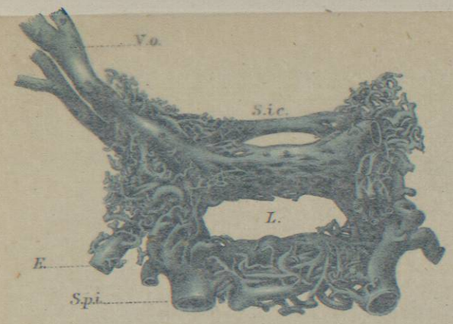
EXPLANATION OF PLATE XVIII.

FIG. 1.—Sinus Cavernosi et Intercavernosi—Sinus Circularis of Ridley.
Inferior aspect of a corrosion preparation from a child, with afferents and efferents (somewhat enlarged, and also arbitrary as to execution of smaller vessels). From Langer's "Der Sinus cavernosus der harten Hirnhaut," *Sitzbr. d. k. Akad.*, 1885, Vienna (Fig. 5).
V.o., Vena ophthalmica superior et inferior.
S.i.c., Sinus intercavernosi.
E, Emissary veins passing through the oval foramen to the pterygoid plexus.
S.p.i., Sinus petrosus inferior.
L, Space for the dorsum ephippii.

FIG. 2.—Fine anastomotic network between three arterial twigs in the pia of the parietal region. (Lucas, Paris Thesis, 1879.)

Fig. 3.—Lobule of a choroidal villus; one portion bare of epithelium. Sinuous vascular loop. Enlargement, 500 diameters. (From Luschka.)
a, Portion covered by epithelium.
b, Fibrillary connective tissue.
c, Structureless connecting substance extending well beyond the capillaries.

FIG. 4.—Very perfectly injected vessels of a choroidal villus. Two hilus vessels, a vein, and an artery. Loops, vascular nets, etc. Enlargement, 50 diameters. (From Luschka's "Die Adergeflechte des menschlichen Gehirns," 1855, Taf. ii., Fig. 2.)



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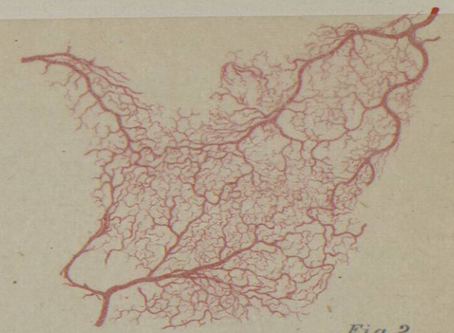

Fig 2.

Fig 3.

Fig 4.

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Brain-Vessels. (Vide Explanation at End of Article).

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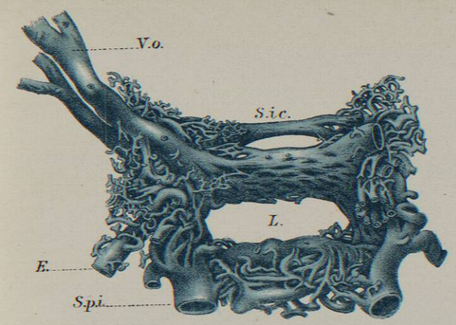

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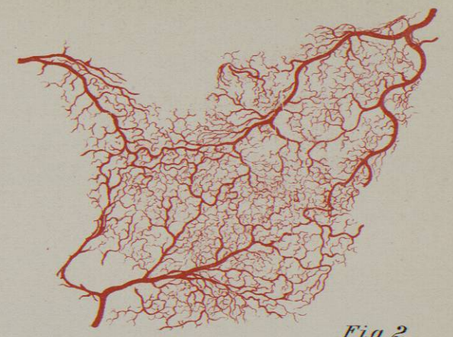

Fig 2.

