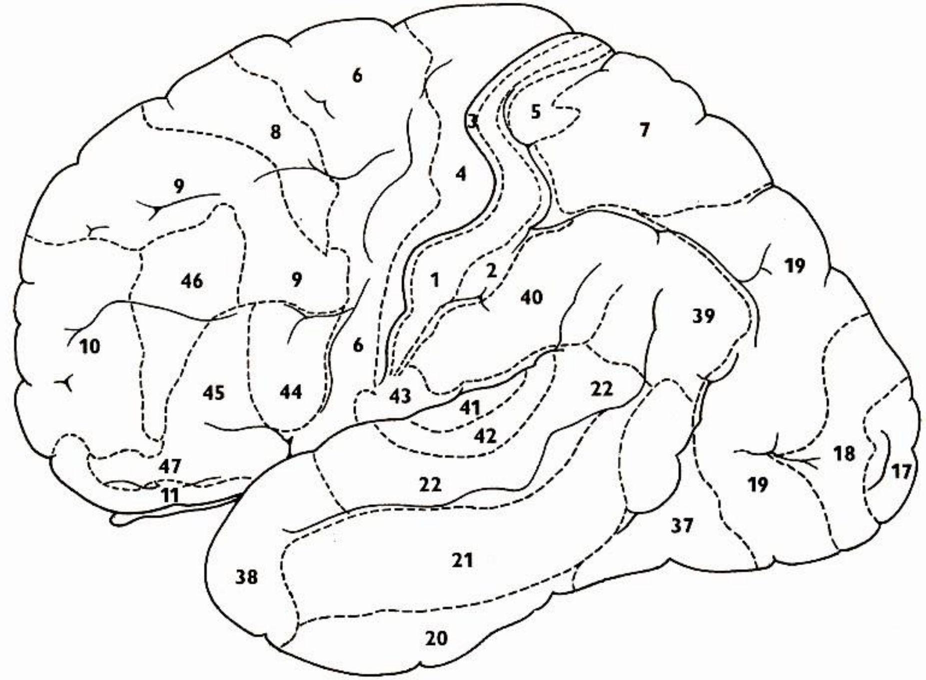


Fig. 17.3. *Brodmann's cytoarchitectonic map of the human brain.* The various areas are labeled with different symbols and numbers.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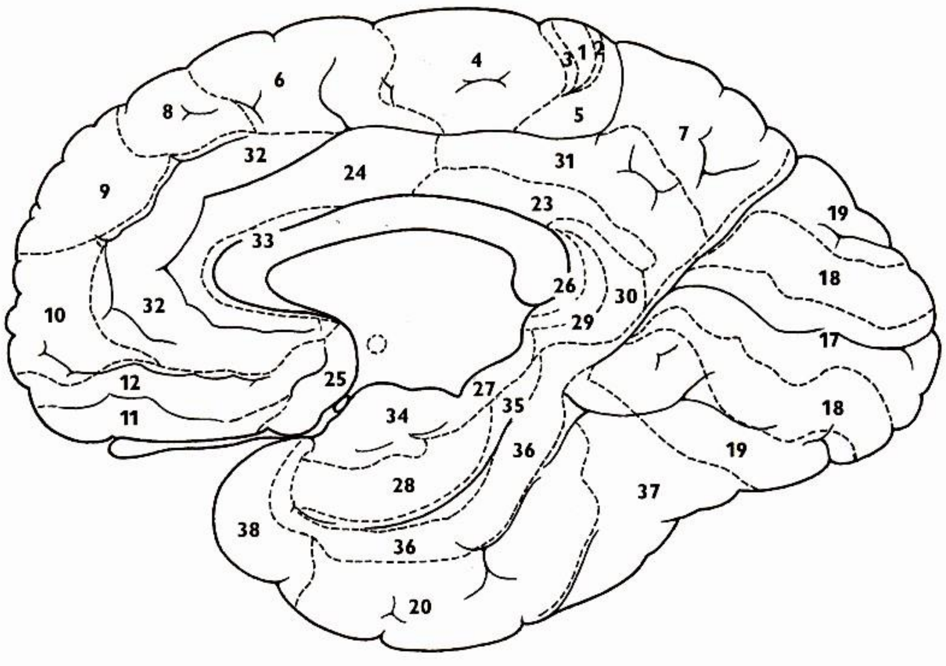
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Vývoj asociačních korových oblastí

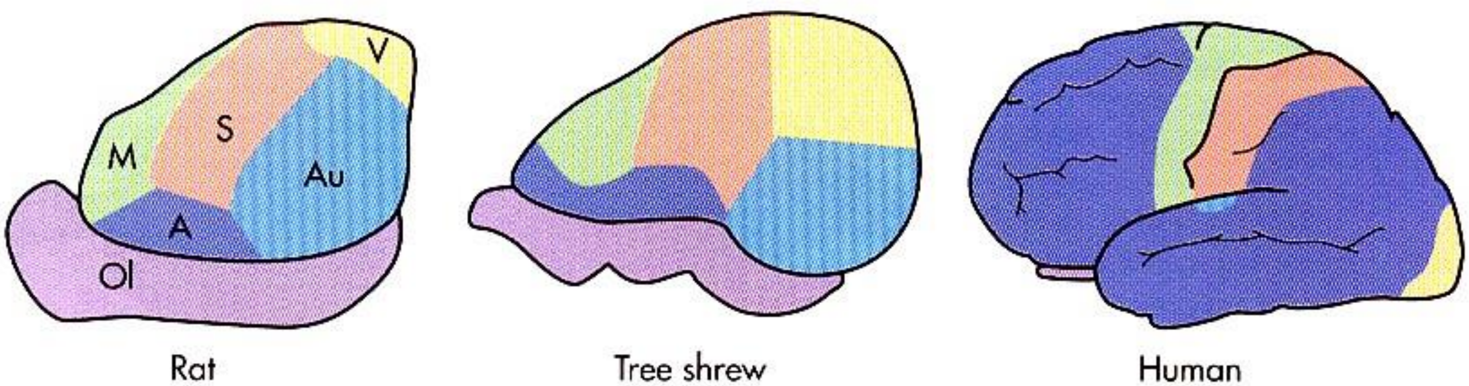
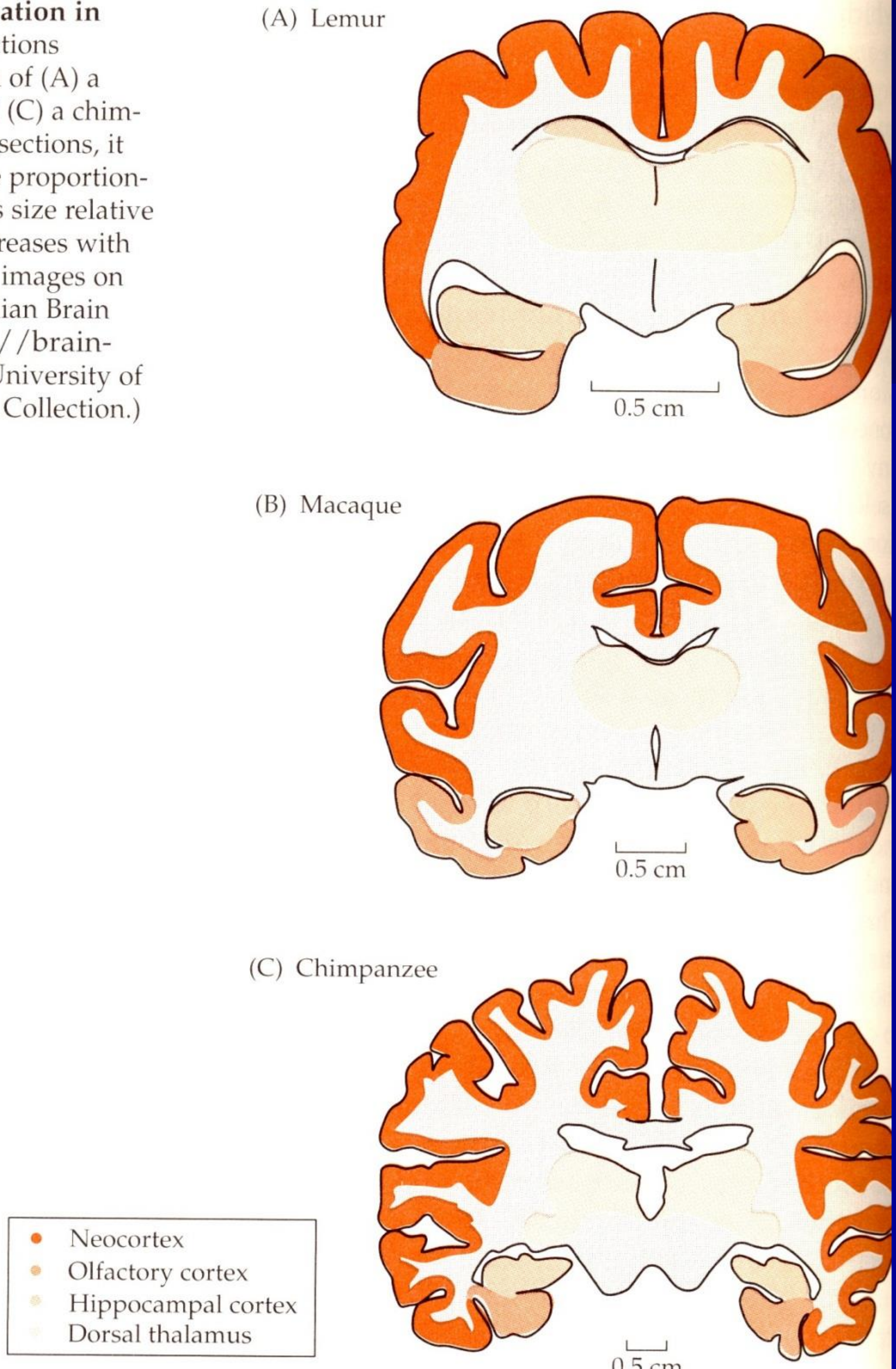


FIGURE 22-14

Motor *(M)*, auditory *(Au)*, somatosensory *(S)*, visual *(V)*, olfactory *(Ol)*, and association *(A)* areas of the cerebral hemispheres of three different mammalian species. All three brains are drawn the same size, even though the human brain is far larger than the other two; the relative and absolute increase in the amount of association cortex is apparent. (Modified from Penfield W: Speech, perception and the cortex. In Eccles JC, editor: *Brain and conscious experience*, New York, 1966, Springer-Verlag.)

Figure 5.3 Neocorticalization in Primates Transverse sections through the telencephalon of (A) a lemur, (B) a macaque, and (C) a chimpanzee. Comparing these sections, it becomes apparent that the proportional size of the neocortex (its size relative to other brain regions) increases with absolute brain size. (After images on the Comparative Mammalian Brain Collections website [http://brain-museum.org], from the University of Wisconsin–Madison Brain Collection.)



Typy neokortexu

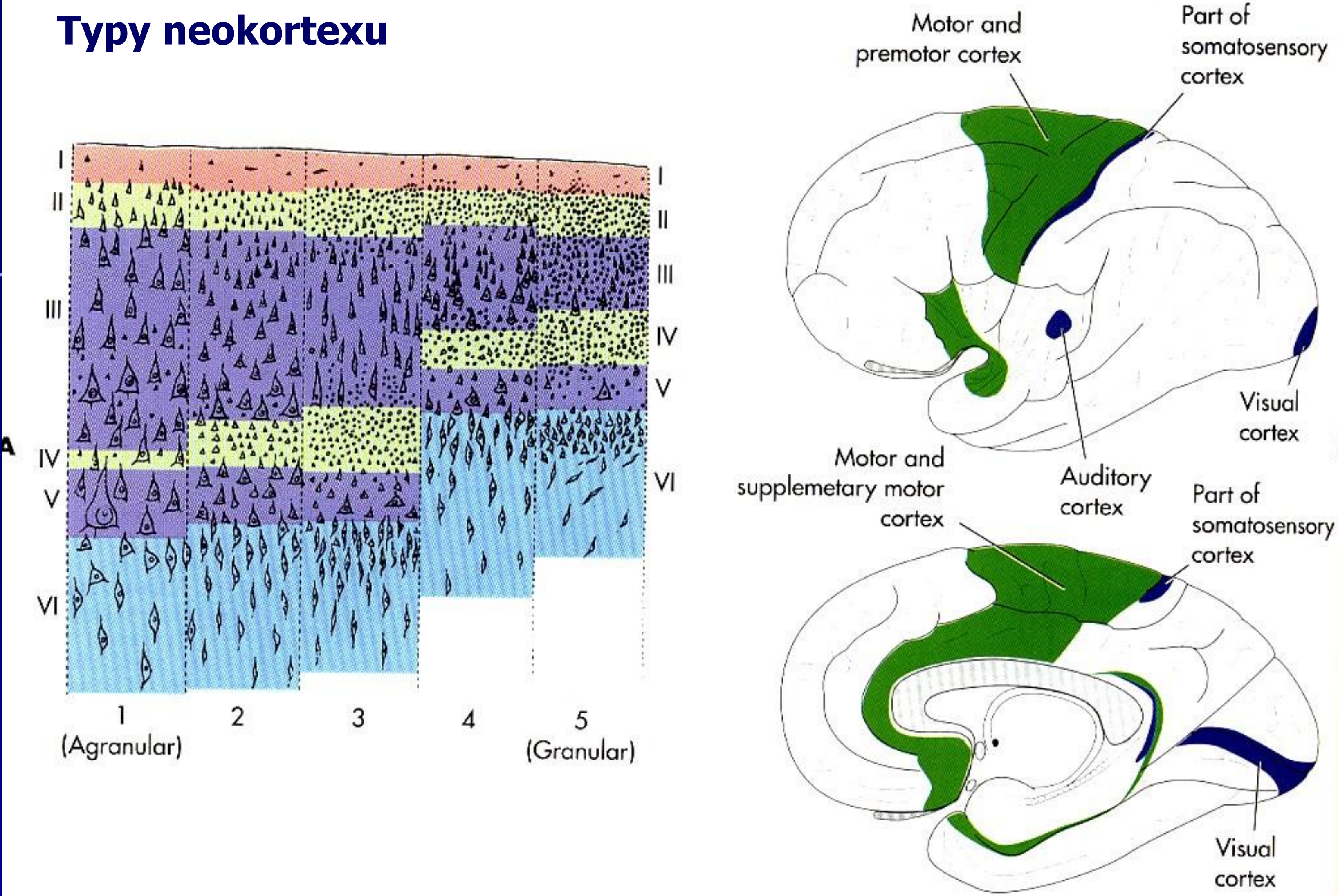
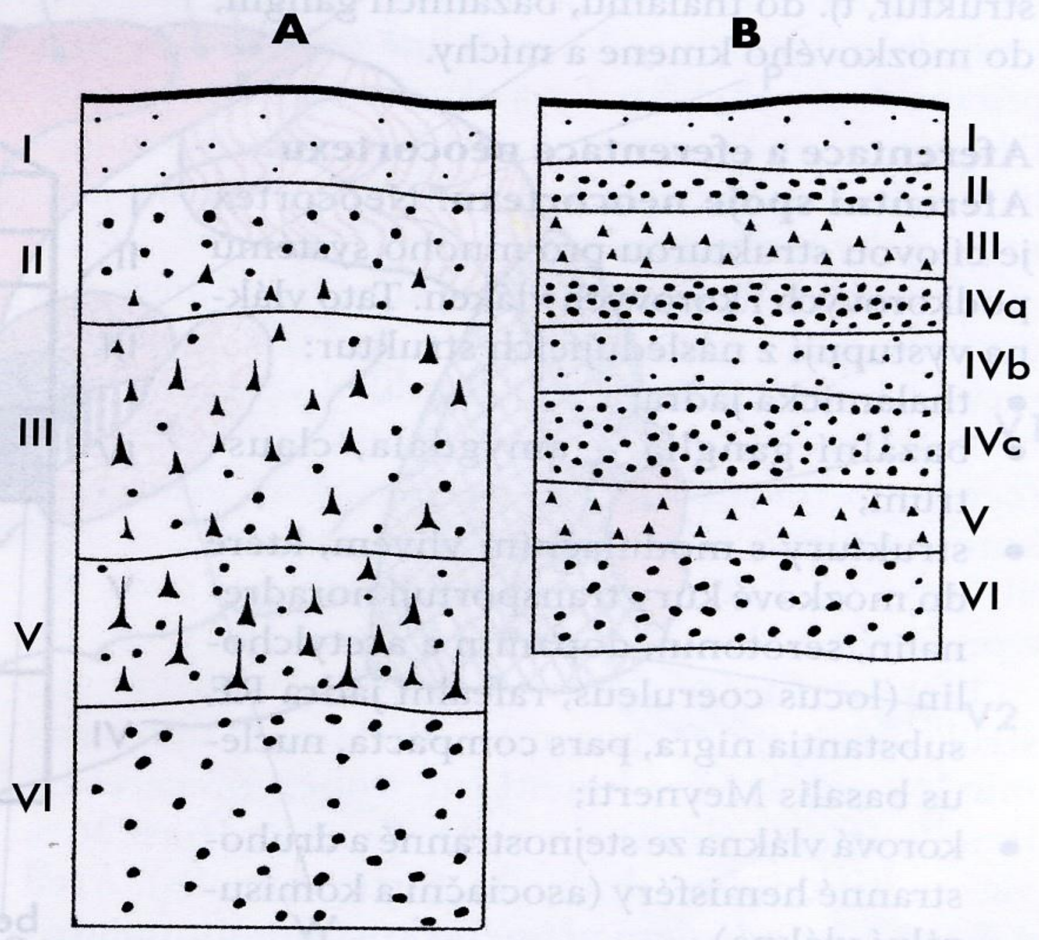


FIGURE 22-7

A, Different types of neocortex. At the two extremes are the heterotypical cortices: agranular cortex dominated by large pyramidal cells and granular cortex (koniocortex) dominated by small cells. Areas with intermediate structures in which six layers can be discerned more clearly are homotypical and were divided into three types by von Economo: *2,* frontal type; *3,* parietal type; *4,* polar type; **B,** Distribution of heterotypical cortex. The lateral view, above, is drawn as though the lateral sulcus had been pried open, exposing the insula. Agranular cortex *(green)* is found primarily in motor areas, granular cortex *(purple)* primarily in sensory areas (compare with Figure 22-16). [Modified from von Economo C: *The cytoarchitectonics of the human cerebral cortex,* Oxford, 1929, Oxford University Press.]

A = Agranulární kůra

B = Granulární kůra

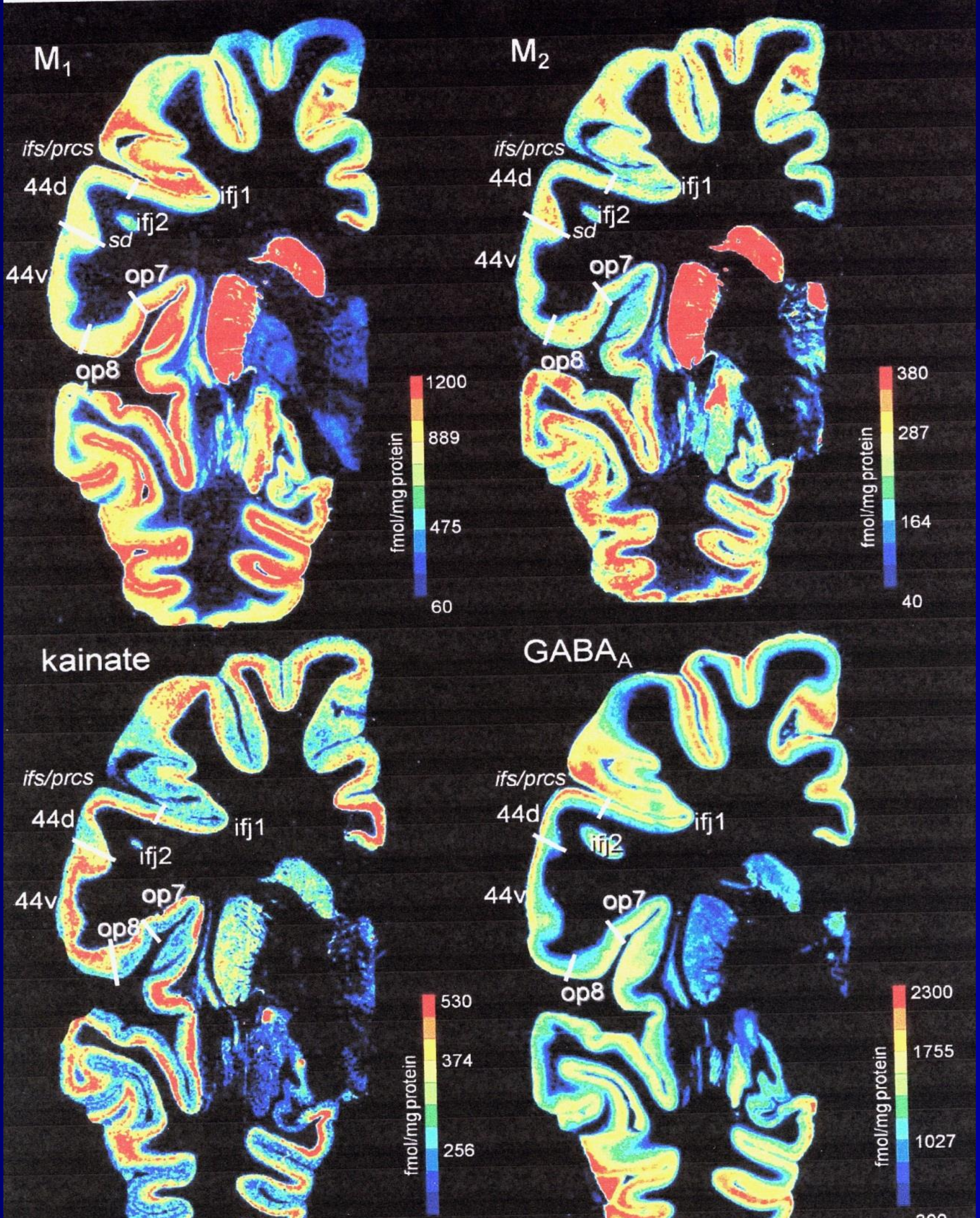


Obr. 123. Příklady různých typů neokortexu (schéma). A – agranulární kůra (motorická korová oblast, area 4), **B** – granulární kůra (zraková korová oblast, area 17). I–VI = vrstvy neokortexu

