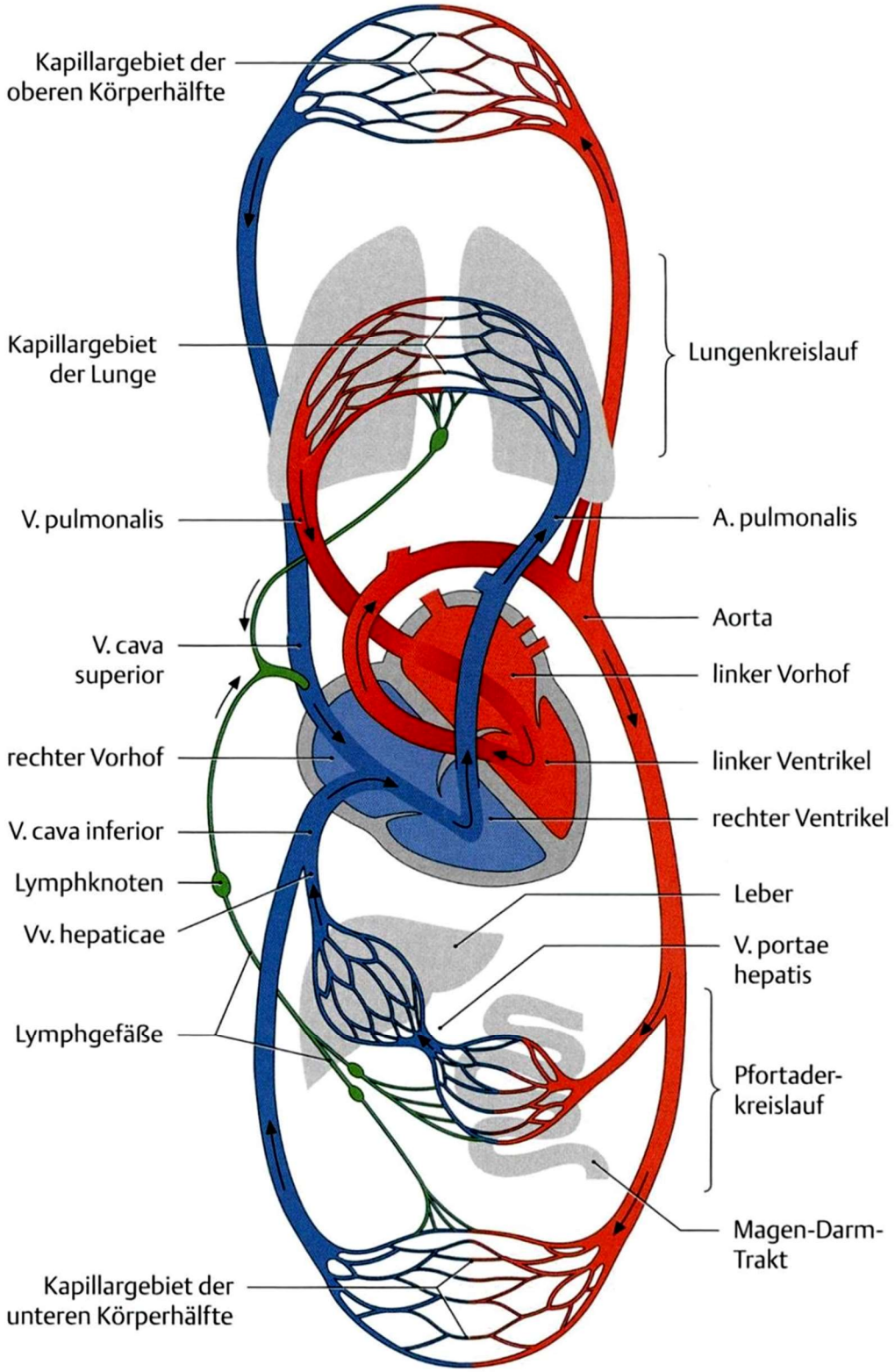
Cortical Blood Vessels

Microanatomy of Blood Vessels

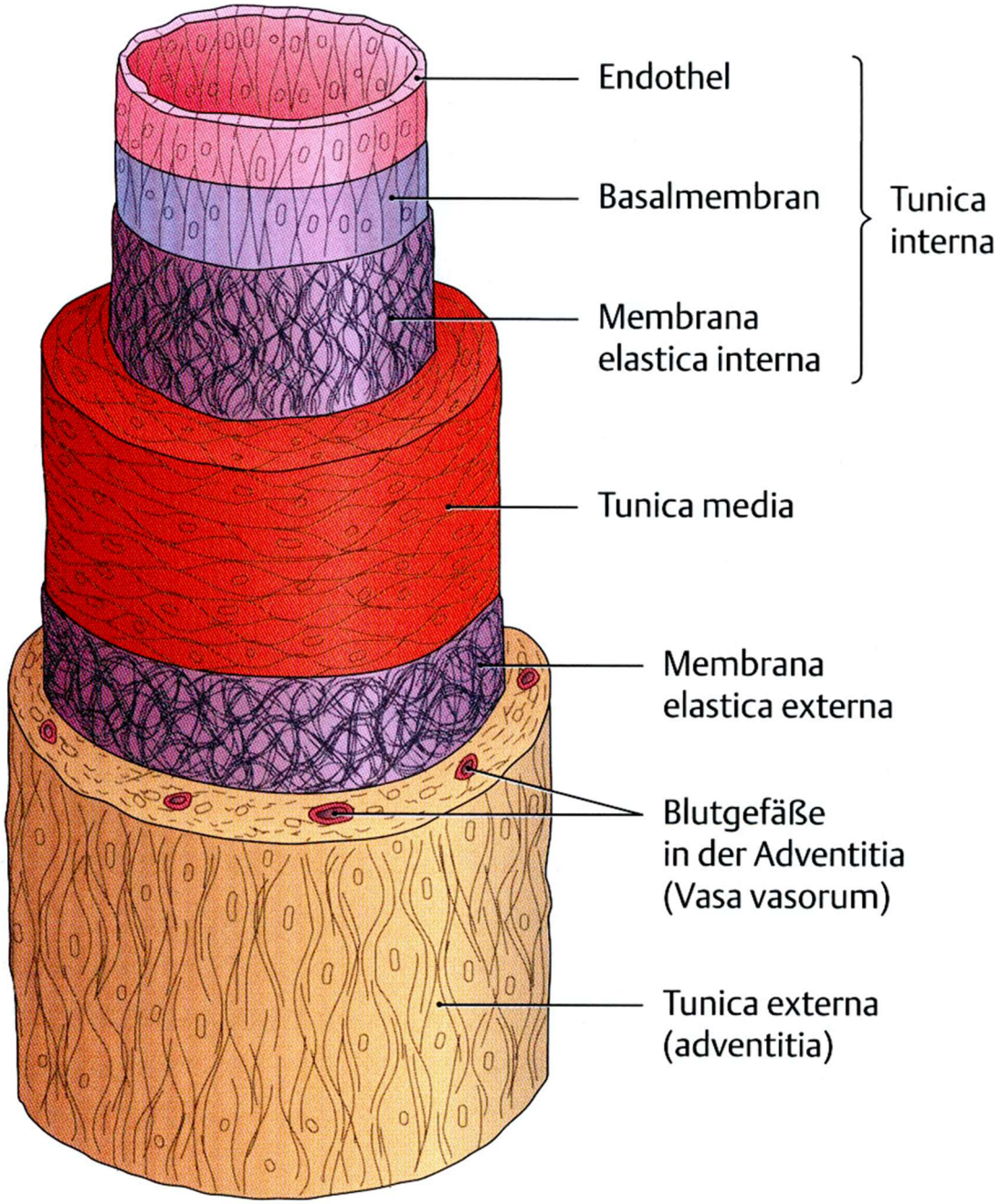
Cerebral Arteries and Veins

Henri Duvernoy‘s Seminal Paper on Cortical Blood Vessels

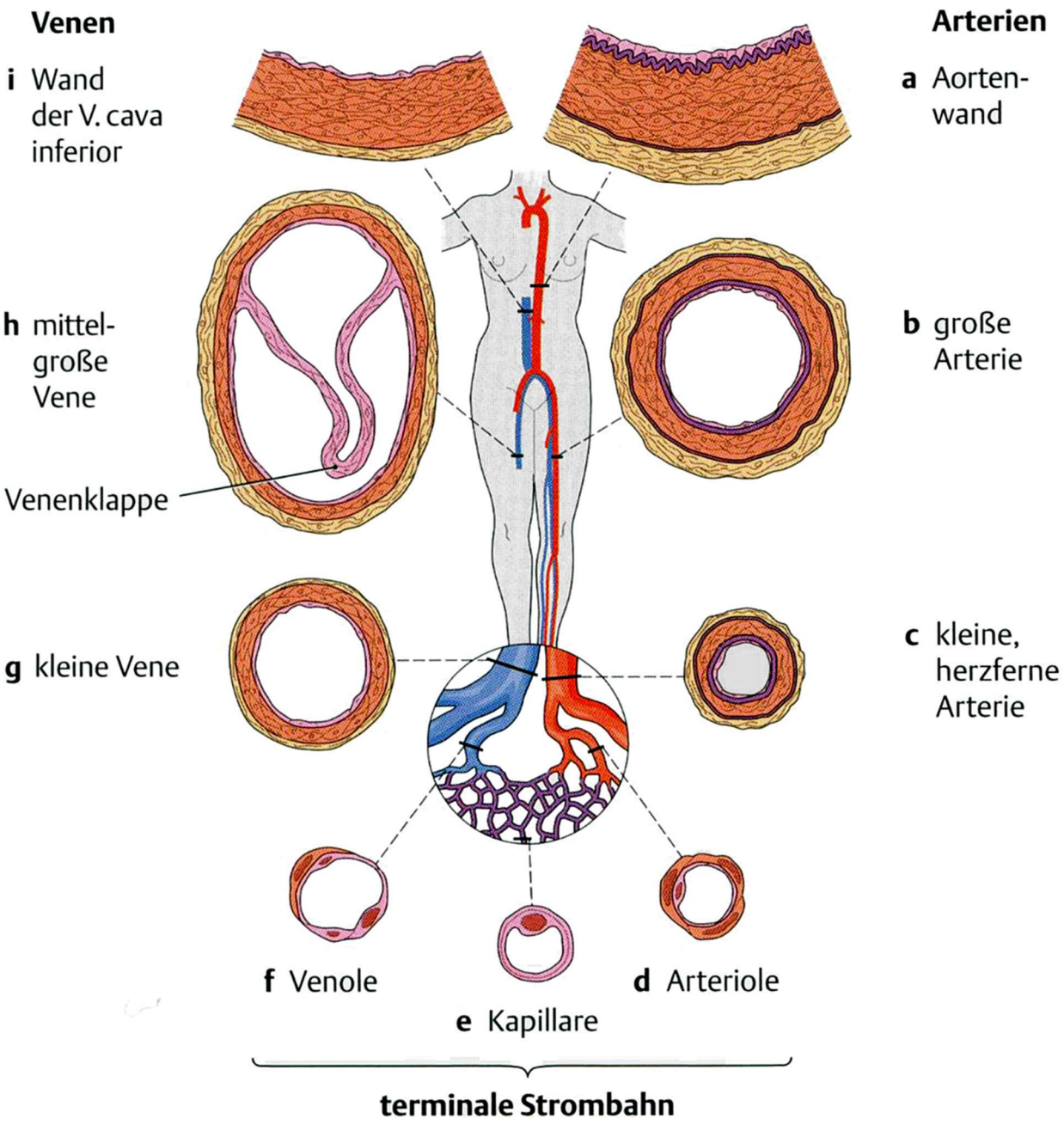
Human Blood Circulation



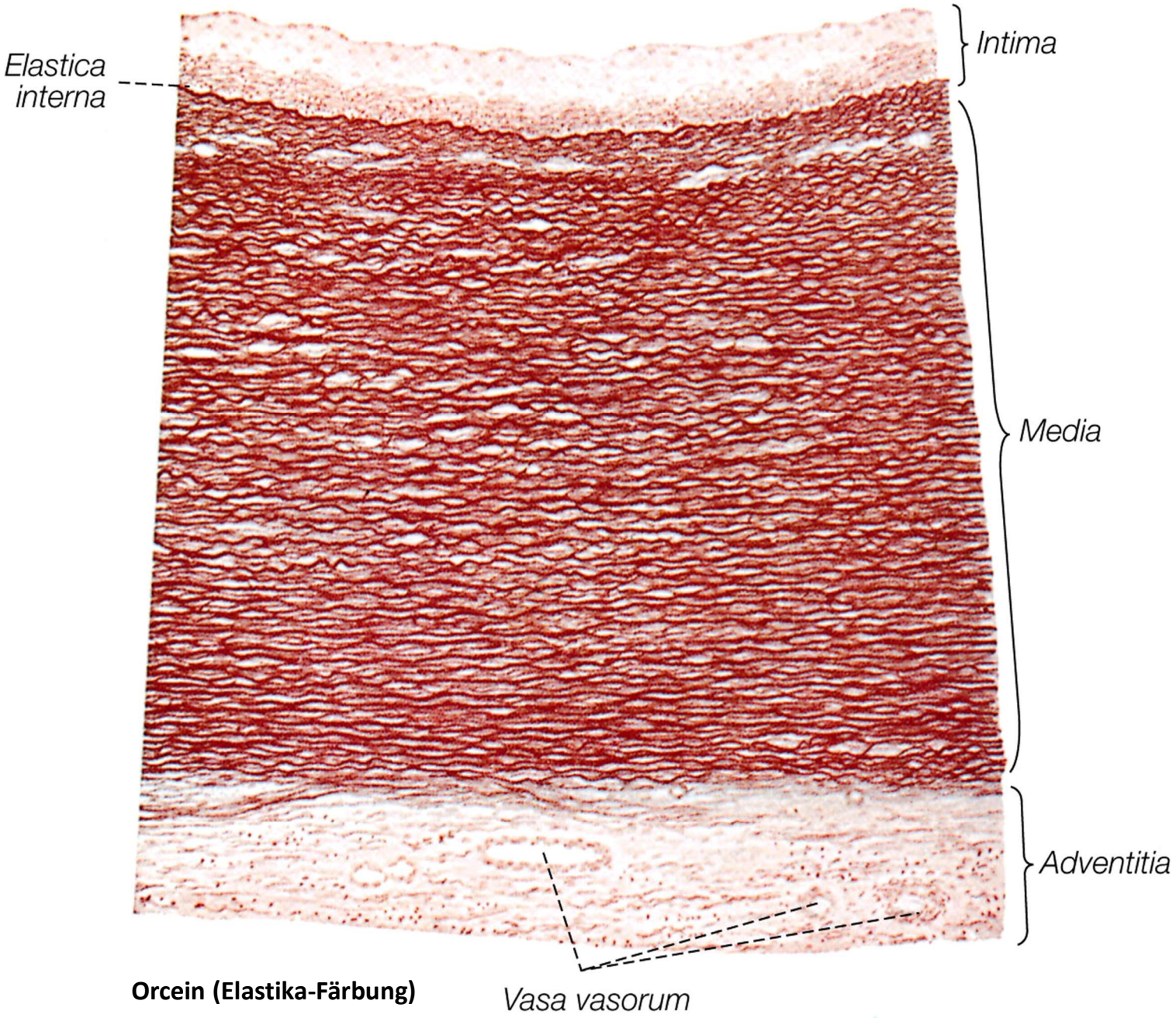
Blood Vessel Walls - Microanatomy



Blood Vessel Types

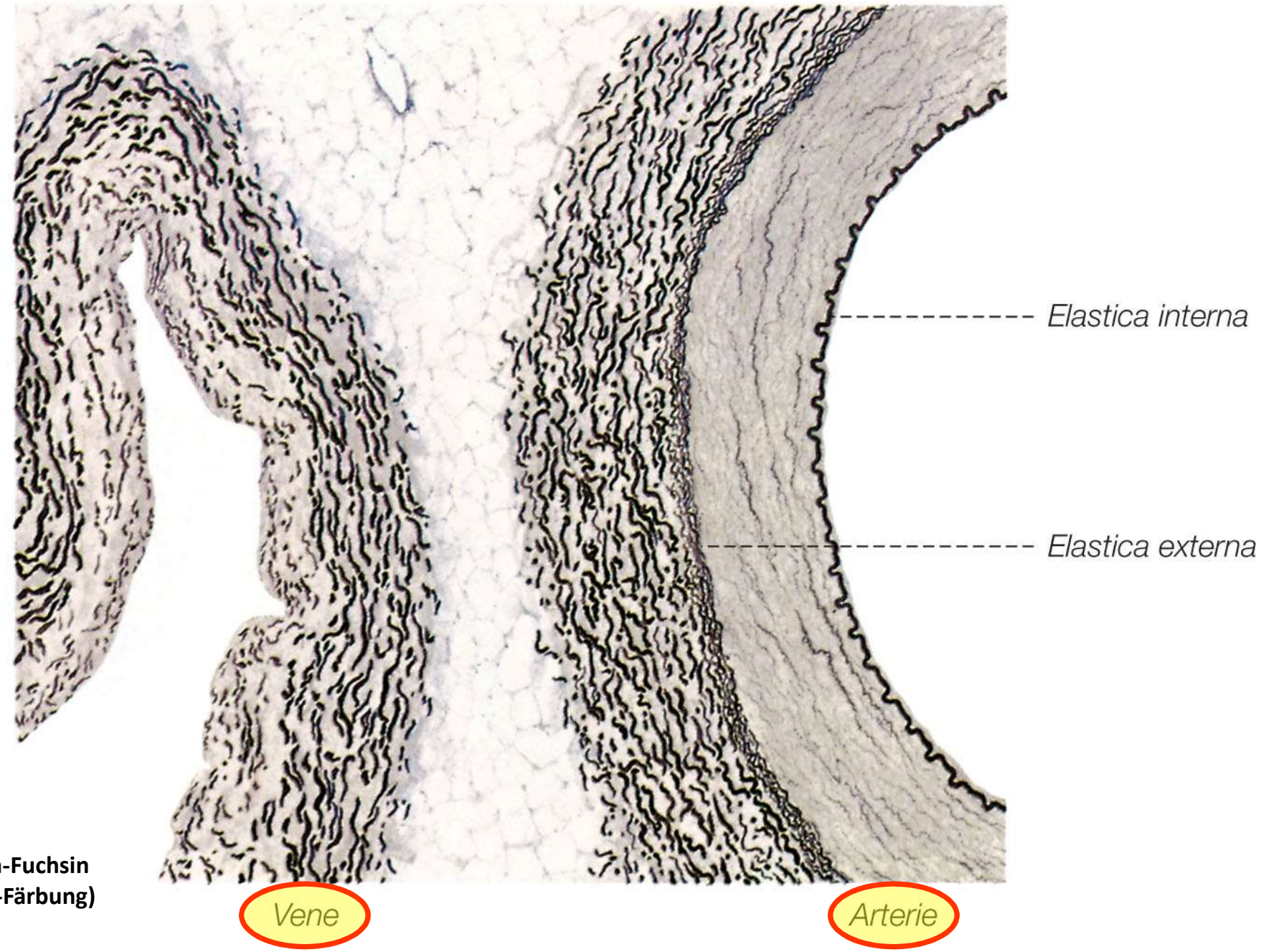


Elastic Artery (Aorta and Large Branches)



