$-OCH_3$), 3·90 (3H, *s*, $-OCH_3$), 6·62 (1H, *s*, C_3–H), 7·08 (1H, *s*, C_6–H), 7·10–7·50 (3H, *m*, $C_{3'}$–H, $C_{4'}$–H and $C_{5'}$–H), 7·84 (1H, *dd*, $J = 8·0$ Hz and 2·0 Hz, $C_{6'}$–H).

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GIANT CELLS IN THE PLACENTA OF THE INDIAN SHEATH-TAILED BAT *TAPHOZOUS LONGIMANUS* (HARDWICKE)

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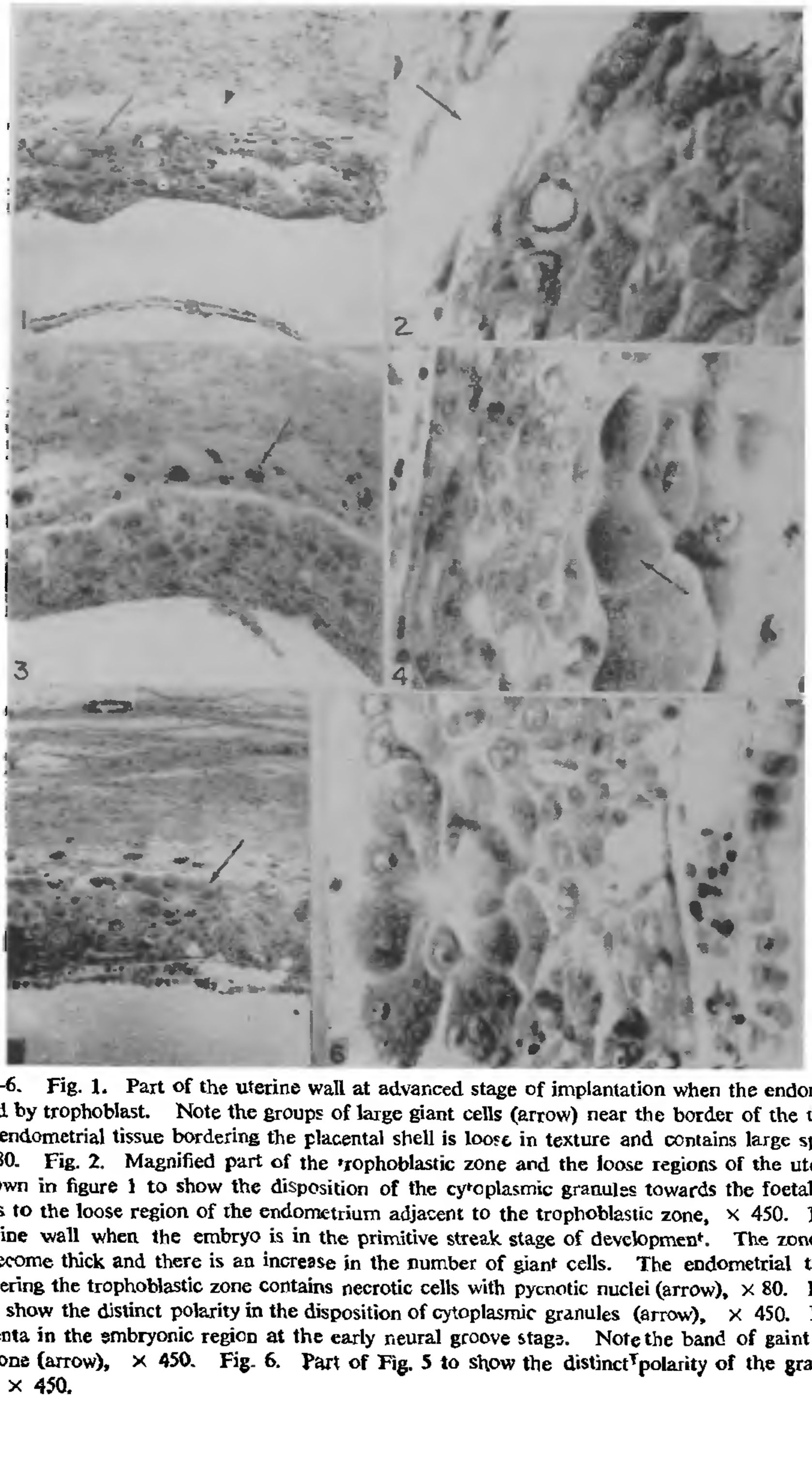
PLACENTAL giant cells have been described by several workers in many mammals, specially in the rodents[1–7], ruminants[8–10], carnivores[11], primates[12,13], and recently in some bats[14]. With regard to their origin they have been shown to be endometrial in some species, trophoblastic in some, endothelial in a few species and from all the three sources in some. There is considerable controversy regarding their function. Most earlier authors attributed to these cells the function of glycogen storage[12,13]. They are also believed to aid in the transformation of the trophoblast during the process of implantation of the blastocyst[15]. Endometrial giant cells are supposed to act as an effective barrier between the mother and the developing embryo and aid in the maternal tolerance of the embryonic homograft providing protection in the nature of an immune reaction[15]. Giant cells have been shown to be important sites of synthesis of chorionic gonadotrophins[8,13,16] and also assist in the invasion of maternal tissues by phagocytic activity[17]. Endothelial giant cells have been attributed a function of transport of iron and ascorbic acid from the mother to the foetus[8,18].