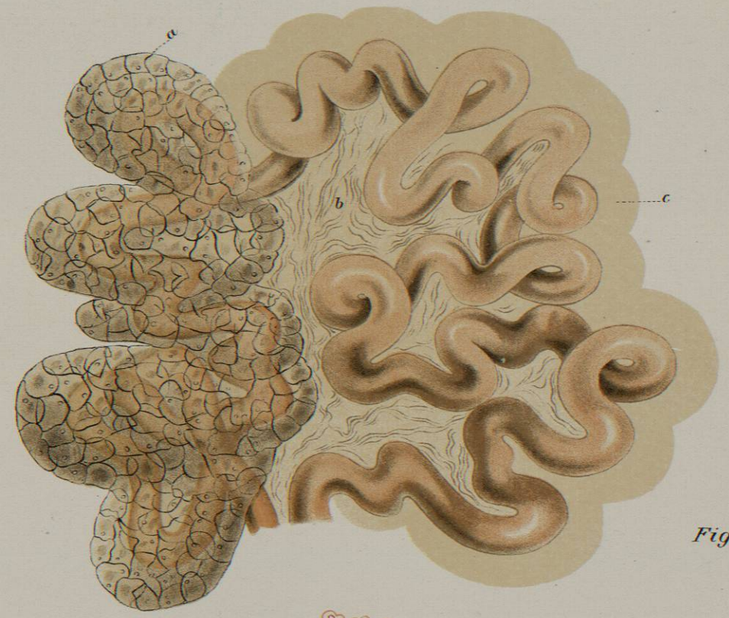

Fig 3.

Fig 4.

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6. *Emissarium Occipitale*, a small mesal conduit from the torcular through the occipital protuberance to the external veins of the occiput. It is often, but not always sinuous, and takes up an azygoid diploic trunk. Knott found it as a small but traceable vein in 6 of his 44 cases. In most of the others there was a small vein piercing one of the bone plates and anastomosing with the diploë veins.

7. *Emissarium Parietale.*—In 100 skulls Gruber found the parietal foramen on both sides in 29, on the right in 19, on the left in 12; average distance from angle of occipital squama, 3–5 cm.; distance from sagittal suture, 2–17 mm. Their size varies ordinarily from ½ to 1 mm. They do not terminate internally directly in the long sinus, but in the parasinual spaces or dural veins.

8. *Diploic Connections.*—Innumerable small openings through the inner plate of the skull connect the dural veins and spaces with the diploë canals. These are largest and most numerous along the longitudinal sinus (corrosion preparation).

9. *Orbital Connections.*—(*a*) The ophthalmic vein is, next to the jugular, the largest and most constant of all the passages. It empties largely into the cavernous sinus (through the orbital fissure, where it bears a constant constriction), but has free anastomosis with the prefacial vein at the inner canthus. Allen says that formerly the trunk of the facial was opened at this point to relieve cerebral congestion. (*b*) The central retinal vein has full anastomoses with the ophthalmic, but goes as a rule to the cavernous sinus, or frequently to a fine venous plexus around the optic nerve, and then by several veinules in part to the subophthalmic vein, in part to the said sinus. (*c*) The smaller subophthalmic vein or veins connect doubly with the larger into which, or oftener into the sinus cavernosus, they discharge (always afferent, say Sesemann and H. Meyer). Peripherally, they anastomose with facial and even pterygoid veins. (*d*) The ophthalmo-dural vein of Hyrtl (1859) is practically included under the more or less constant connection of the medicerebral vein and the sphenoid sinus. Occasionally this sinus or vein has a small anastomosis, through the lateral part of the orbital foramen, with the ophthalmic or other orbital vein. Evidently, the vena aberrans of Verga (1856) should be classed here. As a passage from the ophthalmic vein or cavernous sinus to the lateral sinus, Knott mentions one case (on right); or between ophthalmic vein and superpetrosal sinus, three instances (on left).

10. *The Emissary of the Foramen Rotundum* from the cavernous sinus, and accompanying the superior maxillary nerve as described by Nuhn, was twice seen by Knott (on right).

11. The medidural vein discharges largely through the *oval*, or *spinous, foramen*. Nuhn described a pair of veins which, after traversing the oval foramen, formed a plexus about the inferior maxillary nerve and terminated in the infratemporal veins. Knott found these veins on both sides in 18; two veins on right and one on left in 6, the reverse in 4; a single vein on each side in 11; no vein on one side in 5. Luschka and Trolard describe a vein, from the cavernous sinus, that receives dural veins from the anterior petrous surface and departs through the oval foramen; in this case the medidural emerges through the spinous foramen.