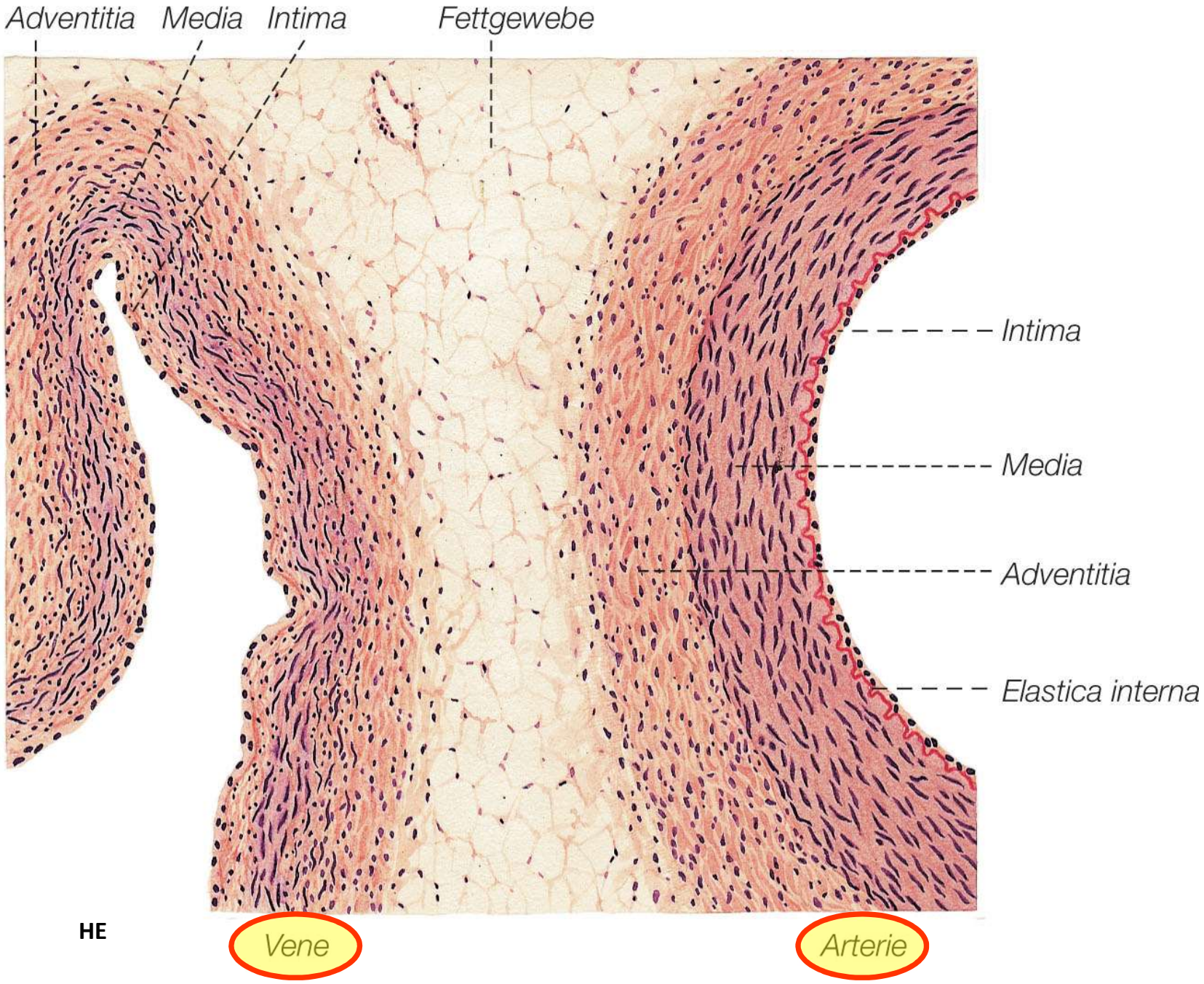
Orcein (Elastika-Färbung)

Vein – Muscular Artery



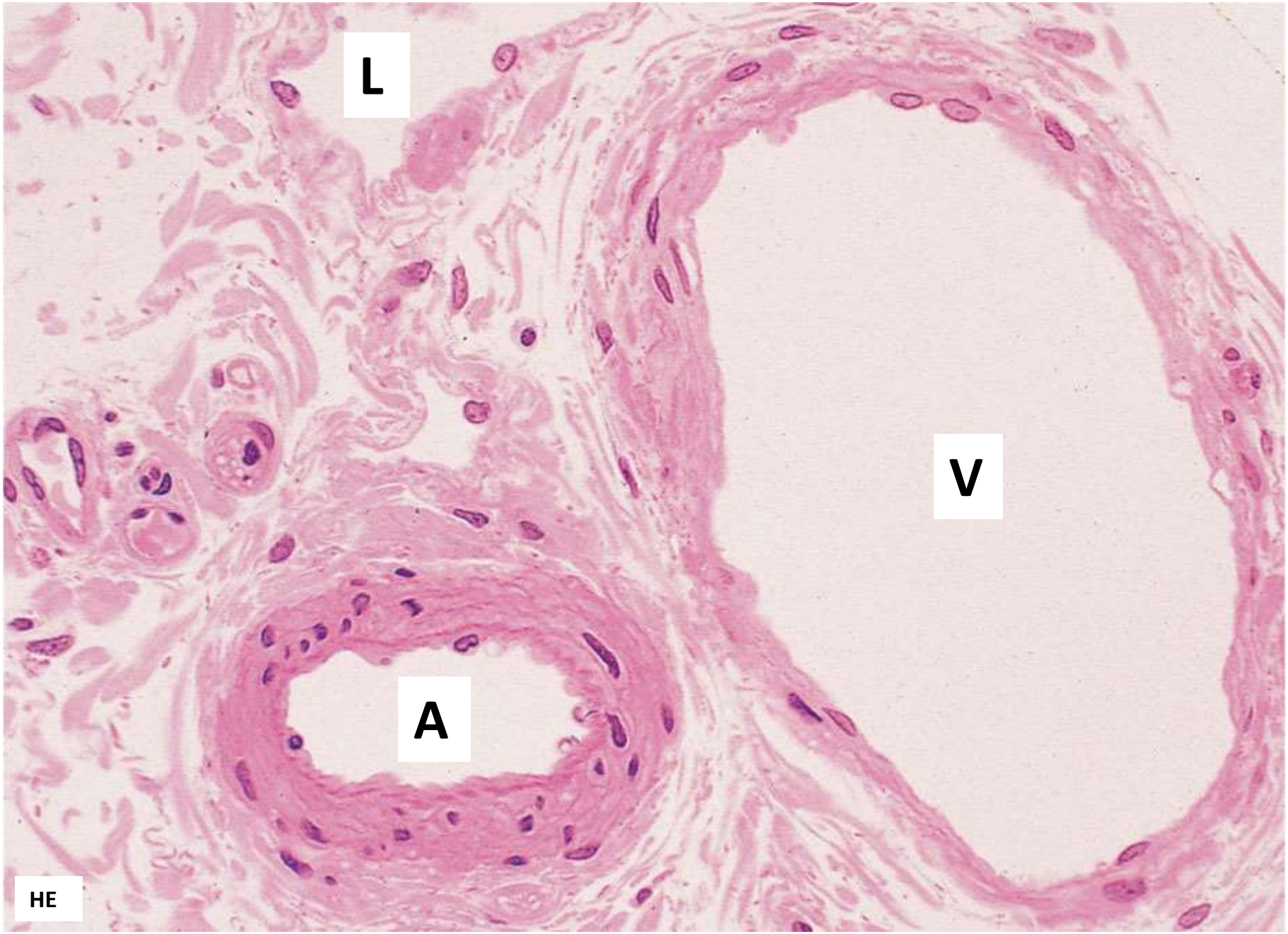
Resorcin-Fuchsin (Elastika-Färbung)

