EXTERNAL CHARACTERS OF THREE FOETUSES OF THE INDIAN ELEPHANT

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AND

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The authors have in their custody three foetuses of the Indian elephant, Elephas indicus, at different stages of development, whose great value lies in their rarity. In so far as we are able to trace references, we find that to date only six foetuses of the Indian elephant have been remarked on or described in scientific literature (Gray, 1868; Eales, 1925; Hill, 1938; Osborn, 1936, 1942). Hence it is considered that observation on these three foetuses would be an additional contribution to the meagre knowledge of the developmental anatomy of this species.

MATERIAL

Of the foetuses, the smallest, of 7.7 cm. crown-rump length, hereafter called Foetus A, has been lying preserved in methylated spirits for many years in the reserve collections of the Government Museum, Madras. It is now on loan for study at the Department of Anatomy, Medical College, Madras. The circumstances in which it was procured are not known. The second foetus of 13.3 cm. crown-rump length, Foetus B, has been preserved in methylated spirits for the last nine years in the Anatomy Department of the Madras Veterinary College. This specimen was aborted by a cow elephant under domestication in 1939 at Calicut. The third specimen of 25 cm. crown-rump length, Foetus C, has been preserved in 5 per cent. formalin in the Anatomy Department of the Madras Veterinary College. It was procured last year at the post-mortem examination of the mother that died in the trench during capture. It was immediately preserved in formalin and later sent over here.
For want of proper facilities on the spot, injection of embalming fluid by the umbilical vessels was not done originally for any of the specimens. The specimens therefore are not ideally preserved, but are well hardened without decomposition. Form and shape are retained and the tissues are reasonably tough. Slight injury in places has been caused by certain extraneous factors. Foetus A has undergone some damage to the head and soles of all the four feet due to the fixing of pins while mounting the specimen for display. Foetus B has undergone slight damage to the head; and its abdominal and thoracic organs have been partly eviscerated through a longitudinal incision of the abdominal wall during preservation. Foetus C is reasonably well preserved except for slight compression of one side due to its lie in the jar containing the preservative solution.

Table I gives a statement of available information regarding comparative size and age of the six Indian elephant foetuses remarked upon by previous authors and the three specimens included in this study. It is seen that the three foetuses described here, bridge a gap of size and naturally of age, in which observations on specimens have not been previously made; they form a well graded intermediate series between the specimens in the British Museum and Colombo Museum. A statement of weights and various linear measurements of the three foetuses is given in Table II.

### Table I

**Comparative Size of Foetuses of Indian Elephant**

(Blanks indicate lack of data)

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Author</th>
<th>Year</th>
<th>Place where specimen is preserved</th>
<th>Size C. R. Length in cm.</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zimmerman</td>
<td>1783</td>
<td>Brunswick Museum</td>
<td>34.0</td>
<td>..</td>
</tr>
<tr>
<td>2</td>
<td>Owen</td>
<td>1857</td>
<td>R. C. S. Museum</td>
<td>..</td>
<td>6 months</td>
</tr>
<tr>
<td>3</td>
<td>Turner</td>
<td>1866</td>
<td>..</td>
<td>..</td>
<td>11 months</td>
</tr>
<tr>
<td>4</td>
<td>Gray</td>
<td>1868</td>
<td>British Museum</td>
<td>6.8</td>
<td>..</td>
</tr>
<tr>
<td>5</td>
<td>Toldt (Jr.)</td>
<td>1913</td>
<td>..</td>
<td>..</td>
<td>11 months</td>
</tr>
<tr>
<td>6</td>
<td>Hill</td>
<td>1938</td>
<td>Colombo Museum</td>
<td>31.5</td>
<td>Passed midterm</td>
</tr>
<tr>
<td>7</td>
<td>Present authors</td>
<td>This study</td>
<td>Madras Museum</td>
<td>7.7</td>
<td>..</td>
</tr>
<tr>
<td>8</td>
<td>Do</td>
<td>do</td>
<td>Anatomy Museum</td>
<td>13.3</td>
<td>..</td>
</tr>
<tr>
<td>9</td>
<td>Do</td>
<td>do</td>
<td>Madras Veterinary College</td>
<td>25.0</td>
<td>..</td>
</tr>
</tbody>
</table>
EXTERNAL CHARACTERS OF THREE FETUSES OF THE INDIAN ELEPHANT

