

Stage 22 Fingers Separate Distally

14 Days, 11–12 mm

Externally. With magnification, one can easily see that the individual *fingers* are separated in the forefoot plate. In contrast, in the hindfoot plate there are deep indentations between the developing toes, but they are not yet separated (Figs. 215–217). Numerous young *hair follicles* may be recognized in the skin, except for the head region. The *somites* are discernible only in the distal part of the tail. The growing pinna is turned forward and covers about one-half of the external auditory meatus. The umbilical hernia is very conspicuous at this stage (Fig. 216 and 217).

Length. The length varies from 10.4 to 12 mm.

Circulatory System

Arteries. Both *umbilical arteries* are united at the umbilical ring to form a single vessel, which passes through the umbilical cord (not visible in Fig. 224).

The arterial system of the *head* is being transformed. In Fig. 224, the *arteria stapedia* is recognizable. It is a branch of the second aortic arch. The stump of the right pulmonary artery is visible below the ductus arteriosus Botalli. The right fourth aortic arch has lost its communication with the dorsal aorta, and flows directly into the artery of the right forelimb (*arteria subclavia dextra*). On the whole, the definitive pattern of the prenatal circulatory system is established, and the definitive shape of the heart as well. The ventricular septum is now closed.

Veins. The *cardinal veins* are markedly asymmetrical. The posterior cardinal vein as shown in Fig. 224 is the original *left* posterior cardinal vein, while the right has regressed (in the reconstruction of a 12-day stage — Fig. 172 — both are present). The anterior cardinals are both present and will persist in the adult mouse.

Intestinal Tract

The palatal processes are elevating and begin to separate the oral and nasal cavities (Figs. 225 and 226). They are not yet fused, so that the cavities are still continuous. Occasionally, the fusion of the palatal processes may be delayed and the tongue appears to be squeezed between them (Fig. 223). The posterior part of the open communication in Fig. 225 always remains open. With progressive growth, this communication will be displaced posteriorly and form a long duct (ductus naso-pharyngeus).

The bud of the first *molar* [73] is visible (Fig. 226). The second and third will appear later. In sagittal section (Fig. 223), the anlagen of the lower and upper incisors [76] may be recognized (not labeled). They are located above and beneath the tip of the tongue.

Meckel's and Reichert's cartilage are more advanced in development than the precartilaginous skeleton of the *larynx*. The tracheal rings are still mesenchymal condensations.

The *thymus* and *thyroid* are easily recognizable (Fig. 223). The thymus has lost its connection with the third pharyngeal pouch, and is situated above the pericardium. The parathyroids are joining the thyroid [146].

The bronchi are considerably distended and have numerous ramifications (Fig. 223).

The gut projects into the wide umbilical hernial sac. The mucosal lining of the gut consists of relatively tall columnar cells. The configuration of the intestinal tract is represented in Fig. 227.

Urogenital System

The *ureter* now opens into the urogenital sinus separately from the opening of the Wolffian duct. The sinus itself has been separated from the rectum in an earlier phase of development. The topography of the embryonic urogenital system is represented in Fig. 228, and microscopic details are shown in Fig. 223.

Sexual differentiation is very apparent: the seminiferous tubules are solid strands of cells, which are nearly symmetrically arranged [118] (Fig. 221). The ovary, on the other hand, does not form cords [122]. In the female, the Müllerian duct is now more highly developed than the Wolffian duct (Fig. 219).

Central Nervous System

In the *telencephalon* cells migrate from the mantle zone and form a *superficial cortical layer* (primary cortex). It is separated from the broad mantle zone by a thin marginal zone, with few nuclei (Fig. 223). The choroid plexus of the lateral ventricle projects far into the lumen. All cranial nerves are now distinctly visible, and the ganglia are relatively large (Fig. 229).

Eye. The cavity of the vitreous body has increased considerably in size. The ganglionic layer of the retina (not the bipolar layer) appears as a zone of clear nuclei. It is distinguishable from the two darker inner zones, which are not yet separated from each other. The separation occurs much later, after birth.