Vein – Muscular Artery

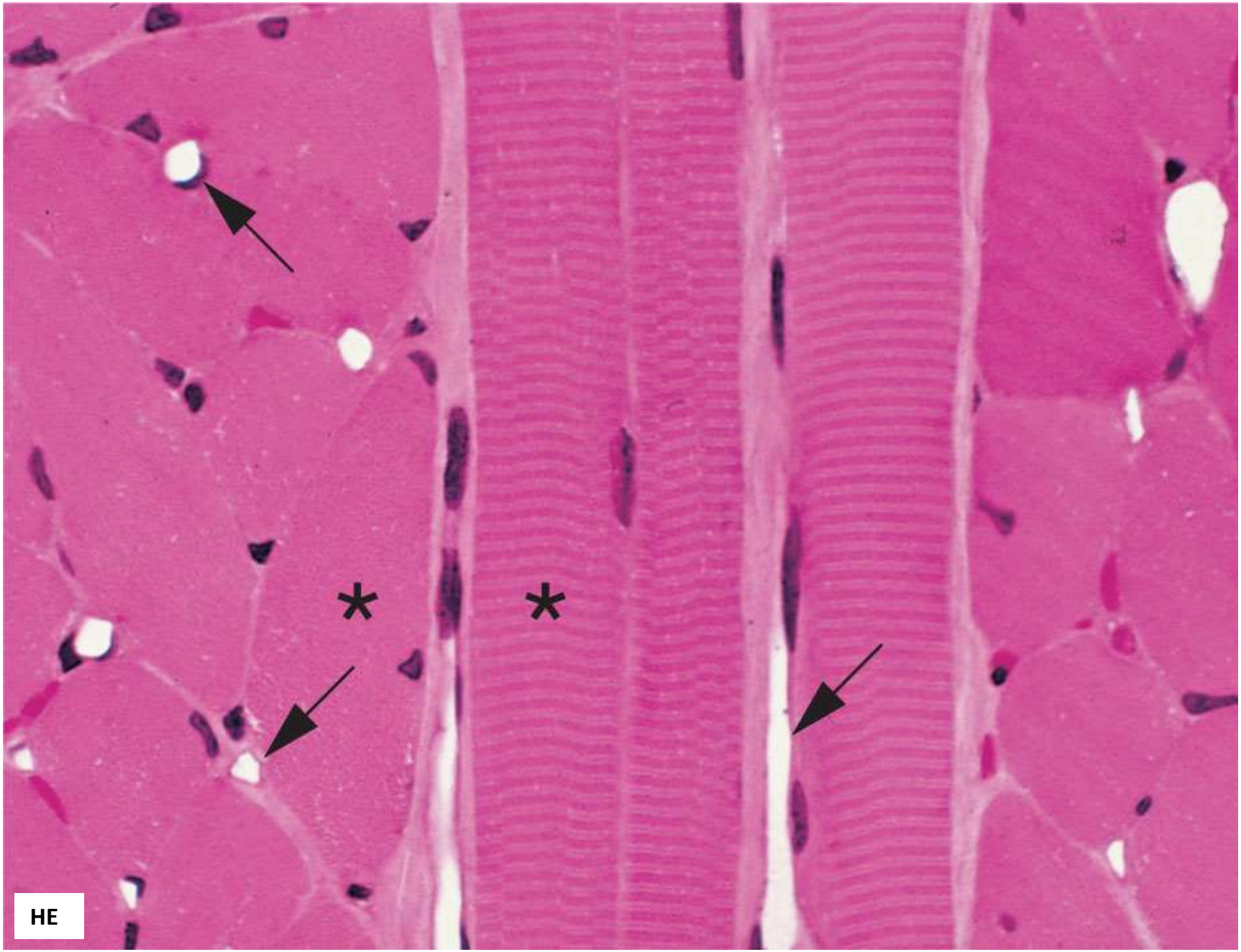


HE

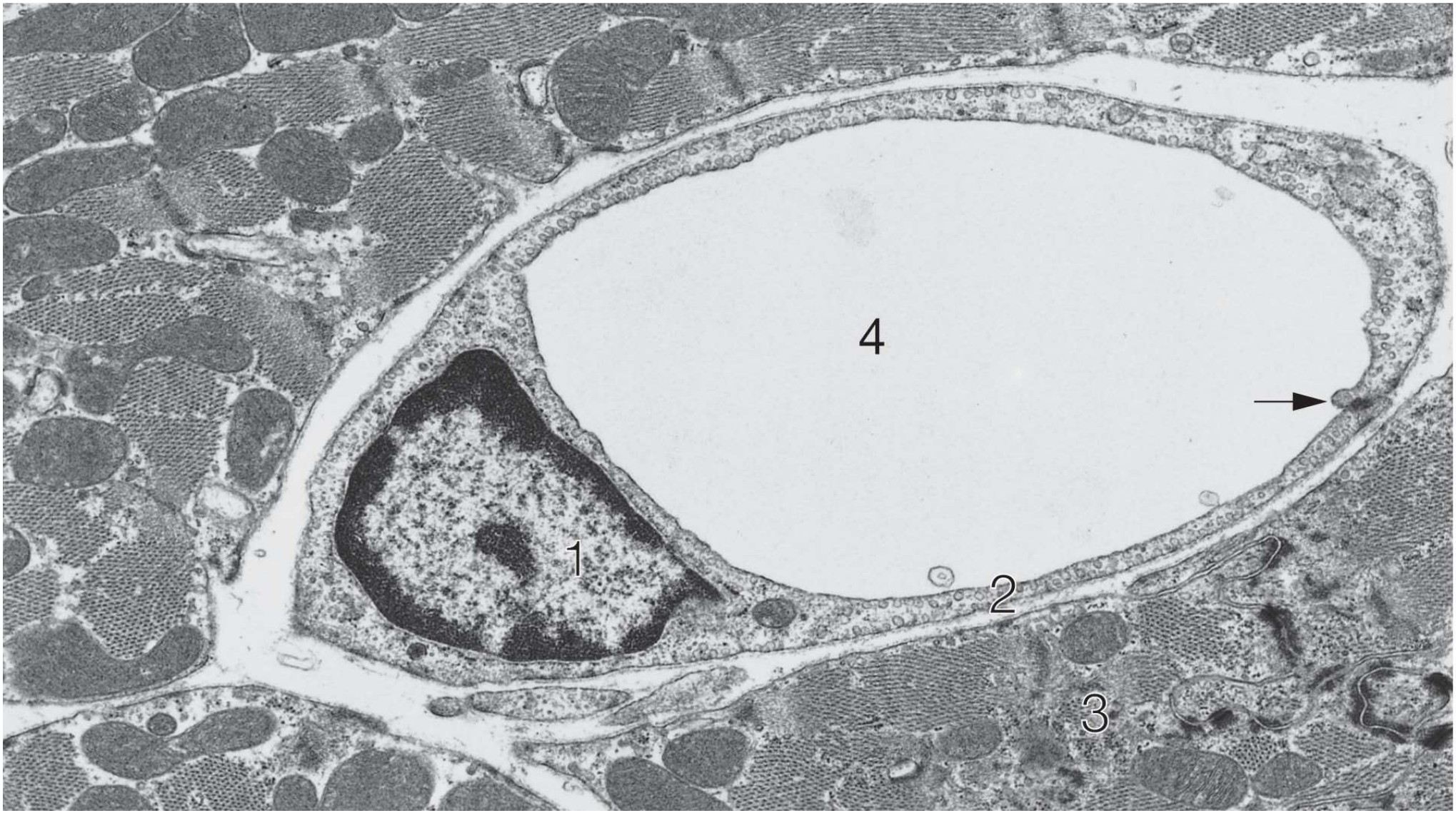
Arteriole – Venule



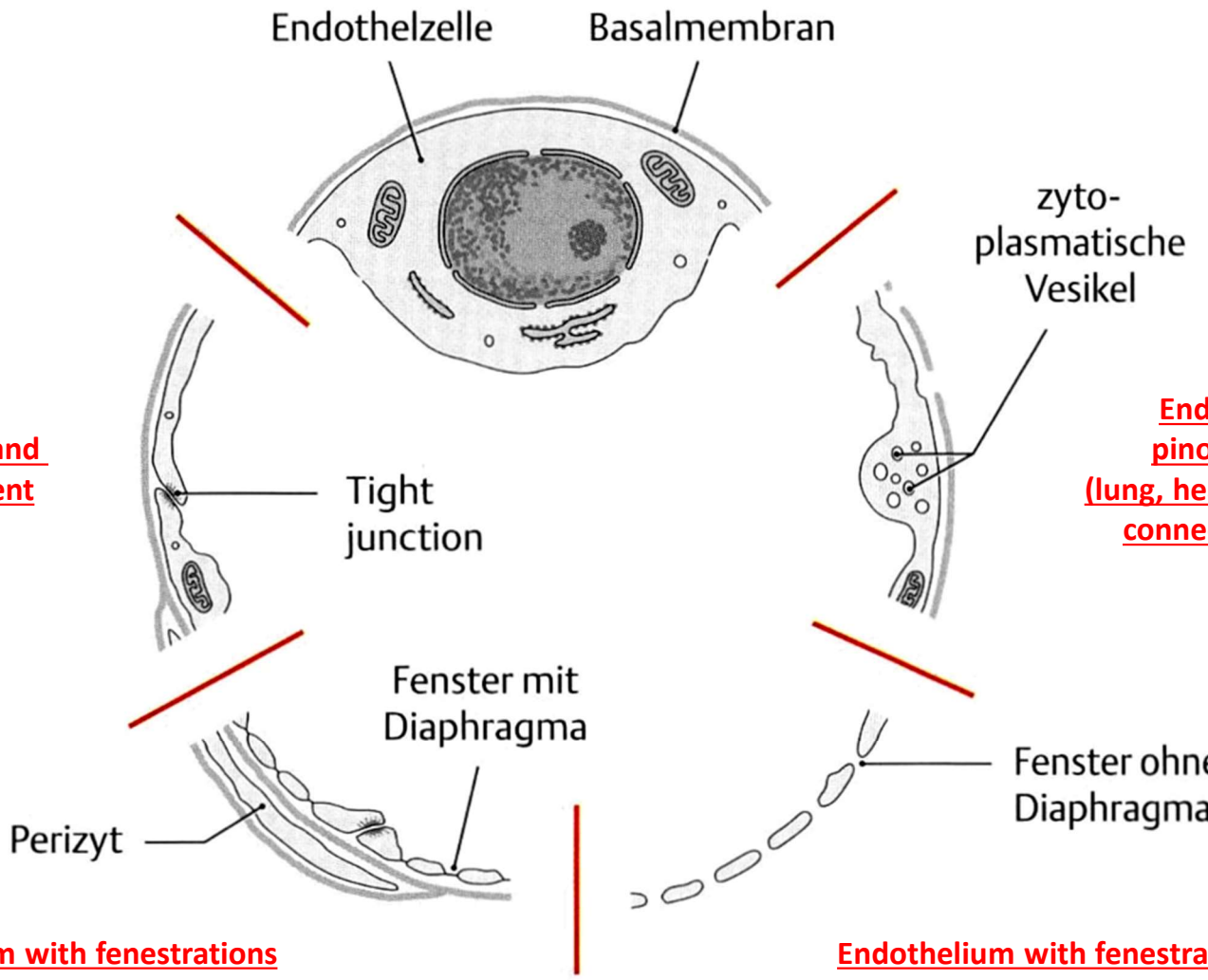
Capillaries



Capillaries



Capillary Types



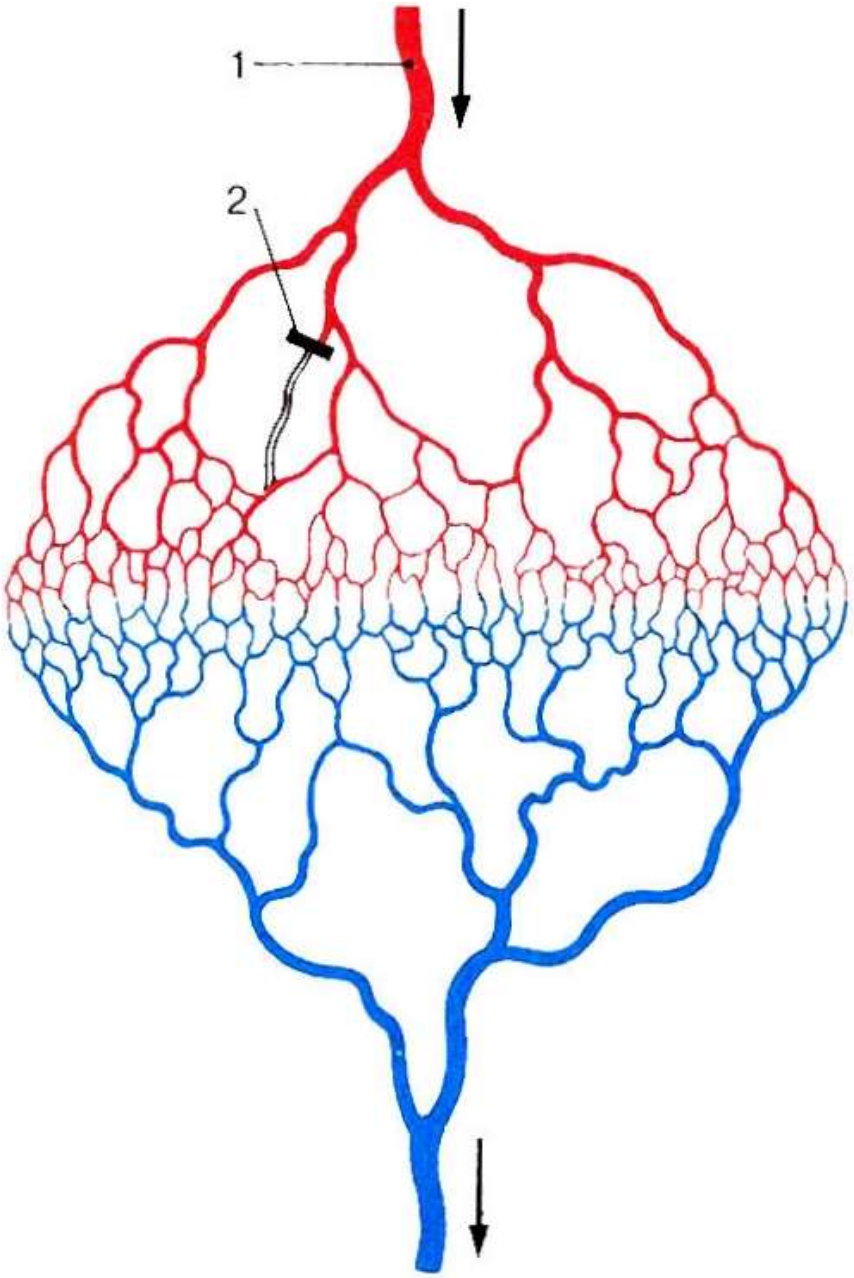
Endothelium without fenestrations and uninterrupted basement membrane (CNS)

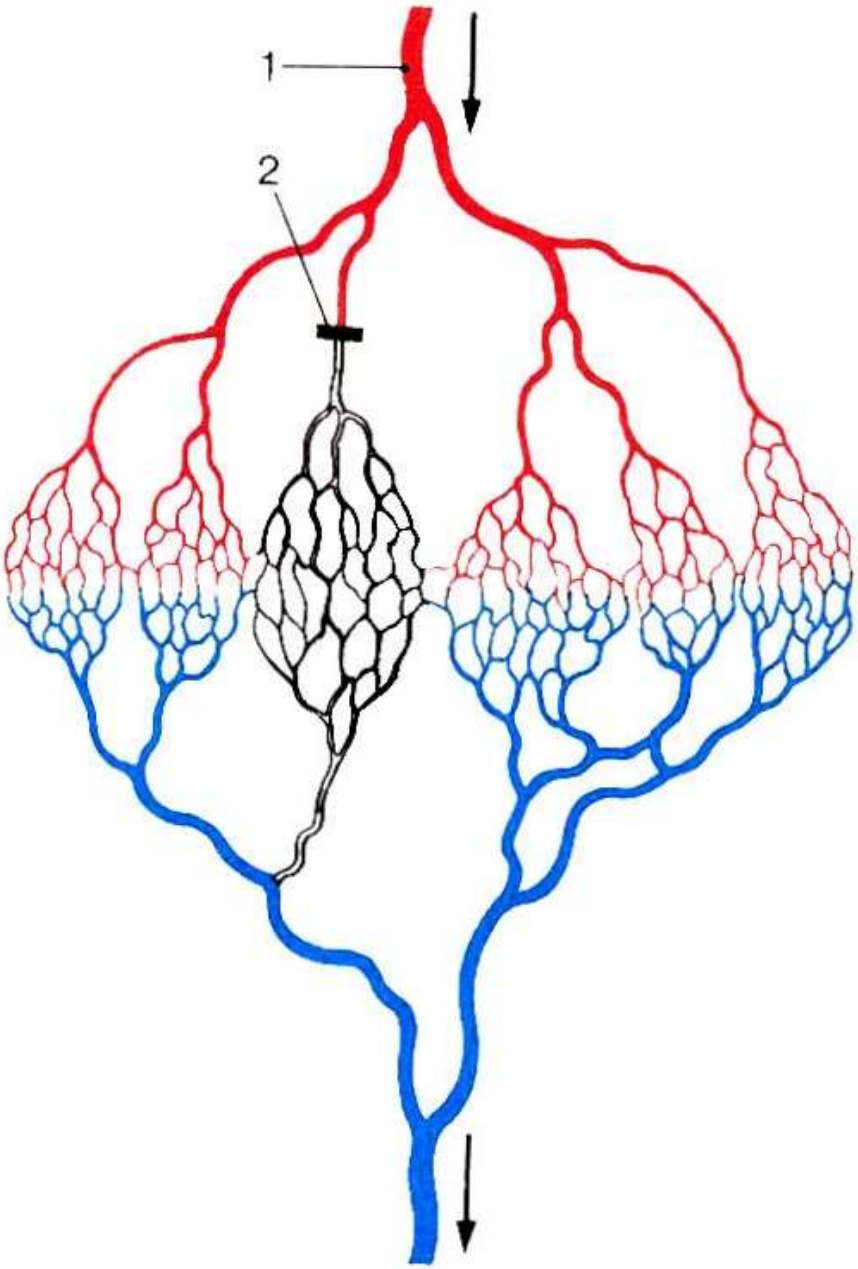
Endothelium with pinocytotic activity (lung, heart, skeletal muscle, connective tissue, skin)

Endothelium with fenestrations occupied by a diaphragm (gut, endocrine glands)

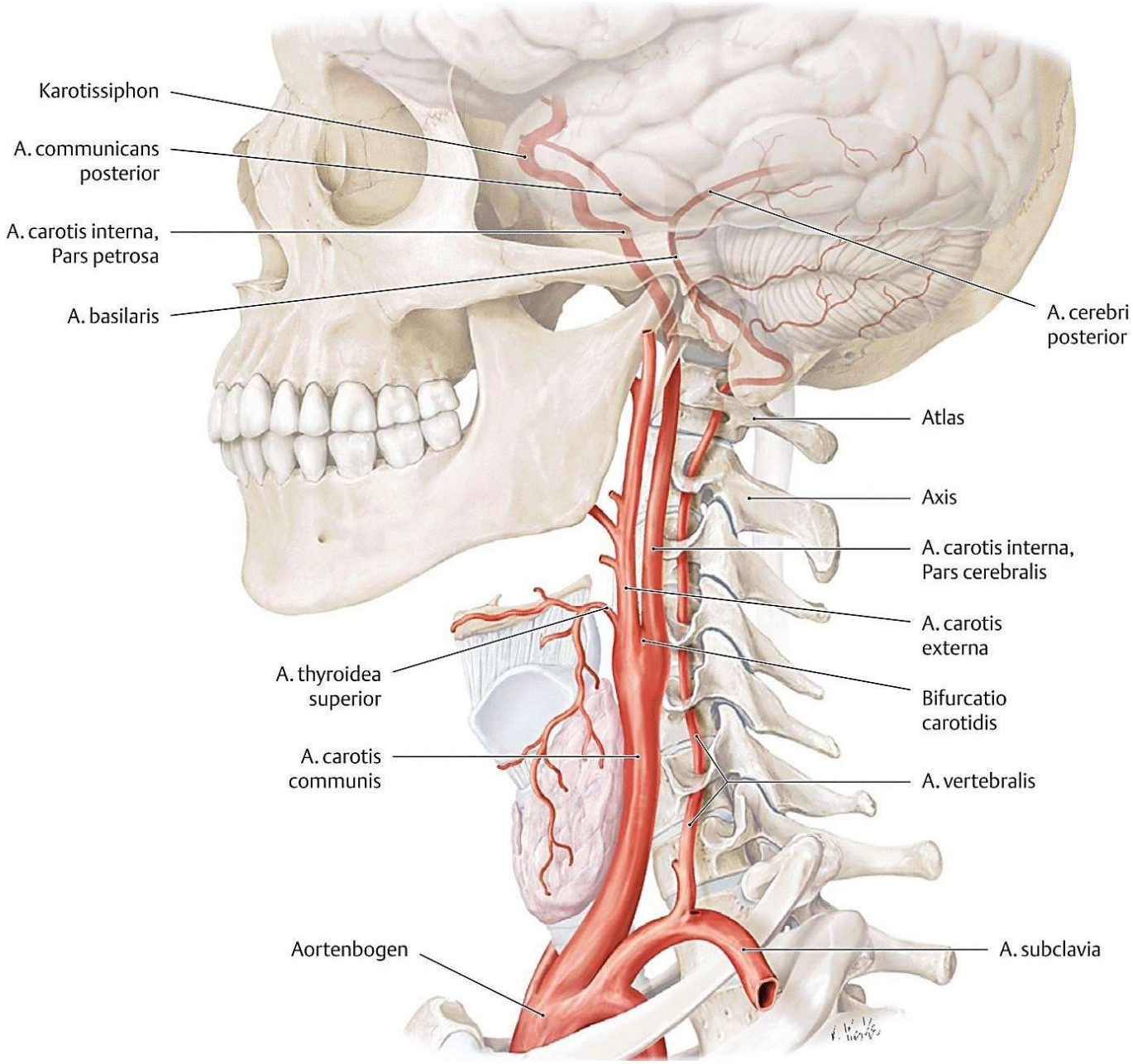
Endothelium with fenestrations without a diaphragm (liver, kidney)

End or Terminal Arteries (Brain, Retina, Heart, Liver, Kidney)