TABLE II

Statement of Weights and Measurements

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Foetus A</th>
<th>Foetus B</th>
<th>Foetus C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (after preservation)</td>
<td>34 gm.</td>
<td>149 gm.</td>
<td>2154 gm.</td>
</tr>
<tr>
<td>Height, standing</td>
<td>5.7 cm.</td>
<td>9.2 cm.</td>
<td>22.5 cm.</td>
</tr>
<tr>
<td>Length from tip of proboscis to tip of tail over curve of back</td>
<td>19.3</td>
<td>31.5</td>
<td>69.5</td>
</tr>
<tr>
<td>Length from forehead to root of tail, in a straight line (crown rump length)</td>
<td>7.7</td>
<td>13.3</td>
<td>25.0</td>
</tr>
<tr>
<td>Length from forehead to root of tail over curve of back</td>
<td>11.6</td>
<td>18.0</td>
<td>36.3</td>
</tr>
<tr>
<td>Proboscis length, from tip of proboscis to angle of mouth, along curve</td>
<td>2.0</td>
<td>4.5</td>
<td>15.2</td>
</tr>
<tr>
<td>Tail length</td>
<td>3.0</td>
<td>5.2</td>
<td>11.0</td>
</tr>
<tr>
<td>Eye, Palpebral slit</td>
<td>0.3</td>
<td>0.5</td>
<td>0.9</td>
</tr>
<tr>
<td>Eye bulge</td>
<td>0.7 x 0.7</td>
<td>1.3 x 1.1</td>
<td>2.2 x 1.8</td>
</tr>
<tr>
<td>Ear pinna</td>
<td>1.1 x 0.6</td>
<td>2.0 x 1.8</td>
<td>5.0 x 3.5</td>
</tr>
<tr>
<td>Distance from angle of mouth to ear opening</td>
<td>2.1</td>
<td>3.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Forelimb, from free portion above the elbow to the sole along the limb flex</td>
<td>3.4</td>
<td>5.3</td>
<td>14.0</td>
</tr>
<tr>
<td>Hindlimb, from external angle of isium to stifle</td>
<td>3.3</td>
<td>4.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Elbow to nail along flexur s</td>
<td>2.0</td>
<td>3.6</td>
<td>8.0</td>
</tr>
<tr>
<td>Stifle to nail, along the flexures</td>
<td>2.0</td>
<td>4.3</td>
<td>9.2</td>
</tr>
<tr>
<td>Circumference of forefoot (sole)</td>
<td>2.5</td>
<td>4.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Circumference of hindfoot (sole)</td>
<td>2.5</td>
<td>3.7</td>
<td>10.4</td>
</tr>
<tr>
<td>Circumference of body at umbilicus</td>
<td>11.5</td>
<td>15.5</td>
<td>41.0</td>
</tr>
<tr>
<td>Circumference of the neck</td>
<td>7.0</td>
<td>11.9</td>
<td>27.0</td>
</tr>
<tr>
<td>Circumference of temporal gland</td>
<td>1.2</td>
<td>2.9</td>
<td>6.6</td>
</tr>
<tr>
<td>Diameter of temporal gland</td>
<td>0.4</td>
<td>0.9</td>
<td>2.2</td>
</tr>
</tbody>
</table>

GENERAL DESCRIPTION OF THE FETUSES

Foetus A (7.7 cm., male)