Receptorové mapy

Koncentrace receptorů

K. Zilles (2005)



Receptorové mapy

Cholinergní receptory M2

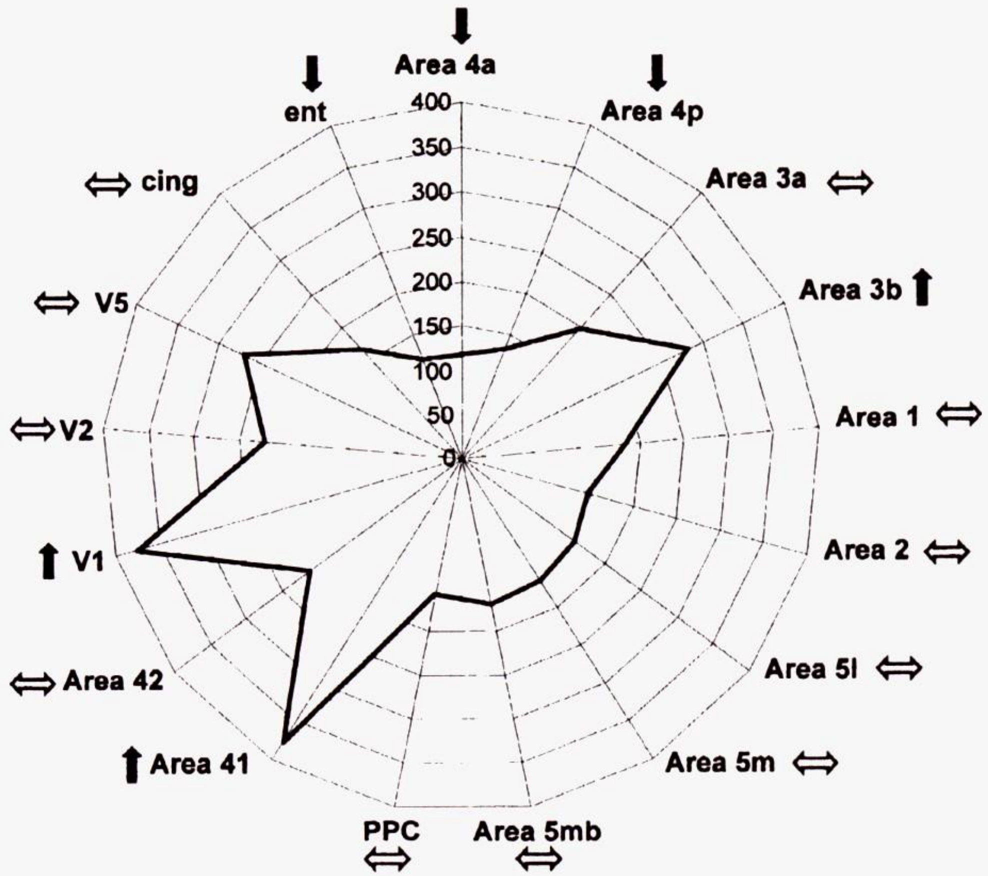


Fig. 2. Mean cholinergic muscarinic M2 receptor densities (fmol/mg protein; specific binding) using [^{3}H]oxotremorine-M in 17 different cortical areas. Primary motor cortex, areas 4a and 4p; primary somatosensory cortex, area 3b; unimodal somatosensory areas, 3a, 1, and 2; areas of the superior parietal lobule, 5l (lateral area 5), 5m (mesial area 5), 5mb (mesial and ventral area 5), PPC (posterior parietal cortex); primary auditory cortex, area 41; secondary auditory cortex, area 42; primary visual cortex, V1; secondary visual cortex, V2; visual area active during presentation of moving stimuli, V5; posterior cingulate cortex, cing; entorhinal area, ent. The arrows indicate high (⇑), intermediate (⇔), and low (⇓) densities.

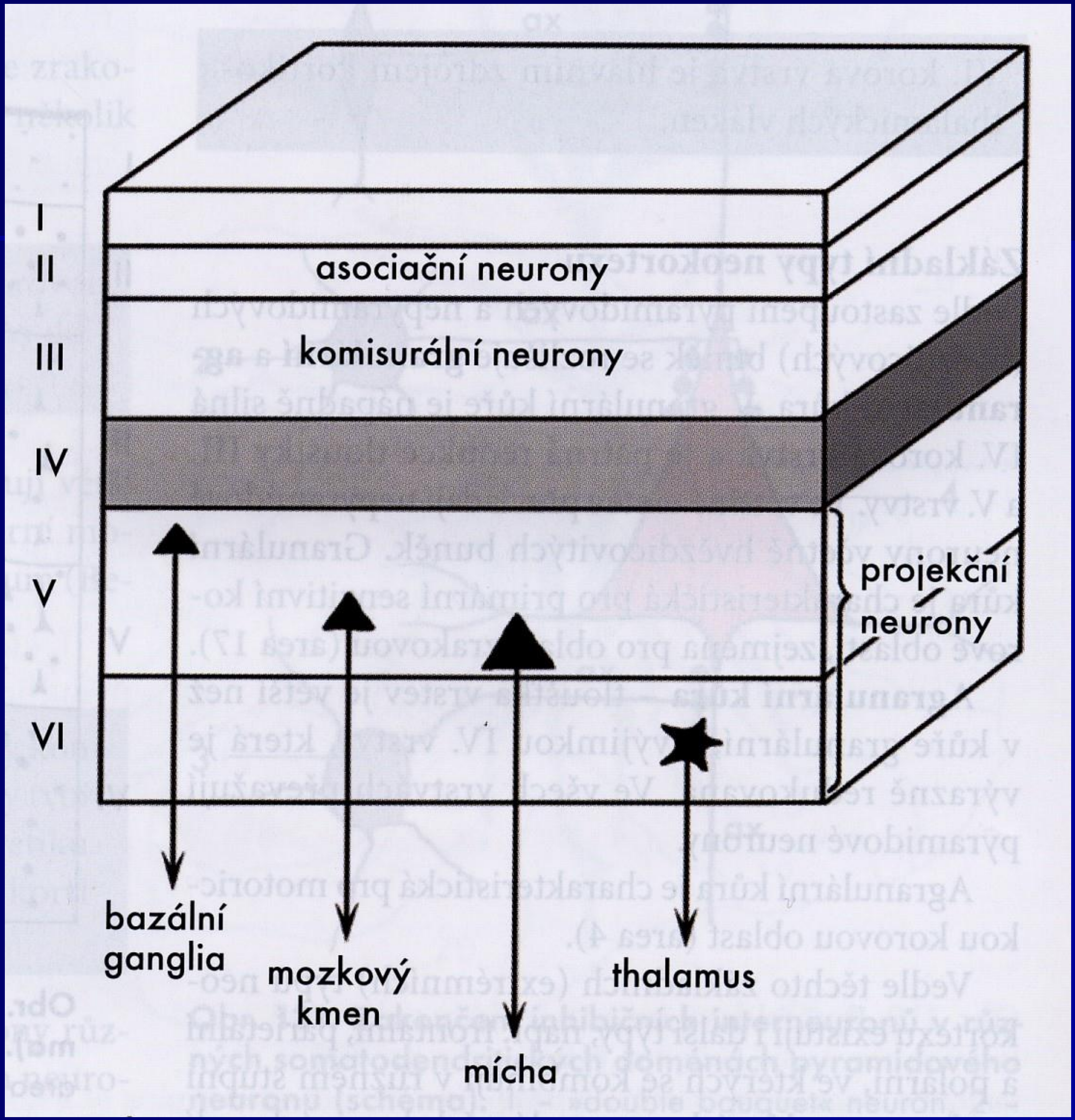
Afferentní neokortikální spoje

- **Talamická jádra** (talamokortikální vlákna)
- Corpus amygdaloideum
- Claustrum
- Ncl. basalis Meynerti (acetylcholin)
- Hypotalamus
- Rafeální jádra (serotonin)
- Locus caeruleus (noradrenalin)
- Substantia nigra + VTA (dopamin)

Eferentní neokortikální spoje

- Talamická jádra
- Bazální ganglia (striatum, corpus amygdaloideum, claustrum)
- Mozkový kmen (pretektální oblast, tectum, ncl. ruber, RF, jádra hlavových nervů, ncll. pontis, ncl. gracilis, ncl. cuneatus)
- Mícha - pyramidová dráha (interneurony, motoneurony)

Funkce korových vrstev



Funkční korové oblasti

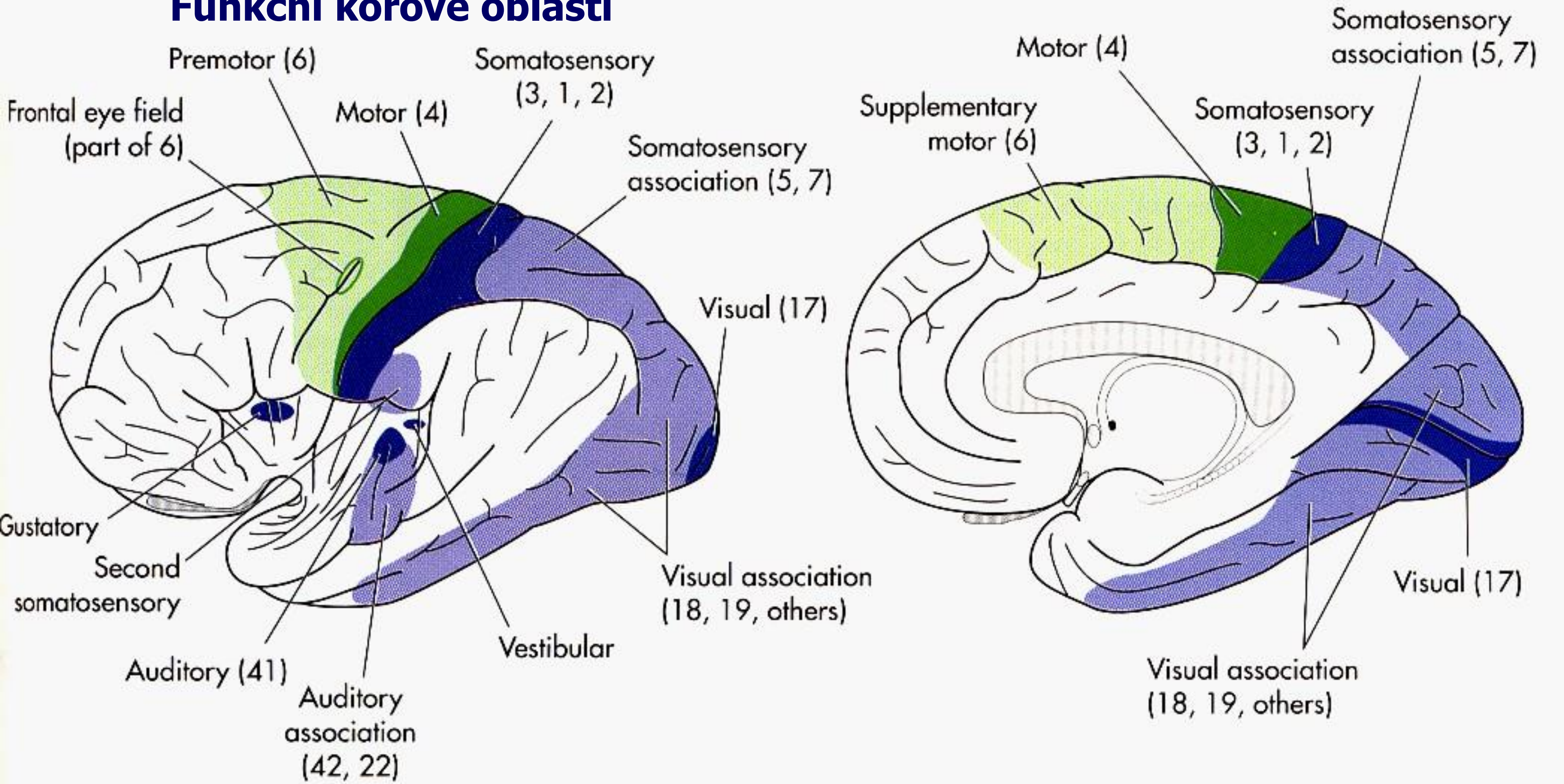


FIGURE 22-16

Summary diagram of some functional areas of the cerebral cortex. The lateral view, as in Figure 22-7, is drawn as though the lateral sulcus had been pried open, exposing the insula. Visual association cortex is particularly extensive in primate brains, occupying not only most of the occipital lobe but also much of the temporal lobe. Many of these various functional areas are associated with one of Brodmann's anatomically defined areas, although sometimes the correspondence is only approximate; commonly used Brodmann numbers are indicated in parentheses. (Modified from von Economo C: *The cytoarchitectonics of the human cerebral cortex*, Oxford, 1929, Oxford University Press.)

Motorická korová oblast

- G. Fritsch a E. Hitzig (1870) prokázali, že elektrická stimulace kůry frontálního laloku u psa vyvolává druhostranné svalové kontrakce (pohyby)

Primární motorická oblast M I

- Gyrus precentralis, area 4
- Elektrickou stimulací této korové oblasti lze snadno vyvolat pohyby
- Motorický homunkulus (somatotopická reprezentace svaly ruky, obličeje, jazyka mají disproporčně velké korové okrsky)
- Afferenty: S I, talamické jádro VL (cerebellum)
- Efferenty: bazální ganglia, talamus (VL), RF, colliculus superior, ncl. ruber, RF, ncll. pontis, mícha
- Kontrola distálních svalů
- Poškození vyvolává obrnu kontralaterálních svalů (zejména svalů HK, jazyka, mimických svalů)

Penfield a Jasper (1950)

2. Precentral and Postcentral Gyri. The precentral gyrus is primarily a motor organ that is indispensable for certain forms of voluntary action. The postcentral gyrus is a sensory organ that is indispensable for the appreciation of discriminative tactile and proprioceptive sensation. Taken together, these two organs form a sensorimotor functional unit.

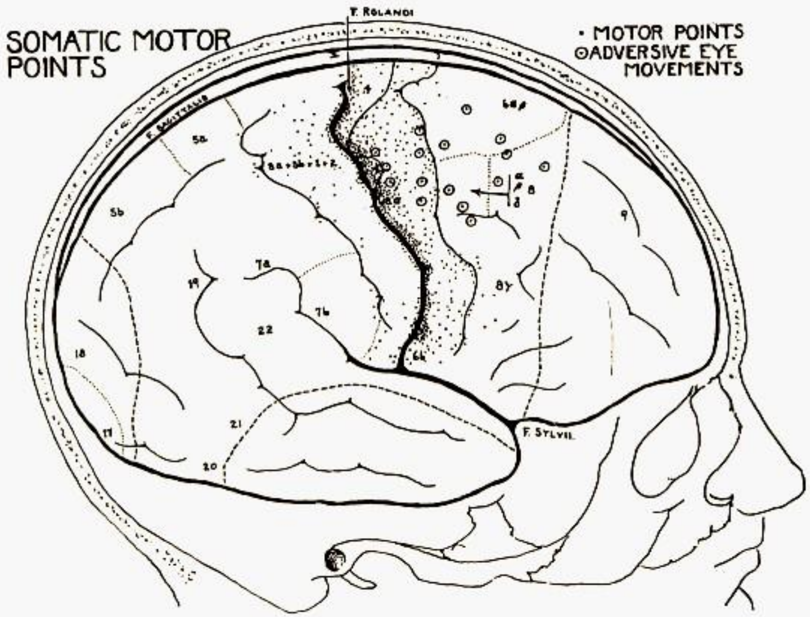


Fig. III-11

Fig. III-11. Rolandic motor cortex. Each dot represents a point which gave a motor response in a complete summary of 163 cases of cortical stimulation (Penfield and Boldrey, 1937).

The connecting fibers which pass between the two gyri are shown in a simple drawing in Figure III-4. Stimulation of the precentral gyrus (marked 4 and 6a alpha in Fig. III-10) produces bodily movement, and excision of this gyrus produces paralysis of the contralateral extremities. Stimulation of the postcentral gyrus (marked 3, 1, and 2 in Fig. III-10) produces somatic sensation, and removal produces loss of discriminative sensation in the parts represented. But the precentral strip of cortex seems to carry out a minor sensory function and the postcentral strip a minor motor function as well.

M I

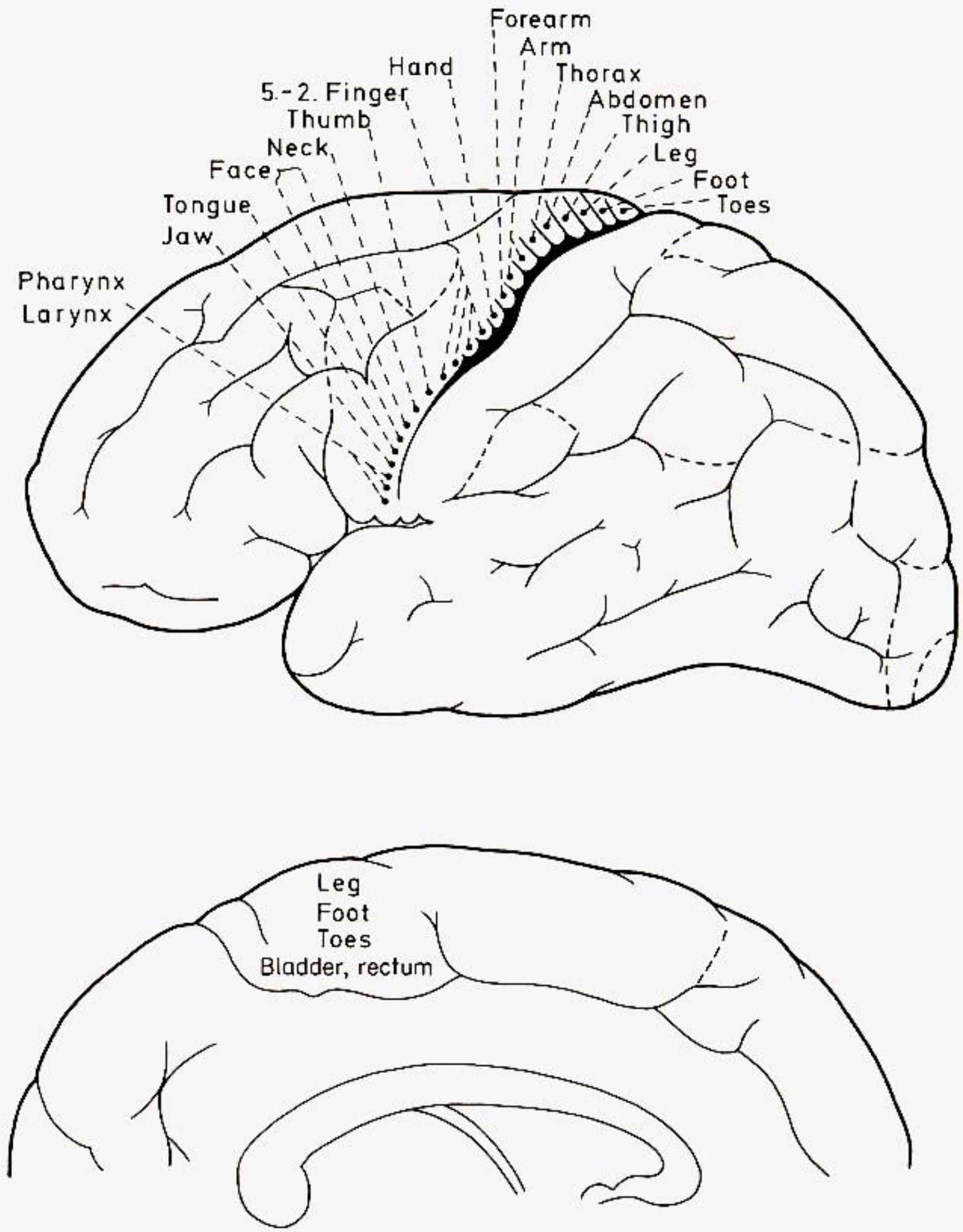


Fig. 9.4. *The somatotopic organization of the motor cortex.* The points indicate the sites from which muscle contraction in a particular body part was produced by weak electrical stimul tion. Based on Foerster (1936).

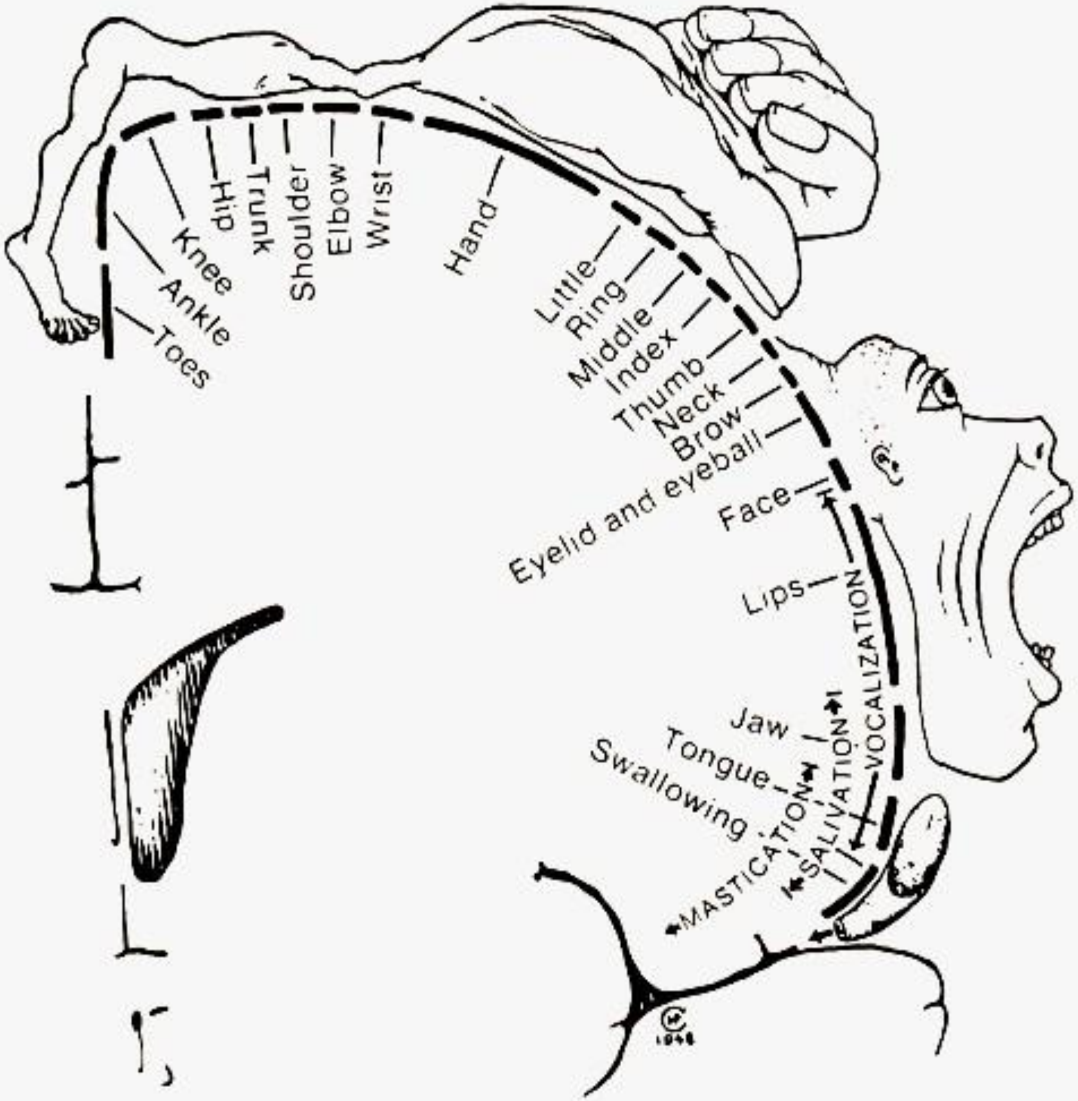


Fig. 9.8. *The relative size of the regions of the MI representing various body parts.* Based on electrical stimulation of the exposed human MI. From Penfield and Rasmussen (1950).