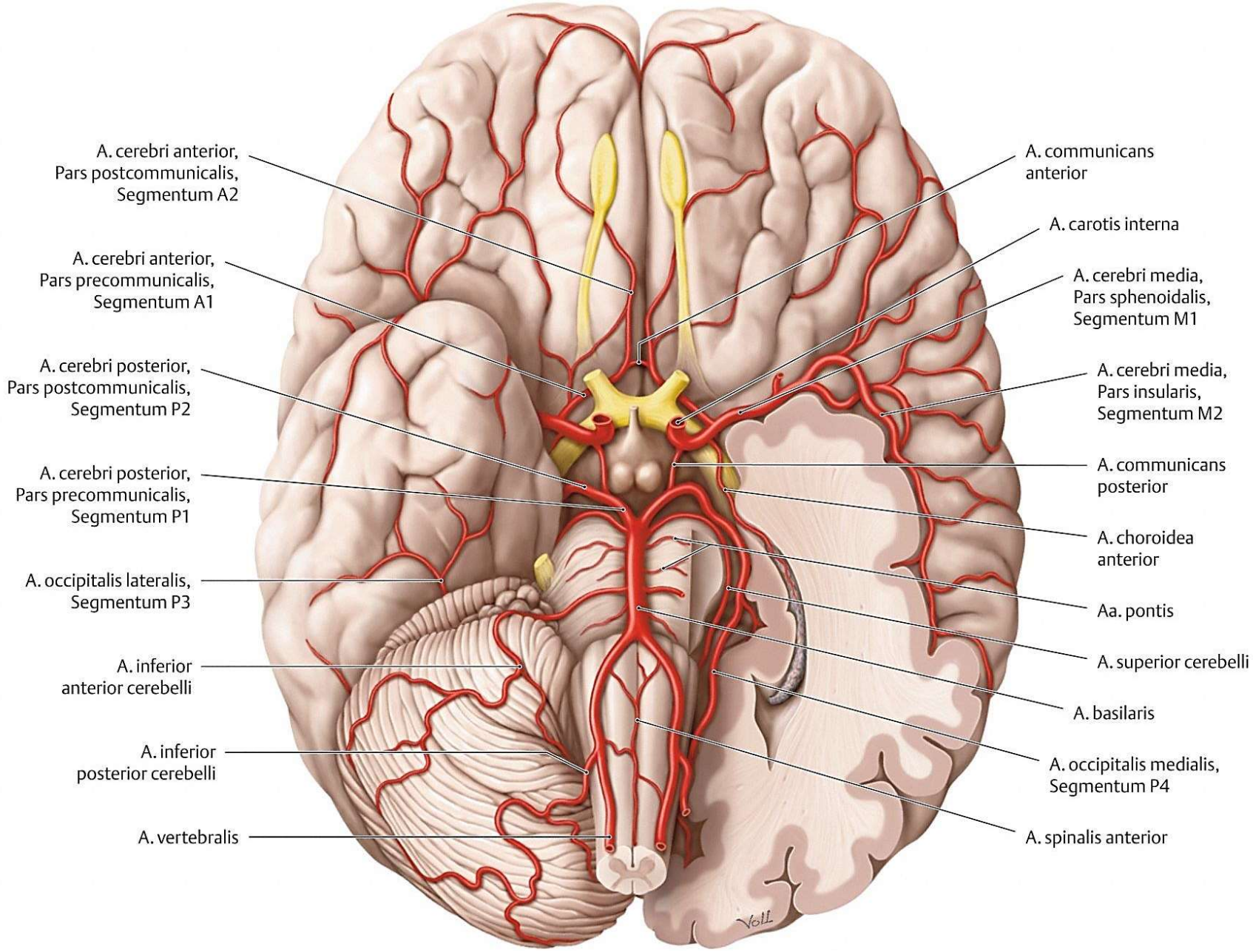




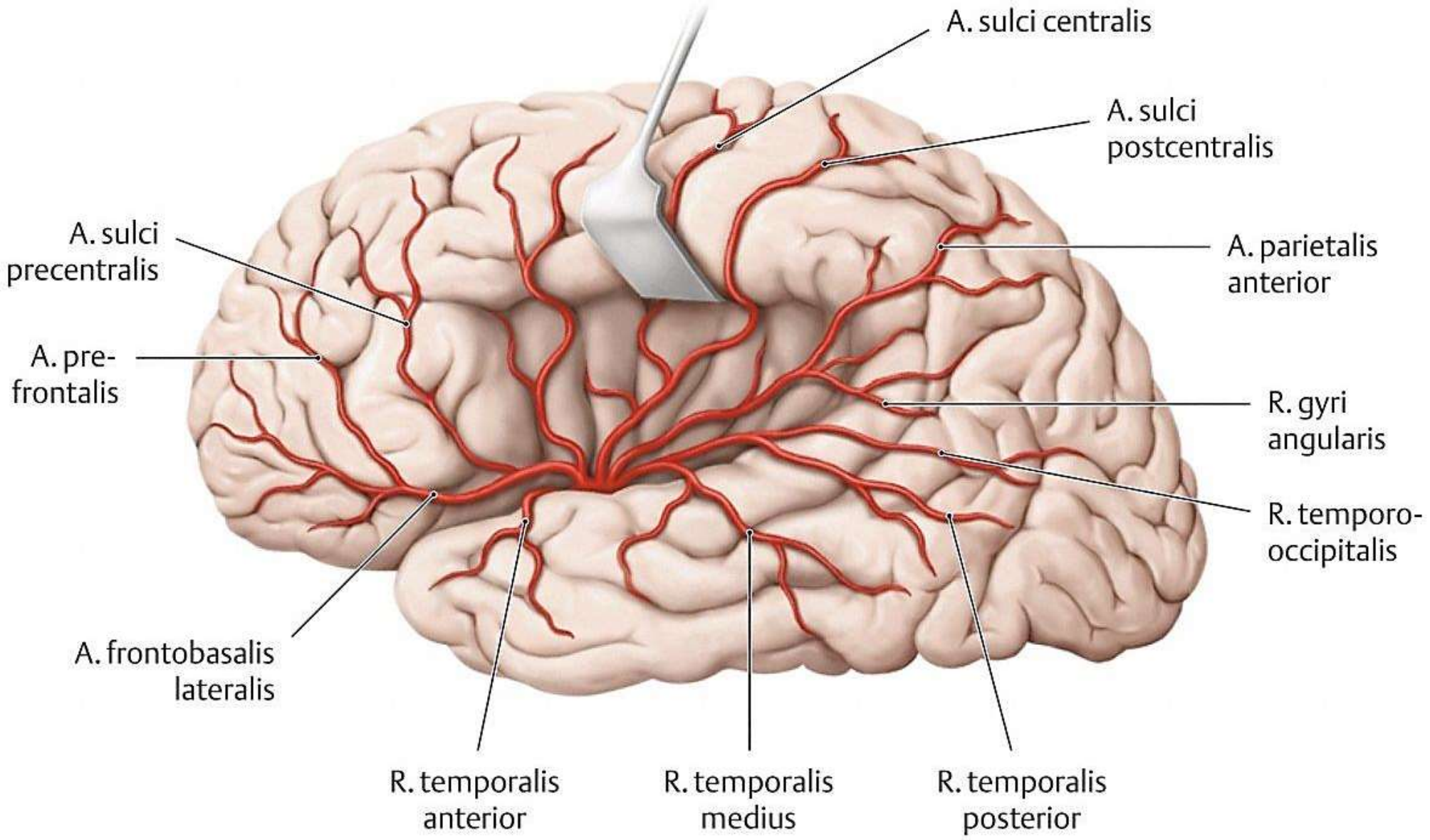
Macroanatomy: Internal Carotid & Vertebral Artery



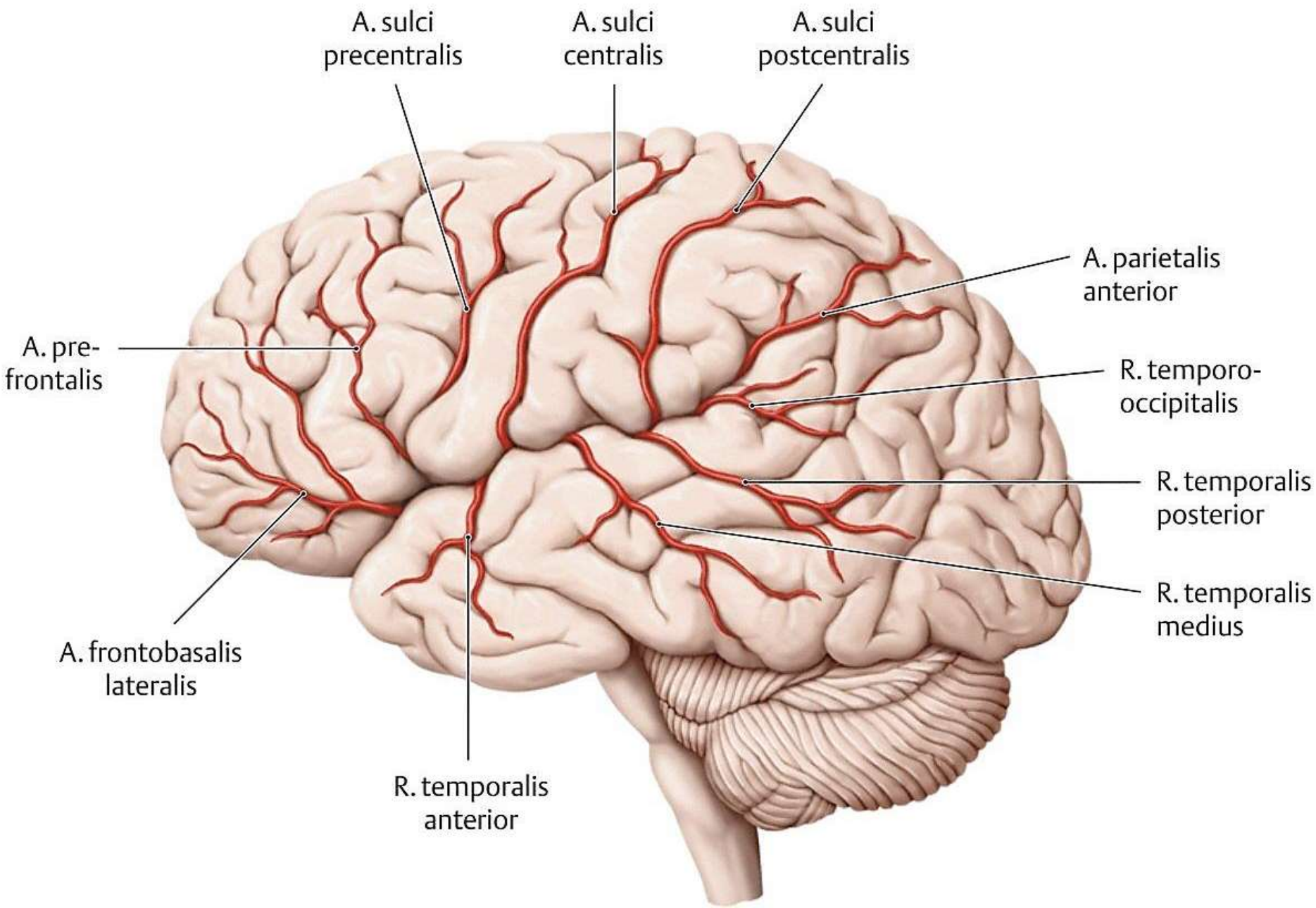
Macroanatomy: Basilar Artery & Circle of Willis