In *Taphozous longimanus* the giant cells were first noticed at an early stage of pregnancy after the invasion of the trophoblast into the uterine endometrium. At this stage they occur as large cells at the peripheral border of the invading trophoblastic zone, and are continuous with the layer of cytotrophoblastic cells (Figs. 1 and 2). There is a progressive increase in the size of these cells from the foetal surface towards the deeper regions of the trophoblastic shell, and it is possible to trace the progressive transformation of the cytotrophoblastic cells into the large giant cells. The endometrial tissue immediately bordering the zone of giant cells appears to be undergoing destruction as evidenced by the fact that the endometrial cells have lost their distinctive shapes, their nuclei have become pycnotic, and, in many of the cells, the nuclei are fragmented. Consequently, this region of the endometrium is loose and often tears off during fixation and processing of the tissue. Hence, in many stained sections there appears to be a space between the zone of giant cells and the necrotic zone of the endometrium. The fully formed giant cells at this stage have numerous stained granules most of which are located in the pole towards the foetal border of the cells and the clear cytoplasm towards the endometrium. At this stage while most of the giant cells are mononucleate a few have two to three nuclei.

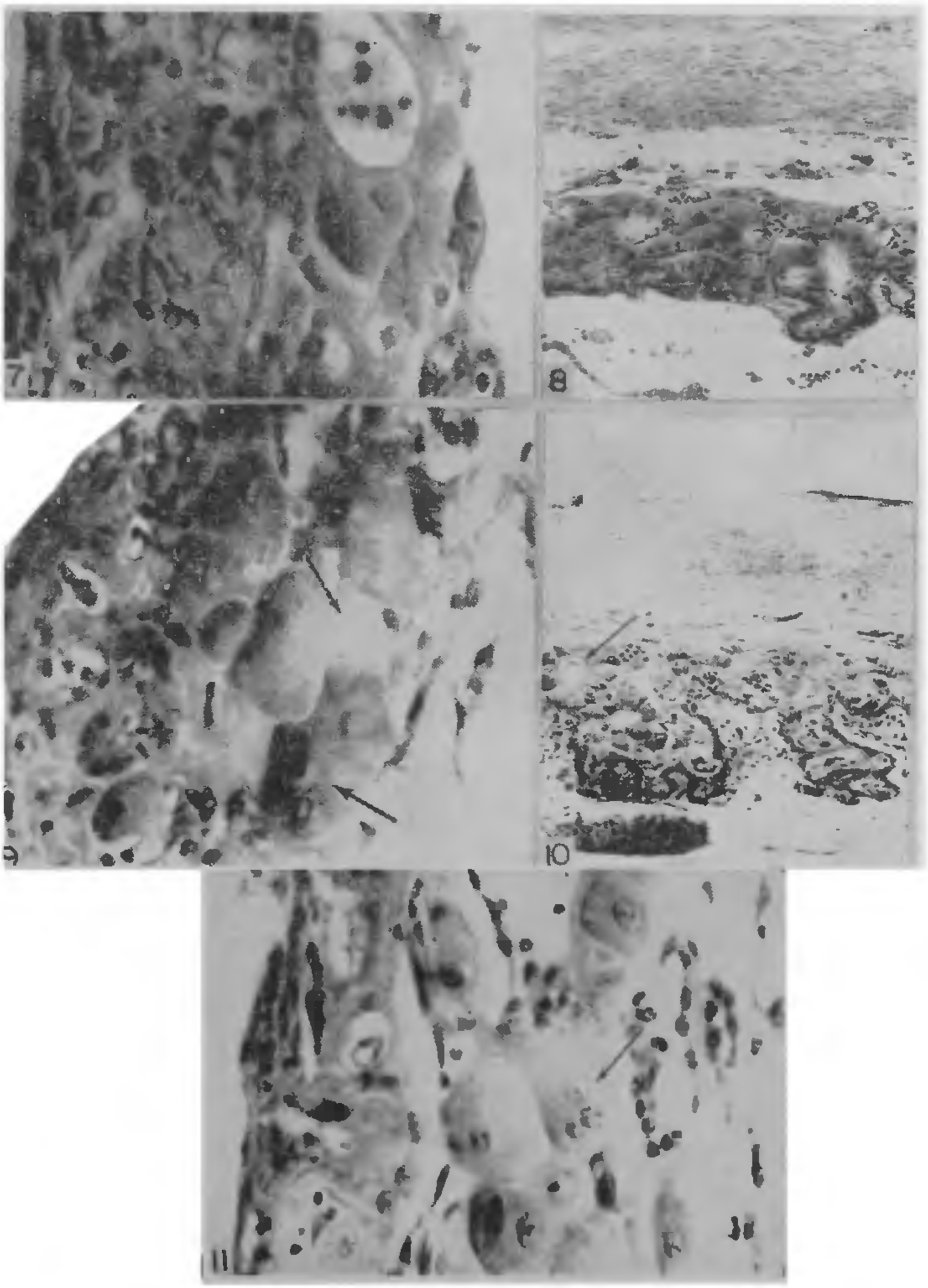
At a slightly more advanced stage of gestation, when the embryo reaches the primitive streak stage, the thickness of the placental shell increases considerably, and there is a concomitant increase in the number and size of the giant cells (Figs. 3 and 4). Many of the giant cells are binucleate and trinucleate and they are located mostly near the utero-placental junction. Their