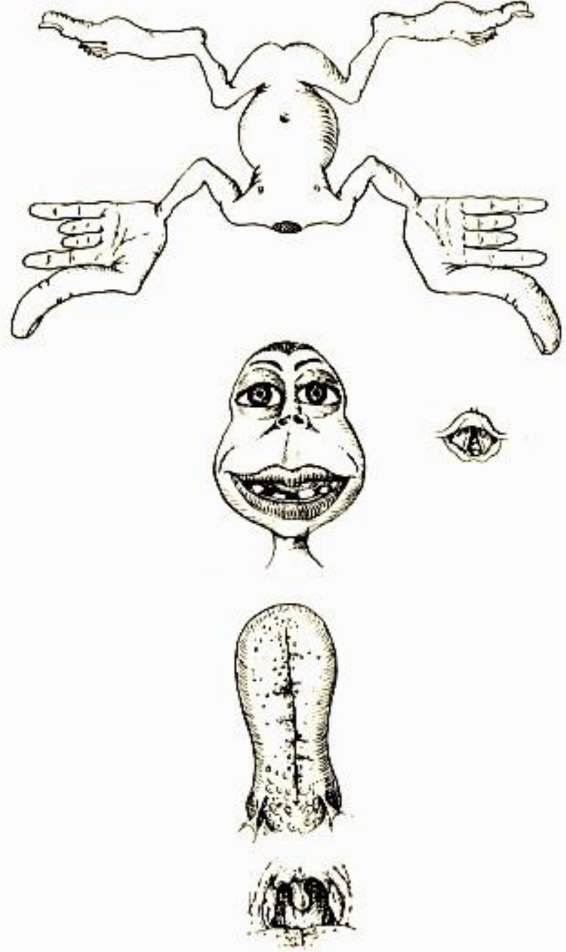
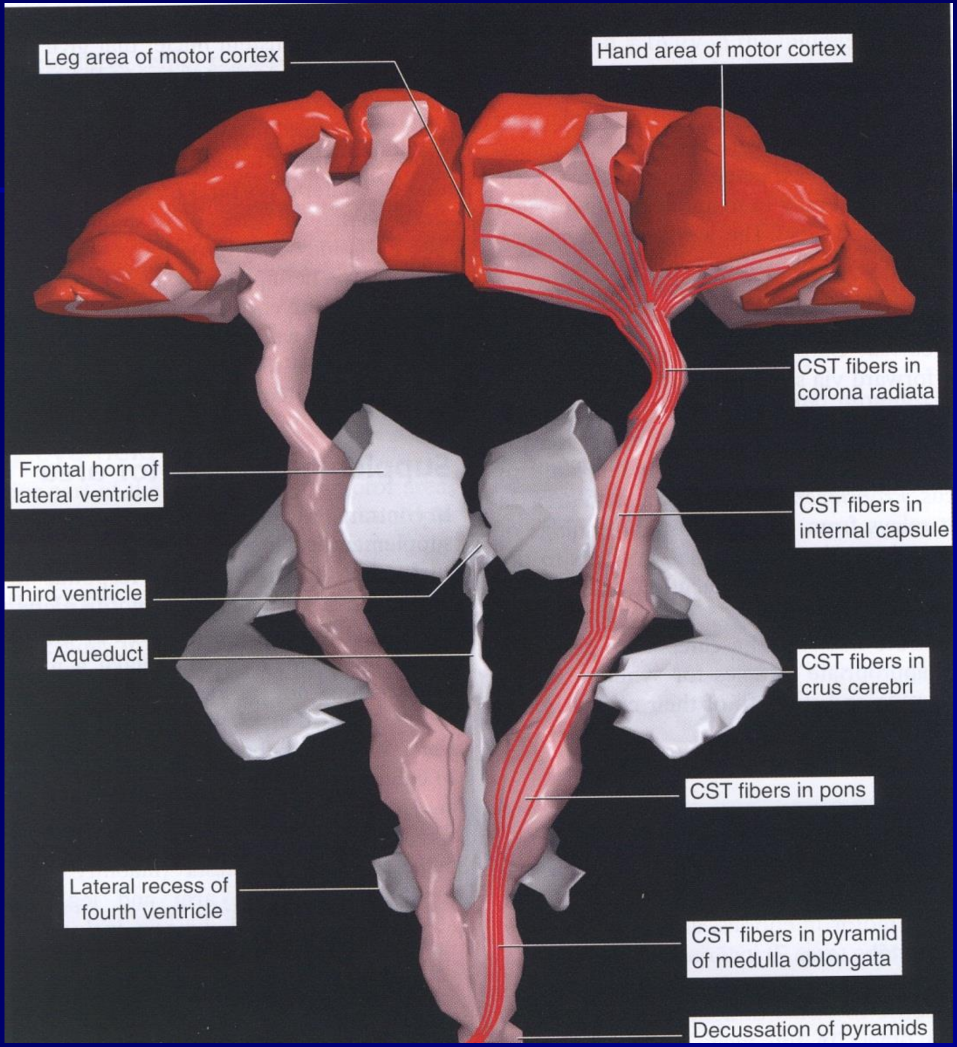
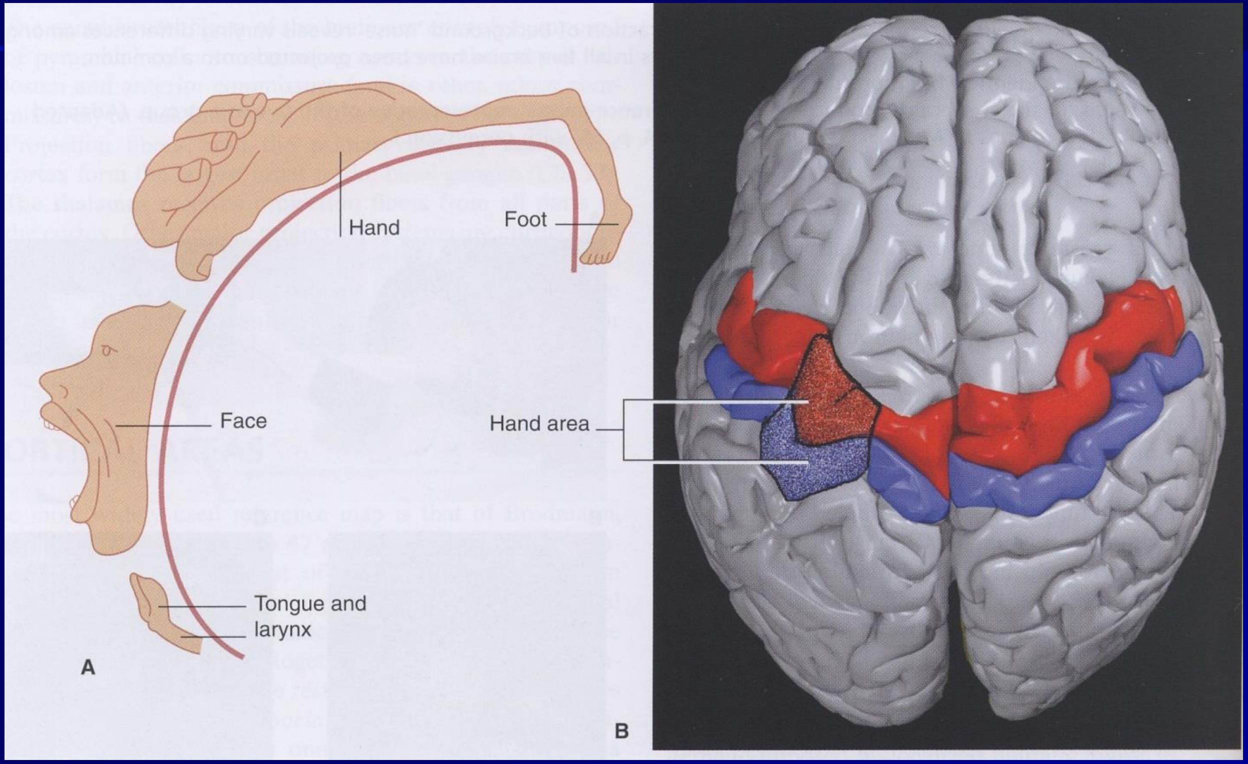


Fig. III-15

Fig. III-15. Sensory and motor homunculus. This was prepared as a visualization of the order and comparative size of the parts of the body as they appear from above down upon the Rolandic cortex. There are certain unavoidable inaccuracies in the drawing. It does not show the differences between sensory and motor representation which are apparent in Figure III-16.


Leg area of motor cortex
Hand area of motor cortex
CST fibers in corona radiata
Frontal horn of lateral ventricle
CST fibers in internal capsule
Third ventricle
Aqueduct
CST fibers in crus cerebri
CST fibers in pons
Lateral recess of fourth ventricle
CST fibers in pyramid of medulla oblongata
Decussation of pyramids



Hand
Foot
Face
Tongue and
larynx
A
Hand area
B

Premotorická korová oblast, Doplňková motorická oblast - area 6

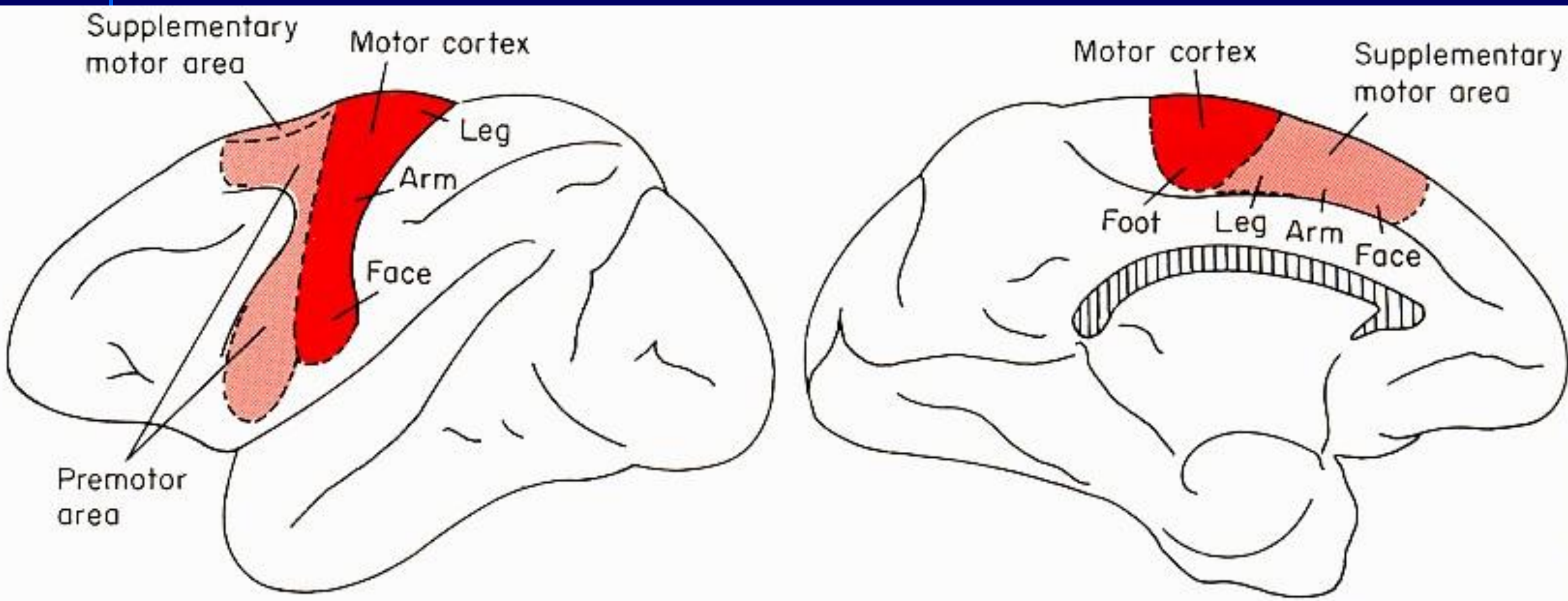
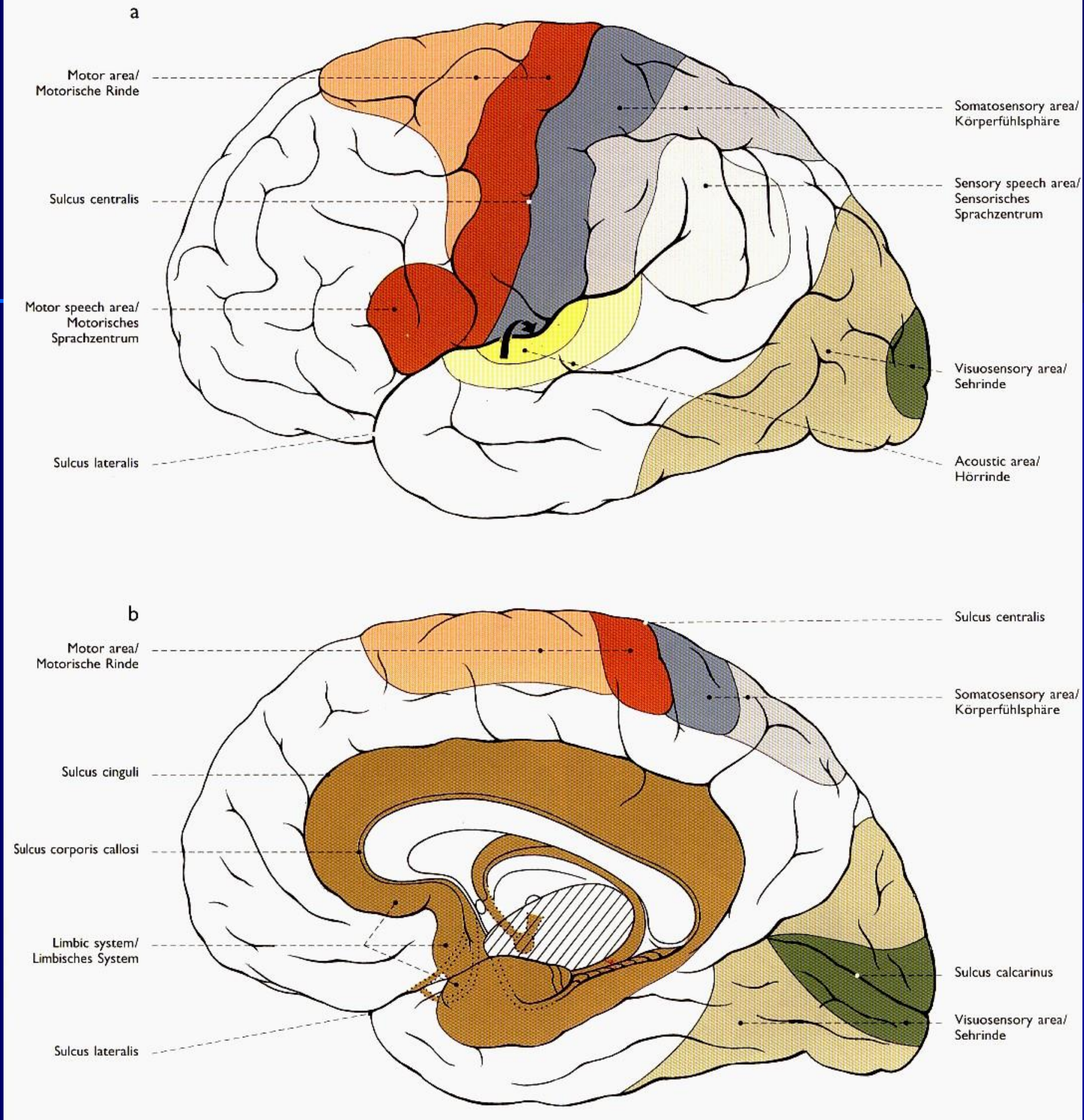


Fig. 9.7. *The motor and the premotor areas.* The positions of MI, SMA, and PMA are shown in a drawing of the left hemisphere of a monkey.

Premotorická oblast (PM)

- **Area 6**
- Somatotopická reprezentace svalů těla, organizace je méně přesná
- Eferentace – M I, bazální ganglia, RF, mícha (ovlivňuje zádové svaly a proximální svaly končetin)
- Aferentace – talamus VA (bazální ganglia), S I
- Příprava pohybu


a
Motor area/
Motorische Rinde
Somatosensory area/
Körperfühlsphäre
Sulcus centralis
Sensory speech area/
Sensorisches
Sprachzentrum
Motor speech area/
Motorisches
Sprachzentrum
Visuosensory area/
Sehrinde
Sulcus lateralis
Acoustic area/
Hörrinde
b
Sulcus centralis
Motor area/
Motorische Rinde
Somatosensory area/
Körperfühlsphäre
Sulcus cinguli
Sulcus corporis callosi
Limbic system/
Limbisches System
Sulcus calcarinus
Visuosensory area/
Sehrinde
Sulcus lateralis

Doplňková motorická oblast (Supplementary motor area)

- Area 6, mediální povrch hemisféry
- Somatotopická organizace, méně přesná
- Afferentace – talamus VA (bazální ganglia), parietální korová oblast
- Eferentace – MI, Bazální ganglia, RF, mícha
- Organizování a plánování pohybů a jejich pořadí
- Poškození – zástava pohybů, řeči(„ pacient ztrácí kinetickou melodii svých pohybů „ - A.R. Luria)

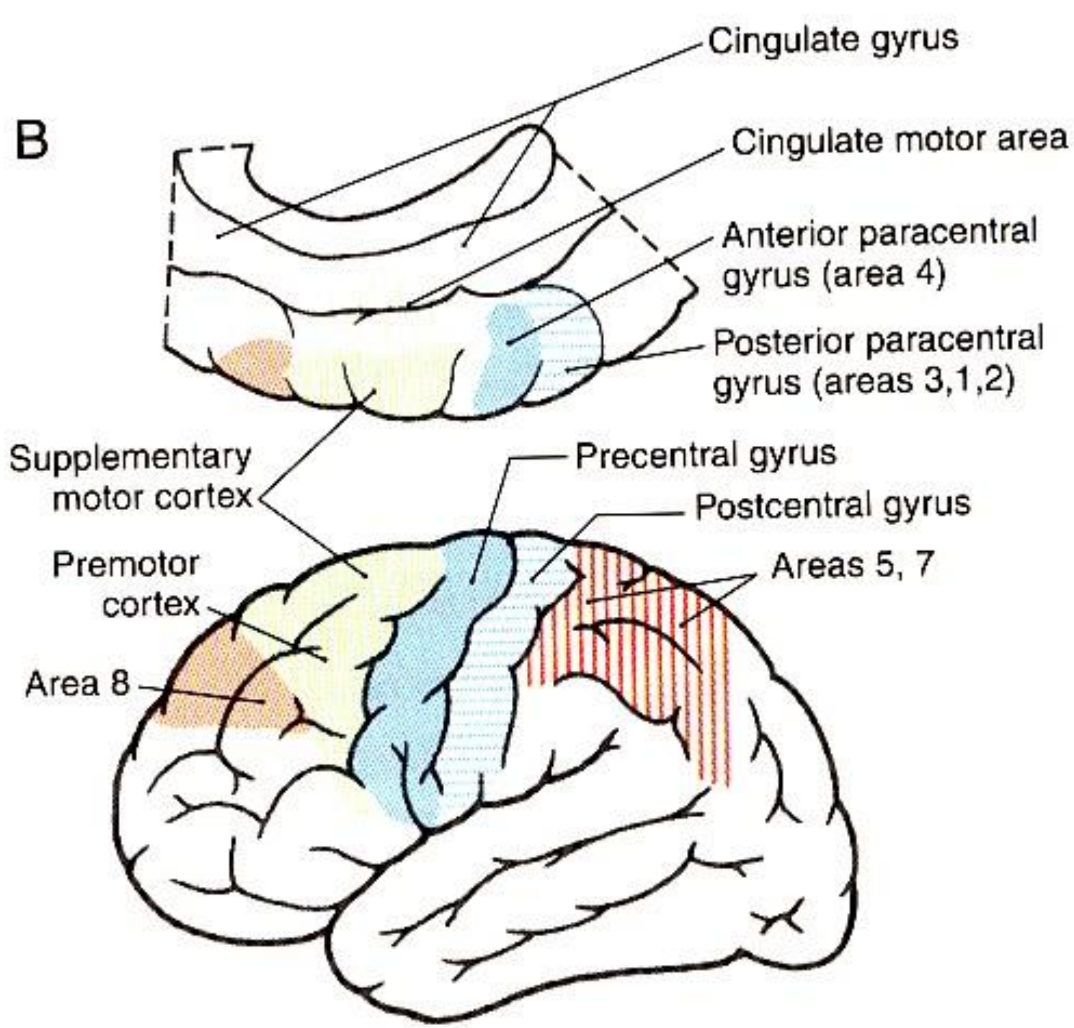


Figure 25–2. The motor-related areas of the cortex. A cross section through the precentral gyrus, showing pyramidal cells in layer V *(A)*. The main areas of the cortex that give rise to corticospinal axons *(B)*.