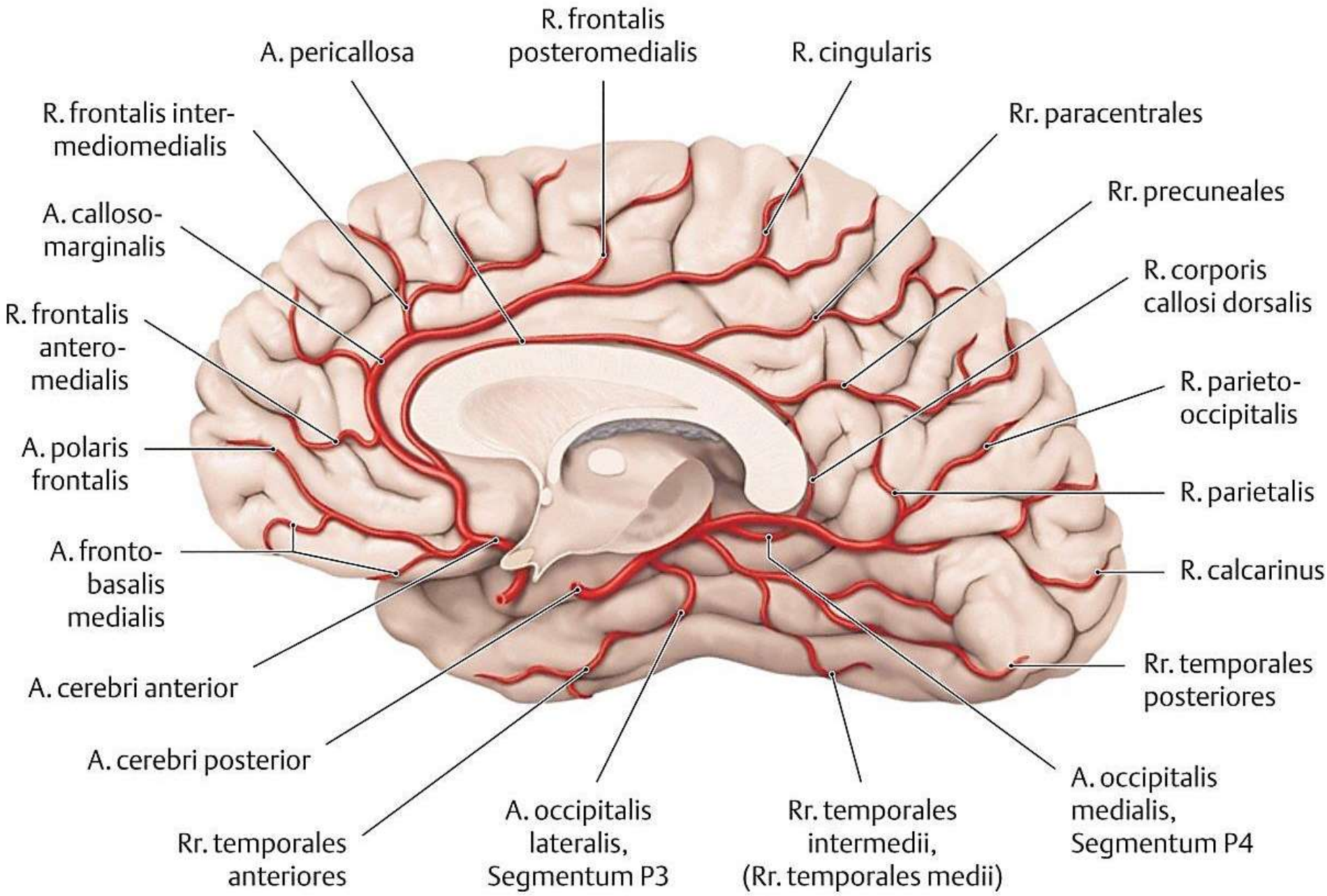
Macroanatomy: Middle Cerebral Artery



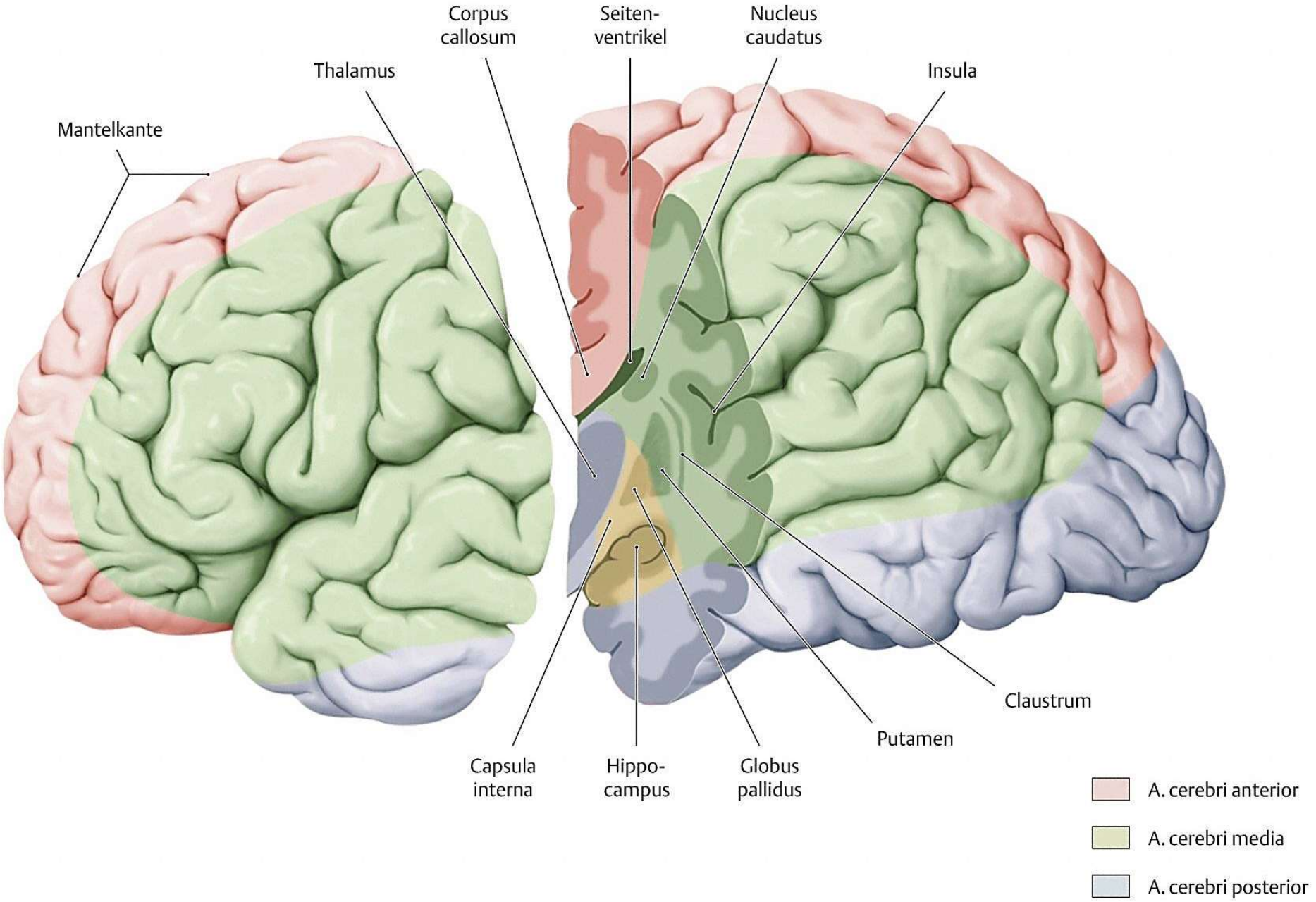
Macroanatomy: Middle Cerebral Artery



Macroanatomy: Anterior & Posterior Cerebral Artery



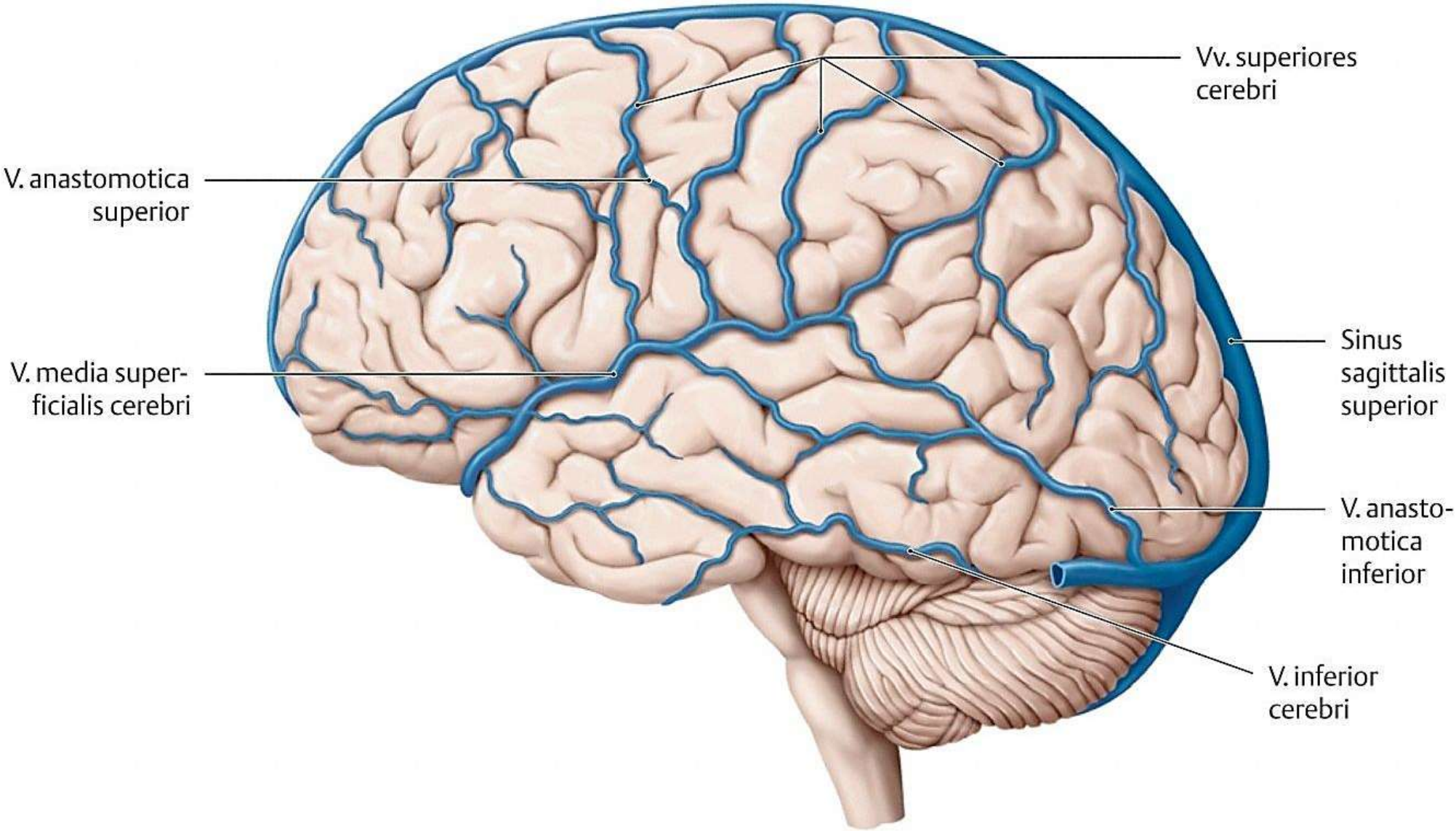
Macroanatomy: Vascular Territories of the 3 Arteries



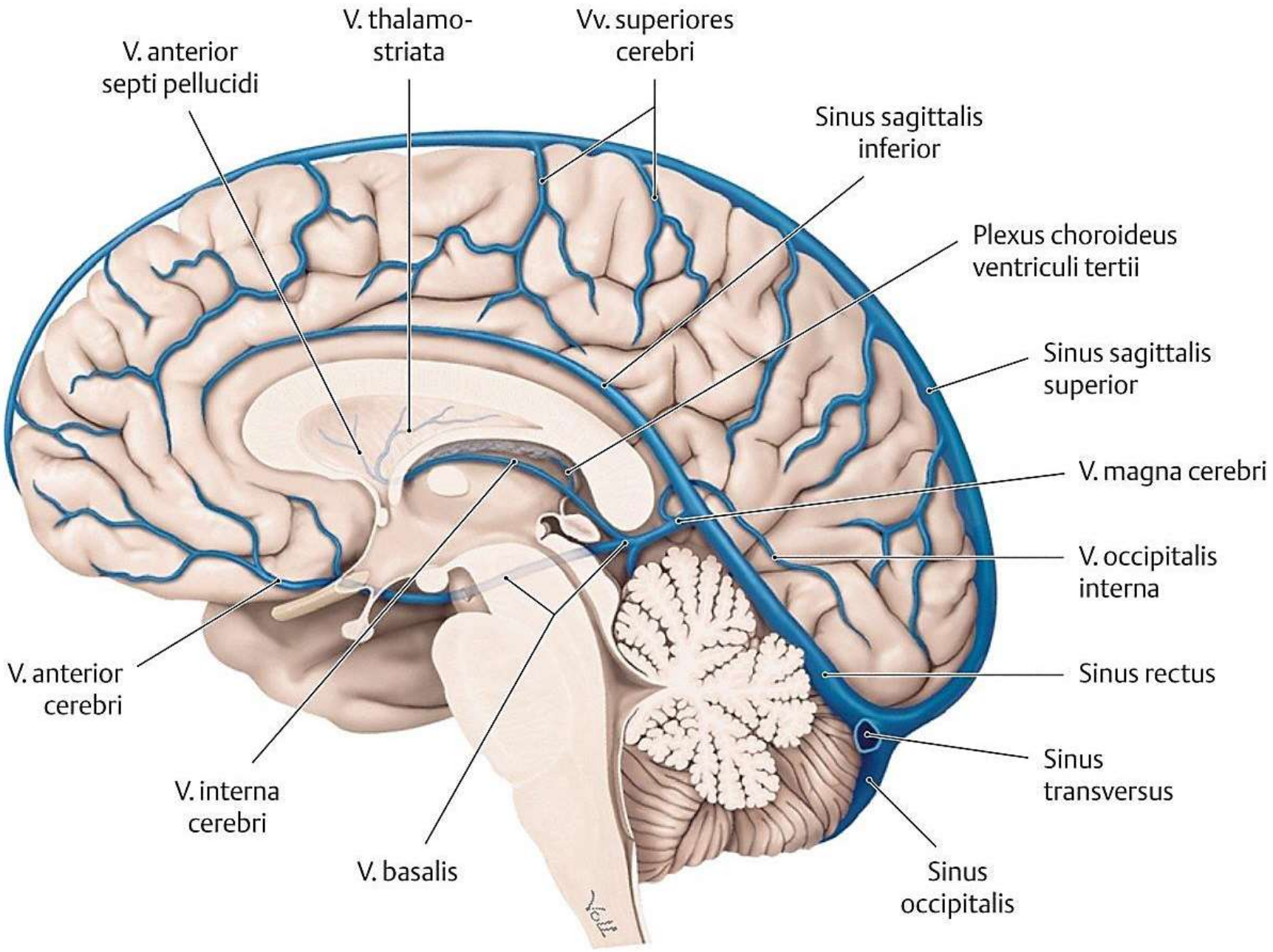
The Gap

??

