19. Shumway, W., *Vertebrate Embryology*, New York, 1942.
20. Hyman, L. H., *Comparative Vertebrate Anatomy*, Chicago, 1942.
21. Mookerjee, H. K., *Phil. Trans.*, 1931, 219 B, 165.
22. Erdmann, K., *Z. Anat. Entw. Ges.*, 1933, 101, 566.
23. Smit, A. L., *Ann. Univ. Stellenbosch.*, 1953, 29, 79.

FOETAL MEMBRANES IN THE INDIAN HORSE-SHOE BAT, *RHINOLOPHUS ROUXI* (TEMMINCK)

A PERUSAL of the literature on the embryology of bats reveals that there is no information about the development and the structure of the foetal membranes of any member of the family Rhinolophidae except for a casual reference to the yolk sac of *Rhinolophus hipposideros* by Van der Sprenkel (1932) and to the presence of a discoidal endotheliochorial placenta in "rhinolophids" by Hamlett (1934). The present report embodies the description of the arrangement and the structure of the foetal membranes of *Rhinolophus rouxi* at full term.

The uterus is bicornuate, but a single embryo is carried invariably in the right cornu during each pregnancy. At full term the pregnant uterine cornu measures 3 cm in the tubo-cervical axis and 2·3 cm in cross-section. The foetus lies in the uterus in such a manner that its cranio-caudal axis is parallel to the tubo-cervical axis of the uterus, the head of the foetus lies towards the cervix, and the dorsal side of the foetus is towards the median side of the uterus. Due to this orientation of the foetus the umbilical cord bends towards the placental disc which is mesometrially located.

The general arrangement of the foetal membranes at term is indicated in Fig. 1. The amnion is a thin bilaminar membrane which is closely adherent to the body of the foetus on all the sides except near the cranial and the caudal flexures where a small part of the fluid filled amniotic cavity persists.

The yolk sac lies adjacent to the placental disc on the mesometrial side of the uterus in the form of a collapsed bag with intensely folded walls. Consequently the cavity of the yolk sac is reduced to streak-like spaces. The endodermal cells have hypertrophied and are cubical to columnar each with a centrally placed vesicular nucleus with a darkly staining nucleolus (Fig. 2). The endodermal cells form a continuous lining for the remnants of the yolk-sac cavity. The mesodermal cells are fusiform or polygonal and contain darkly staining nuclei.

The umbilical cord is 1 cm long and has undergone coiling two or three times. Five blood vessels—two umbilical arteries, an umbilical vein, a vitelline artery and a vitelline vein—and a narrow endodermal allantoic duct are seen in transverse sections of the umbilical cord (Fig. 3).