Head.—All the features of the foetus are well formed giving it the characteristic appearance of the animal (Fig. 1). The frontal bosses are not marked. The neck is distinct. The ears are small and triangular. The proboscis is small and extends down to the level of the carpus. The posterior aspect of the proboscis shows only the median longitudinal sulcus. The finger or prehensile lobe at the anterior margin of the lower end of the proboscis has not yet formed. The eyes are small and the lids closed. The palpebral fissure is a narrow open slit indicating the unfused condition of the eyelids. Between the eye and ear, a flattened circular swelling of 4 mm. diameter marks the site of the temporal gland. The upper lip-base of the proboscis—shows an elliptical opening on either side indicating the site of eruption of the future milk tusk. The lower lip is elongated with its tip pointed. Its upper aspect is grooved to accommodate the tip of the tongue. The labial cushions of the upper lip (Eales, 1925) are not distinct.
Trunk (Body).—The body is short and globular. The external genitalia are well formed and show indubitable male character. The penis and its prepuce are well developed. The external orifice of the urethra is a small vertical slit.

Tail.—The tail is short and tapering. It does not show any terminal tuft of hairs.

Limbs.—The limbs are well developed but are slender and lack the characteristic stumpy shape found in older foetuses and the adult. The sole of the fore foot is nearly circular and bears five white, soft nails at the periphery. The nails of the fore foot are in descending order of size, 3, 4, 2, 5, 1; and the third nail has a transverse measurement of 4 mm. The sole of the hind foot is elongated with the heel pointed, and bears four white soft nails. The size of the nails in descending order is 2, 3, 1, 4; and the second has a transverse measurement of 2.7 mm. The relation between the circumference of the sole of fore foot and the shoulder height is 1: 2.3. This point is discussed subsequently.

Skin.—The skin is not pigmented and does not show any hairs. The eyebrows and eyelashes have not begun to erupt. No hair follicles are noticeable even on close observation on the proboscis or on the terminal part of the tail.

Temporal Gland.—A flattened circular swelling of 4 mm. diameter between the eye and the ear marks the site of this gland. Due to slight damage the opening of the duct on the surface could not be made out with certainty.

Fœtus B (13.3 cm., male)

Head.—All the features of the foetus are well formed (Fig. 2). The neck is distinct. The ears are small. The proboscis is small extending only slightly below the level of the carpus. The posterior aspect of the proboscis shows only the median longitudinal sulcus. The anterior margin of the lower end shows the prehensile lobe or ‘finger’ just developing. The eyes are small and closed and the slit like palpebral fissure indicates the unfused condition of the eye lids. The temporal gland is represented by a flattened circular swelling between the eye and ear. The upper lip-base of the proboscis—shows on either side an elongated opening, the site of eruption of the future milk tusks, and immediately behind this an ill-defined labial cushion. The lower lip is elongated with its tip pointed and its upper aspect grooved to accommodate the tongue.

Trunk (Body).—The trunk is relatively long. Due to the prior evisceration of the abdominal and thoracic contents it presents flatness of sides and floor,
not showing its real contour as in other specimens. The external genitalia show the penis and prepuce to be well formed; and the external urethral orifice is a small vertical slit. Two small roughened spots in the pectoral region indicate the position of the mammary glands.

*Tail.*—The tail is tapering and has not developed the terminal tuft of hair.

*Limbs.*—The limbs are well developed. The sole of the fore foot is nearly circular and bears at its periphery five soft nails. The nails in order of size are 3, 4, 2, 5, 1 and the third one measures 5 mm. transversely. The sole of the hind foot is an oval with the heel pointed. The hind foot bears four soft nails in descending order of size, 2, 3, 1, 4. The second nail is 4·5 mm. wide. The ratio between the circumference of the sole of fore foot and the height of the specimen is 1:2·3.

*Skin.*—The skin is not pigmented and does not show hairs in any part of the body.

*Temporal Gland.*—The gland is 9 mm. in diameter. The opening of the duct is seen on the surface of the flattened swelling formed by the gland, in the postero-inferior quadrant, eccentrically placed 1 mm. above its lower border.