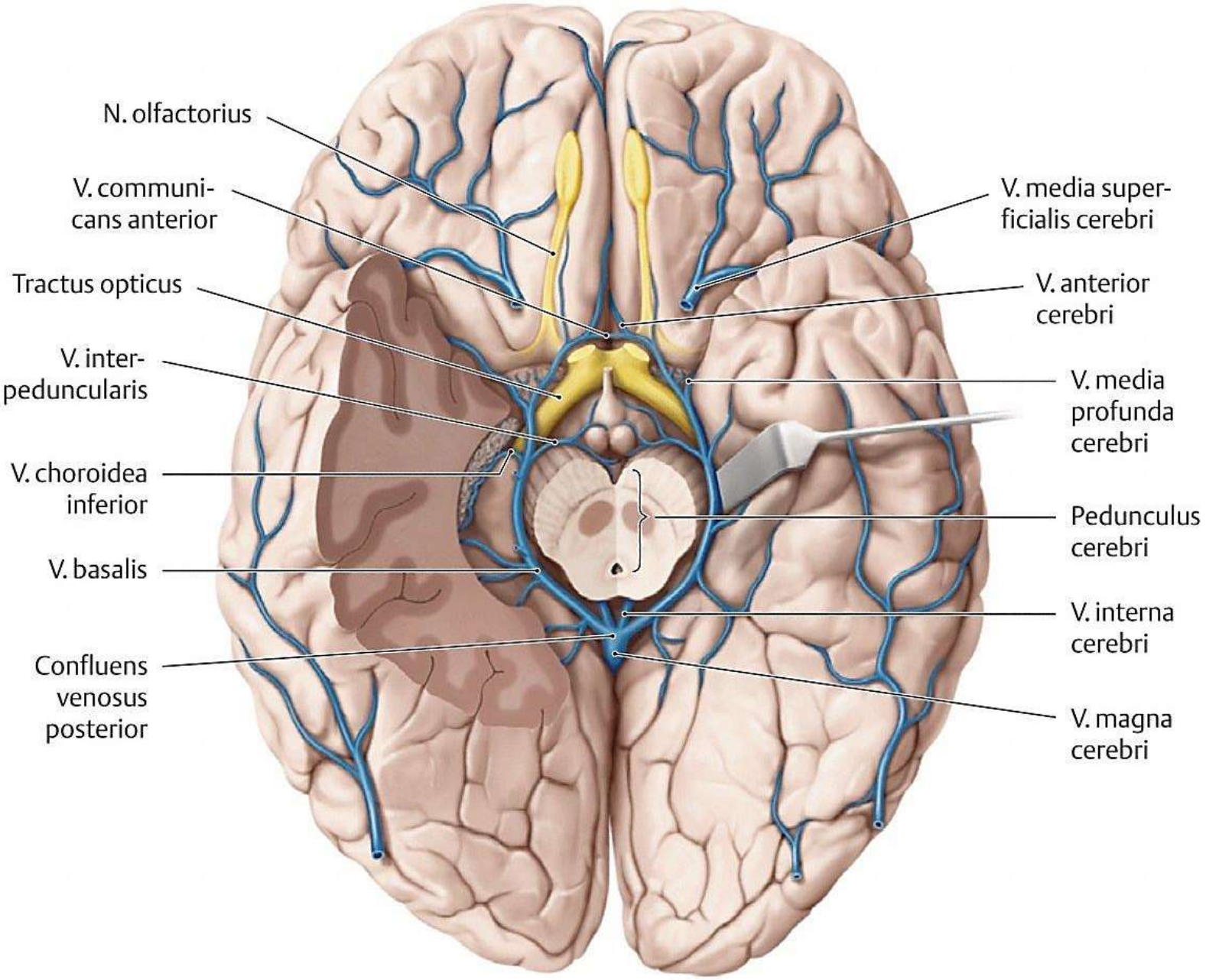
Macroanatomy: Superficial Veins



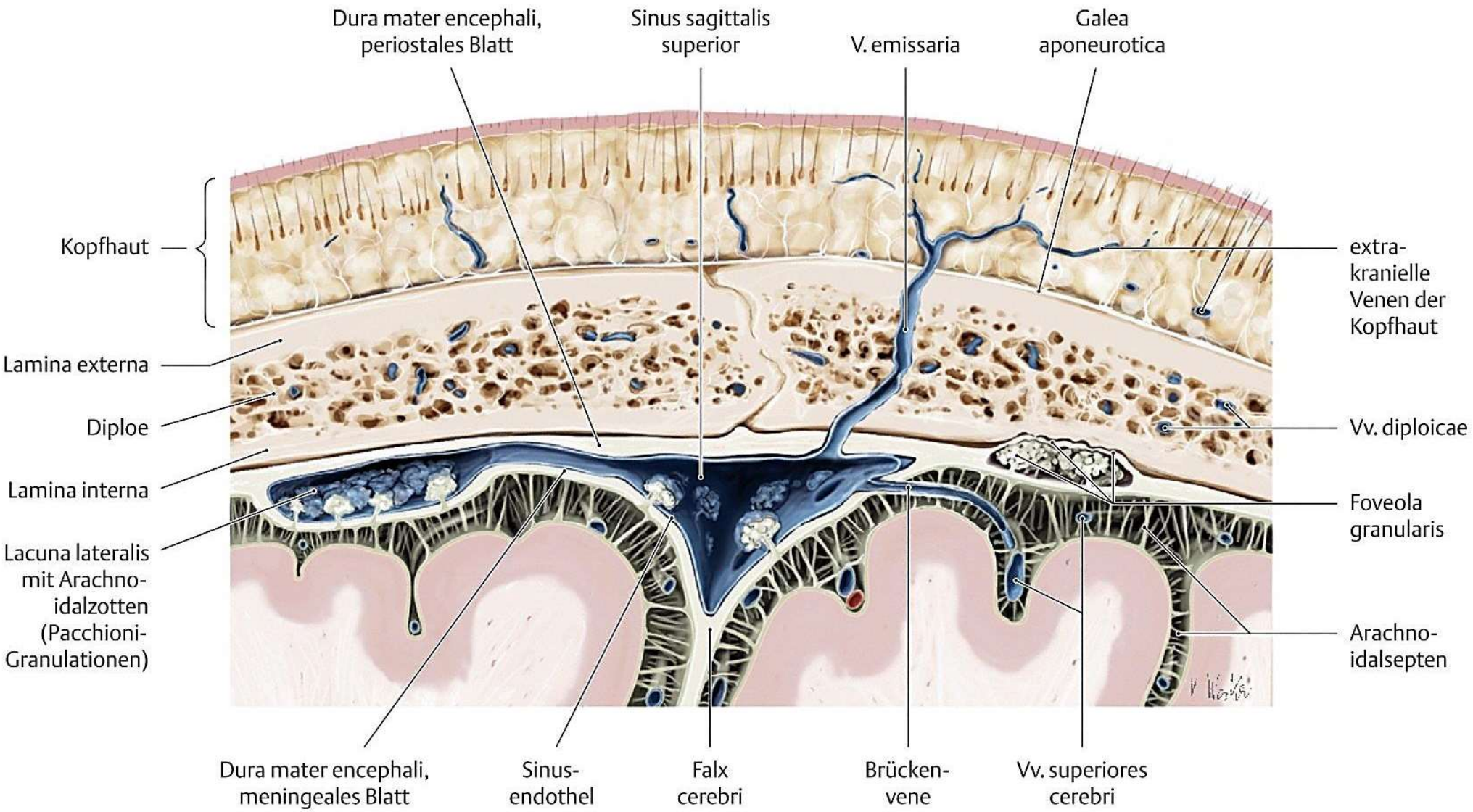
Macroanatomy: Superficial Veins



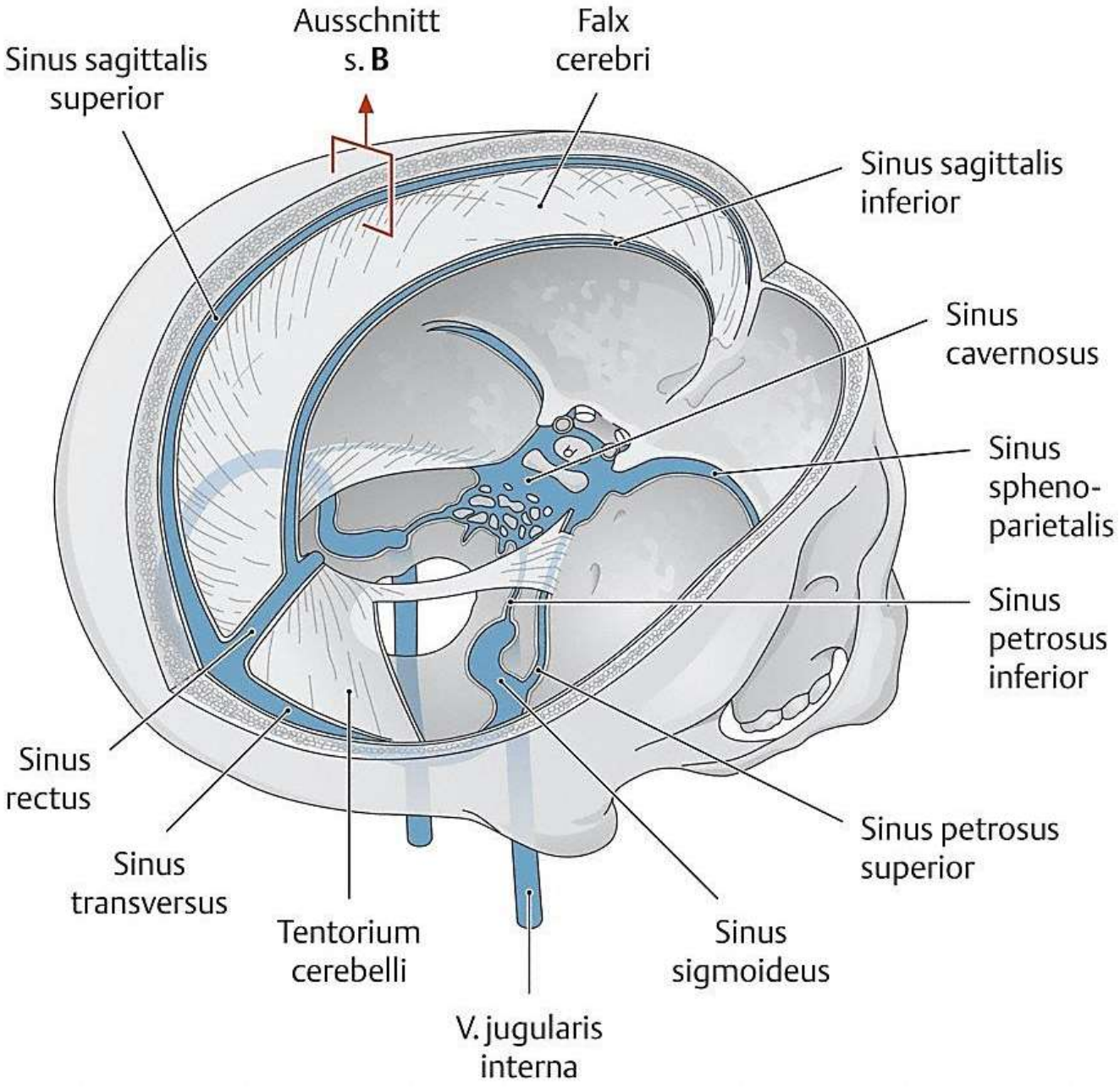
Macroanatomy: Deep Veins



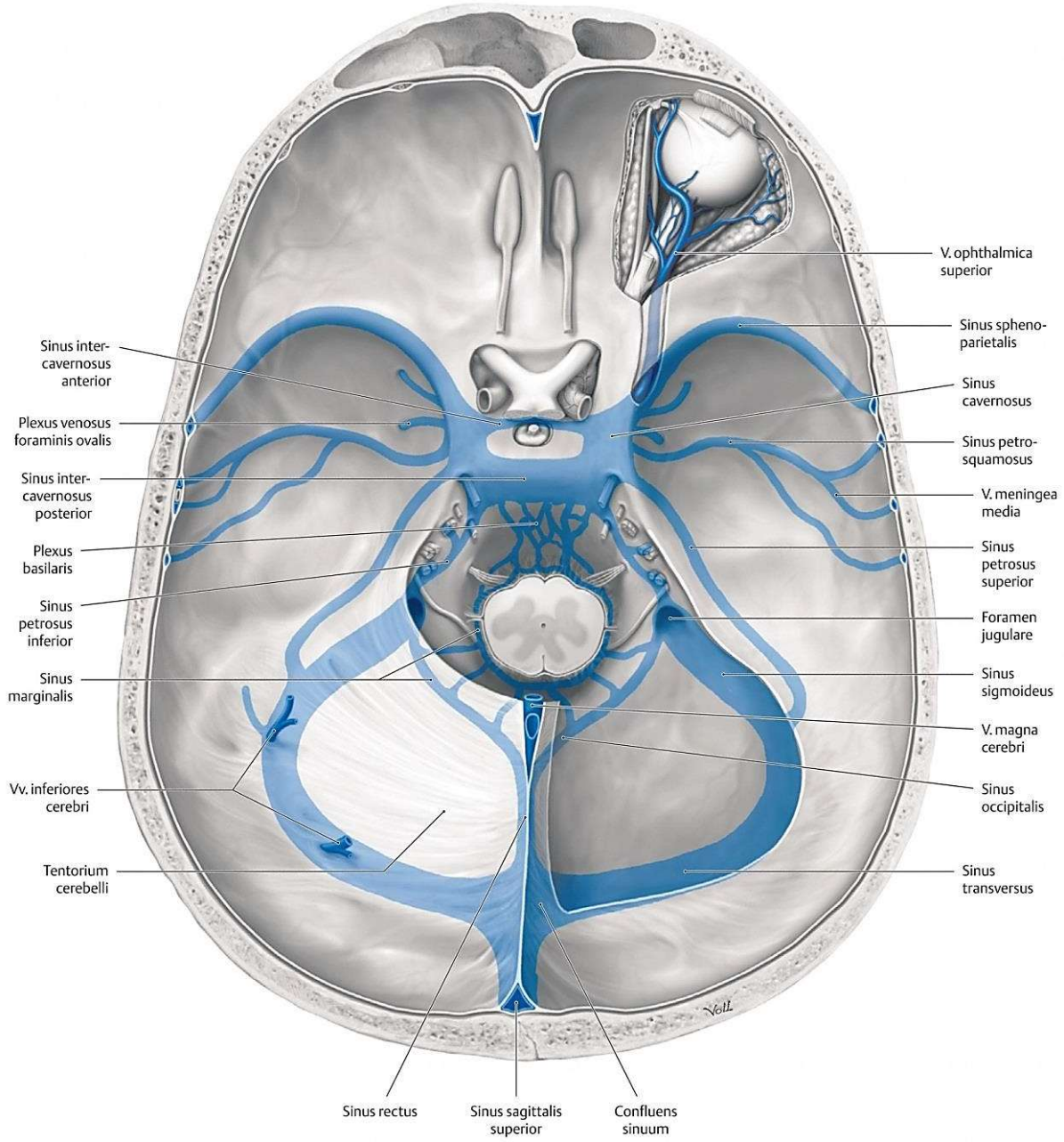
Macroanatomy: Dural Venous Sinuses



Macroanatomy: Dural Venous Sinuses



Macroanatomy: Dural Venous Sinuses



Henri M. Duvernoy: Cortical Blood Vessels (1981)

Brain Research Bulletin, Vol. 7, pp. 519–579, 1981. Printed in the U.S.A.

Cortical Blood Vessels of the Human Brain

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Received 24 February 1981

DUVERNOY, H. M., S. DELON AND J. L. VANNSON. *Cortical blood vessels of the human brain.* BRAIN RES. BULL. 7(5) 519–579, 1981.—The study is divided into two parts. (a) Superficial or pial vessels: Arterioles and venules at the gyrus surface as well as their mode of penetration into or emergence from nervous tissue is described. The absence of pial capillaries is noted. Arterial and venous anastomoses are described whereas arteriovenous anastomoses were not encountered. In particular, the relationship of superficial vessels to the arachnoid was studied. (b) Intracortical vessels: Arteries and veins were divided into 5 groups according to their degree of cortical penetration. Considering its density, the vascular network of the cortex was divided into 4 vascular layers. A correlation between these layers and the cellular layers was established. Problems in distinguishing between arteries and veins, the geometric disposition of cortical vessels, different types of anastomoses and particular vascular features whose significance remains unclear, are discussed.

Cerebral cortex Cerebral vascularization Human brain Microcirculation

DUVERNOY, H. M., S. DELON ET J. L. VANNSON. *l'Architecture vasculaire du cortex cérébral chez l'homme.* BRAIN RES. BULL. 7(5) 519–579, 1981.—Ce travail est divisé en deux chapitres. (a) Les vaisseaux superficiels ou pie-mériens: Les artérioles et les veinules de la surface des gyri sont décrites ainsi que leur mode de pénétration ou d'émergence dans le tissu nerveux; on constate l'absence de capillaires pie-mériens. Des anastomoses artérielles et veineuses ont été décrites tandis que des anastomoses artérioveineuses n'ont pas été recontrées. Les rapports des vaisseaux superficiels vis-à-vis de l'arachnoïde ont été particulièrement étudiés. (b) Les vaisseaux intracorticaux: Les artères et les veines ont été divisées en 5 groupes suivant leur degré de pénétration dans le cortex. La trame vasculaire du cortex, en tenant compte de sa densité, est répartie en 4 couches vasculaires dont la corrélation avec les couches nerveuses a été établie. On a discuté ensuite les problèmes de distinction entre artères et veines, de répartition géométrique des vaisseaux dans le cortex, des différents types d'anastomoses et des images particulières dont la signification est encore obscure.

Cortex cérébral Vascularisation cérébrale Cerveau humain Microcirculation

Henri M. Duvernoy: Cortical Blood Vessels (1981)

Cited 383 times since its publication (as of 10.2017)

Techniques for Studying Vascularization

- **Intravascular injection of india ink or gelatin ("Injektionspräparate")**

  Injection → Fixation of tissue →

  (a) Cutting (thick paraffin sections, 400 µm) → Tissue clearing (Spalteholz) → Light microscope

  (b) Uncut tissue block → Stereomicroscope (for surface vessels)

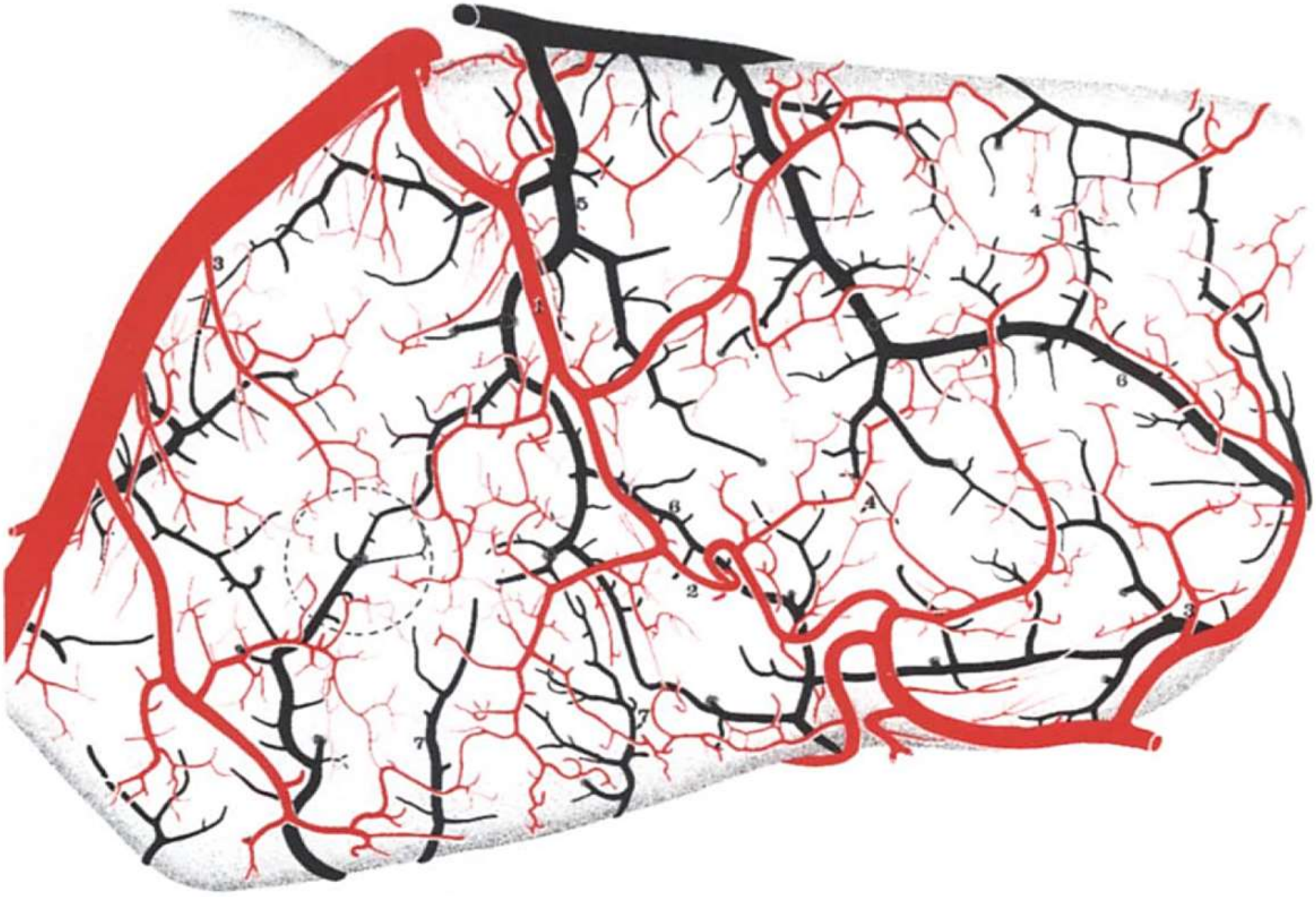
- **Intravascular injection of polymerizing agents ("Korrosionspräparate")**

  Injection of methyl methacrylate (Mercox) → Tissue destruction (potassium hydroxide) → Cast of cortical vessels

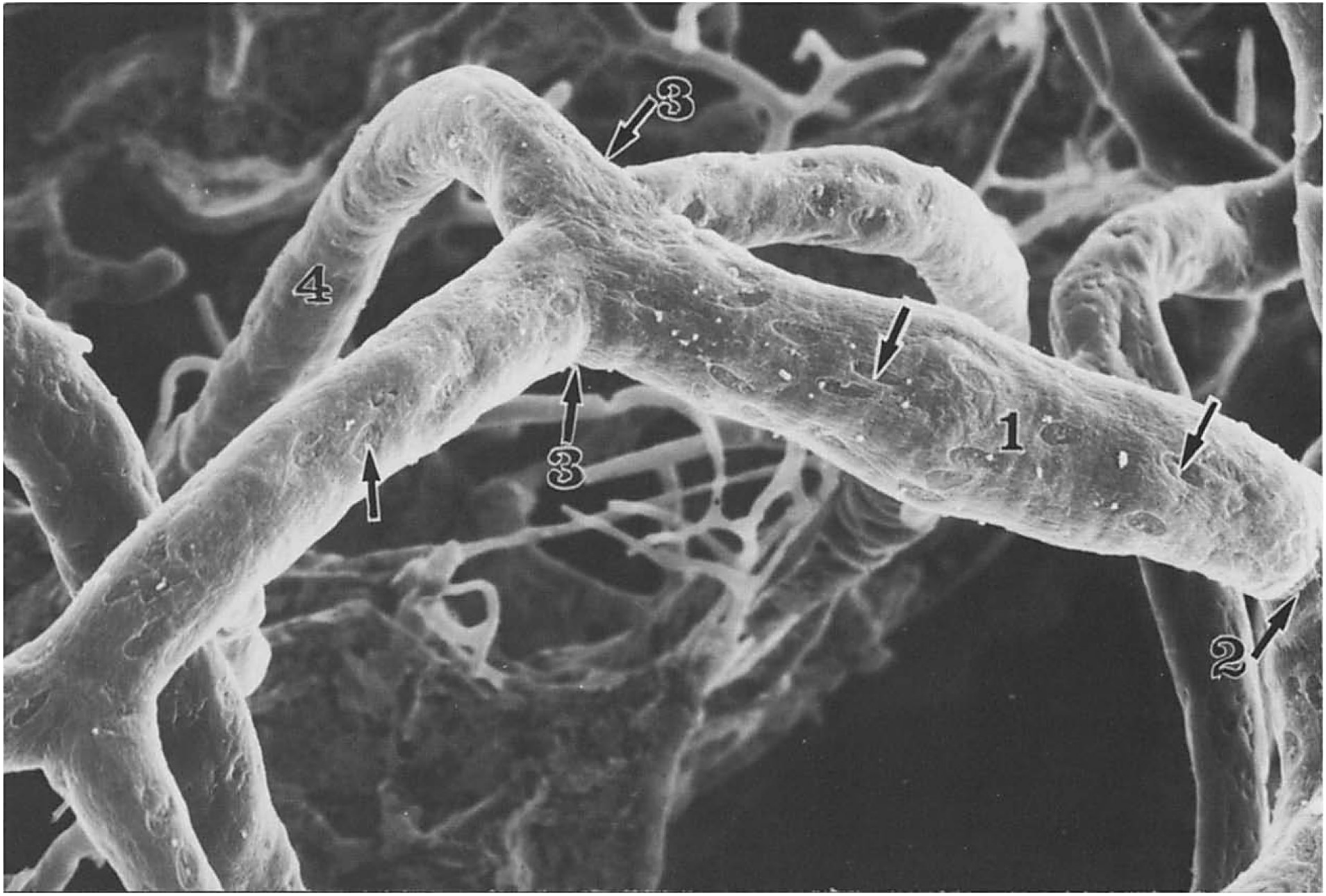
  (a) Stereomicroscope

  (b) Scanning electron microscope (SEM)