Pyramidová dráha – přímé spojení : neokortex - mícha

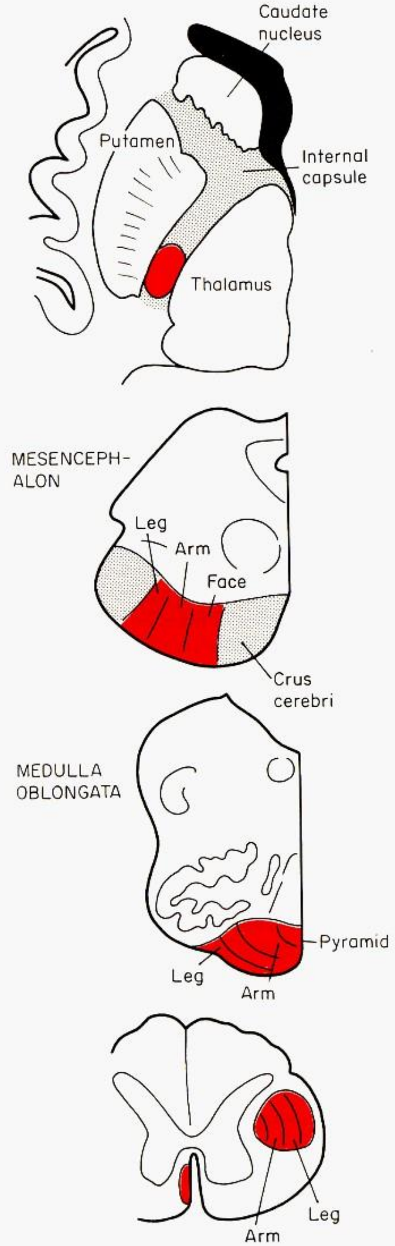


Fig. 9.5. *The pyramidal tract.* Its position and somatotopic pattern are illustrated in sections from various levels of the brain stem and the cord. The **upper** drawing is of a horizontal section (cf. Fig. 2.30), whereas the other drawings are of transverse sections.

Somatosenzitivní oblast

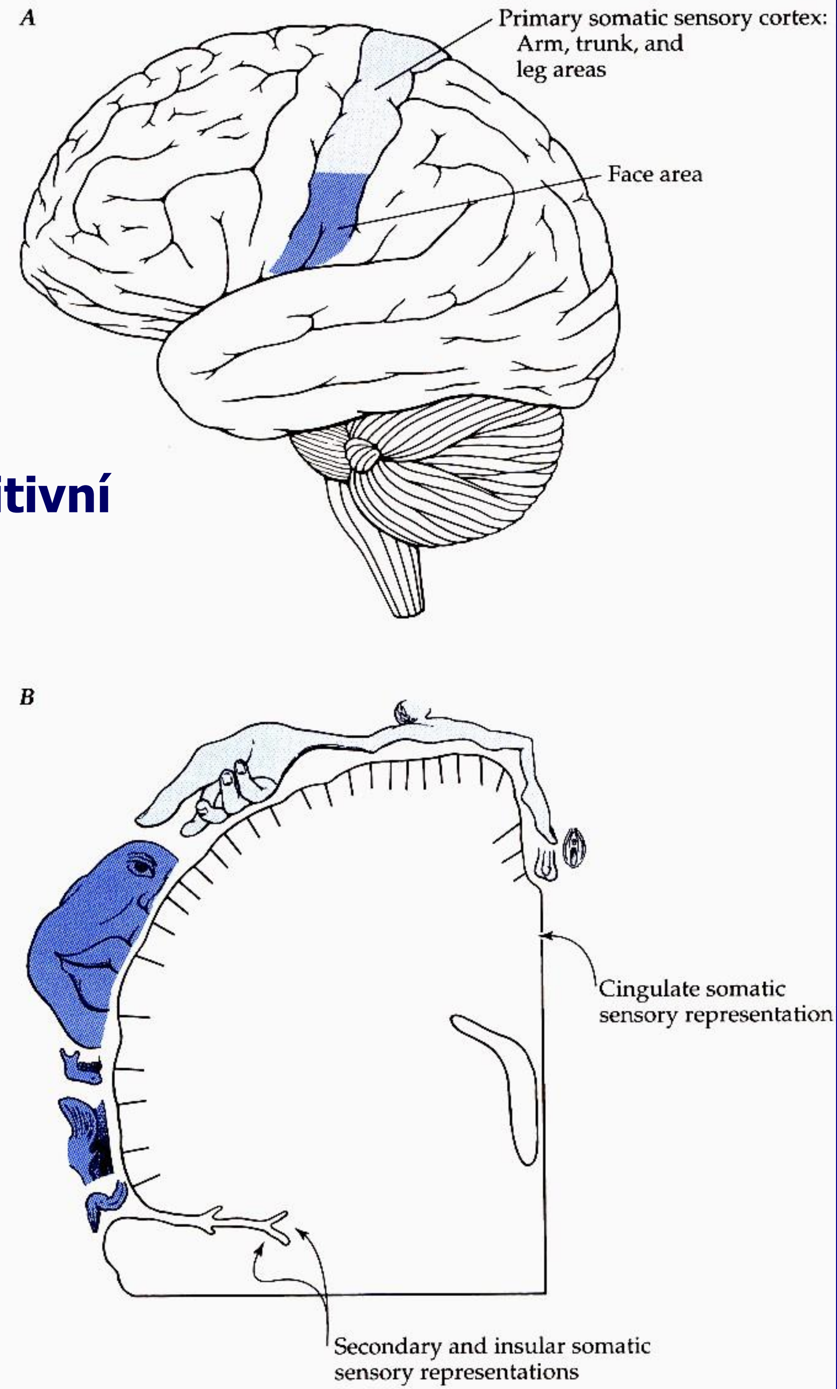


Figure 6–15. **A.** Lateral view of the cerebral hemisphere, with the representation of the limbs, trunk, and face indicated on the postcentral gyrus. **B.** Somatotopic organization of the postcentral gyrus. (**B,** *Adapted from Penfield W, Rasmussen T: The Cerebral Cortex of Man: A Clinical Study of Localization of Function. Macmillan, 1950.*)

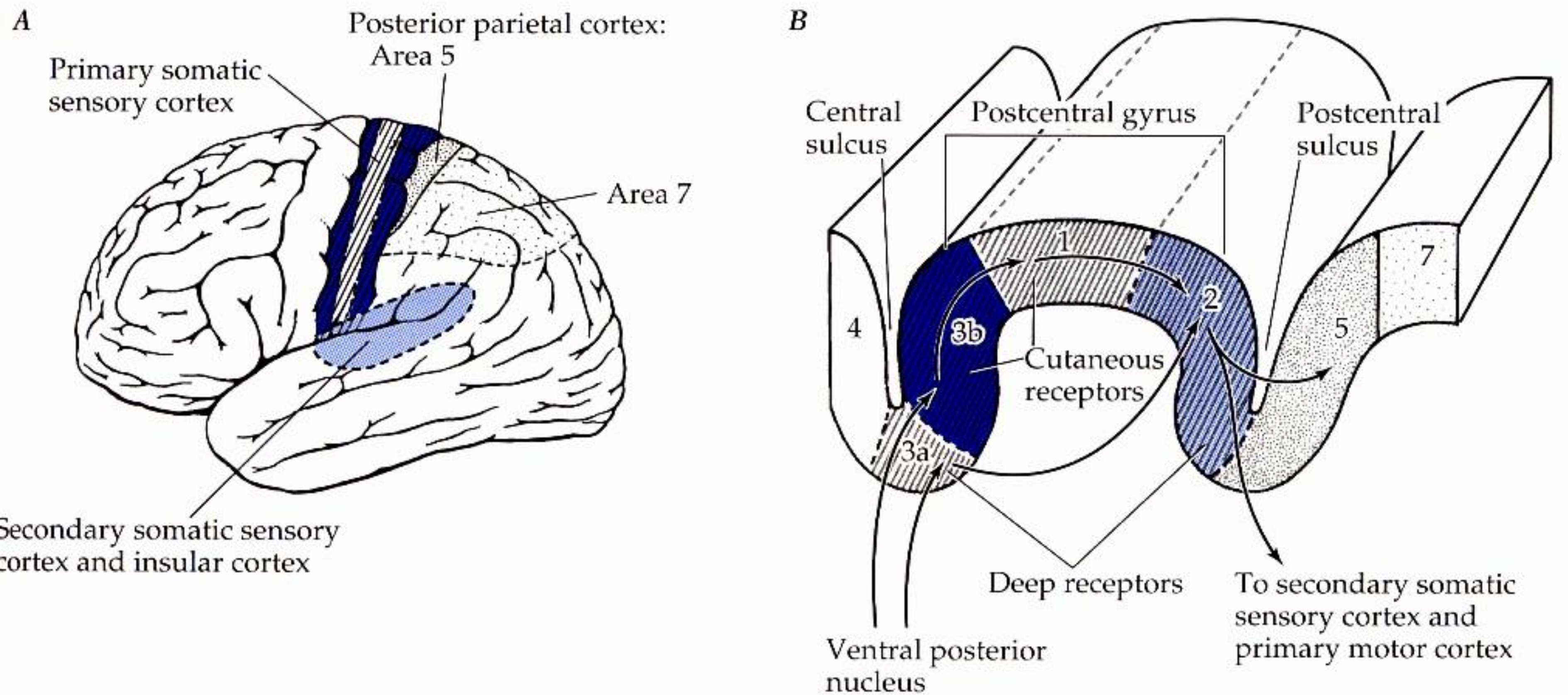


Figure 5–19. **A.** The locations of the primary and higher order somatic sensory areas are indicated on a lateral view of the cerebral cortex. The light blue region corresponds to the areas beneath the surface, in the insular cortex and the parietal and temporal operculum. **B.** A schematic section cut perpendicular to the mediolateral axis of the postcentral gyrus. *(Adapted from Kandel ER, Schwartz JH: Principles of Neural Science. Elsevier, 1985.)*

Sensory homunculus

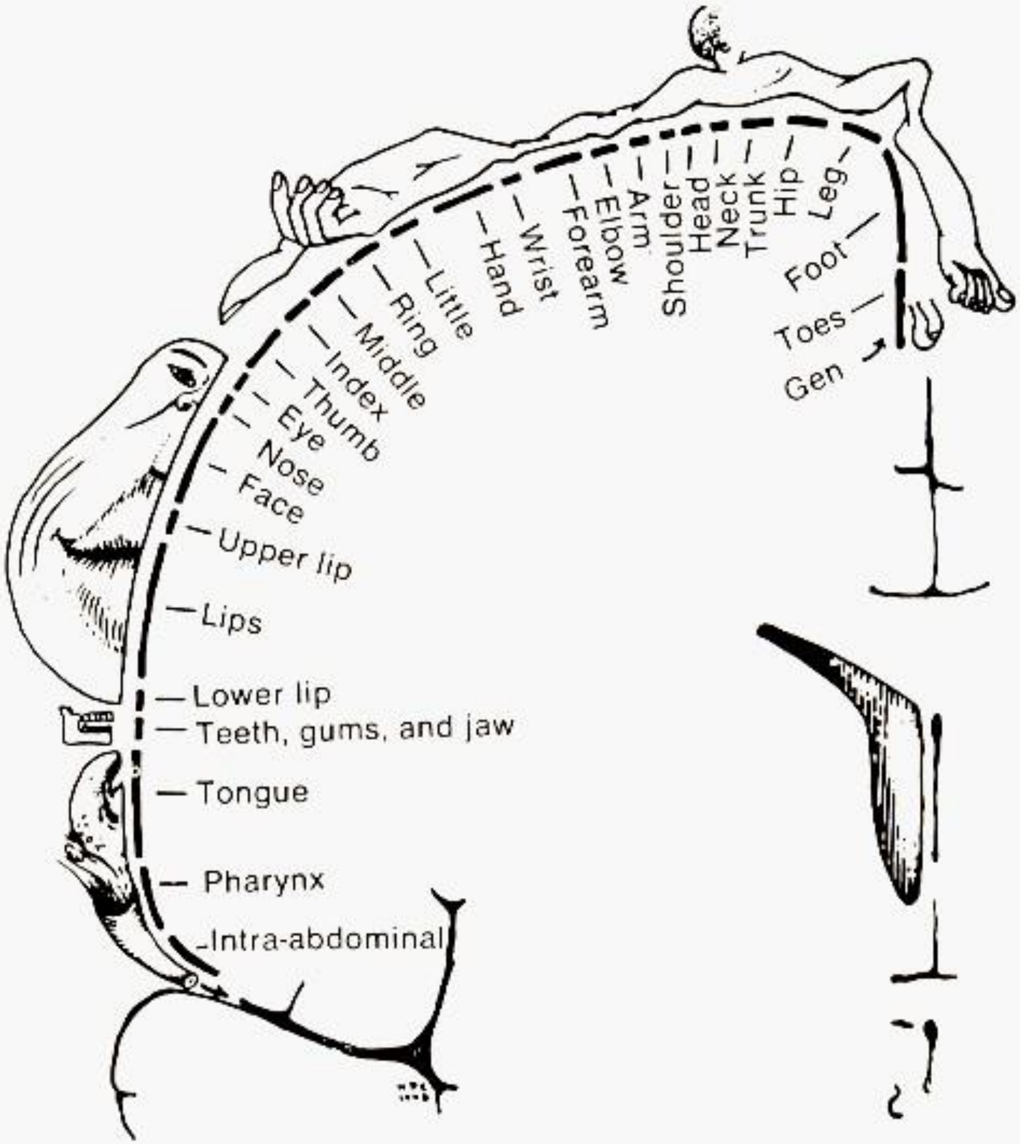


Fig. 4.21. *Relative size of the cortical regions representing various body parts.* Schematic section through the postcentral gyrus (SI) of the human brain. Based on electrical stimulation during brain surgery under local anesthesia. From Penfield and Rasmussen (1950).

Somatosenzitivní oblast S I

- Gyrus postcentralis
- Area 3a, 3b, 1, 2
- Aferentace: VPL, VPM
- Eferentace: M I, talamus (VPL, VPM), ncl. pontis, jádra hlavových nervů (V.), mícha
- 3a – signály ze svalových vřetének
- 3b – kožní receptory
- 2 – kloubní receptory
- 1 – všechny modality

Řečové korové oblasti

Broca : motorická afázie **- pacient ztrácí schopnost mluvit, jednotlivá slova nebo slabiky, je zachována schopnost porozumět řeči. Často kombinace s agrafií (area 44 a 45).**

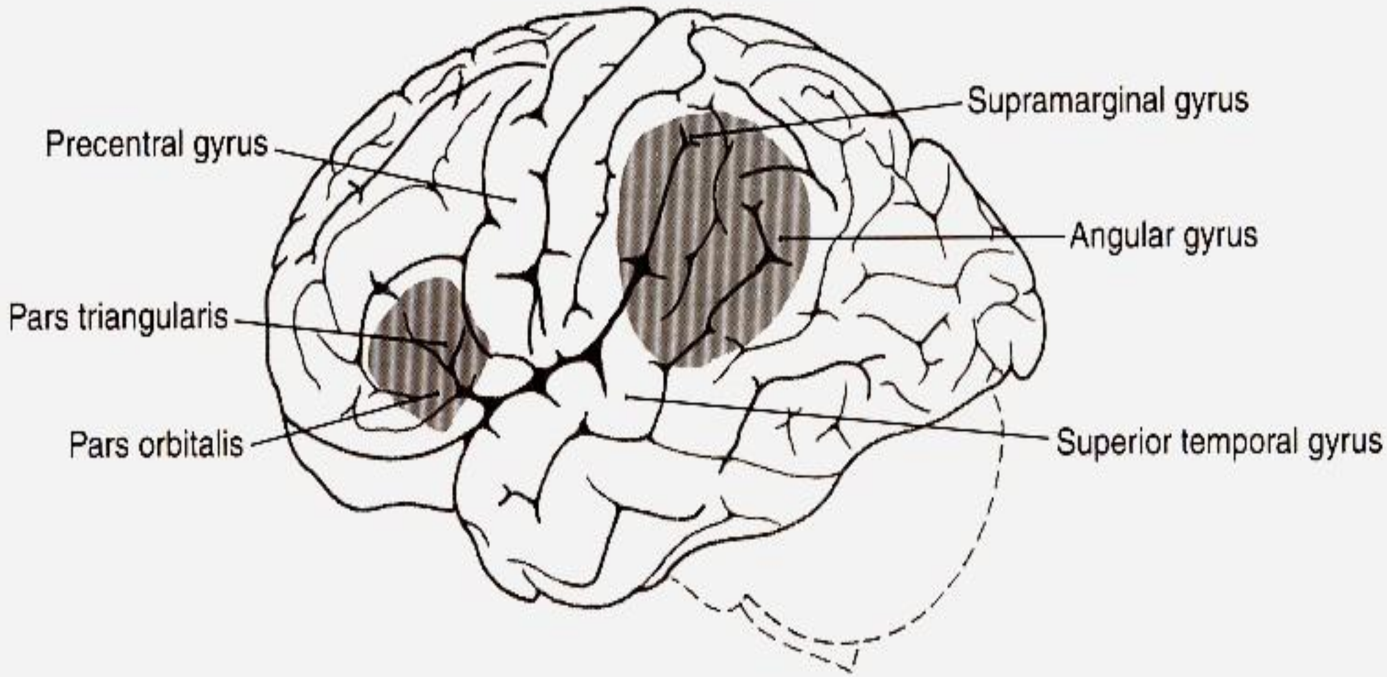
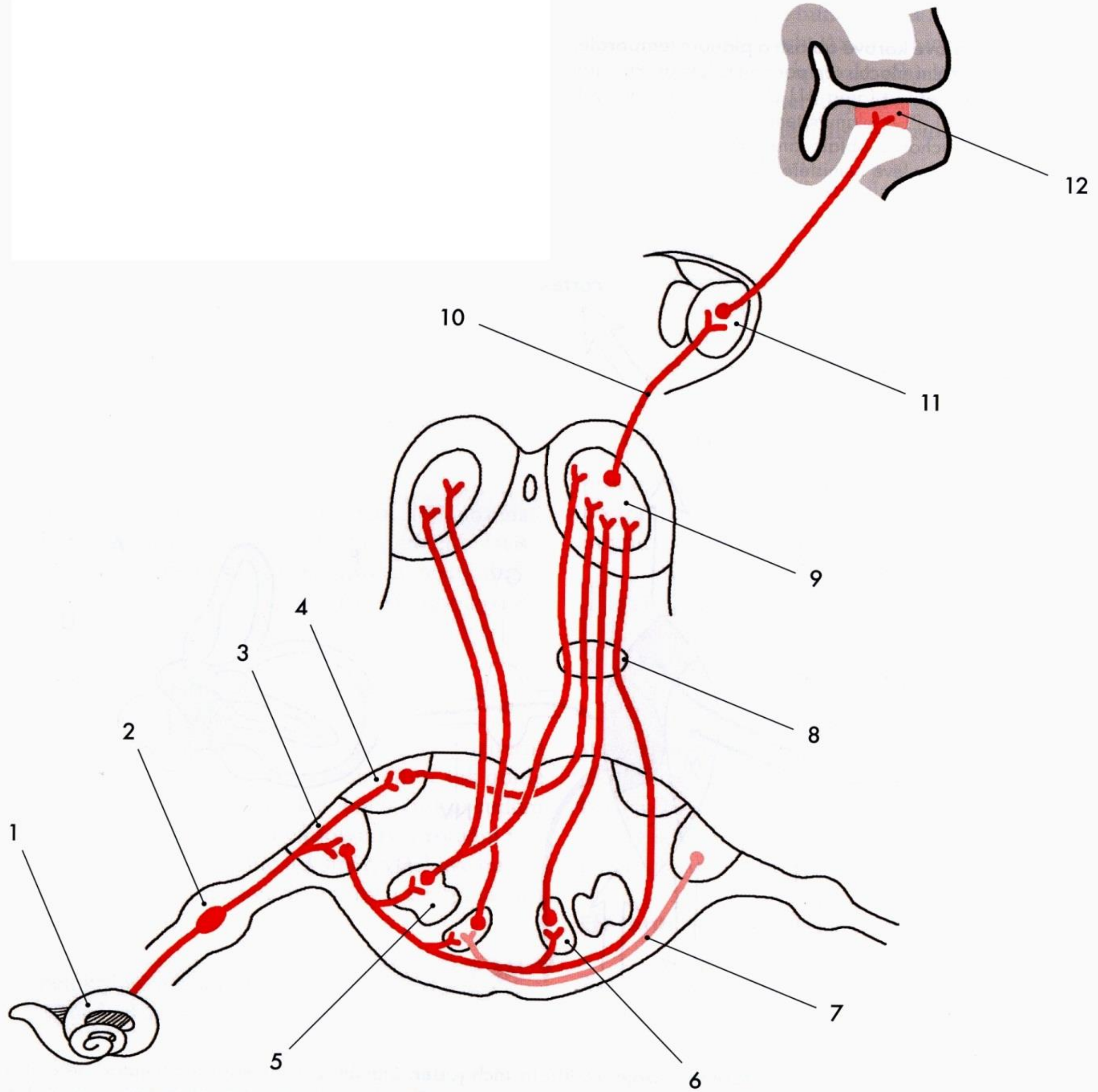


Figure 32–13. Cortical areas that mediate the processing of language. Lesions in the pars orbitalis and pars triangularis of the inferior frontal lobe will result in Broca aphasia, whereas damage in the supramarginal and angular gyri and adjacent superior temporal gyrus will result in Wernicke aphasia.