12. *Plexus s. Sinus Caroticus.*—Bell (1827) mentions a *vena sodalis arteriæ carotidis*, as an emissary from a petrous sinus, descending through the carotid canal. Rektorzik (1858) seems to have rediscovered this. A prolongation of the cavernous sinus into the carotid canal constitutes the sinus caroticus. This breaks up into a plexus of small veins about the artery, converging to one or more small trunks below, that may pass to the internal jugular. It may connect with 11 and 13. Knott was always able to find this communication, though the vessels varied much in size and number.

13. *Vena Meditacerata.*—Englisch is credited with having described (1863) a constant communication, outside the skull, between the cavernous sinus and the subpetrosal vein. As *inferior petro-occipital sinus*, Trolard independently described the same. "On the exterior base of the cranium a small vein occupies a groove extending between the two lacerated foramina. Its direction is latero-caudad. It inosculates with cavernous sinus or carotid plexus, and with the precondyloid confluens" (*vide supra, sub* 4). Knott found this in 14 out of 33 cases.

14. *Vena Subpetrosa*, from the subpetrosal sinus, through the premedian portion of the foramen postlacerum, to the jugular vein. Here it is separated—not rarely by bony lamina, thus forming the foramen anomalum of Gruber, 1869—by three nerve trunks from the jugular canal. From numerous investigations Gruber found that only rarely did this vein pass quite through the foramen before entering the jugular, and that then it first connected with the termination of the lateral sinus. However, in 8 out of 22 times Knott found that the vena subpetrosa ended at about the level of the lower margin of the jugular foramen, in 9 a little above, and in 5 a little below. It connects also with the precondyloid vein or confluens, and commonly receives the internal auditory veins.

To these may be added the following, of rare occurrence in the adult:

15. *Emissarium Temporale* (foramen jugulare spurium). This is held to be a relic of the primary jugular vein. When present, it proceeds from the prepetrosal sinus, perforates the temporal bone beneath the root of the zygomatic arch, emerges just behind the glenoid fossa at the edge of the porus acusticus externus, and ends in the external jugular system.

16. *Foramen Cæcum*, in fetal life a communication between the longitudinal sinus and the veins of the frontal sinus, ethmoid bone, and nose. Rarely, if ever, observed in the adult.

17. The very rare pathological venous blood tumors of the cranium (*vide* Mastin, *Journal of the American Medical Association*, 1886), arterio-venous aneurisms of the scalp, etc., occasionally communicate on the one hand with external veins of the head, on the other through openings in the bone usually with the long sinus.

18. Possibly a couple should be added from Hédon. Small rami accompany the olfactory bundles through the cribriform plate of the ethmoid, of course connecting above with the vein of the olfactory bulb. "A vein leaves the aqueduct of Fallopius by the stylomastoid foramen to anastomose with the external jugular or post-auricular (Sperino). It joins, according to Blandin, a small dural ramus traversing the hiatus of Fallopius."

Lymphatic System in the Brain.—There are no lymphatic glands in the cranial cavity; nor does the brain possess a system of independent lymphatics. Within the brain substance all the larger lymph passages accompany the blood-vessels as cylindrical enveloping spaces. These are at least twofold: (*a*) *Adventitial* spaces between media and adventitia, which latter are not closely bound together in the vessels of the central nervous system as in the remainder of the body; (*b*) *perivascular* spaces of His and Robin, connecting with the subpial or so-called epicerebral space. Their existence in normal tissues has been repeatedly disputed, and unquestionably their size is artificially much increased by the usual methods of preparation. The latest investigators, Rossbach and Sehrwald, assert very positively the real existence of these spaces. They worked by Golgi's method, claiming that this marks the lymph, and thus the lymph spaces, rather than the ganglion cell and its processes.

The beginning of the lymph passages is to be sought in the very narrow spaces surrounding the ganglion cells —*pericellular spaces* (Obersteiner). To each of these latter spaces run, according to Rossbach and Sehrwald, many fine canals (rootlets), often coming a long distance through the albalis, and starting about vessels and from glial lymph spaces. These surround the protoplasmic cell processes. The efferents from these cell spaces pass along the apex process, branch, and empty into perivascular and superficial glial spaces, or directly into the epicere-