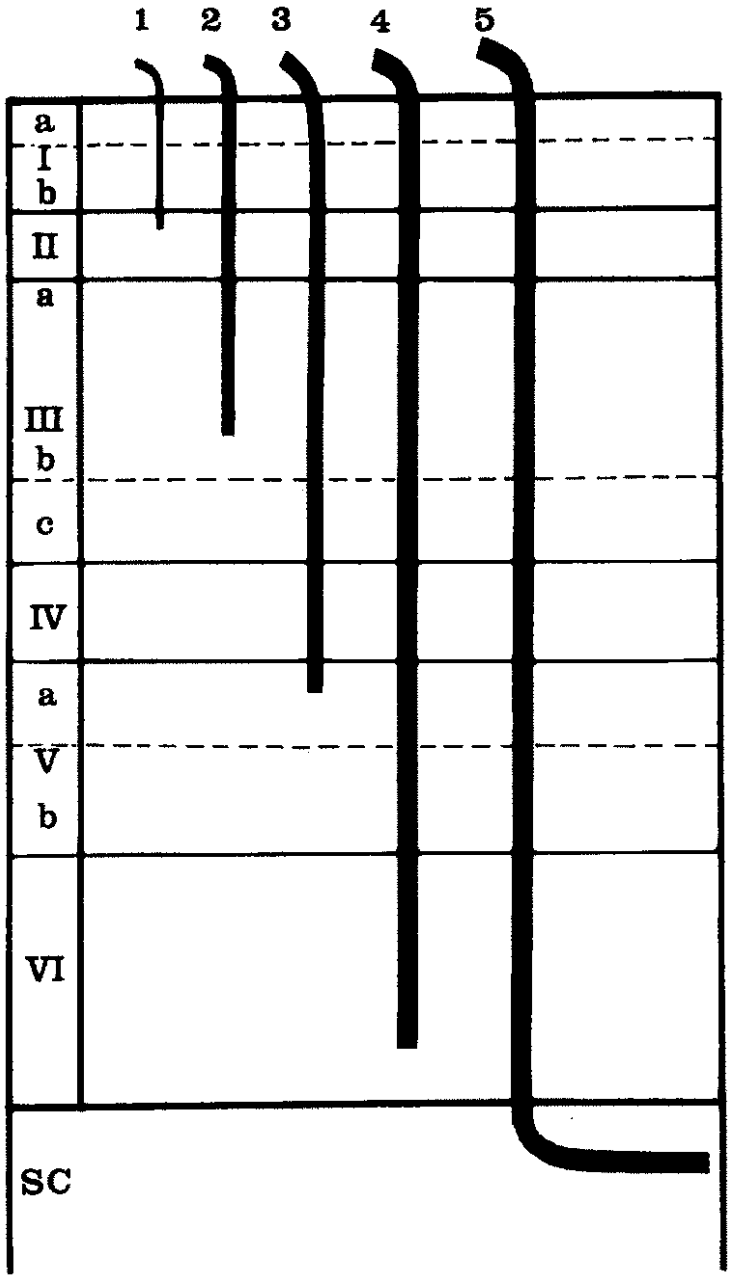
Cortical Pial Vessels (Medial Orbital Gyrus)



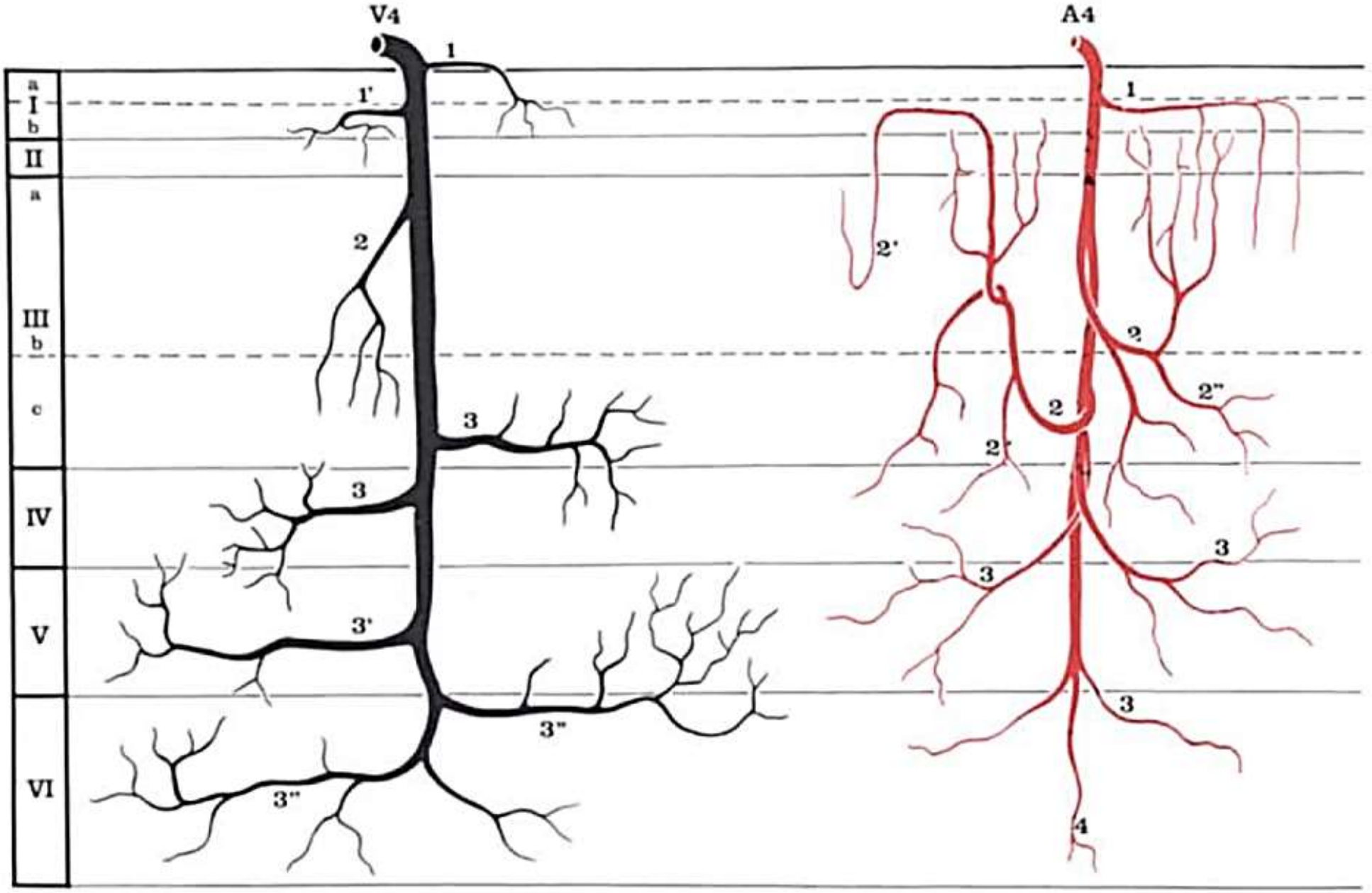
Cast of Pial Arterioles (SEM)



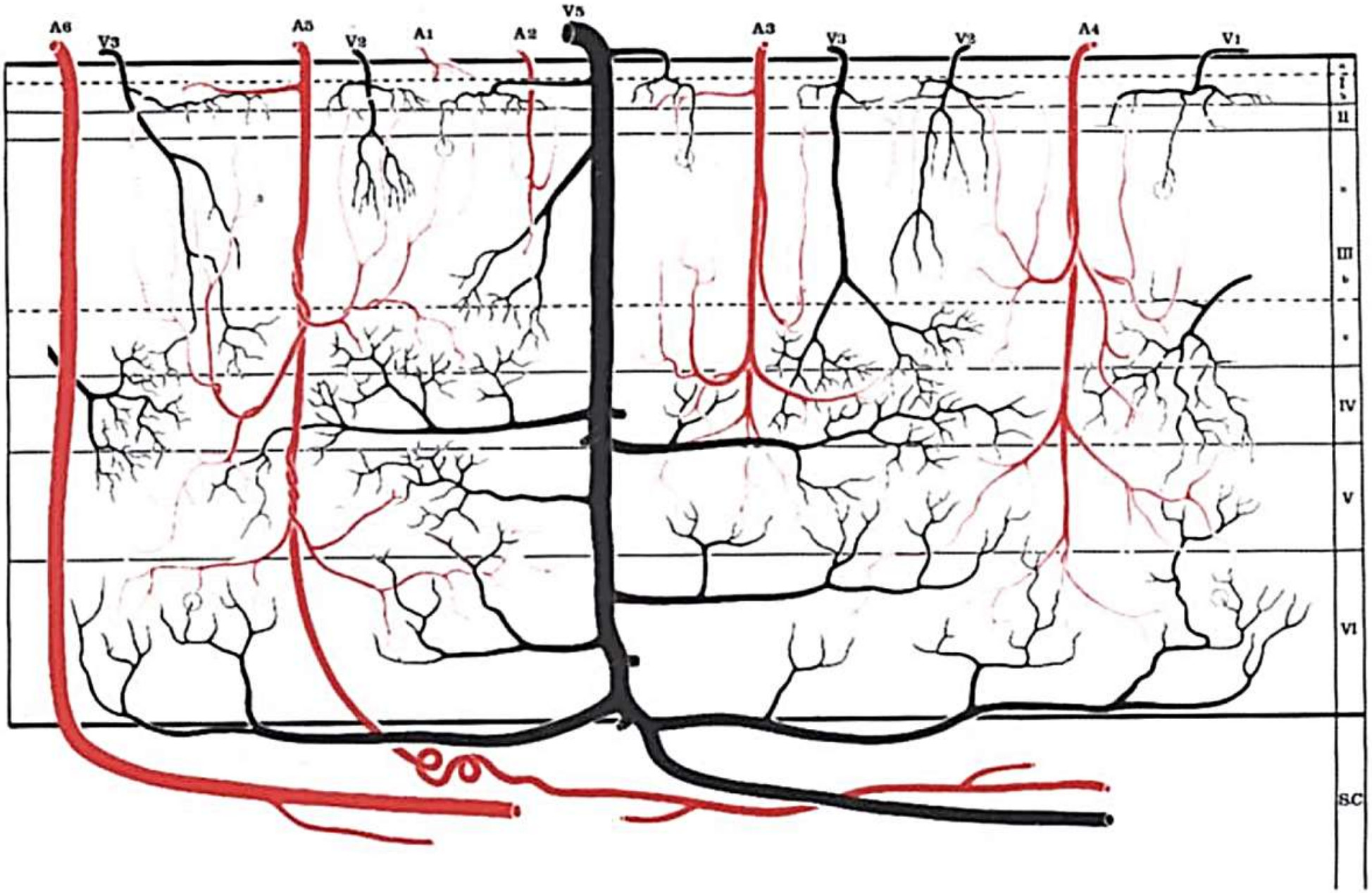
Principal Groups of Intracortical Arteries and Veins



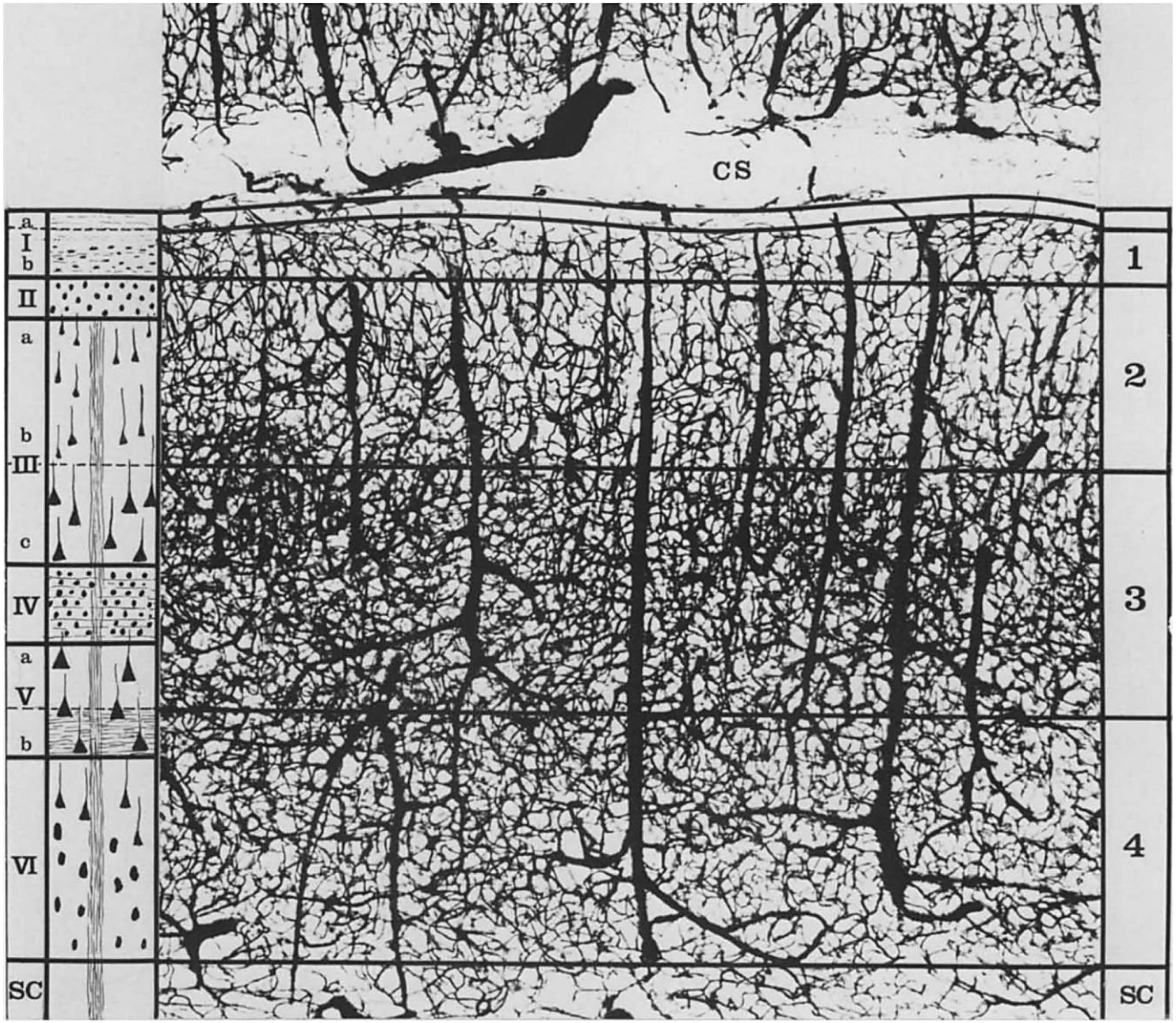
Typical Intracortical Artery and Vein (Group 4)