Wernicke : senzorická nebo receptivní **afázie - spontánní řeč je plynulá, ale hlásky a slabiky jsou často spojovány do slov, která nemají význam – „ slovní salát „. Častá kombinace s dyslexií a alexií – neschopnost číst (area 39, 40).**

Sluchová dráha



Obr. 181. Obecné schéma sluchové dráhy savců. 1 – cochlea, 2 – ganglion cochleare, 3 – nc. cochlearis ventralis, 3 – nc. cochlearis dorsalis, 5 – nc. olivaris superior lateralis, 6 – nc. olivaris superior medialis, 7 – corpus trapezoideum, 8 – lemniscus lateralis, 9 – colliculus inferior (centrální jádro), 10 – brachium colliculi inferioris, 11 – corpus geniculatum mediale (nc. ventralis), 12 – primární sluchová korová oblast (A I, area 41)

Sluchová korová oblast

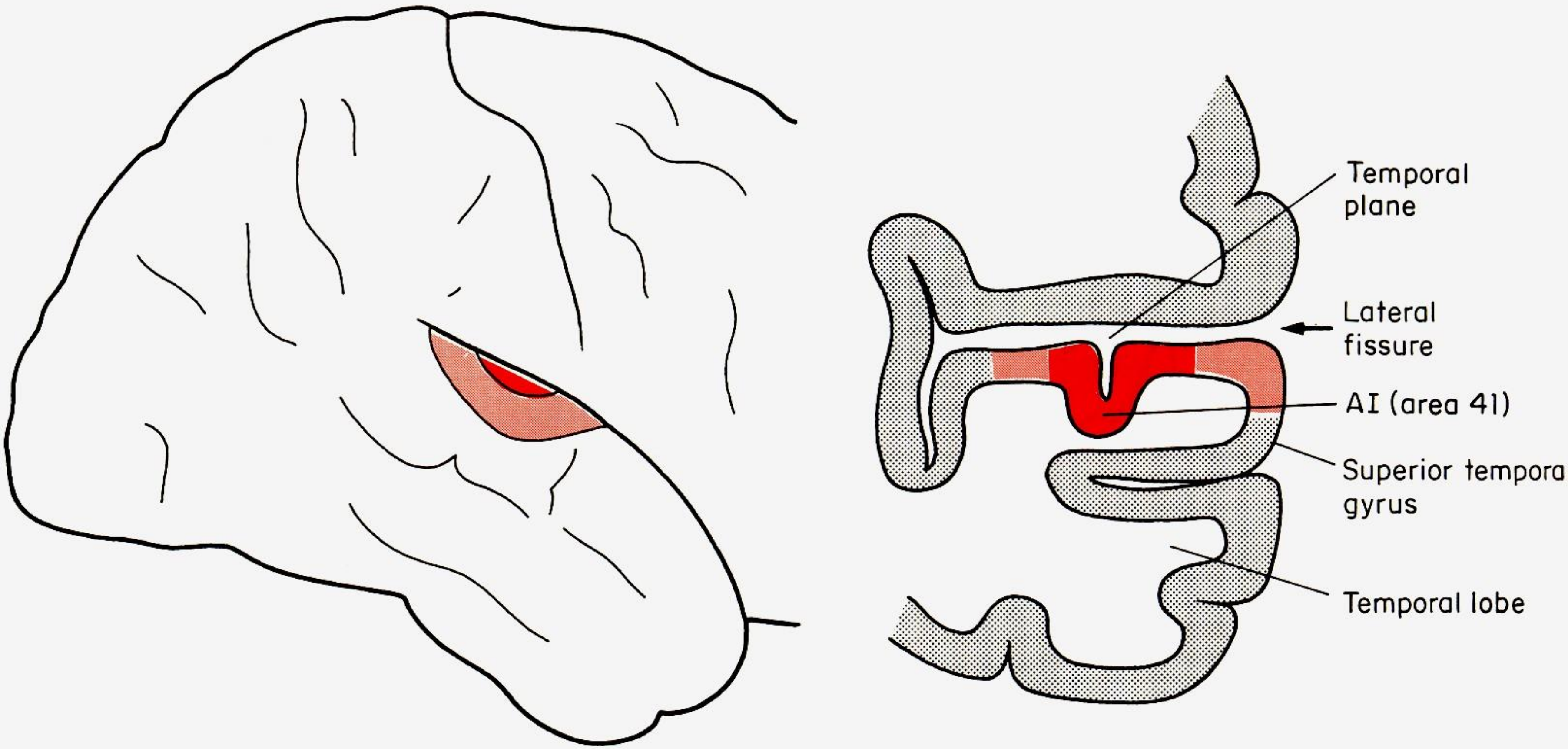


Fig. 6.10. *The human auditory cortex.*

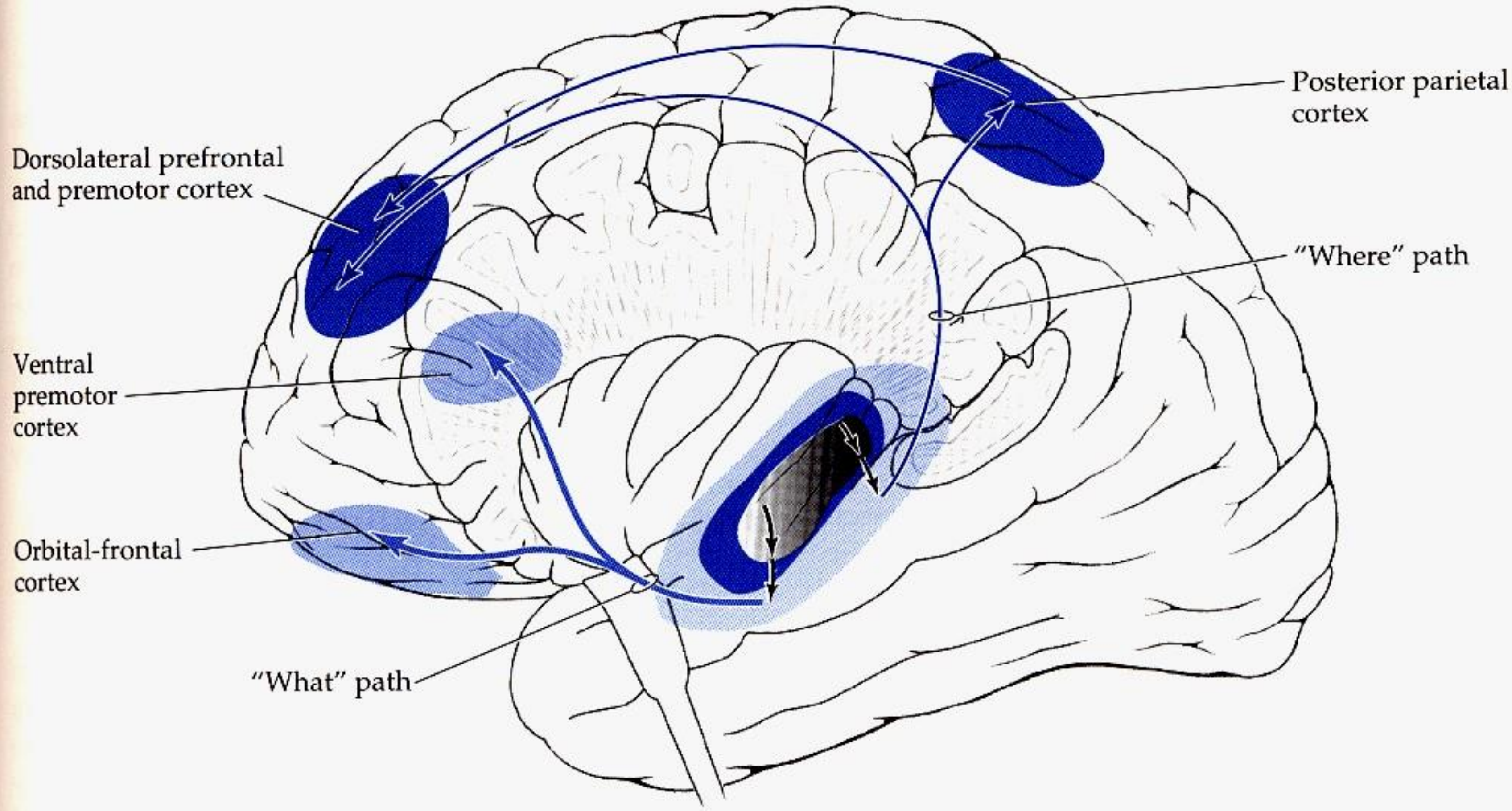
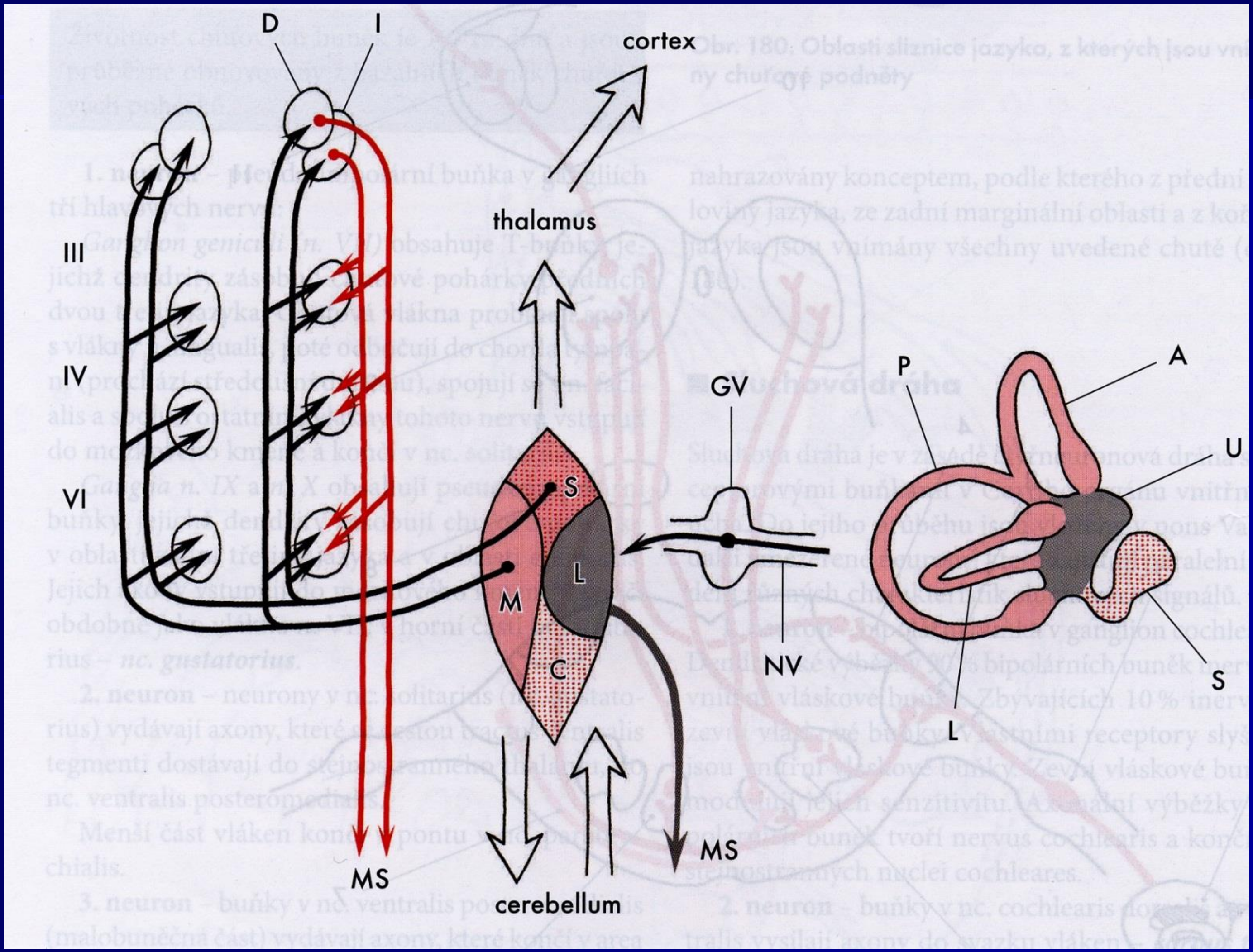


Figure 8–10. Separate "what" and "where" pathways originate from the auditory cortex and project to different regions of the prefrontal cortex and parietal cortex.

Sluchová korová oblast

- Area 41
- Aferentace: sluchová dráha (talamus, corpus geniculatum mediale)
- Eferentace: talamus (corpus geniculatum mediale), colliculus inferior, asociační korové oblasti (dráha „ co „ dráha „ kde „)

Vestibulární dráha



Vestibulární korové oblasti

Prefrontální

Parietální

Insulární

Cingulární

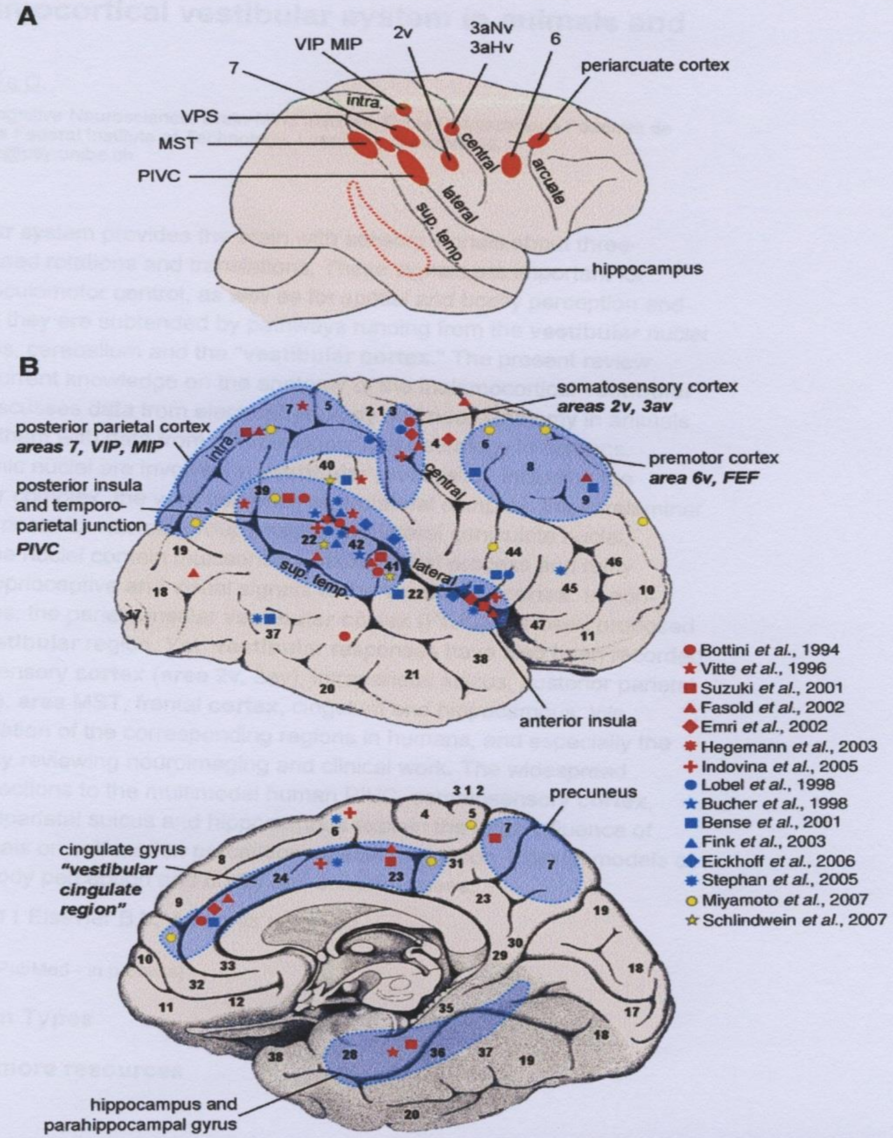
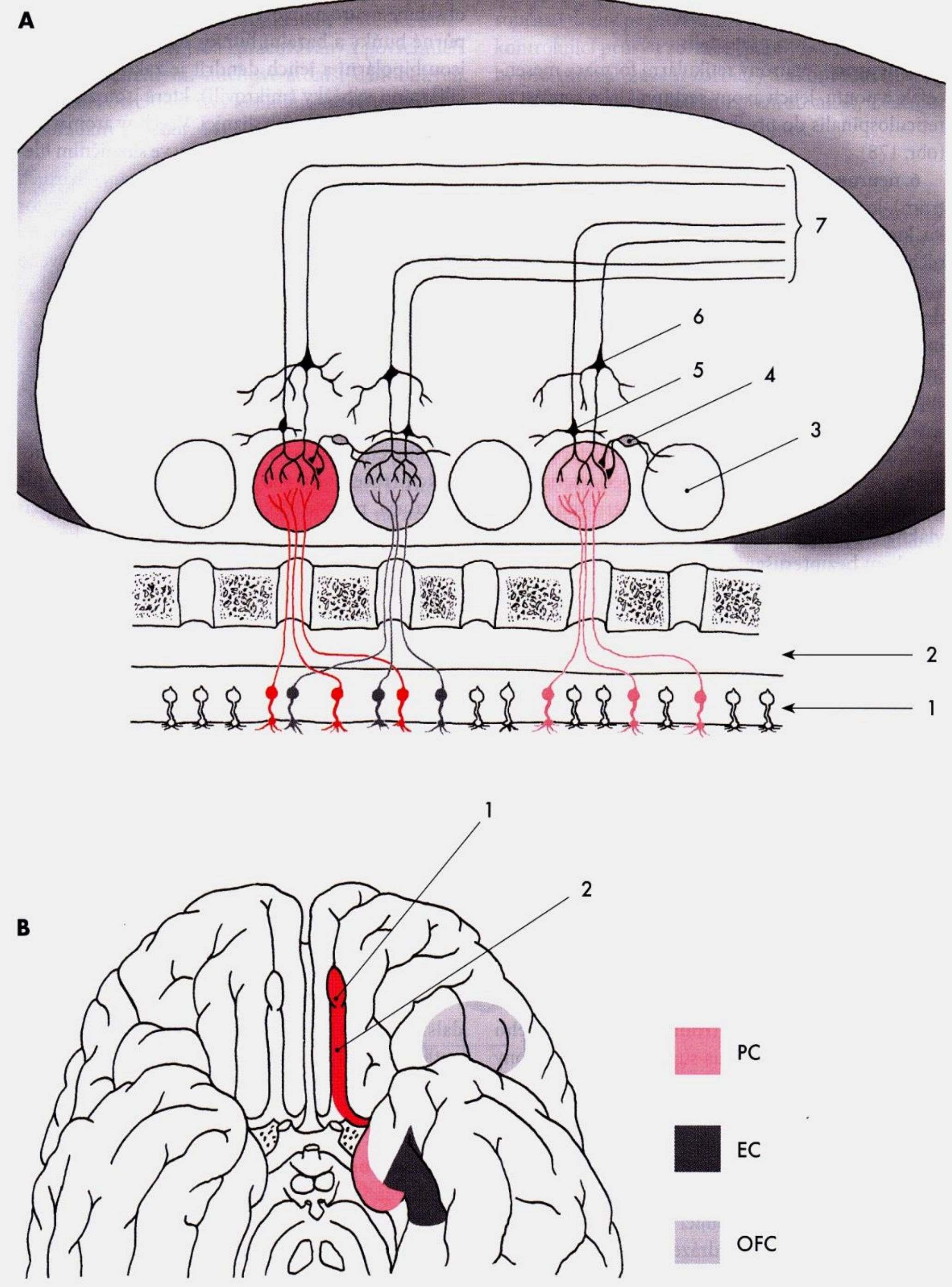
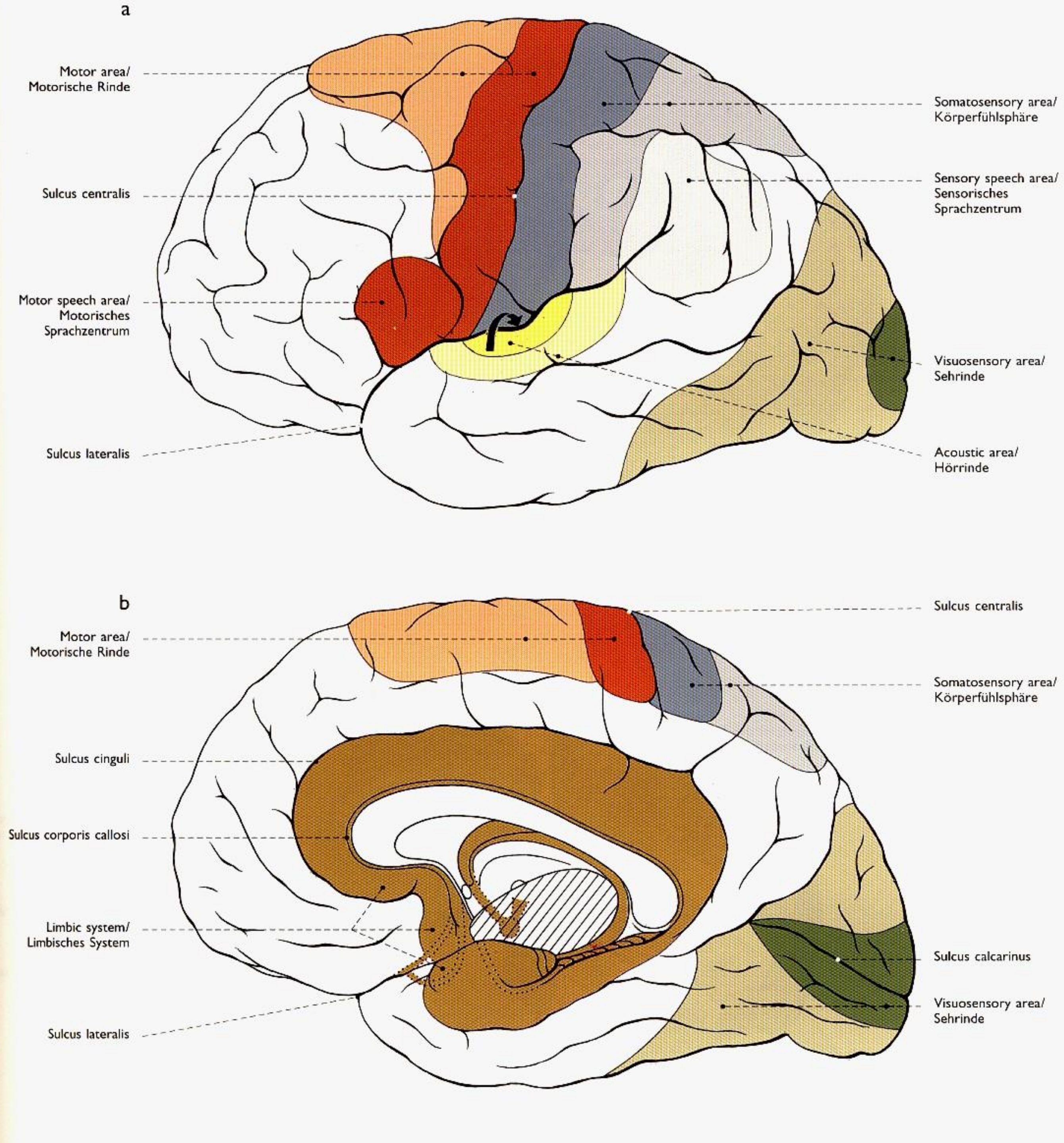


Fig. 3 – Comparative anatomy of monkey and human vestibular cortex. (A) Schematic representation of the vestibular areas in monkeys. Areas 2v, 6v, 7 and 3av (3aHv: 3a-hand-vestibular region, 3aNv: 3a-neck-vestibular region), MIP: medial intraparietal area, MST: medial superior temporal area, PIVC: parieto-insular vestibular cortex, VIP: ventral intraparietal area, VPS: visual posterior sylvian area. Major sulci are represented: arcuate sulcus (arcuate), central sulcus (central), lateral sulcus (lateral), intraparietal sulcus (intra.) and superior temporal sulcus (sup. temp.). Adapted from Sugiuchi et al., 2005. (B) Vestibular areas in humans revealed by neuroimagery during caloric (*red symbols*) and galvanic (*blue symbols*) vestibular stimulation, as well as during short auditory stimulation (*yellow symbols*). To summarize, right and left cerebral activations are reported on a lateral view of the right hemisphere (modified after Duvernoy, 1999). The supposed homologous vestibular areas reported in animals are indicated in bold letters (FEF: frontal eye fields). The numbers on the cortex refer to the cytoarchitectonic areas defined by Brodmann. Adapted from Lopez et al. (2008).