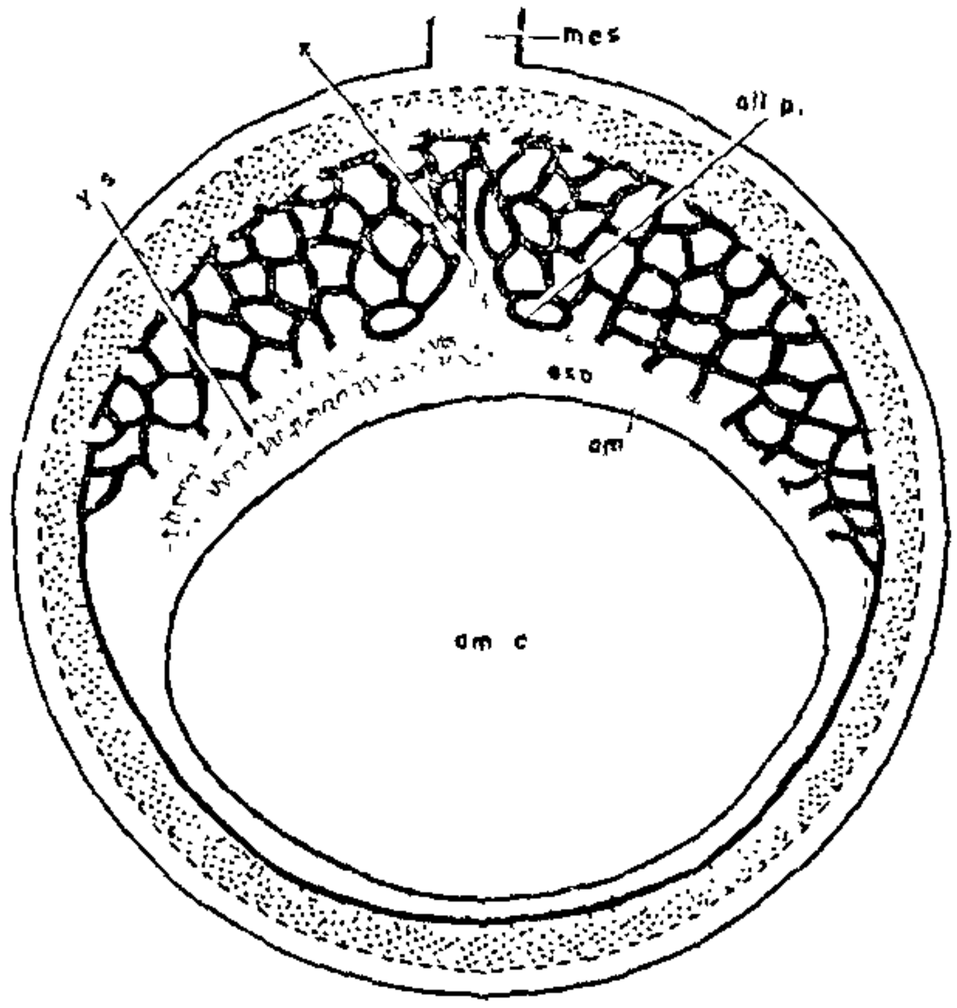
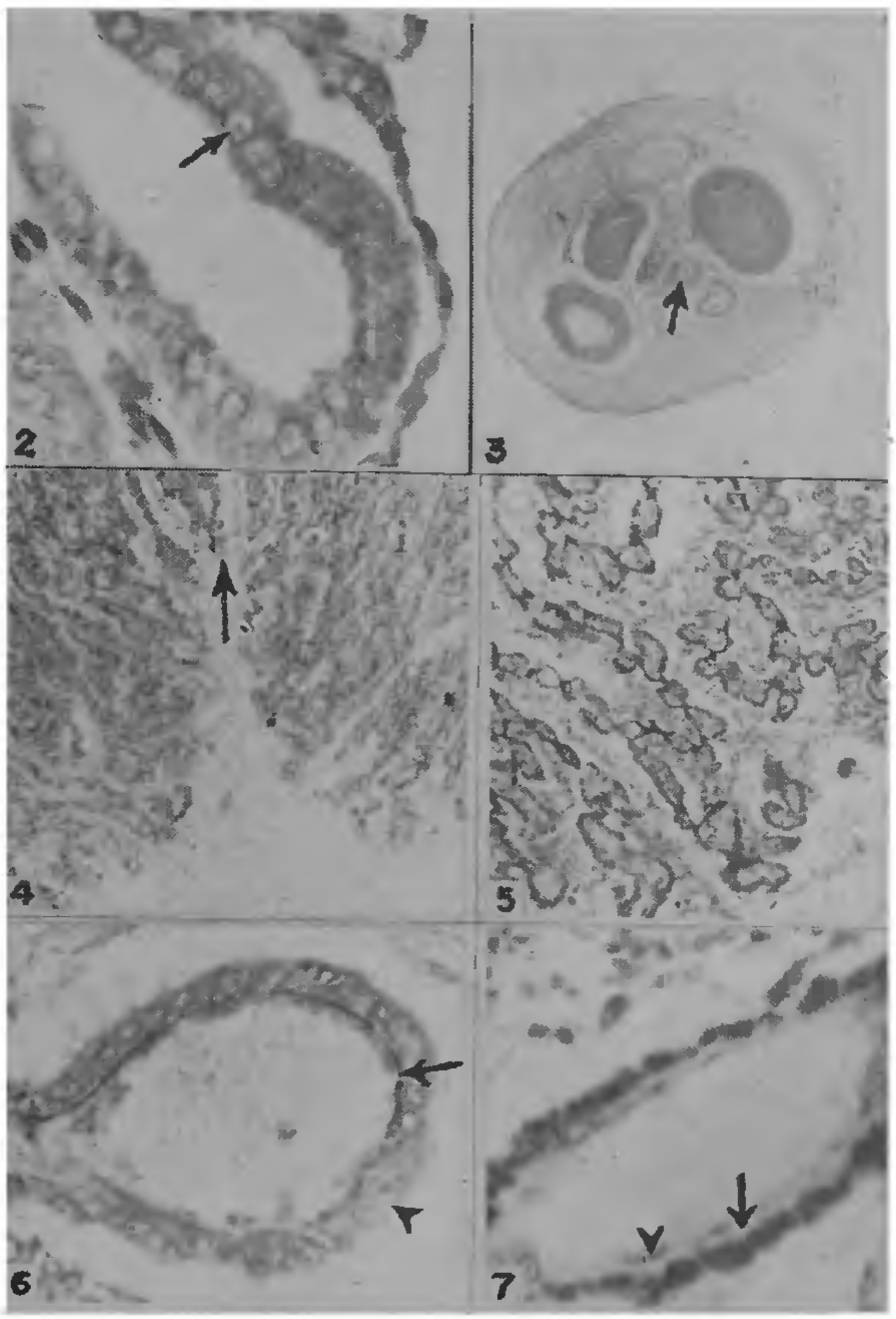