The eyelids are prominent.

Ear. The ductus cochlearis has elongated and it curves to form a full circle. It is bordered by a thin cartilaginous capsule. The presumptive sensory epithelium may be recognized by its height.

Hypophysis (Fig. 230–232). The connecting strand of epithelial cells (marked *S* in Fig. 214) has disappeared. The pars tuberalis continues to elongate. Ventral to the hypophysis is the cartilaginous base of the skull.

Placenta (Figs. 233–234). The labyrinth reached the peak of its development at 12 days.

The development of the so-called “yolk sac diverticles” is a conspicuous characteristic of this stage. They arise as clefts within the trophoblastic labyrinth and may perforate it [33] (Fig. 234). The visceral (proximal) layer of the yolk sac has many branching folds.

| Material | Age | |
|------------|-----------------|--|
| KT 618 | 13 days 21 h | 4 embryos, 11–11.5 mm |
| KT 642–44 | 14 days | 7 embryos, 11.5–12 mm (1 of them exencephalic) |
| KT 659–660 | 14 days | 5 embryos, 10.5–12 mm |
| KT 1017–22 | 14 days 2 h | 5 embryos, 10.6–11.9 mm |
| KT 1043–45 | 14 days 4 1/2 h | 4 embryos, 10.4–11.3 mm |

FIG. 215. Embryo from the left. Life photograph.
KT 642, 14 days, 12 mm length. 6:1

FIG. 216. Embryo from the left (albino of control series). Bouin fixed, 14 days, 11 mm length.
6.6:1

FIG. 217. Explanation of Fig. 216.
O = pinna; *H* = hair follicles; *Fi* = finger, separated; *Nb* = umbilical hernia; *So* = tail somites.

FIG. 218. Horizontal section through eye.
G = ganglion nervi optici, *K* = nuclear layers (dark), *P* = pigmented layer.
KT 643, 14 days. 55:1

FIG. 219. Ovary and vicinity, sagittal section.
W = Wolffian duct, *M* = Müllerian duct, *U* = mesonephric tubules, *Ma* = stomach, *DM* = Dorsal mesogastrium.
KT 643b, 14 days. 100:1

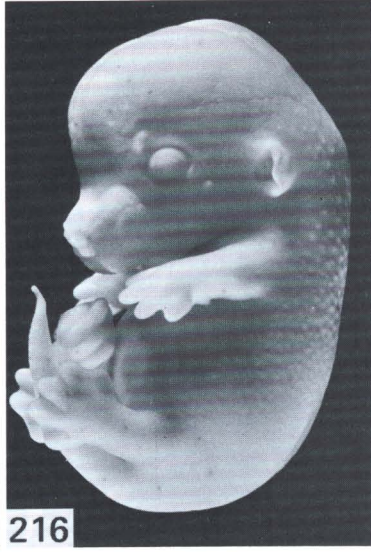
FIG. 220. Detail of Fig. 219.
Oz = oocyte, *Ep* = epithelium, *Er* = erythrocyte in capillary. 700:1

FIG. 221. Testis, tangential section. Seminiferous tubules, solid, nearly symmetrical arrangement.
Li = liver.
KT 643a, 14 days. 135:1

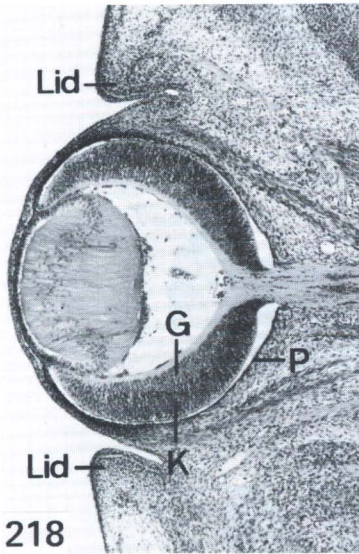
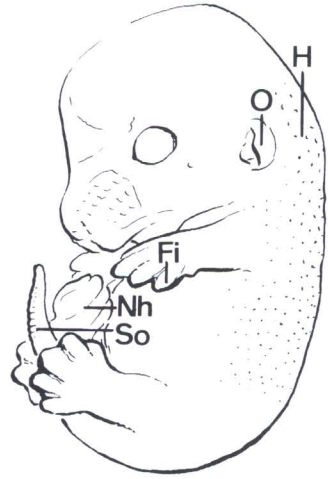
FIG. 222. Enlarged view of seminiferous tubule.
Sp = gonocyte, in prophase. 700:1