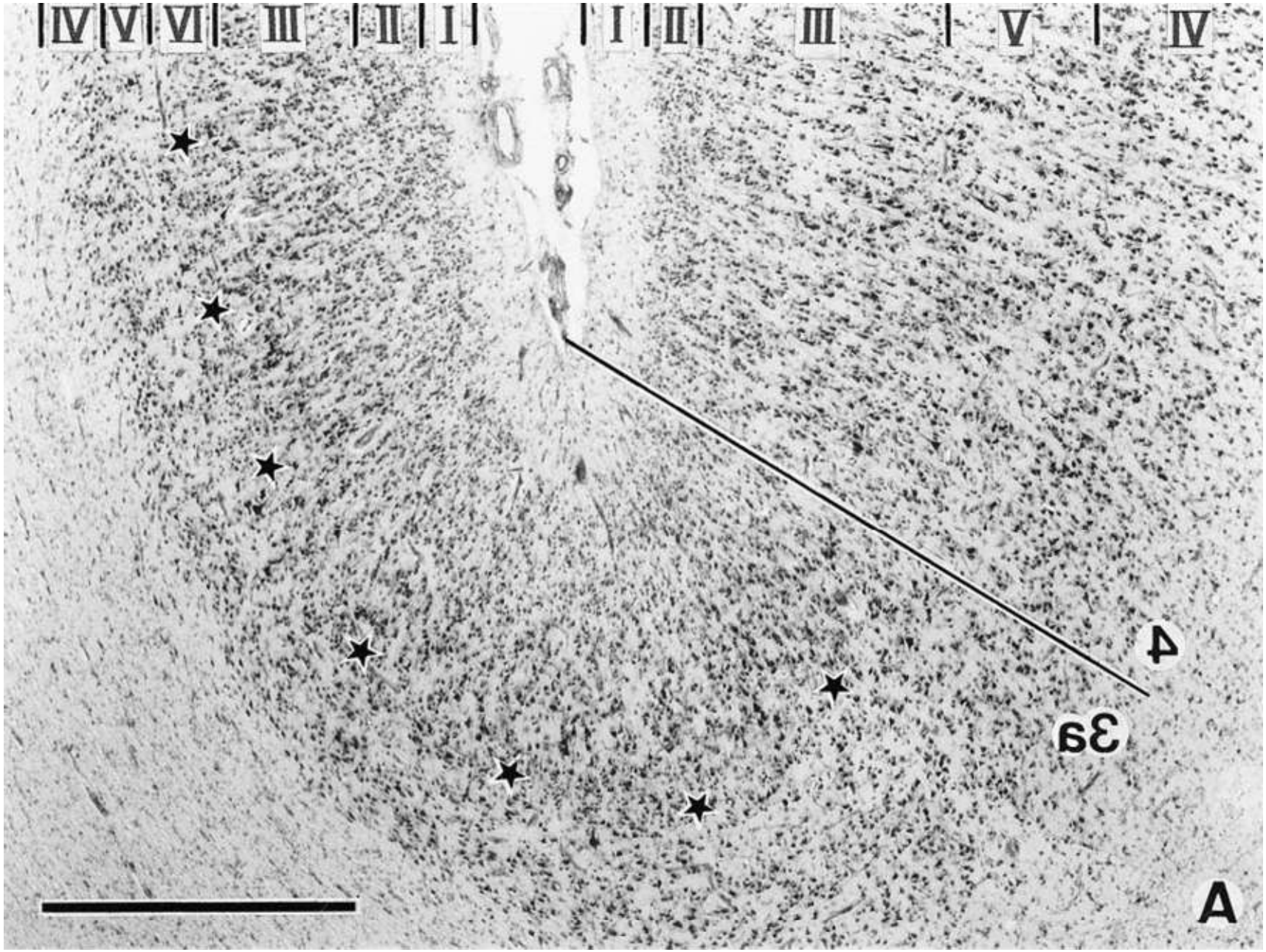
All Groups of Arteries and Veins



Vascular Layers

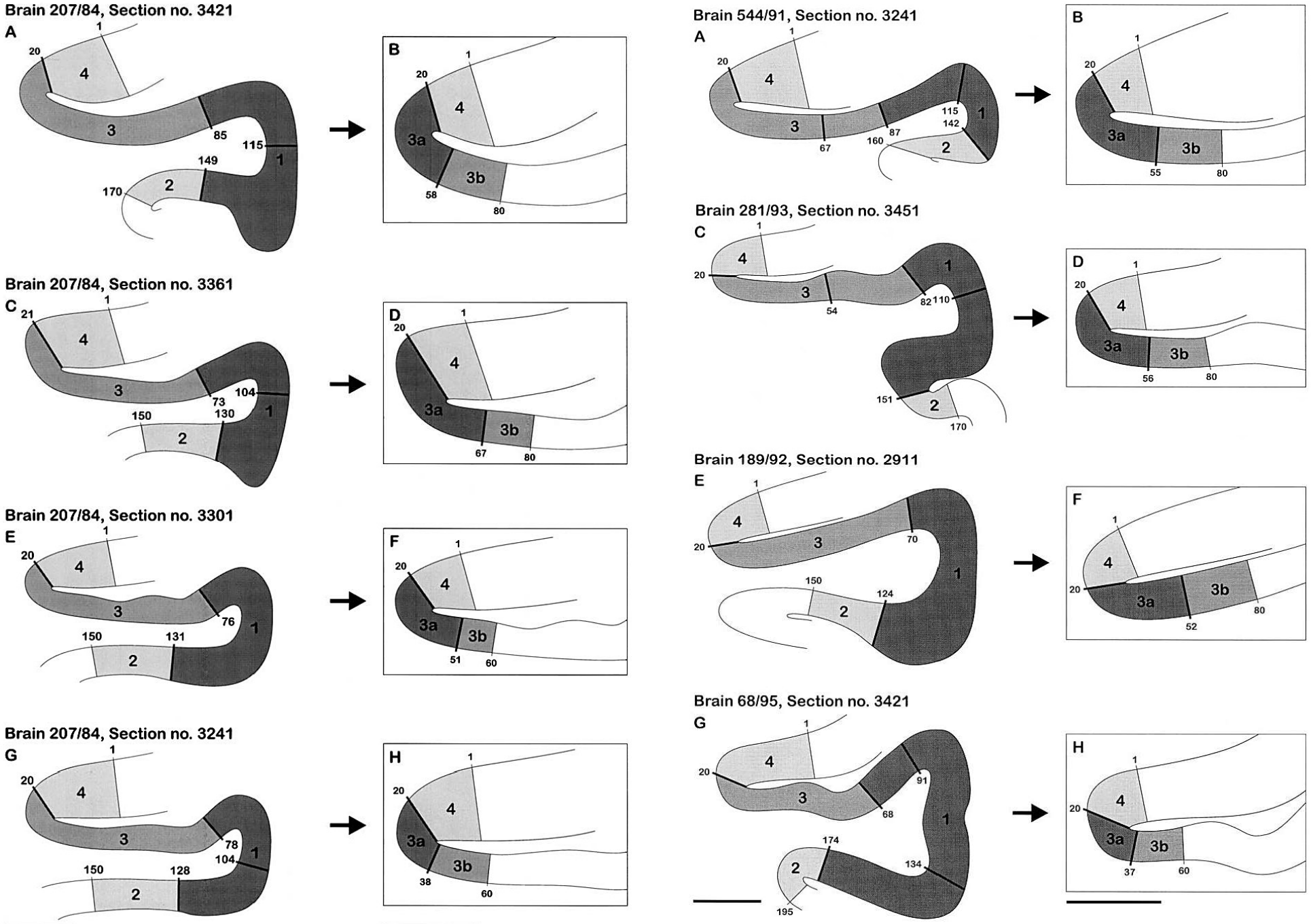


Differences between Cortical Areas – Cytoarchitecture

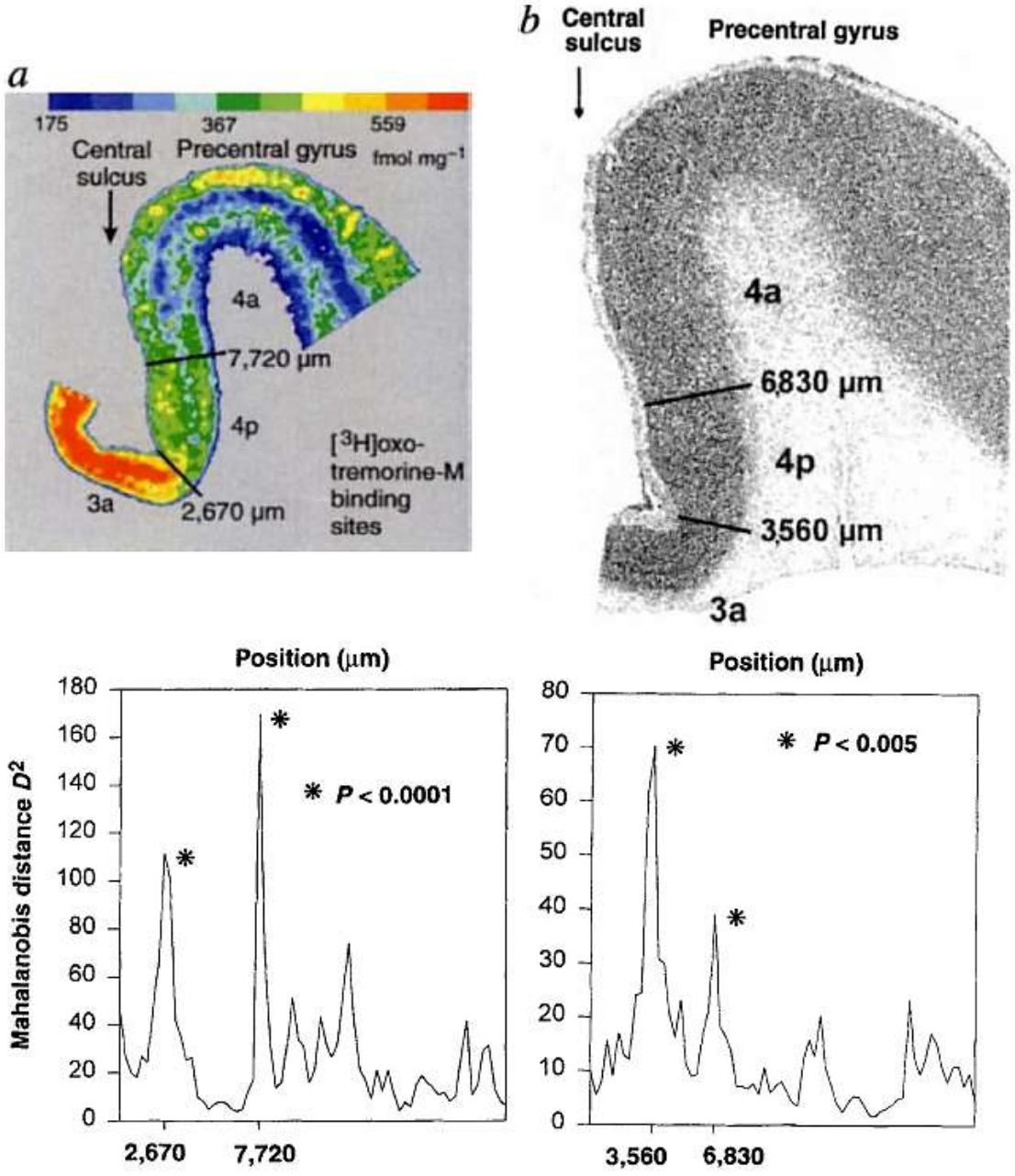


Geyer et al.
NeuroImage
1999

Differences between Cortical Areas – Cyto Variability



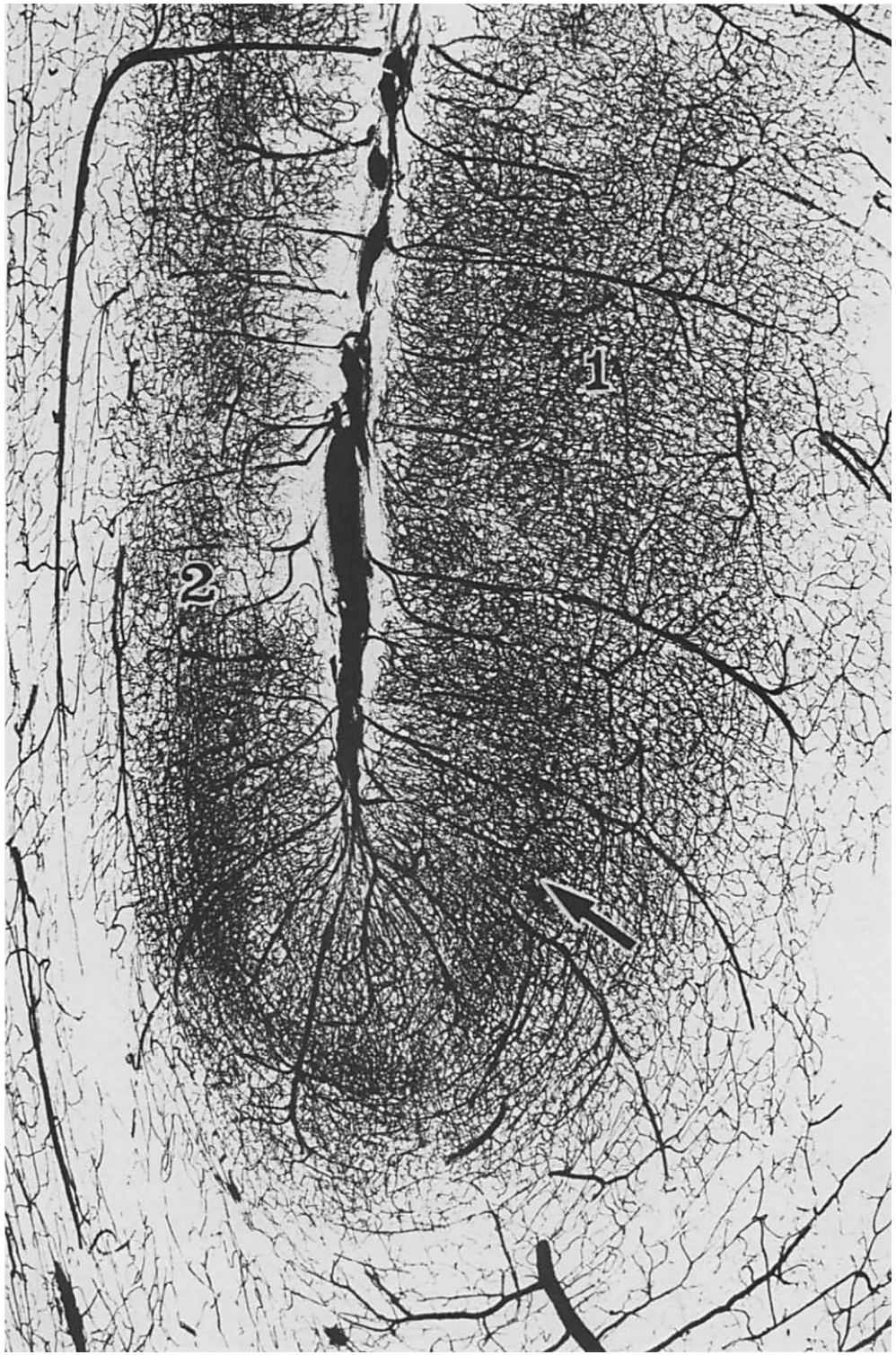
Differences between Cortical Areas – Ligand Binding Sites



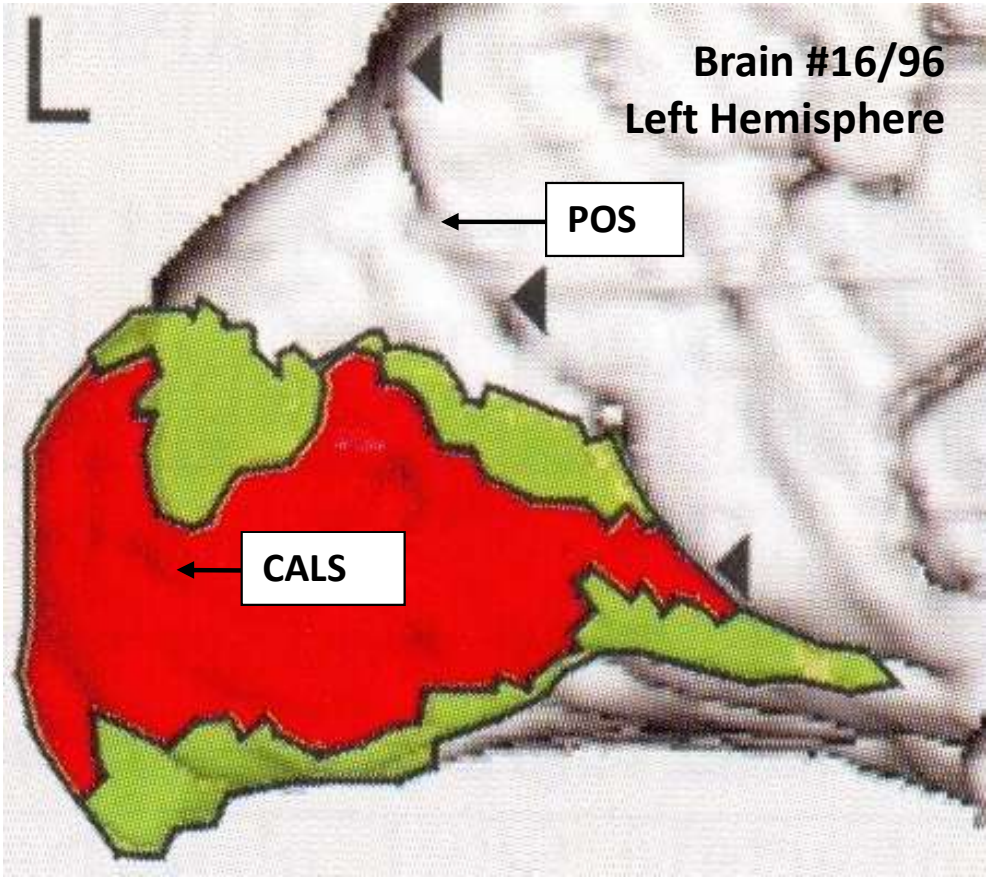
Geyer et al.
Nature 1996

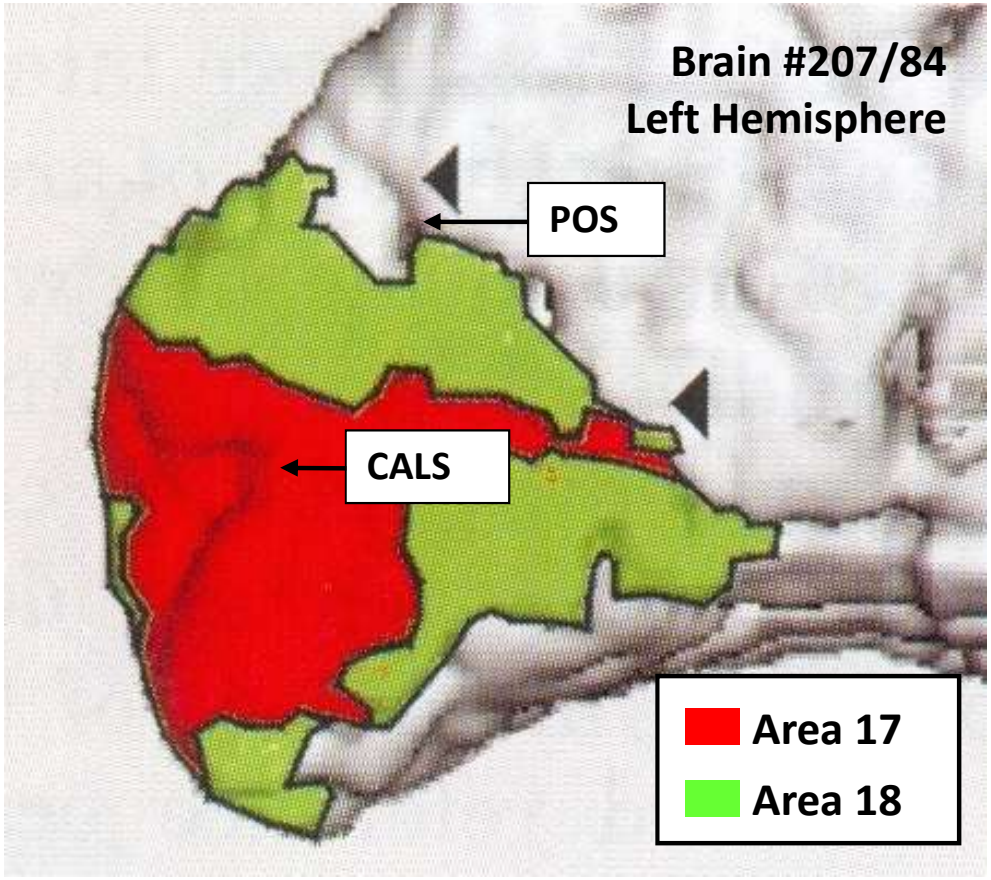
Differences between Cortical Areas – Vasculature

Central Sulcus



Differences between Cortical Areas – Cyto Variability





CALS: Calcarine Sulcus
POS: Parieto-Occipital Sulcus

Amunts et al.
NeuroImage 2000

Differences between Cortical Areas – Vasculature

Calcarine Sulcus