Čichová dráha



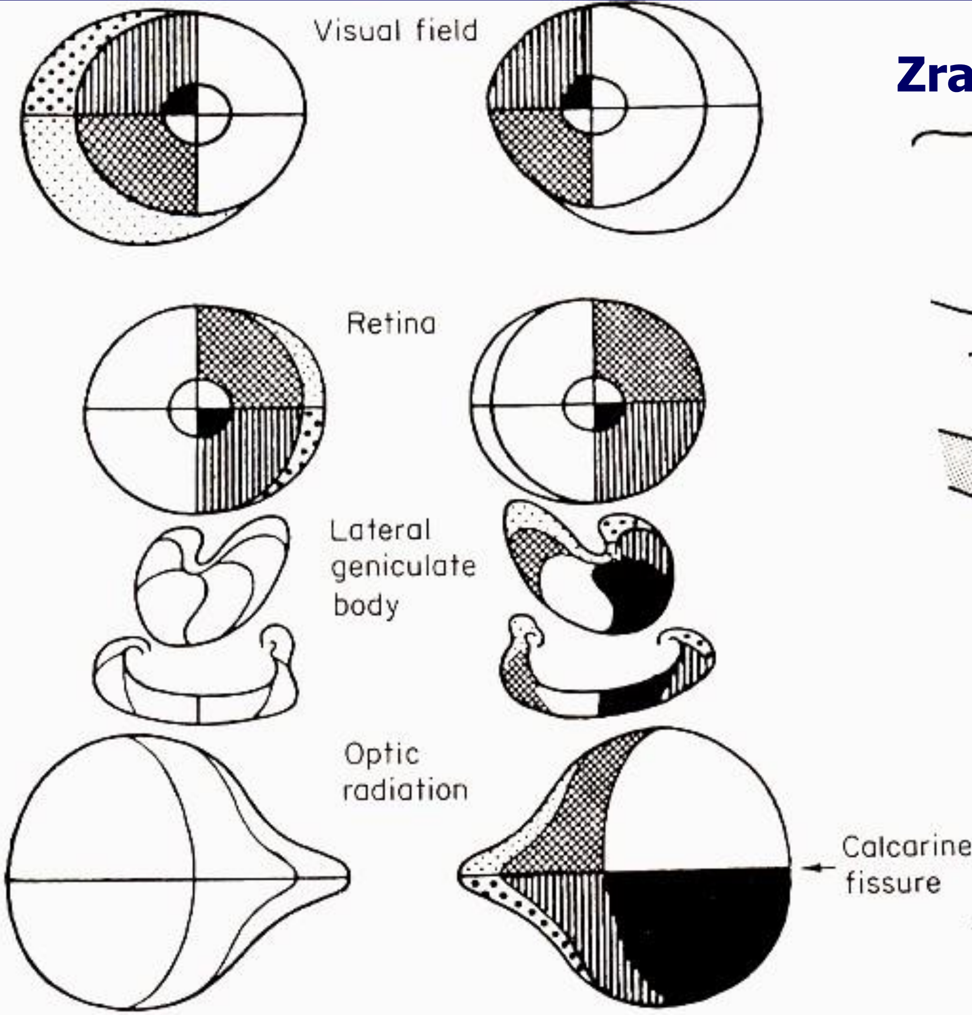
a


Motor area/
Motorische Rinde
Sulcus centralis
Motor speech area/
Motorisches
Sprachzentrum
Sulcus lateralis
Somatosensory area/
Körperfühlsphäre
Sensory speech area/
Sensorisches
Sprachzentrum
Visuosensory area/
Sehrinde
Acoustic area/
Hörrinde

b

Motor area/
Motorische Rinde
Sulcus cinguli
Sulcus corporis callosi
Limbic system/
Limbisches System
Sulcus lateralis
Sulcus centralis
Somatosensory area/
Körperfühlsphäre
Sulcus calcarinus
Visuosensory area/
Sehrinde

Zraková korová oblast



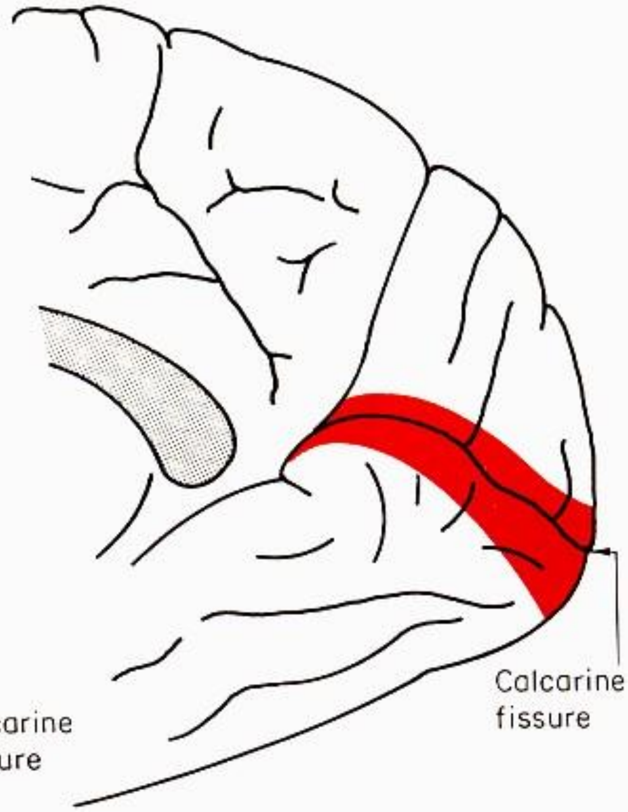
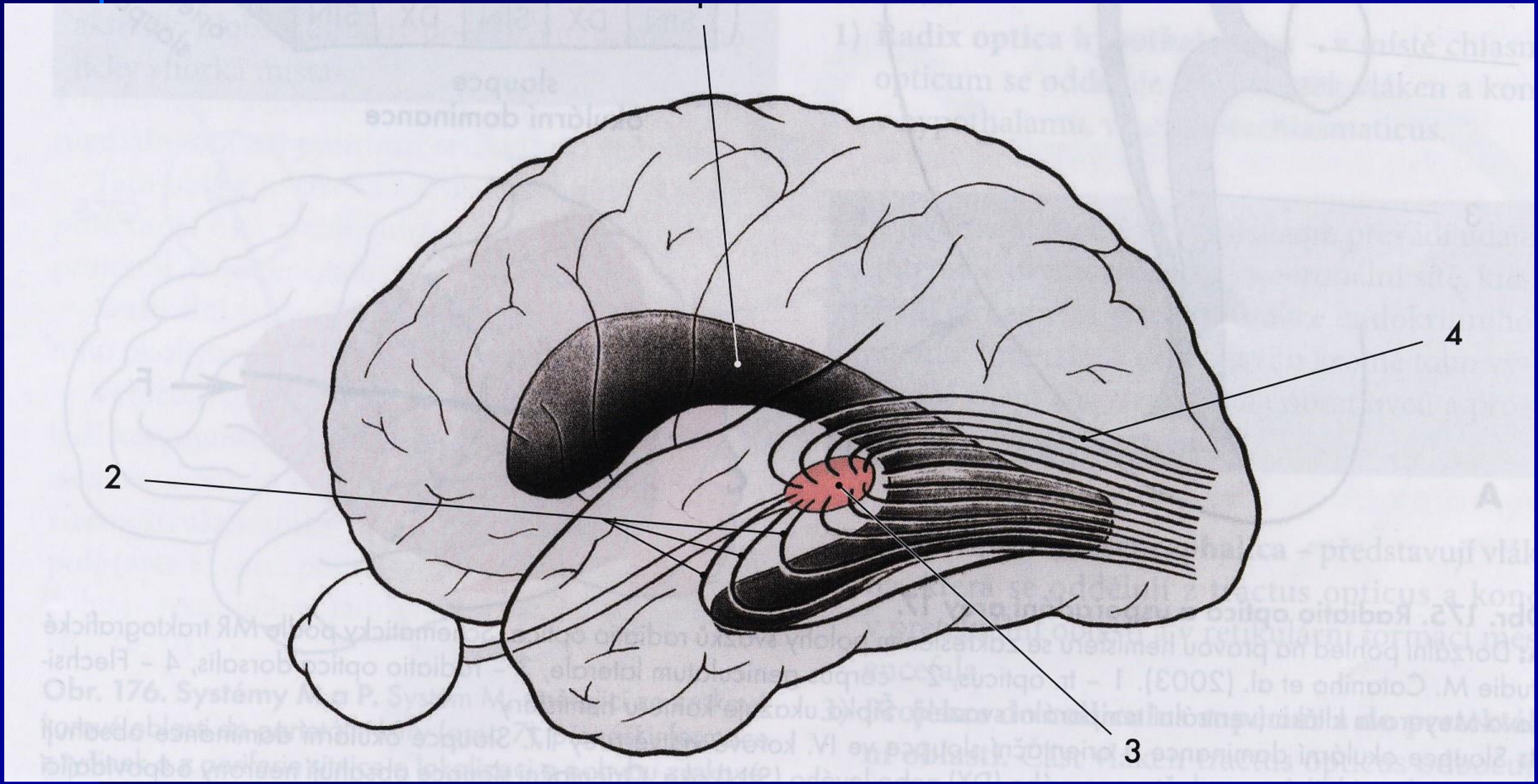
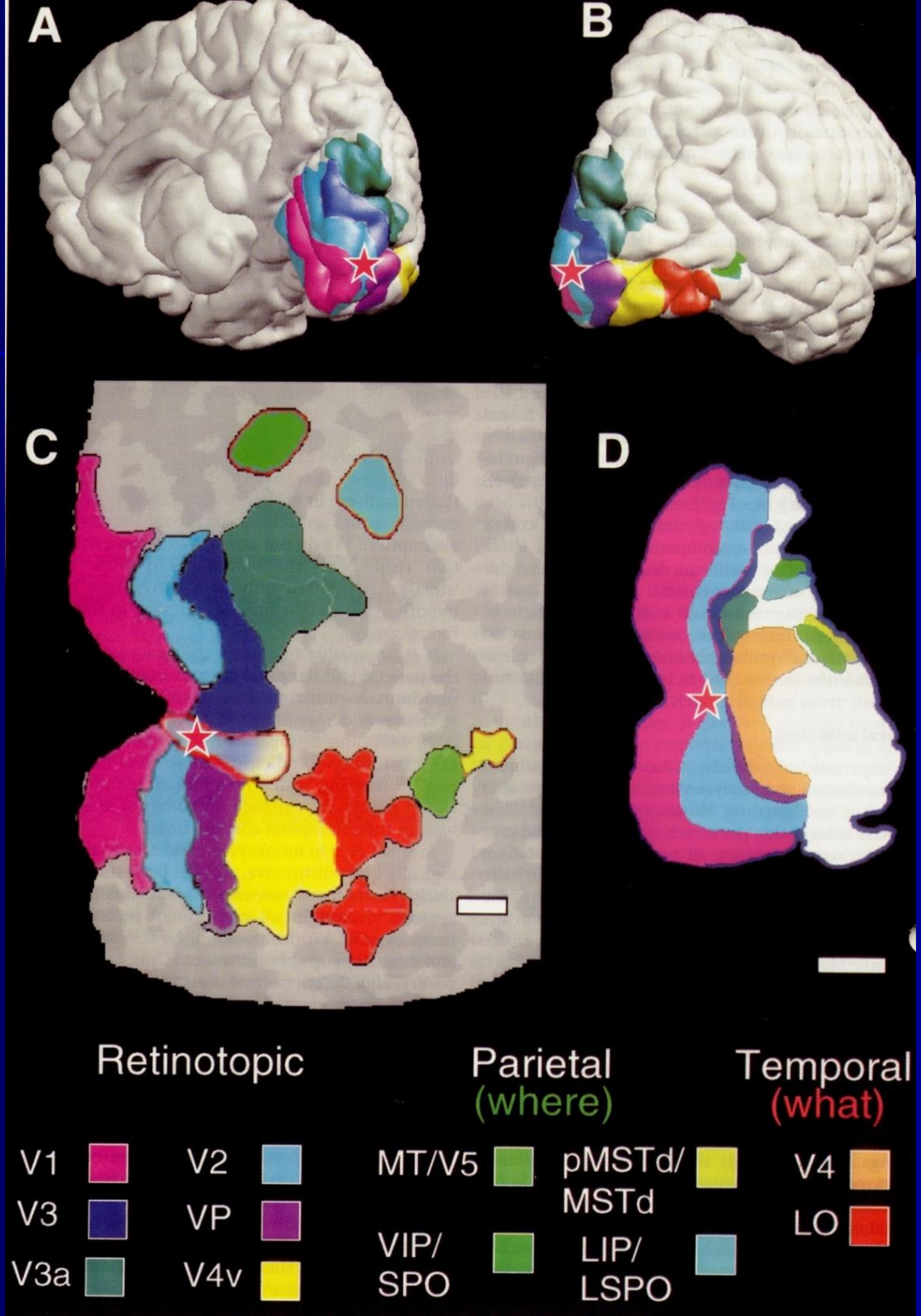


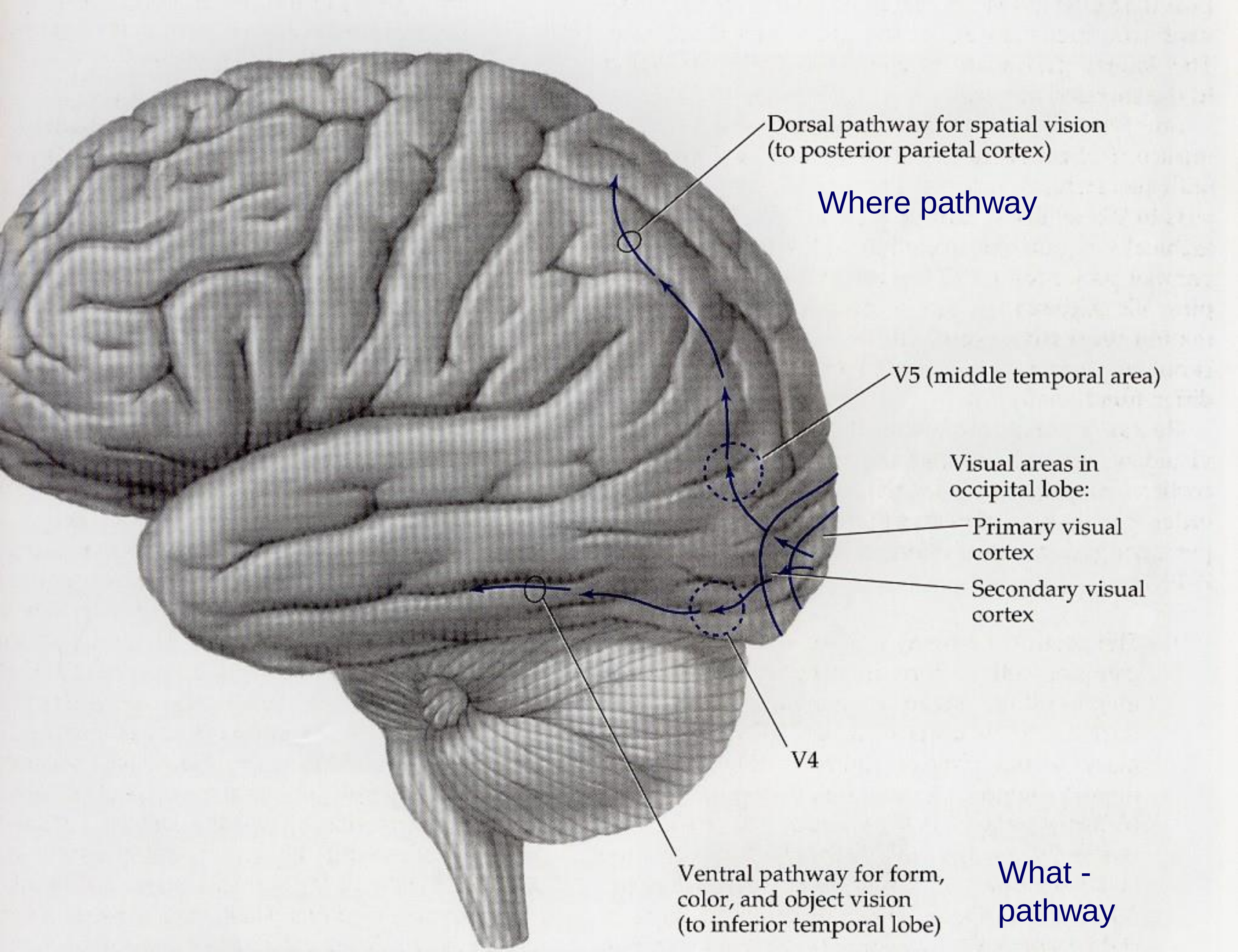
Fig. 5.16. *Retinotopic localization of the visual pathways.* The striate area has been unfolded. Note that information from the upper half of the visual field reaches the part of the striate area below the calcarine fissure, whereas the lower visual field projects above. Central parts of the visual field are represented most posteriorly and peripheral parts most anteriorly in the striate area. The **right** drawing illustrates the extension of the striate area on the surface of the occipital lobe; most of it is buried in the calcarine fissure. The striate area is similarly oriented in the **left** and the **right** figures.

Radiatio optica



2 – Flechsigova – **Meyerova** klička

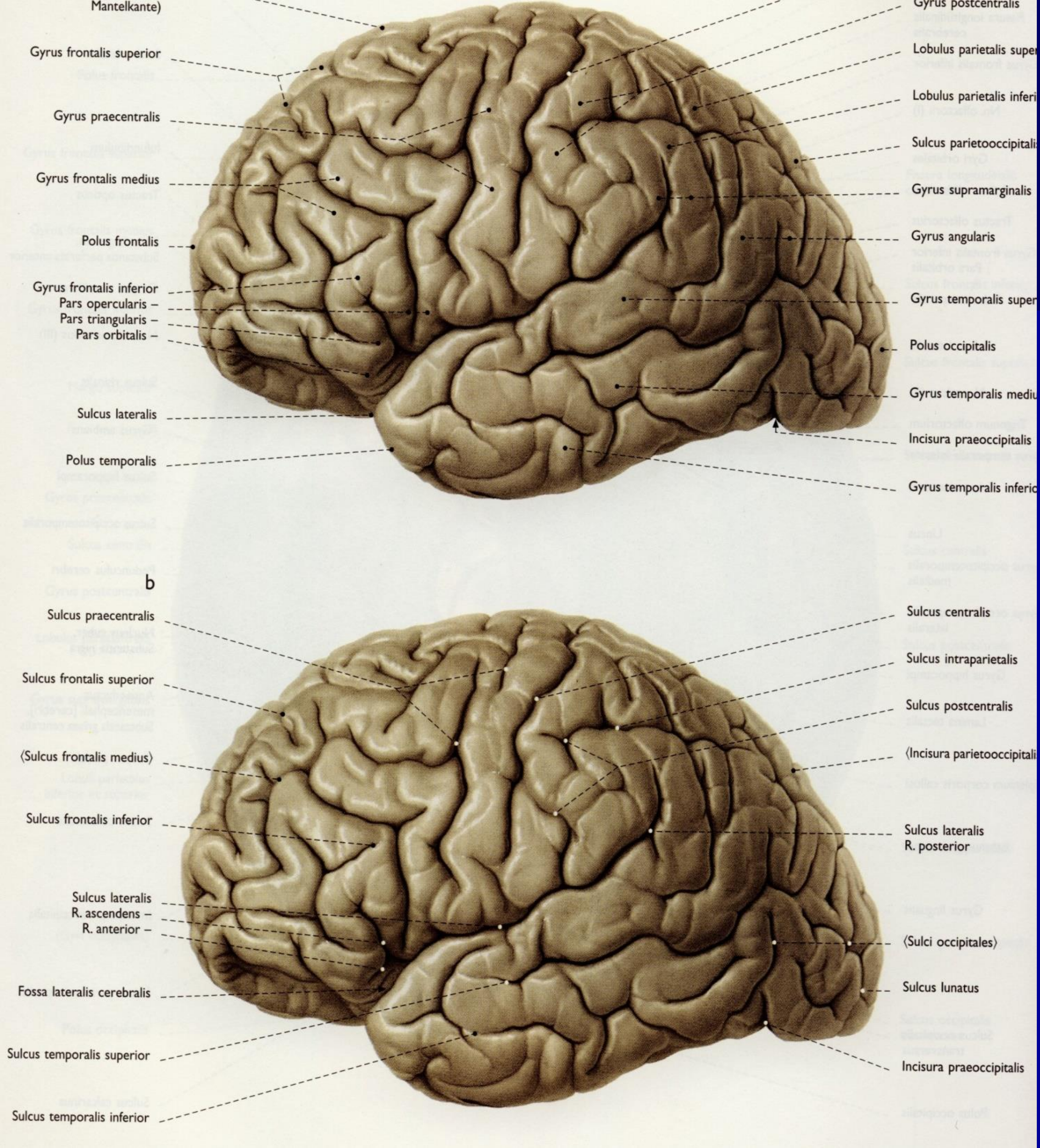

A
B
C
D
Retinotopic
Parietal
(where)
Temporal
(what)
V1
V2
V3
VP
V3a
V4v
MT/V5
pMSTd/
MSTd
VIP/
SPO
LIP/
LSPO
V4
LO