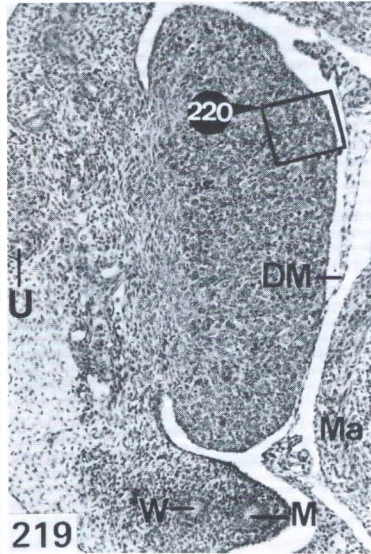
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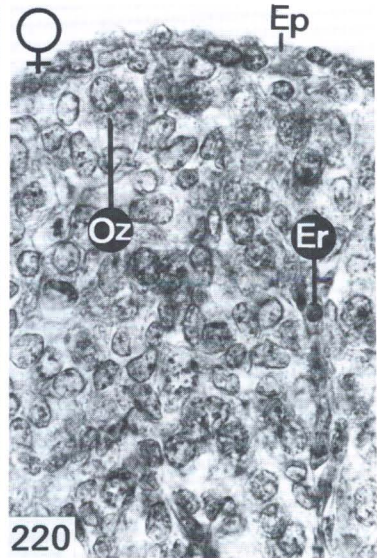
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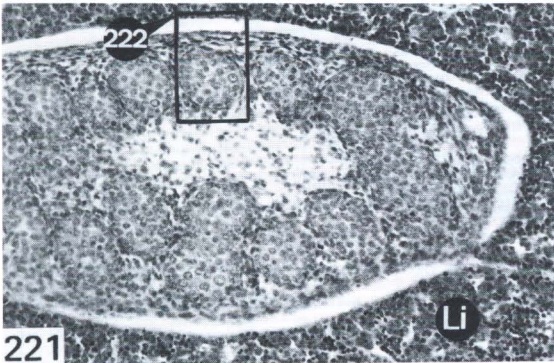