*Fœtus C (25·0 cm., male)*

*Head.*—The head is slightly compressed. The ears are large. The proboscis is well developed, extending considerably below the level of the forefoot, thus approximating the adult stage. The neck is apparently thick possibly due to its ventral flexure in accord with the marked curve of the fœtus (Fig. 3). The posterior aspect of the proboscis shows three longitudinal sulci, one median and two lateral, which are more distinct in the lower part (Fig. 4). Besides, there are transverse sulci on both the aspects of the proboscis as seen in the adult (Figs. 4 & 5). The dorsal margin of the lower end of the proboscis shows the well developed prehensile lobe or 'finger'. The eyes are small and closed but the eyelids are not fused. Posterior to the eye a flattened circular swelling of 22 mm. diameter marks the temporal gland. The upper lip-base of the proboscis shows on either side in front of the well defined labial cushion, a deep oval fossa, the site of eruption of the milk tusks. The lower lip is elongated with its tip pointed; its upper face is grooved to accommodate the tip of the tongue.

*Trunk (Body).*—The trunk is strongly arched in its dorso-lumbar part indicating the postural adaptation of the developing fœtus in the uterus. The external genitalia are well formed. The external urethral orifice is 'Y' shaped with the two dorsal diverging limbs shorter as in the adult. The
prepuce nearly completely covers the penis, exposing the tip of the glands at the preputial orifice. The two pectoral mammae are well developed with the nipples seen as small conical elevations, placed 2 cm. apart.

Tail.—The tail is proportionately longer and lacks a terminal tuft.

Limbs.—The limbs are well formed. The sole of the forefoot is oval in outline with the broader end posteriorly (Fig. 6) and is flesh coloured. It bears five nails of the same colour. The nails are slightly hard indicating the degree of keratinisation. Their size in decreasing order is 3, 4, 2, 5, 1, the third measuring 12 mm. transversely. The sole of the hind foot is an elongated oval in outline with the narrow end posteriorly and is flesh coloured. It bears four nails of the same colour which are partly keratinised as in fore foot. Their size in decreasing order is 2, 3, 1, 4, the second measuring 11 mm. in width. The relation between the circumference of the forefoot and the height is 1:2.25.

Skin.—The skin shows a generalised pigmentation throughout the external body surface except the soles of the feet. The degree of pigmentation,
however, varies in different parts of the body. The skin on the dorsum of the body, crown of the head, and the anterior aspect of the proboscis in its upper half is dark brown; that on the ventral aspect of the trunk (body), limbs and the lower part of the proboscis is light brown. The difference in the degree of pigmentation of the skin is due to the density of distribution

![Diagram](image)

Fig. 6. Outline of sole of fore foot and that of hind foot of Fetus C. *S.L.F.*, sole of left fore foot; *S.L.H.*, sole of left hind foot; N. 1, N. 2, etc., indicate nails of corresponding digits.

of the chromatophores. A thin layer of the epidermis was dehydrated, cleared and mounted in Xylo1 damar and examined under the microscope (microphotograph Fig. 7). It shows the squamous cells with the chroтомatophores arranged in their cytoplasm with varying distribution in different cells. The intercellular cement substance also shows chromatophores of finer size.
The skin all over the body shows numerous macroscopic pits, the sites of invagination of the epidermis to form the hair follicles. The hair follicles on the skin of the dorsal aspect of the proboscis are represented in Fig. 8.

![Diagram](image)

**Fig. 8.** Hair tracts on the dorsal aspect of the lower part of the proboscis of Fœtus C. 1, 2, 3, 4, are regions showing different directions of hair tracts.

The dorsal face of the tip of the proboscis shows white conical hairs sprouted above the epidermal surface. In no other part of the body (including the eyebrows, eyelids, and the tip of the tail) were the sprouting of the hairs on the epidermal surface observable. Hill (1938) mentions that the skin surface is everywhere hairless in the larger fœtus (31.5 cm. C.R. length) described by him.