shape and cytological picture are as in the previous stage. The giant cells reach their maximum development at the early neural groove stage of development of the embryo when they occur as a distinct band of large cells immediately below the endometrial stroma (Figs. 5 and 6). They are very large and most of them are multinucleate. It is noteworthy that there was not a single mitotic stage in any of these cells at any stage of pregnancy. The polarity of the localization of stainable cytoplasmic inclusions



FIGS. 1–6. Fig. 1. Part of the uterine wall at advanced stage of implantation when the endometrium has been invaded by trophoblast. Note the groups of large giant cells (arrow) near the border of the trophoblastic zone. The endometrial tissue bordering the placental shell is loose in texture and contains large spaces (arrow head), × 80. Fig. 2. Magnified part of the trophoblastic zone and the loose regions of the utero-placental junction shown in figure 1 to show the disposition of the cytoplasmic granules towards the foetal side. The arrow points to the loose region of the endometrium adjacent to the trophoblastic zone, × 450. Fig. 3. Part of the uterine wall when the embryo is in the primitive streak stage of development. The zone of trophoblast has become thick and there is an increase in the number of giant cells. The endometrial tissue immediately bordering the trophoblastic zone contains necrotic cells with pycnotic nuclei (arrow), × 80. Fig. 4. Part of Fig. 3 to show the distinct polarity in the disposition of cytoplasmic granules (arrow), × 450. Fig. 5. Part of the placenta in the embryonic region at the early neural groove stage. Note the band of gaint cells at the junctional zone (arrow), × 450. Fig. 6. Part of Fig. 5 to show the distinct polarity of the granules in the giant cells, × 450.