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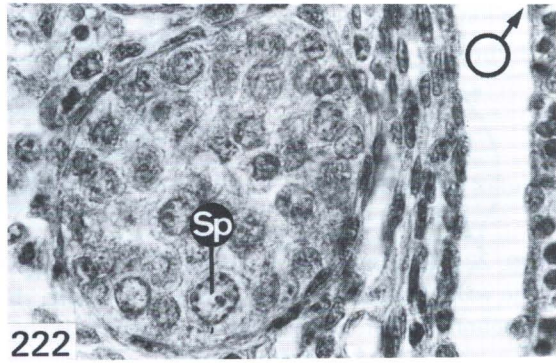
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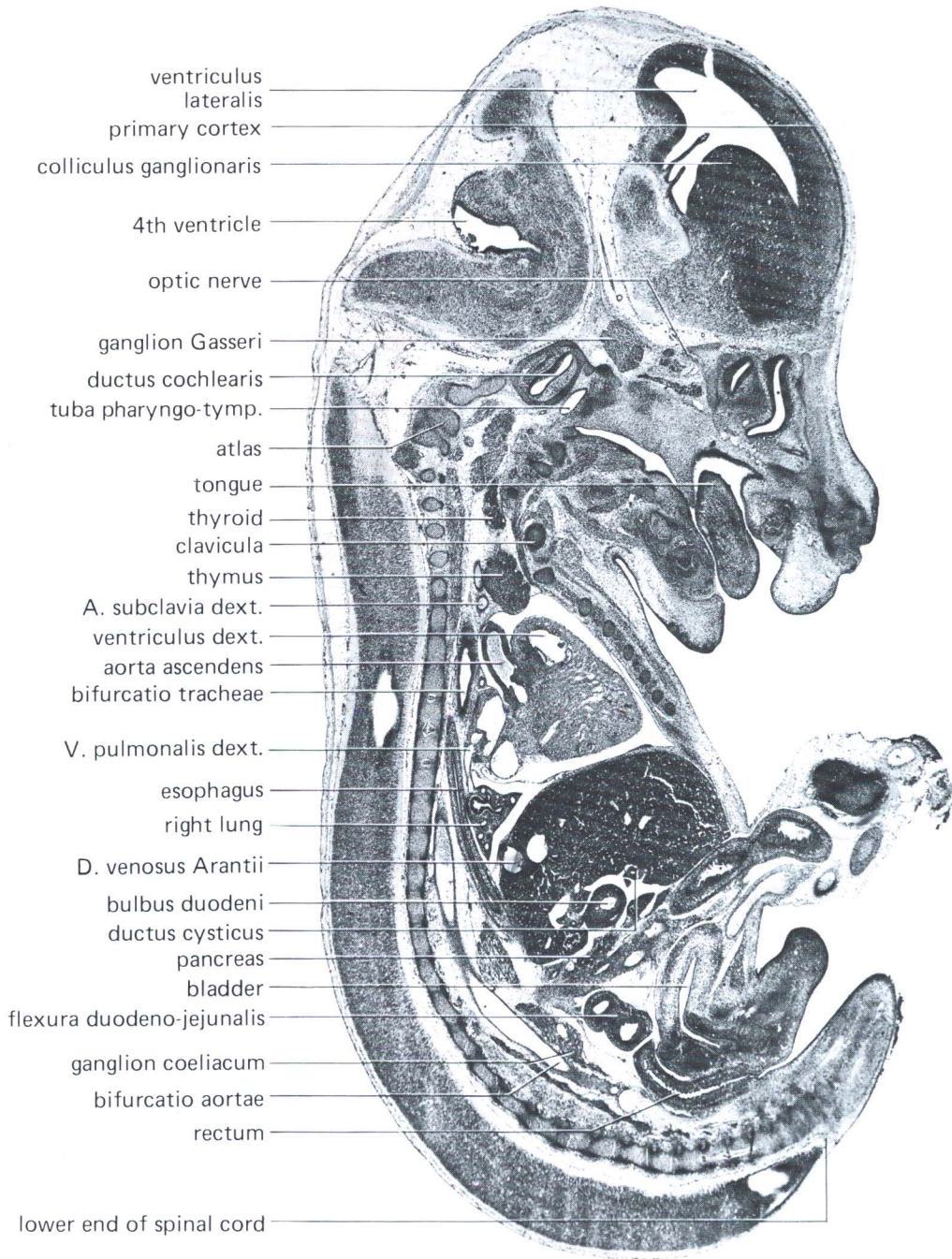