**Histology of the skin.**—Vertical sections of the skin reveal under the microscope five to six layers of wavy stratified squamous epithelium constituting the epidermis which is moulded on the dermis (Fig. 9). The deepest layer of the epidermis consists of columnar cells and above them there are three to four layers of squamous cells, having affinity for the basic stain. The superficial layer consists of a narrow zone of transversely elongated scales keratinised to form the stratum corneum having affinity for the acid stain. At several places the epidermis invaginates into the dermis forming the rudiments of hair follicles. The hair follicles are still primitive not exhibiting the forked bottom embracing the vascular dormal papilla. The cells of the hair follicle are all protoplasmic, not showing keratinisation of the central cells to form the hair.
The dermis consists of a loose network of fibroblasts which preponderate over fibres that are just being formed around the rudiments of the hair follicles. The upper part of the dermis is papillated adapting itself to the wavy epidermis.

Sebaceous and sweat glands are not yet developed and consequently arrectores pilorum muscles are not differentiated.

*Mammary gland.*—The nipples are situated one on each side at a distance of 10 mm. from the median line in the pectoral region. Histological examination of the mammary gland reveals a close net-work of fibroblasts in which are ducts lined by stratified epithelium of three to four layers of short columnar cells constituting the undifferentiated stage of the gland (Fig. 10).

*Temporal gland.*—Posterior to the eye a flattened circular swelling of 22 mm. diameter marks the temporal gland. The opening of its duct on the surface of the skin covering the gland is in the postero-inferior quadrant, eccentrically placed 6 mm. above its inferior border.

*Histology of the temporal gland.*—A tangential section of the gland (Fig. 11) across the main duct reveals several lobules separated by an abundant interlobular connective tissue in which the main duct is running to the surface of the gland receiving several small lobular ducts all round. The main duct is lined by stratified squamous epithelium thrown into folds.
that occlude the lumen. The deepest layer of the epithelium consists of columnar cells, and the other layers, of squamous cells. The wall of the duct is fibro-muscular consisting of a thin layer of plain muscle fibres next to the epithelium and a thick outer layer of connective tissue. The lobula ducts are small and are lined by a double layered epithelium of short columnar cells.

The lobules show several irregularly tubular alveoli that are separated by a small amount of interalveolar connective tissue. The alveoli have a thin wall of connective tissue lined by a double layered epithelium of short columnar cells.

From the structure and staining affinity of the alveolar epithelium the authors conclude that the temporal gland of the elephant is a modified sweat gland of the tubulo-alveolar type and agree with Eggeling (cited by Eales, 1925). We have personally observed in the adult animal the exuding secretion of the temporal gland to be a viscid dark fluid during 'must' which is generally
considered to be a period of sexual excitement. The term 'oily' has been applied by some authors (Evans, 1910) to describe this secretion. It appears that the term has been mistakenly used to denote the viscous nature of the secretion. The question suggests itself, whether the gland is apocrine in nature containing in its viscid secretion ingredients of partial cellular disintegration? This can only be determined by a study of the temporal gland at the time of 'must'.

**DISCUSSION OF CERTAIN DEVELOPMENTAL FEATURES**

*Auricula.*—The illustrations in Fig. 12 show the auricula in the three foetuses drawn to natural size under the camera lucida.

The auricula in foetus A is a triangular flap with its anterior border (base) attached round the external auditory meatus. The superior border is short and nearly horizontal. The posterior border is longer than the others and is oblique, directed downwards and forwards. The inferior angle shows anticipations of the appearance of the inferior border.
The auricula in foetus B is quadrilateral with the anterior border attached round the external auditory meatus. The superior border is markedly convex and is longer than the other borders. The posterior border is nearly as long as the superior, directed with an increased obliquity downwards and forwards. The inferior border is nearly half as long as the posterior with its concavity directed downwards.

The auricula in Foetus C is pentagonal and leaf-shaped, with an anterior border attached round the external auditory meatus. The superior border is the longest and represents two adjacent sides of the pentagon, consisting of an anterior oblique part above and in front of the external auditory meatus, and a posterior horizontal part. The posterior border is shorter than the superior with more increased obliquity downwards and forwards. The two small linear folds near its inferior part seen in the Fig. are not permanent but due to folding of the edge. The inferior border is shorter than the posterior, with its concavity directed downwards. The combined inferior and posterior borders are symmetrical with the superior border.