is markedly noticeable at this stage. While they form a thick band of cells in the embryonic hemisphere (Fig. 6), they are less in number in the abembryonic hemisphere (Fig. 7).

At the advanced neural groove stage of development of the embryo the giant cells form nearly the entire thickness of the placental shell, especially in the region of the chorio-vitelline placenta (Fig. 8) where the



FIGS. 7–11. Fig. 7. Part of the embryonic wall of the uterus at early neural groove stage to show the giant cells are less abundant than in the embryonic part (see Figs. 5 and 6). × 450. Fig. 8. Part of the embryonic pole of the uterine wall at the late neural groove stage of development. The giant cells occupy about the entire thickness of the placenta, × 80. Fig. 9. Part of the placenta on the embryonic pole enlarged to show the large giant cells surrounding maternal capillary (arrow). Large arrow points to a multinucleate giant cell. × 450. Fig. 10. Part of the embryonic pole of the placerta at late neural groove to show that the giant cells surround maternal capillaries (arrow), × 80. Fig. 11. Part of the placenta at early limb-bud stage. Note the small population of giant cells some of which are multinucleate (arrow), × 450.

giant cells also surround maternal blood capillaries (Fig. 9). After this stage, with the formation of the chorionic villi, there is a progressive reduction in the number of the giant cells in the placenta, and those that remain lie surrounding the maternal capillaries (Figs. 10 and 11) until they disappear altogether by the time the embryo reaches the late limb-bud stage.

A histochemical examination revealed that the giant cells contained only neutral mucins, mostly located between the nucleus and the pole of the cells facing the foetal side, that is, the side towards the original uterine lumen. Prolonged (18 hr) pepsin as well as trypsin digestion followed by alcian blue staining[19,20] did not alter the stainability of these cells thereby indicating the absence of acidic mucins. Cytochemical tests for the localization of sialic acid proved negative.

According to Wimsatt[8] the multinucleate giant cells of the trophoblast arise by a mitotic division of the nucleus without subsequent division of the cell. Further, according to him, the giant cells resemble the syncytial trophoblast of deciduate placentae and may be considered as the homologue of this tissue in the non-deciduate placentae of ruminants and may, therefore, have evolutionary significance. The present investigation has, however, shown that there was not a single nucleus of the giant cells in mitosis. Evidently the multinucleate trophoblastic giant cells of the placenta of *Taphozous longimanus* arise by the coalescence of two or more adjacent giant cells. Wimsatt[8] also noted a marked polarity within the binucleate giant cells of ruminants. He observed that these cells were always oriented such that the dense cytoplasmic zone containing the organelles was towards the uterine lumen. The placental giant cells of *Taphozous longimanus* also exhibit such a polarity in the localization of stainable granules. The physiological significance of this is not known.

The enormous increase in the size of the giant cells lying adjacent to the endometrium, the occurrence of a necrotic zone of endometrial stroma immediately below the zone of giant cells and the loosening of the endometrial stromal tissue in this zone afford strong circumstantial evidence to indicate that the giant cells are in some way concerned in the progressive destruction of the endometrial stroma and thus assist in the firm implantation of the embryo. Histochemical tests indicate that glycogen stoarge is not a primary function of the giant cells in the placenta of *Taphozous longimanus*, nor is the synthesis of chorionic gonadotrophins since sialic acid, which is an important constituent of the chorionic gonadotrophins, was not present in these cells. Among the mucins only neutral mucins were present in these cells.

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