FIG. 223. Sagittal section, female. The choroid plexus is now projecting far into the lateral ventricle. The wall of the hemisphere, which is cut here, shows peripherally a small primary *cortical layer*. The vertebral column has become chondrified. It contains relatively big notochordal segments. Some of them are visible in the thoracic region of the section (Fig. 223). At the base of the tail they are still small.

KT 643b, 14 days, 11.5 mm

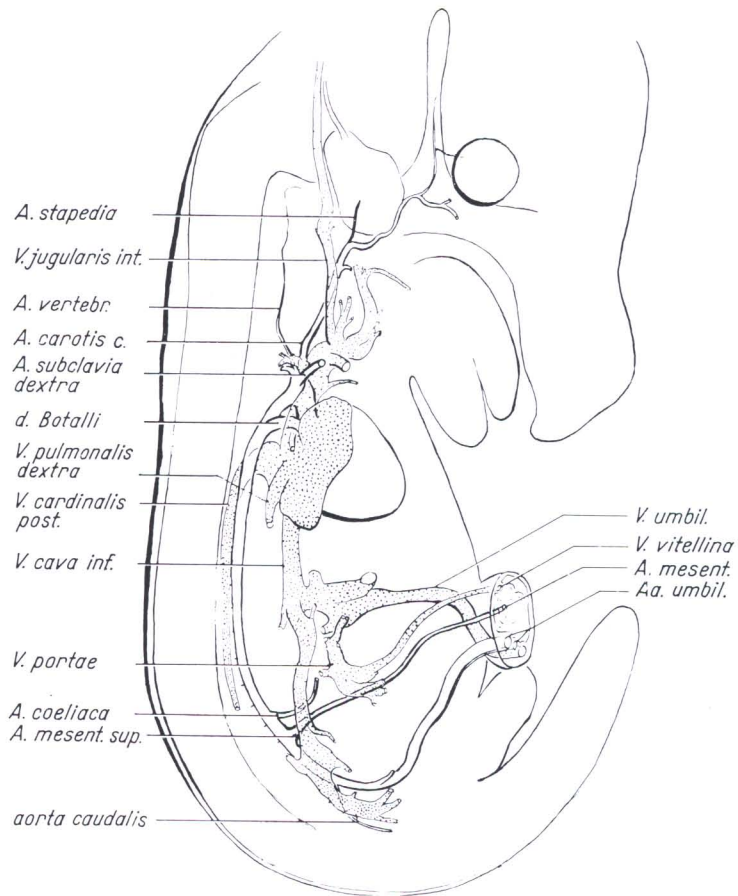


FIG. 224. Reconstruction of the vascular system, viewed from the right. Stippled areas indicate venous system. KT 643b, 14 days

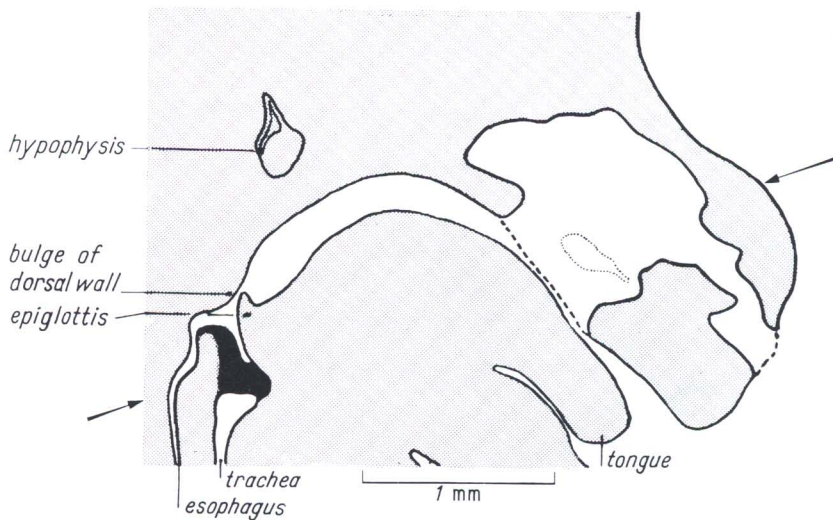


FIG. 225. Reconstruction of the nasal cavity. Plane of section Fig. 226 indicated by arrows. Broken line indicates communication within oral cavity. Lightly stippled contour indicates localization of Jacobson's organ, within the nasal septum.