FIG. 1. Semischematic diagram to illustrate the general arrangement of the foetal membranes at term of *Rhinolophus rouxi*. *am* : amnion ; *am. c* : amniotic cavity ; *ch-all. pl* : chorio-allantoic placenta ; *exo* : exocoelom ; *mes* : mesometrium ; *x* : clef in the placenta ; *y.s* : yolk sac.

The chorio-allantoic placenta is in the form of a concavo-convex disc located on the mesometrial side of the uterus. It is 1·5 cm in diameter and 6 mm thick in its centre. There is a deep and wide cleft in the centre of the placental disc. Hence, in transverse sections the placenta appears to be made up of 2 discs (Figs. 1 and 4). The umbilical cord is inserted to the centre of the cleft in the placenta.

Histologically the chorio-allantoic placenta consists of a complex three-dimensional network of highly convoluted tubules, the meshes of the network being occupied by allantoic mesenchyme and foetal capillaries (Fig. 5). Each placental tubule typically consists of a central maternal blood capillary with a distinct lining of endothelial cells, a PAS-positive interstitial membrane and a well-defined cytotrophoblastic layer with regularly arranged cubical cells each with a large vesicular nucleus (Fig. 6). In the larger placental tubules near the foetal border of the placenta there is an enucleate cytoplasmic lamina between the endothelial lining and the cytotrophoblastic layer (Fig. 7). This is the

remnant of the syncytiotrophoblast. However, this is absent from the finer tubules in the deeper regions of the placenta where only the cytotrophoblast forms the foetal component of the placental tubules. Hence, during the final stages of gestation the composition of the placental barrier appears to be different at different regions, being vasodichorial in the larger placental tubules where both cytotrophoblast and the syncytiotrophoblast are present, and vasomonochorial in those regions where only the cytotrophoblast is present.



FIGS. 2 TO 7. Fig 2. A part of the yolk-sac splanchnopleure to show the hypertrophied endodermal cells (arrow), × 325. Fig. 3. Transverse section of the umbilical cord at term. The arrow points toward the allantoic duct, × 22. Fig. 4. Part of the placental disc to show the cleft (arrow) in the centre cf the disc., × 20. Fig. 5. Part of the allantoic placenta to show the network of convoluted placental tubules embedded in allantoic mesenchyme, × 40. Fig. 6. Part of the placental tubule (PAS-staining) showing the cytotrophoblast (arrow head) and the PAS-positive interstitial membrane (arrow). Note also the endothelial cells lying on the maternal side of the interstitial membrane, × 325. Fig. 7. Part of the placental tubule to show the thin enucleate lamina of the syncytiotrophoblast (arrow) between the endothelial cells (arrow head) and the darkly staining layer of cytotrophoblast, × 180.

Department of Zoology,
Institute of Science,
Nagpur, *November* 15, 1973.

A. GOPALAKRISHNA.
D. A. BHIWGADE.

1. Hamlett, G. W. D., *Anat. Anz.*, 1934, 79, 145.
2. Van der Sprenkel, H. B., *Zeitschr. f. mikr-anat. Forsch.*, 1932, 28, 185.