For comparing the proportionate growths of the auriculae in the three foetuses, the following technique was devised. The temporal region between the posterior angle of the eye and the external auditory meatus was taken as a relatively stable region for comparing the axial lengths of the auriculae.
measured from the external auditory meatus to the apices. A ratio was worked out with the auricular length as the numerator and the temporal length as the denominator. This ratio in the three foetuses A, B, and C is $8:15$, $20:21$ and $47:44$, respectively. The above indicates that there has been much accelerated growth of the auricula as compared with the rate of growth of the temporal region during development from stage A to C.

The auriculae of the adult African elephant are very large and foliate, extending far above the level of the crown so that both together form a hood to cover the crown enabling the animal to withstand the heat of the tropics in the open. This is in marked contrast to the comparatively small ears of the Indian elephant which is known to be unsuited for an open life in the tropics and prefers a natural habitat in thick jungle. Fig. 13 which is a tracing from authenticated photographs (Evans, 1910) illustrates the contrasted auriculae.

![Fig. 13. Tracings from photograph of the adult African elephant and Indian elephant to show the difference in form of the auriculae.](image)

The evidence from foetal anatomy indicates that a large auricula is not to be considered as a primitive condition but as a specialization. The African elephant illustrates this tendency in an exaggerated manner.

**Proboscis.**—Recognising the fact that proboscis has been evolved progressively in the evolution of the Proboscidea, we wished to make a comparison of the relative lengths of the proboscis of the three foetuses with that of the adult. With this in mind we also measured the length of the proboscis and the height at shoulder of an adult tusker in the Madras Zoo. Due to the constant active mobility of the proboscis very accurate measurement of the same, it must be admitted, was not possible. Approximately the ratio of the length of proboscis to height at shoulder is $1:1.5$, in the tusker.
The corresponding ratio of proboscis length to height at shoulder in the foetuses was 1:2.8 in Foetus A; 1:2 in Foetus B; and 1:1.5 in Foetus C. Thus it is evident that Foetus C has attained the relative length of the proboscis as in the adult. There is a notion in general that the new-born elephant calf has a shorter proboscis to facilitate mammary sucking. But from the observation on Foetus C, this view seems to be unwarranted.

**Neck.**—Eales (1925) remarks that the neck in the African elephant foetus is relatively longer and more slender than in the full grown. The neck in Foetus A and Foetus B is distinct and slender. But in Foetus C the neck is not so distinct. To make a comparison between the relative size of neck to body, we adopted the following procedure. The ratio of the circumference of the neck to the girth at the umbilicus was worked out in the foetuses and also in two adult elephants in Madras Zoo. The ratio is 1:1.7 in Foetus A; 1:1.5 in Foetus C; and 1:1.9 in the adults. The ratio in Foetus B has not been taken as its abdomen was already eviscerated and hence the girth at umbilicus was not reliable. This ratio is found approximately equal in Foetus A (the smallest foetus) and the adult. But Foetus C shows the ratio altered in favour of the neck. This we consider as due to the uterine adaptation of the foetus involving the ventral flexure of the neck giving it an apparently stouter neck.

**Hair tracts.**—There is no evidence of any eruption of hair anywhere on the body in Foetuses A and B. In Foetus C, as already noted, there is generalized development of hair follicles all over the body. But sprouted hairs are seen only in the lower part of the dorsal aspect of the proboscis. The hair tracts in this region are represented in Fig. 8. Though hairs were not noticed in all the follicles due to partial peeling of the epidermis, the pattern of the hair tracts here could be studied. The hair tracts along the sides of the dorsal aspect of the proboscis were oblique rows (marked 3 in Fig. 8). These oblique rows tend to become more transverse in the lowest part of the proboscis. The obliquity of these tracts tend to become nearly vertical as they are traced upwards (region marked 4 in Fig. 8). On either side of the edge above the terminal finger of the proboscis in the region marked 1, the hair tracts are pronouncedly oblique and meet each other over the base of the finger. A little above this region are some transverse tracts of hair marked 2 in the Fig. The hairs seen were white and conical and the general direction of individual hairs was downwards and medially.