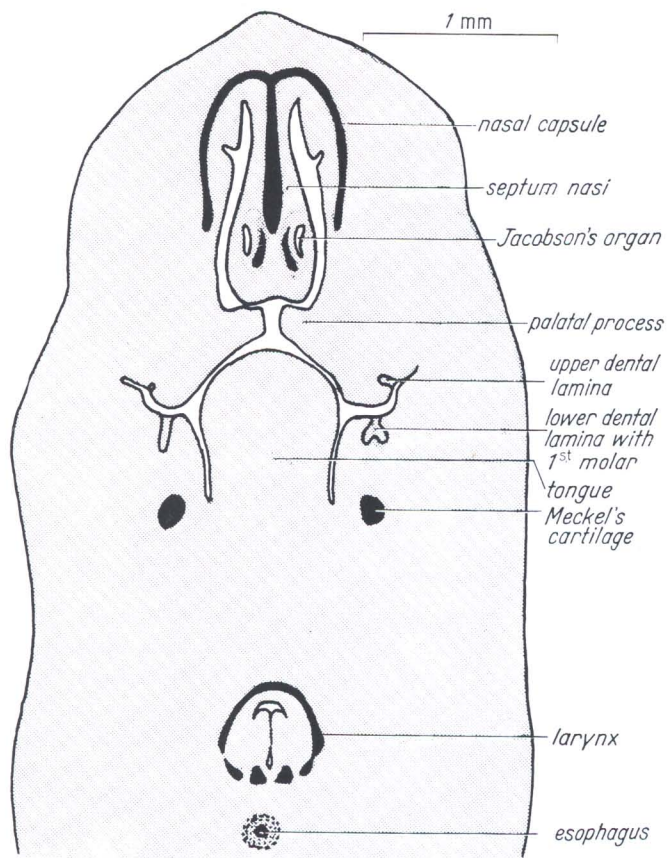


FIG. 226. Transverse section of nasal cavities (for plane of section see Fig. 25, arrows).

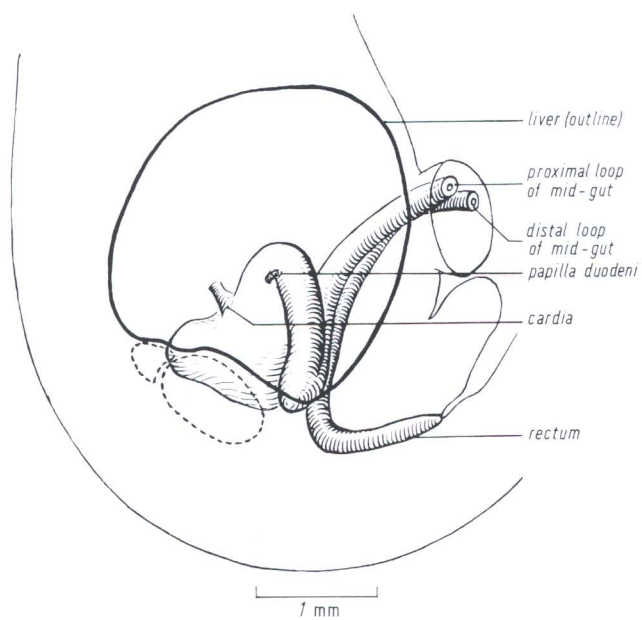


FIG. 227. Reconstruction of mid- and hindgut, viewed from the right. Dotted lines indicate kidney and suprarenal. KT 643b, 14 days