Dorsal pathway for spatial vision
(to posterior parietal cortex)
Where pathway
V5 (middle temporal area)
Visual areas in
occipital lobe:
Primary visual
cortex
Secondary visual
cortex
V4
Ventral pathway for form,
color, and object vision
(to inferior temporal lobe)
What -
pathway

Zraková korová oblast

- **Area 17, granulární kůra**
- **Aferentace: zraková dráha, corpus geniculatum laterale (talamus)**
- **Eferentace: talamus (corpus geniculatum laterale), area 18, 19, parietální kůra, temporální kůra**
- **Dorzální proud – parietální kůra (kde ? : tyčinky, periférie sítnice, area 7)**
- **Ventrální proud – temporální kůra (co ?- barvy, tvary, povrch: čípky, centrální oblast sítnice, area 37, dolní temporální kůra**

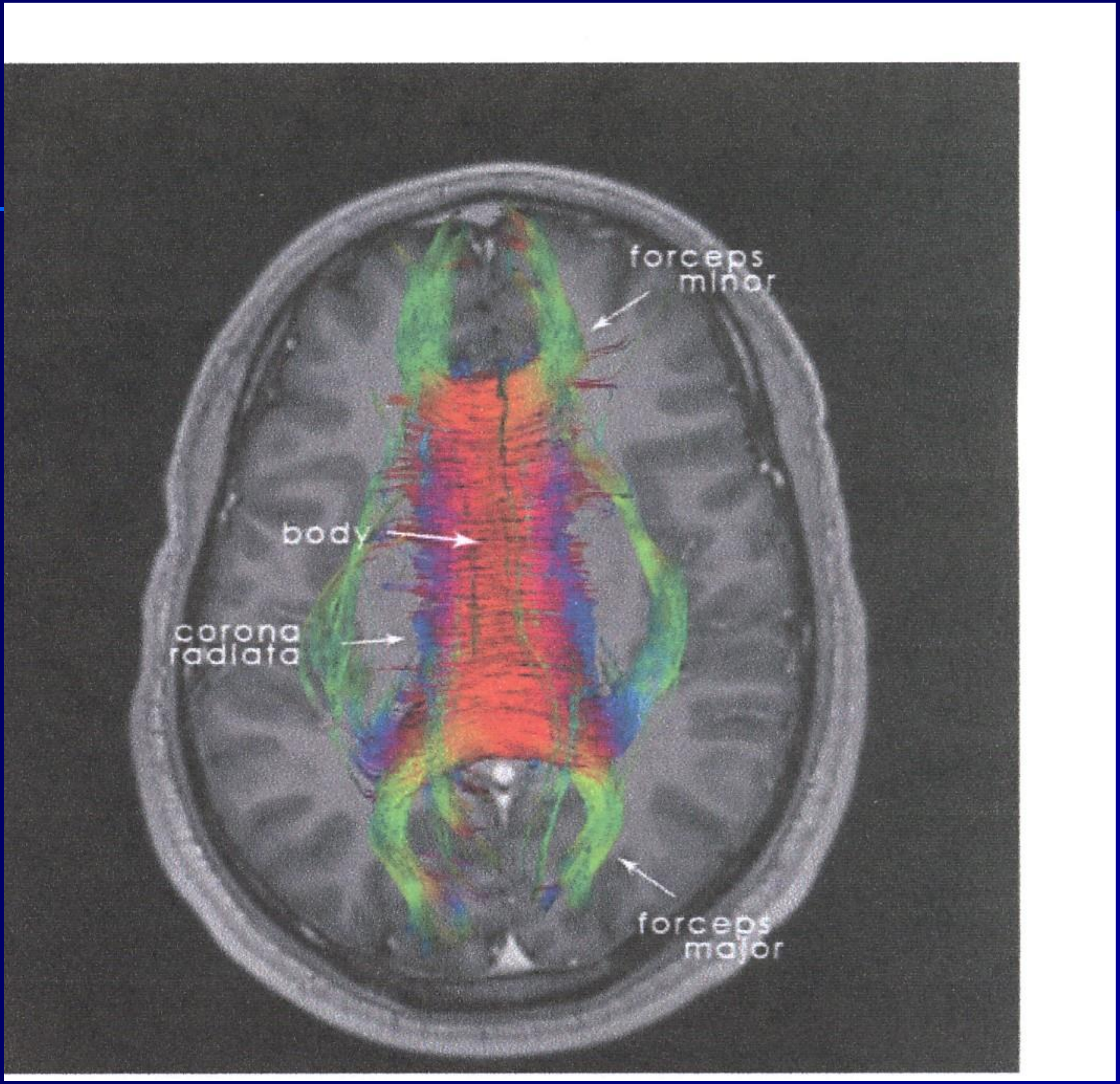
Prefrontální korová oblast - PF



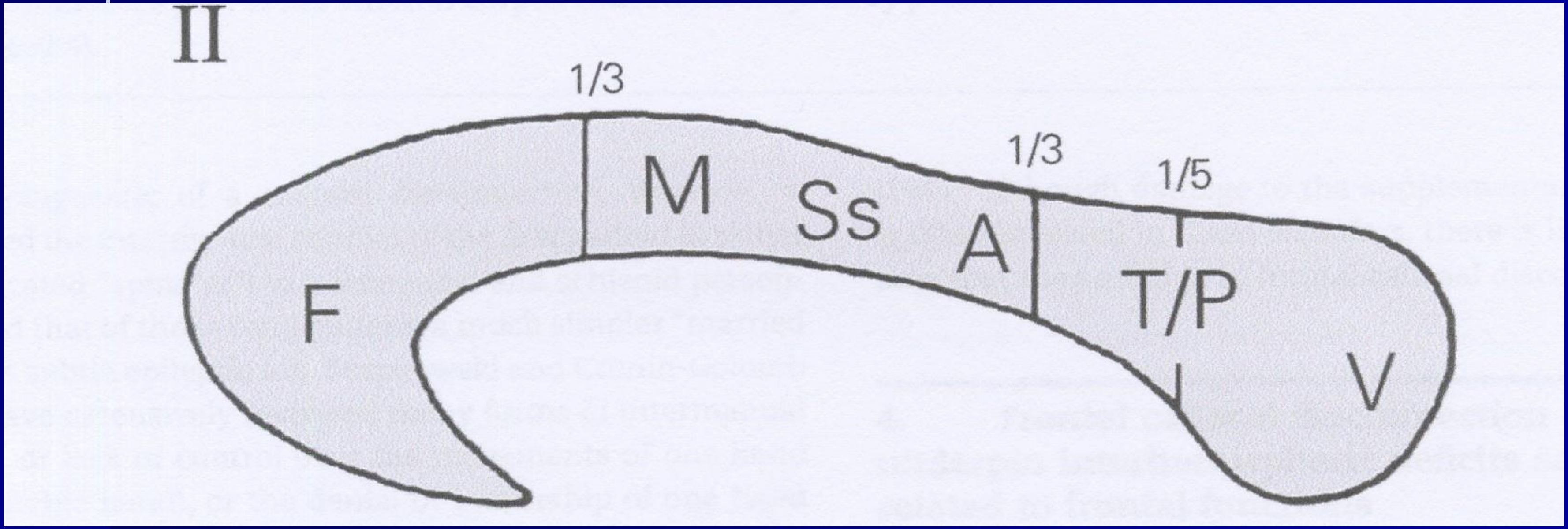
Prefrontální korová oblast (PF)

- Area 9, 10, 11,12,13,14, 46, 47
- Granulární kůra
- Orbitální,mediální a laterální oblast
- Orbitální a mediální oblast = kontrola emočního chování
- Laterální oblast = kognitivní funkce (usuzování, plánování, řeč, časová organizace chování)
- Aferentace – MD, c. amygdaloideum, ostatní asociační oblasti, SNc (dopamin), AASRF

- **Corpus callosum (MR- traktografie)**



Členění corpus callosum podle vláken



Corpus callosum – transekce

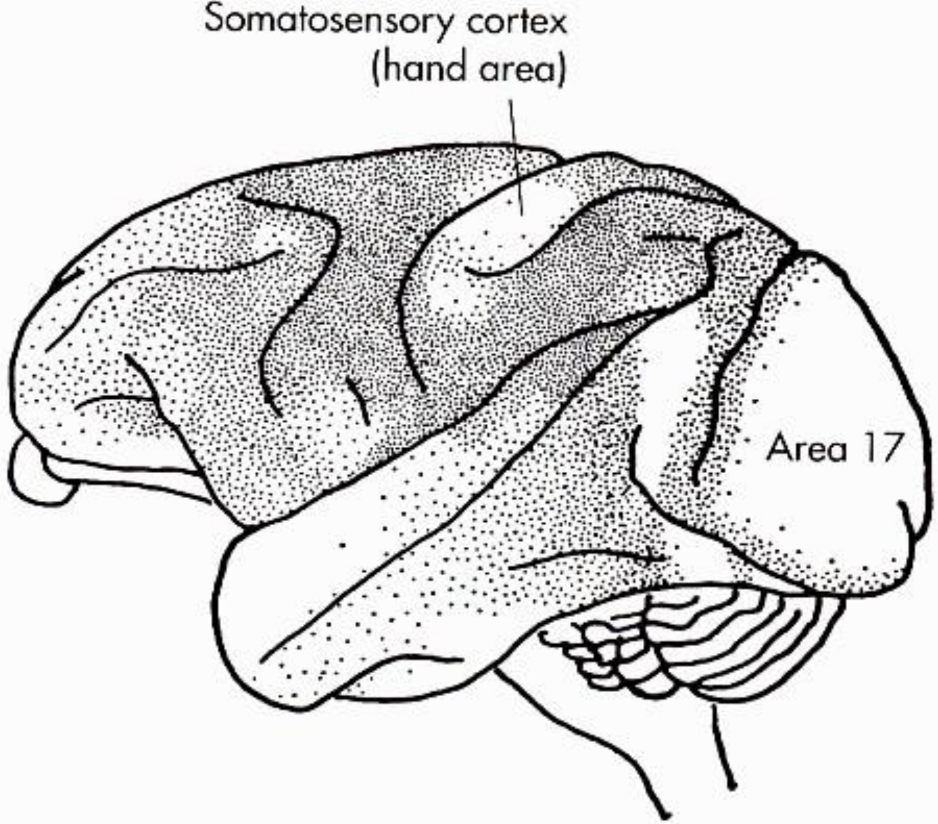


FIGURE 22-26
Distribution of degenerating axon terminals after section of the corpus callosum and anterior commissure in a rhesus monkey. Note that with a few exceptions (e.g., most of the primary visual cortex—exposed in monkeys on the lateral surface of the occipital lobe—and the hand area of somatosensory cortex), the cerebral cortex is blanketed with commissural connections. (The hand area of motor cortex also lacks commissural connections, but is not seen in this illustration because the hand area is mostly buried in the central sulcus in monkeys.) (From Myers RE: Phylogenetic studies of commissural connexions. In Ettlinger EG, deReuck AVS, Porter R, editors: *Functions of the corpus callosum*, Edinburgh, 1965, J and A Churchill.)

Asociační korové spoje

Krátké, dlouhé

Fasciculus longitudinalis inferior

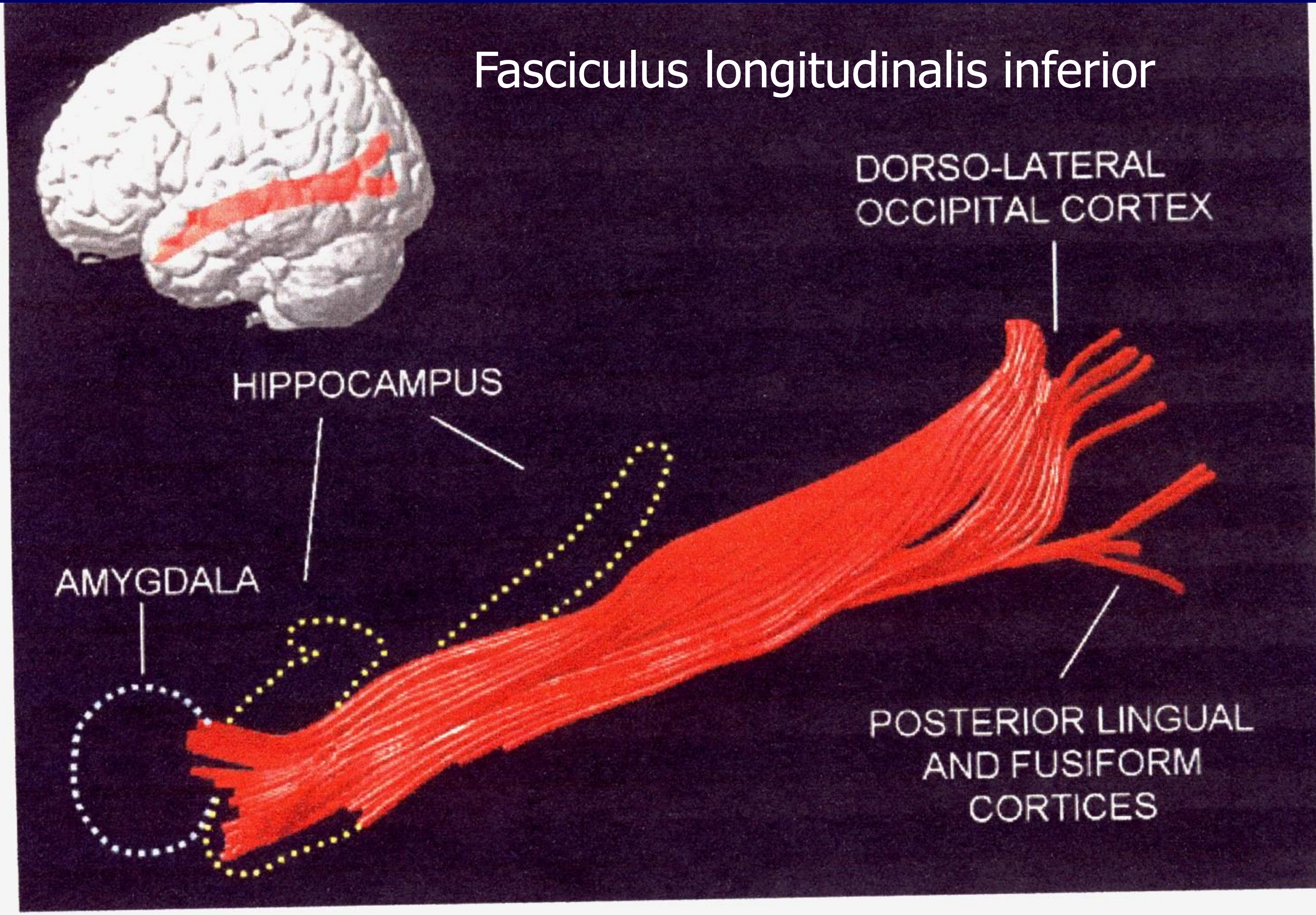


Fig. 7 Reconstruction of the ILF in the average DT-MRI data set. The long fibres originate from extrastriate areas of the occipital lobe and terminate in lateral temporal cortex and medial temporal cortex in the region of the amygdala and parahippocampal gyrus.

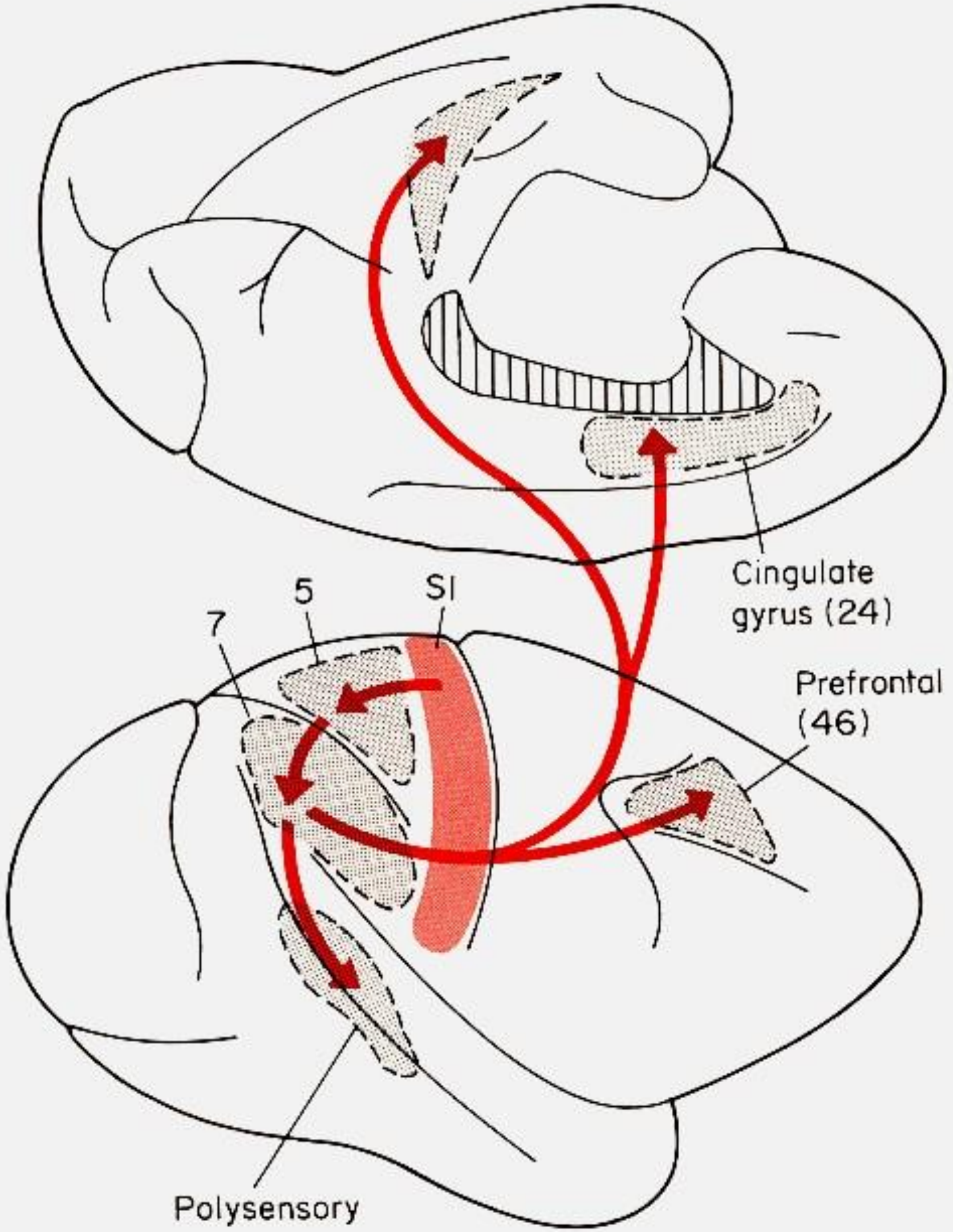


Fig. 17.9. *Association connections of the SI* (monkey). Only some fiber connections are shown, to illustrate the flow of information progressing from SI to the posterior parietal cortical areas, and from there to polysensory areas in the temporal lobe, to the prefrontal cortex, and to limbic cortical regions. Based on Jones and Powell (1970).

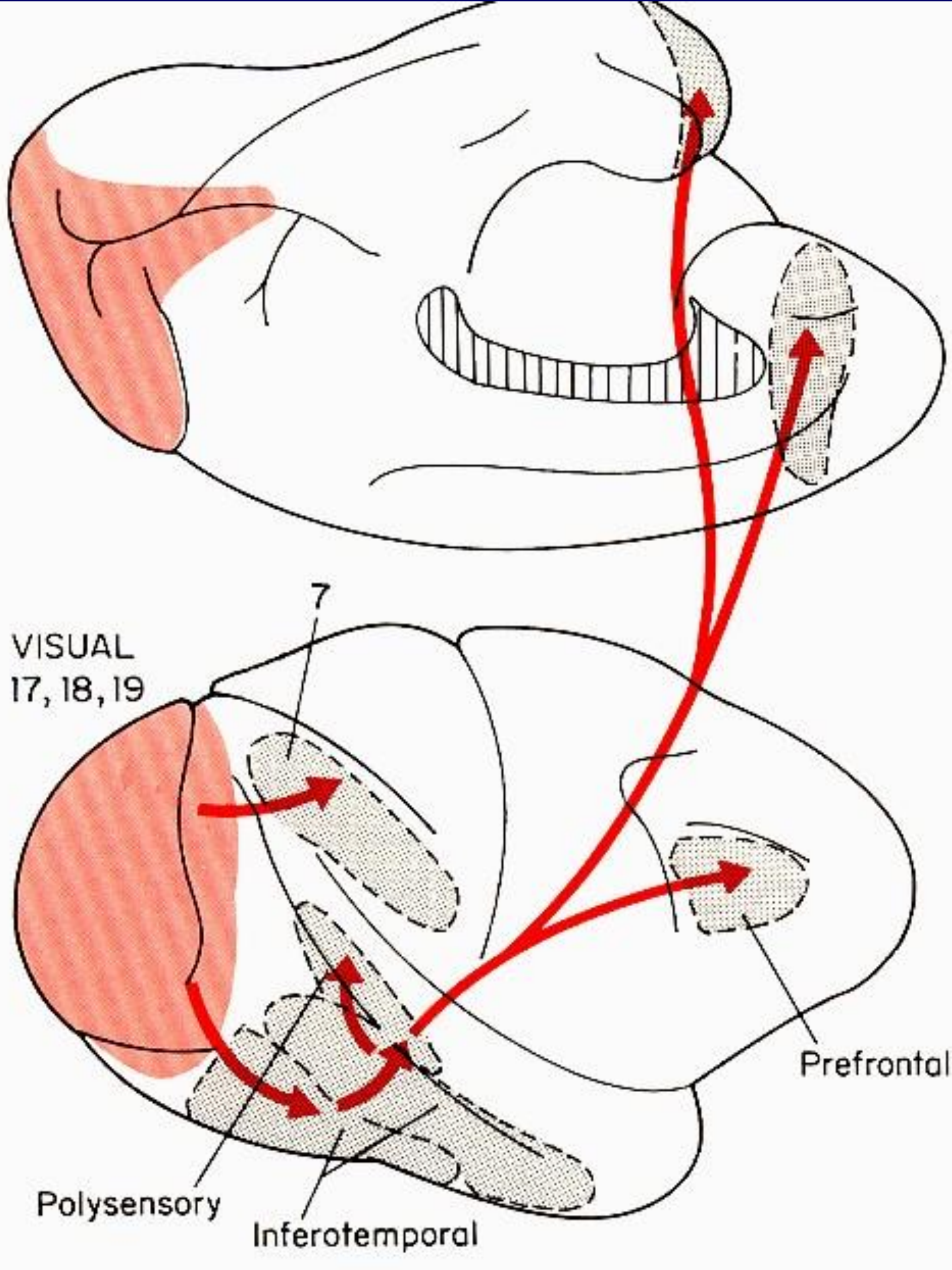


Fig. 17.10. *Association connections of the visual cortex.* Compare with Figure 17.9 and note similarities with regard to the progression of information outward from the striate area. Only some connections are shown. Based on Jones and Powell (1970).