**External Genitalia.**—All the three foetuses under study here happen to be males. This is a misfortune for the authors that they could not study the female genitalia. But it has made possible the observation of the progressive development of the male genitalia.
The external urethral orifice.—In Foetus A it is a small vertical slit (Fig. 14) whose ventral end is very acutely pointed and on close examination under a hand lens is found to be in continuation with the recently closed lips of the urethral groove. This is illustrated in the inset diagram by the side of the Fig. showing the condition in Foetus A. In Foetus B also, a similar condition is noted. In Foetus C the external urethral orifice is ‘Y’ shaped with the two dorsal diverging limbs shorter. This is similar to the condition in the adult.

Penis.—In Foetuses A and B the exposed part of the penis is cylindrical surmounted by a bulbous glans. The glans shows on its ventral aspect the external urethral orifice. The penis behind the glans is only partly covered by the internal layer of the prepuce with the preputial ring a little below the external urethral orifice. The preputial orifice is proximal to the preputial ring and at the orifice the external layer of the prepuce is continuous with the skin of the abdomen. The preputial raphe is clearly seen. The glans is more bulbous in Foetus B than in Foetus A. The preputial ring is also better marked in Foetus B. In Foetus C the penis is nearly completely covered by the prepuce exposing only the tip of the glans at the preputial orifice, as in the quiescent state in the adult (Fig. 15).
Relation between the circumference of the forefoot and the height at shoulder.—The relation between the circumference of the forefoot and the height at the shoulder is regarded as constant in the adult. The ratio is 1:2, well known to elephant hunters who judge the size of the animals being tracked by the footprint. This ratio is 1:2.3 in Fœtus A; 1:2.3 in Fœtus B; and 1:2.25 in Fœtus C. The ratio which is less than 1:2 in the foetus probably becomes gradually changed after birth due to the spreading of the sole with bearing of the weight.

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SUMMARY

The external characters of three foetuses of the Indian elephant, Elephas indicus, of 7.7 cm., 13.3 cm., and 25.0 cm. C. R. length have been figured.
Fig. 1. Photograph of Fœtus A of 7.7 cm. C.R. length.

Fig. 2. Photograph of Fœtus B of 13.3 cm. C.R. length.
Fig. 3. Photograph of Fœtus C of 25.0 cm. C. R. length.

Fig. 7. Microphotograph of epidermis of Fœtus C to show chromatophores.
External Characters of Three Foetuses of the Indian Elephant

and described. In size these foetuses form a valuable intermediate series between foetal specimens previously noticed in scientific literature. Stages in the development of the auricula from a small triangular flap to a shape approximating the adult condition, are seen. The auricula shows a relatively accelerated rate of growth than the temporal region. The relation between the neck and umbilical girth has been studied. In the two smaller foetuses (7-7 cm. and 13-3 cm.) the skin is not pigmented and it is devoid of hair follicles. In the largest foetus of 25 cm. there is generalized pigmentation of skin with varying intensity in different regions; and there is over the surface, development of hair follicles, which are mostly primitive and do not show keratinization of the central cells to form hairs. Erupted hairs are found only on the lower part of the dorsum of the proboscis. Here the general pattern of the hair tracts is oblique as traced downwards and becoming vertical as traced upwards. A little above the 'finger' of the proboscis the tracts are transverse. The direction of hair on probosis is downwards and medially. The temporal gland has been studied in detail in the 25 cm. foetus. Its histology shows it to be a modified sweat gland of the tubuloalveolar type. A question is put forward whether it might be of apocrine nature. The mammary glands are pectoral and are found to be still in an undifferentiated stage even in the largest foetus. All the three foetuses are male and show grades of differentiation of the external genitalia. In the earlier foetuses the closure of the urethral groove could be noted and the largest specimen has features nearly similar to the adult. The ratio of the circumference of the sole of the forefoot to the shoulder height shows a gradual transition, but is different from that in the adult; the adult condition is probably secondary to a functional spread of the sole consequent on weight bearing.

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