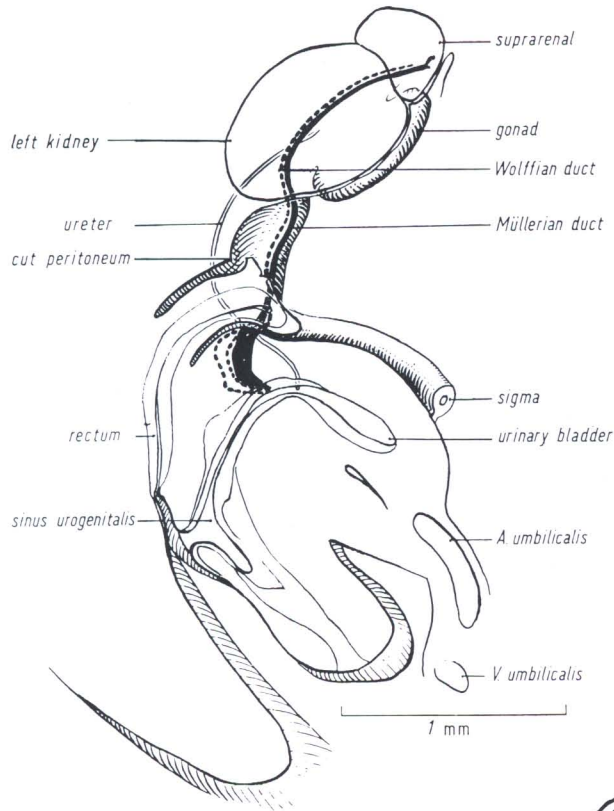


FIG. 228. Urogenital system. Reconstruction of left side.
 Black area indicates Müllerian duct; dotted lines indicate Wolffian duct.
 KT 643b, 14 days

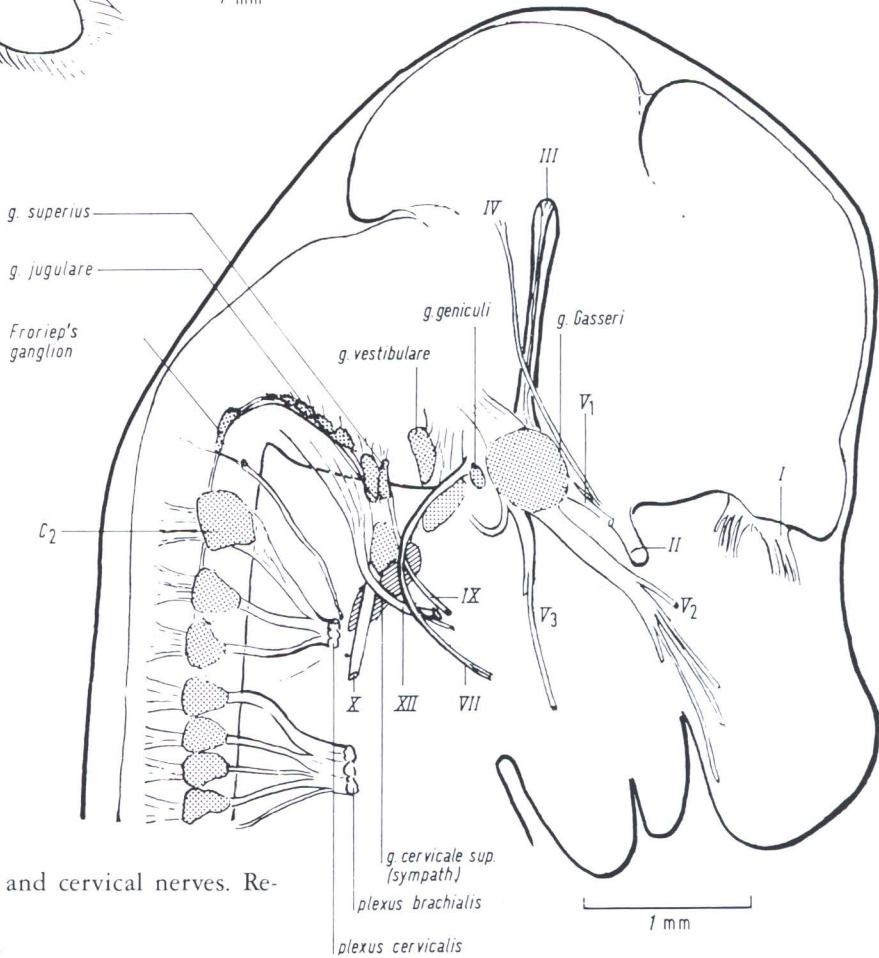
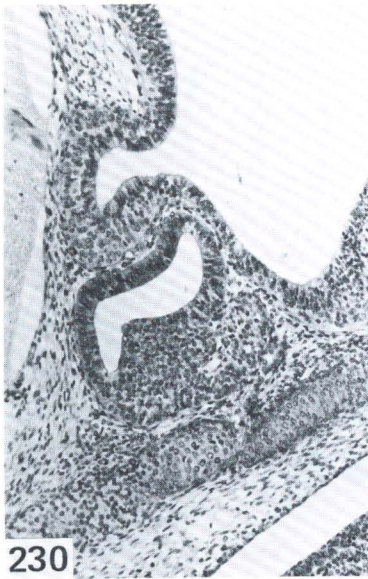