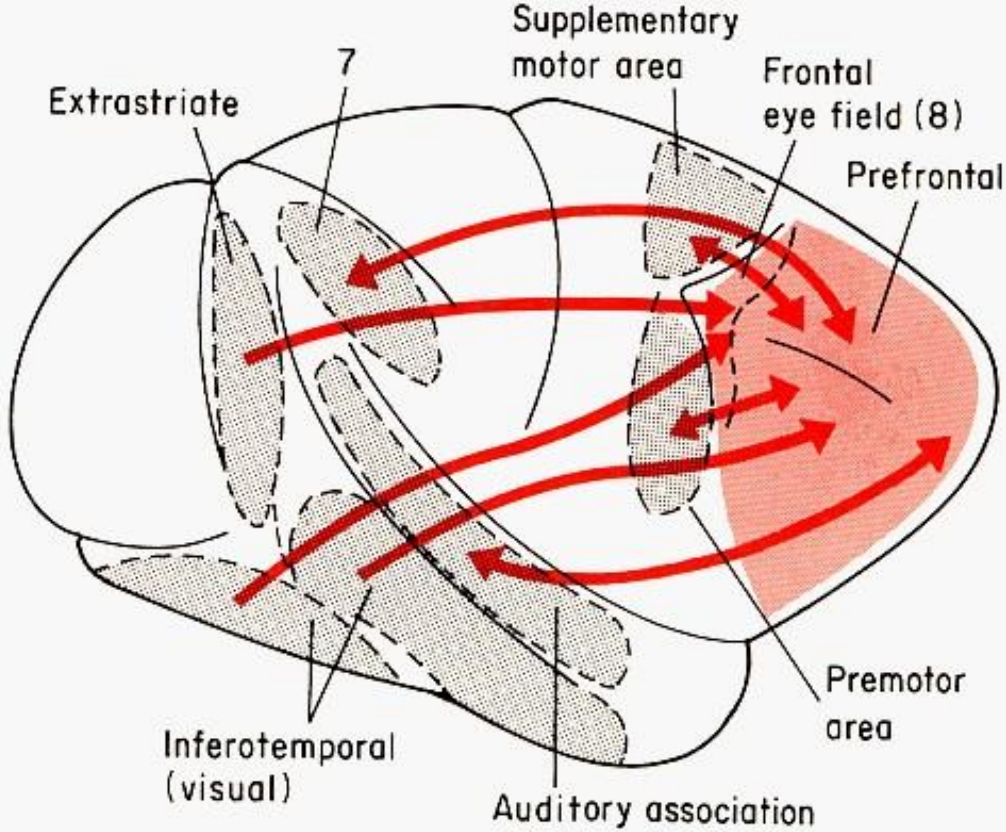


Fig. 17.13. *The association connections of the prefrontal cortex* (monkey). Note the convergence of all kinds of processed sensory information and the connections with PMA and SMA. Connections with limbic cortical areas are not shown (see Figs. 16.3 and 16.4).

ÚPRAVA HEMISFÉRY

Hemisféra – evertovaná

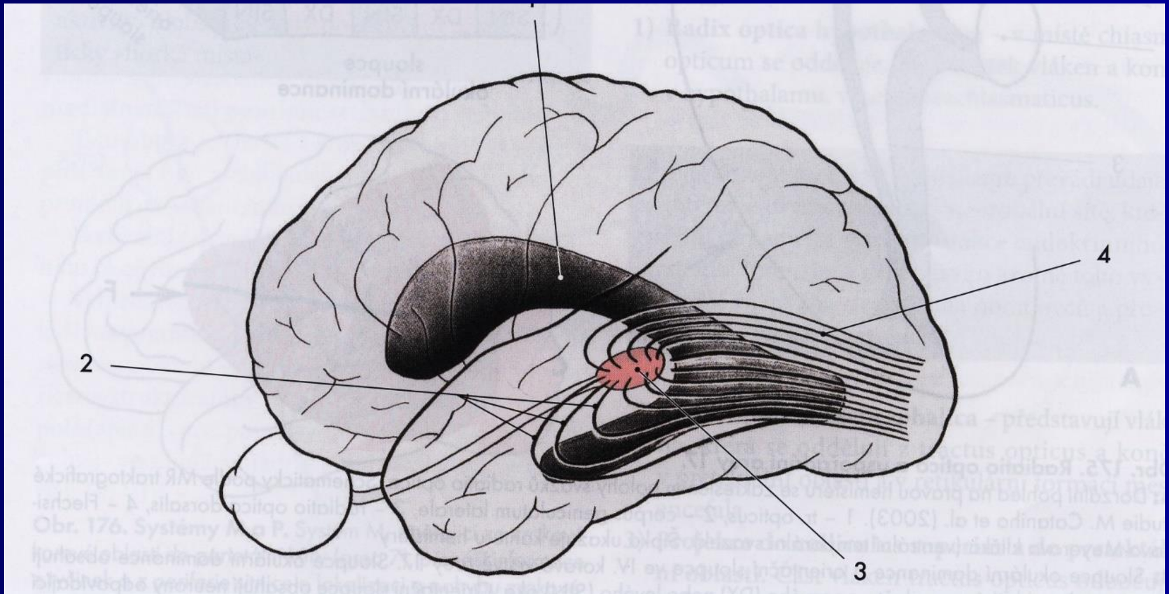
Hemisféra – evaginovaná

Cerebral cortex

- All mammals depend on it

- A man without a cortex is almost vegetable, speechless, sightless, senseless (D. Hubel and T. Wiesel 1979).

- The cortex supports sensory perception, reasoning, planning and execution of behaviors



2
3
4

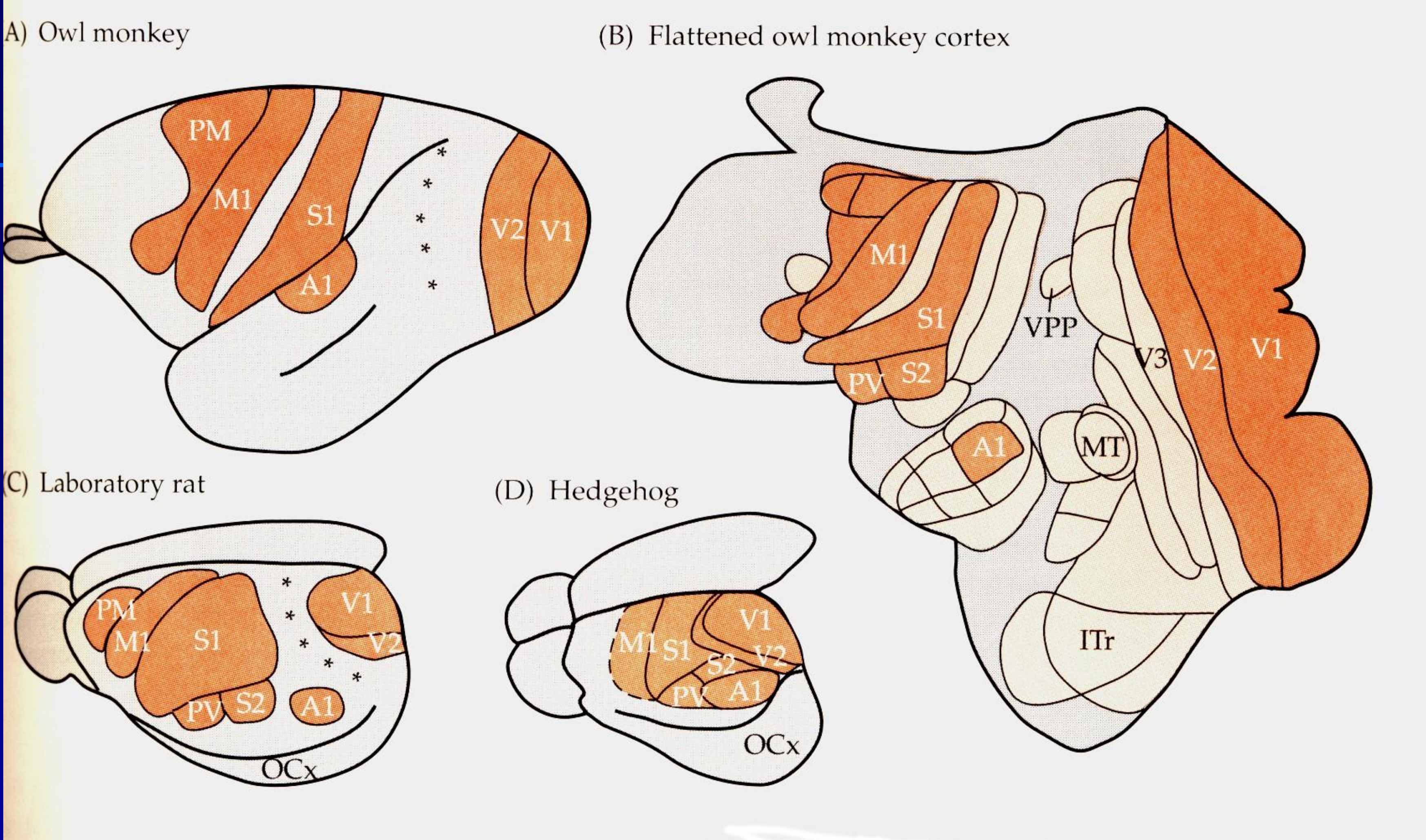
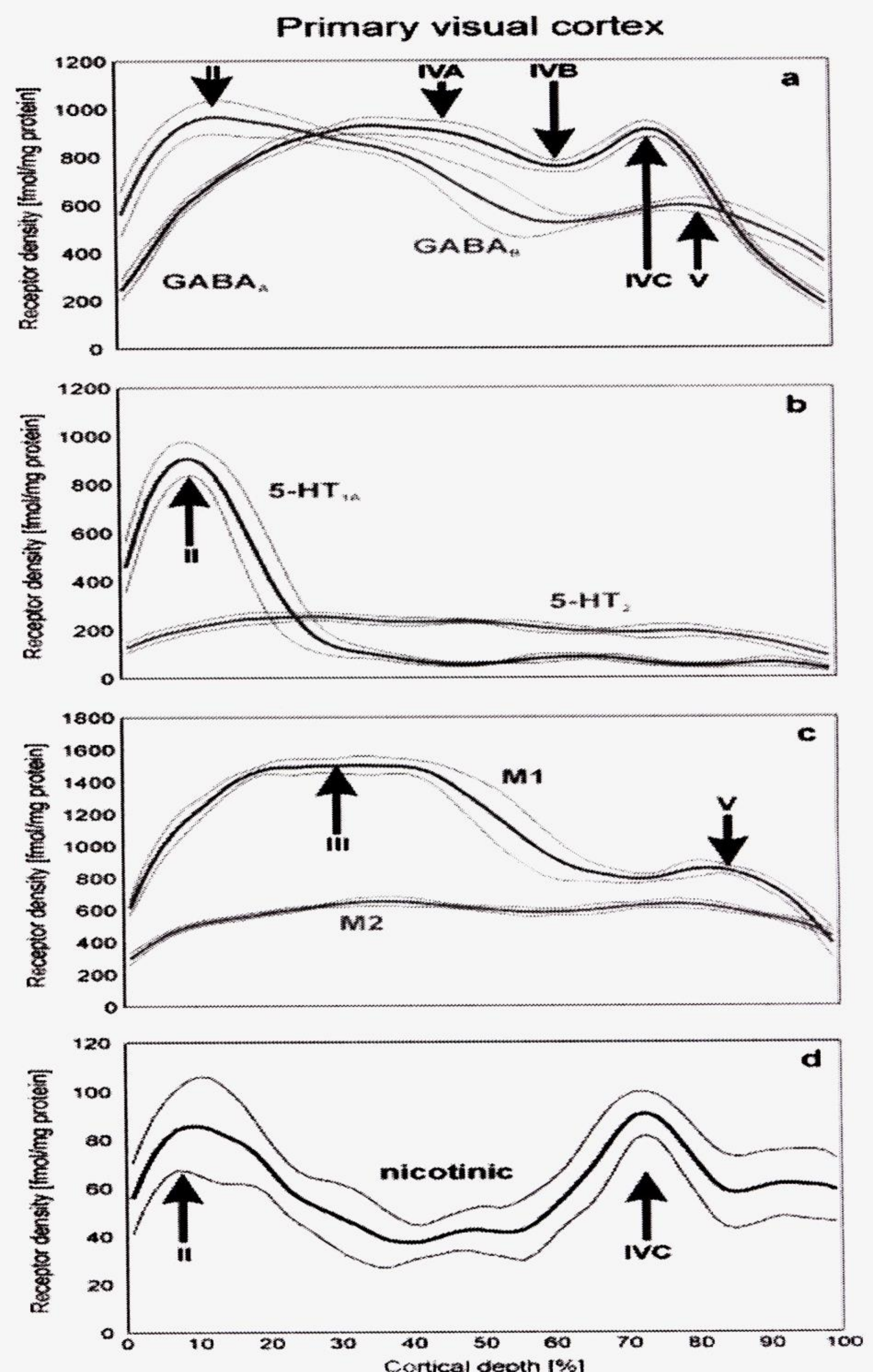


Figure 6.13 "Old" and "New" Neocortical Areas

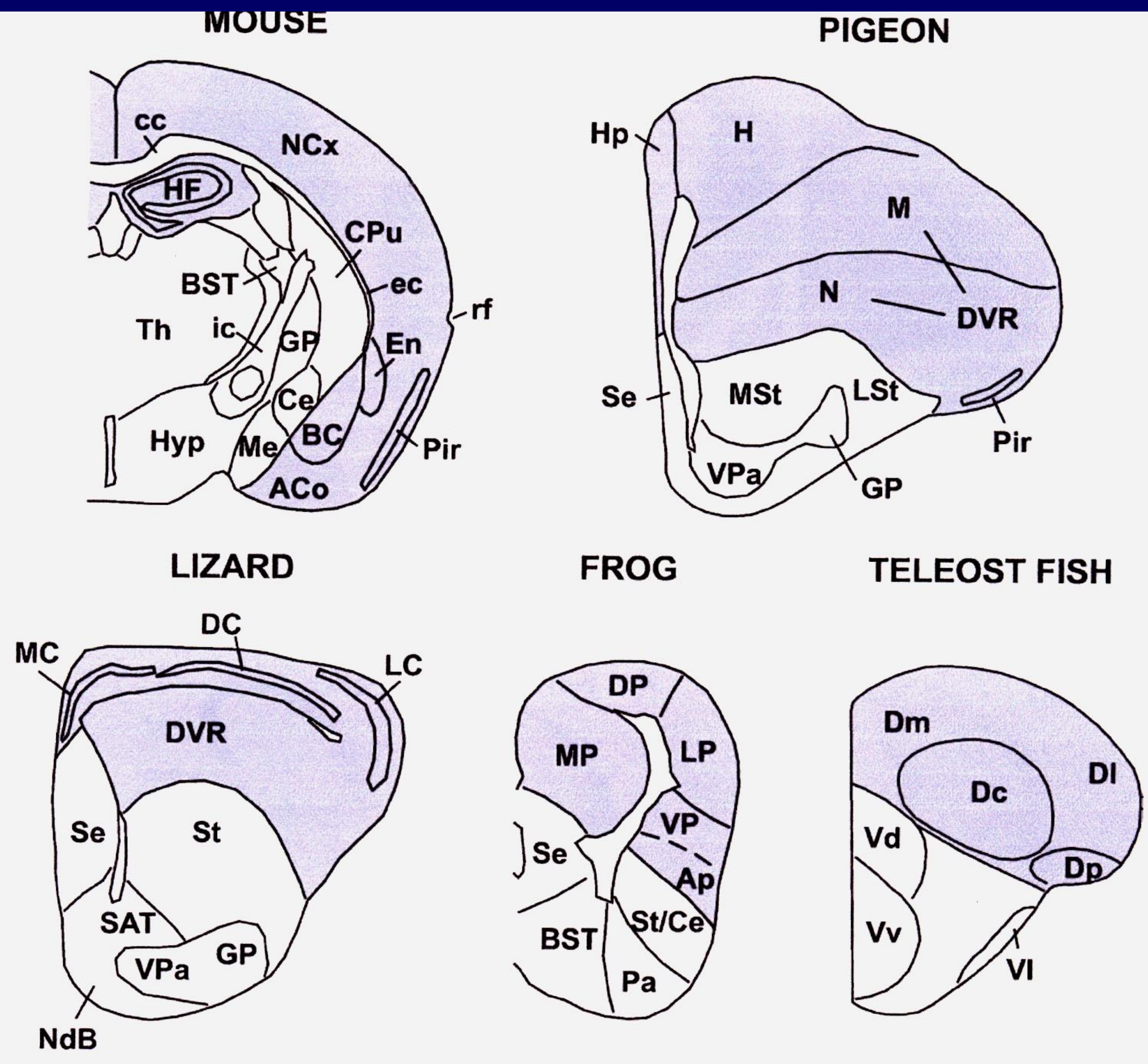
Excitatory connections in the neocortex

- Layer 4 – termination of thalamocortical projections
- Layer 4 – projects to layer 3
- Layer 3 – projects to layer 5

Receptorové mapy v neokortexu



Primary visual cortex
a
II
IVA
IVB
IVC
V
GABA
GABA
Receptor density [fmol/mg protein]
b
5-HT
5-HT
II
c
M1
M2
III
V
d
nicotinic
II
IVC
Cortical depth [%]


MOUSE
cc
NCx
HF
CPu
BST
ec
rf
Th
ic
GP
En
Ce
Hyp
Me
BC
Pir
ACo
PIGEON
Hp
H
M
N
DVR
Se
MSt
LSt
Pir
VPa
GP
LIZARD
DC
MC
LC
DVR
Se
St
SAT
GP
VPa
NdB
FROG
DP
MP
LP
VP
Se
Ap
BST
St/Ce
Pa
TELEOST FISH
Dm
Dc
Dl
Vd
Dp
Vv
Vl

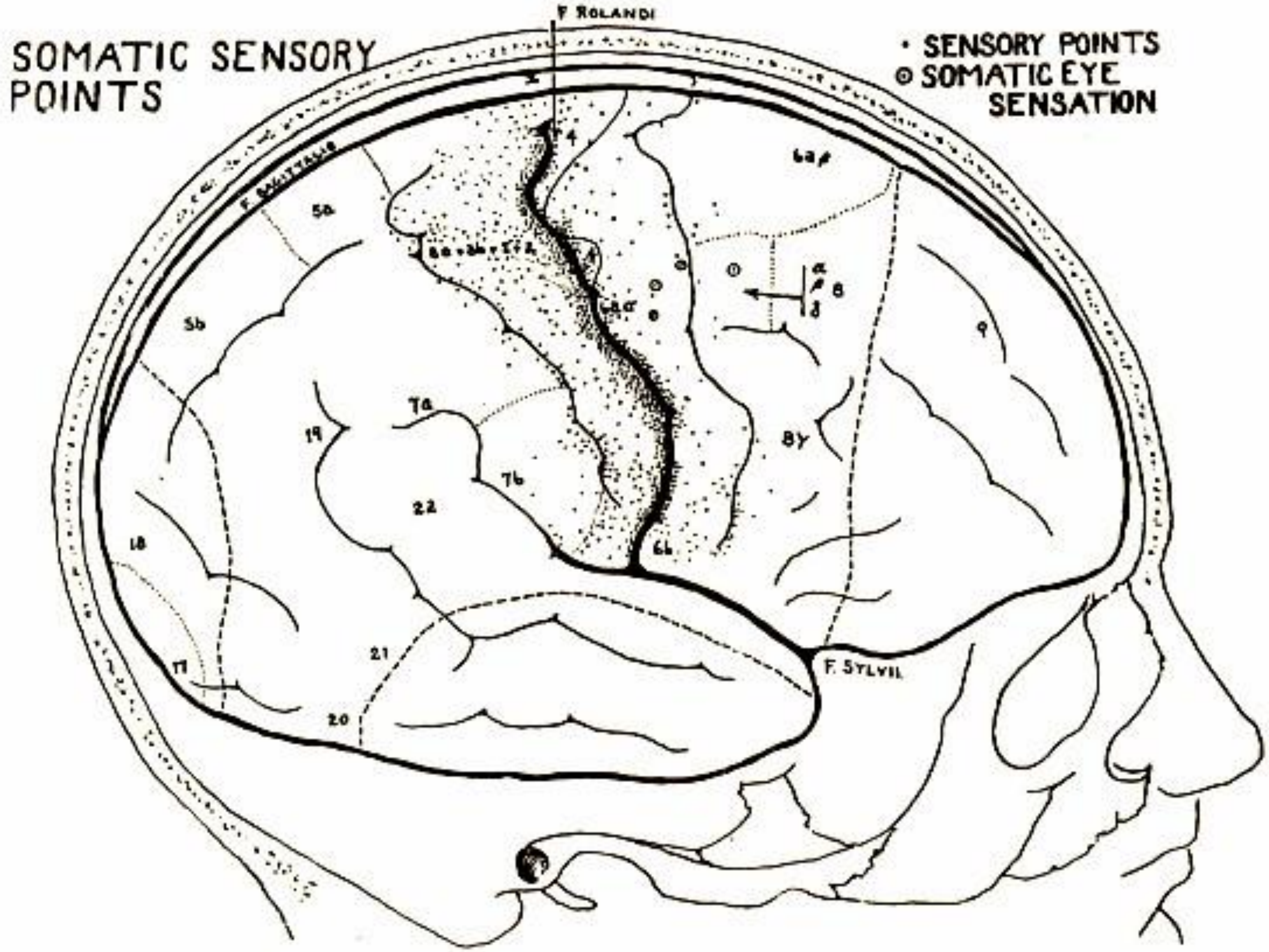


Fig. III-12

Fig. III-12. Rolandic sensory cortex. The black dots are the points from which stimulation produced sensory responses in some part of the body. Summary of same series of cases as in Figure III-11 (Penfield and Boldrey, 1937).