FIG. 229. Cranial and cervical nerves. Reconstruction.
 KT 643b, 14 days

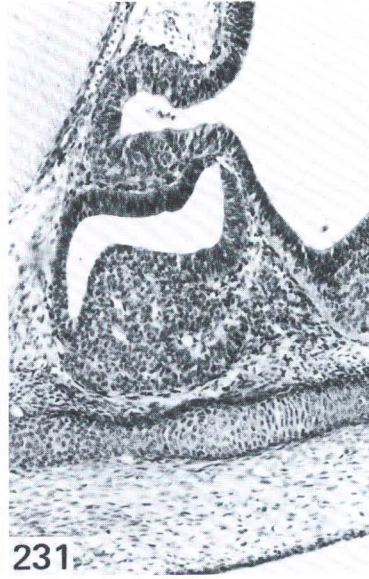
13 1/2 days

14 days

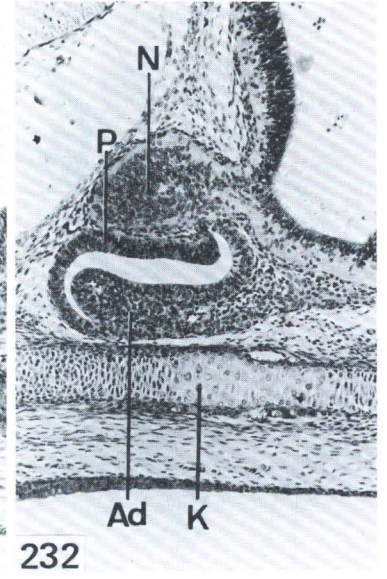
16 days



230

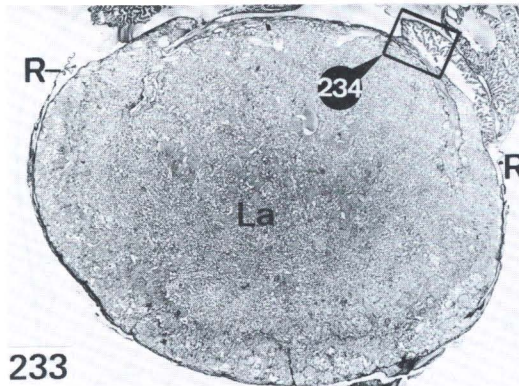


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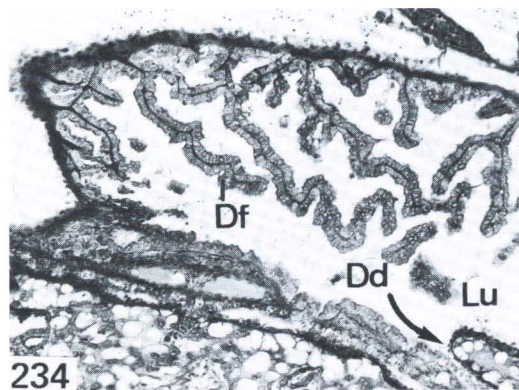
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FIGS. 230–232. Development of hypophysis. Sagittal sections, 13 1/2–16 days (Figs. 230 and 231: 115:1. Fig. 232: 88:1).
K = cartilaginous base of skull (sphenoid), *Ad* = adenohypophysis, *N* = neurohypophysis, *P* = pars intermedia.



233

FIG. 233. Section of placenta, PAS-reaction. *La* = labyrinth, *R* = Reichert's membrane. KT 1017, 14 days 2 h. 12.5:1



234

FIG. 234. Enlarged view. *Df* = fold of yolk sac wall, *Lu* = lumen of yolk sac, *Dd* = "diverticle of yolk sac" (communication between lumen of yolk sac and intraplacental space).