

Mills⁷ also suggests that lateral moraine tills have slightly more subangular to subrounded clasts than do the ablation tills.

That the deposits which are considered to be lodgement tills exhibit clasts with high roundness and sphericity indices is in agreement with their considered mode of origin.^{4,6,7} Conversely, the let-down ablation till, which has not been subjected to subglacial crushing and abrasion, exhibits the more angular and less spherical shape, which would be expected of clasts little changed from their original state. The moraine origin of the Platy Till is clearly indicated by the landform within which it occurs, yet it would apparently be possible to distinguish it by clast shape parameters alone, for the range of very angular to subrounded clasts gives it a standard deviation greater than that found for ablation tills.

The percentage of striated clasts can also be used as an adjunct indicator of till genesis. Mills⁷ has shown that ablation tills exhibit a far lower percentage of striated clasts than do lodgement tills, whilst tills from lateral moraines display an intermediate value (as was found at Macaroni Rocks [Table 1]). This striation information is a reflection of the clast transport mechanism¹² and thus may be indicative of the till mode of origin.

Measurement of the relative percentages of pyroclasts and grey lava debris within a till unit may be an approach only applicable to Marion Island or a site where a similar sequence of events occurred. It is a particularly useful technique for determining the first till of each glacial, in the apparent absence of any volcanic activity during the glacial, the initial ice advance reworked the interglacial pyroclastic material to give a pyroclast-rich till. Thus, the till which is rich in pyroclastic material acts as a datum for that glacial.

Clast size was not found to be a useful criterion for considering till genesis on Marion Island, although it is suitable as a comparative means of distinguishing between successive till units.

The method of analysis described above, although time-consuming, has been shown to provide objective criteria by which tills on Marion Island may be differentiated, and also permits an assessment of their mode of formation.

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Anatomical Society of Southern Africa

The following are abstracts of papers presented at the XIth Annual Congress of the Society held at the University of the Western Cape, Bellville on 16 and 17 May 1980.

Anatomiese Vereniging van Suider Afrika

Die volgende is uittreksels van referate, wat gedurende die XIde Jaarlikse Kongres van die Vereniging vanaf 16 tot 17 Mei 1980 by die Universiteit van Wes-Kaapland, Bellville gehou is.

The Secondary Fossa for the Posterior Lobe of the Hypophyseal Gland

J. I. Grimes

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In 1979 a survey was carried out on the hypophyseal fossae of 62 cadavers. In 32 of these the hypophyseal glands were dissected out personally. In 30 the hypophyseal glands were removed by students and fossae personally inspected.

The 32 hypophyseal glands dissected out were adherent to the dura mater in the region of the angle between the floor and dorsum sellae and to the dorsum sellae itself. In this region, in 28 cadavers, there was a secondary fossa in the dural lining of the hypophyseal fossa, which contained the posterior part of the hypophyseal gland, shown histologically to be the posterior lobe. In some of these there was a secondary diaphragm formed

by the dura at the entrance to the secondary fossa, which sometimes almost sequestered the posterior lobe from the rest of the gland. On removal of the secondary dural fossa from the underlying bone, to which it was very adherent, a fossa in the bone of the sphenoid in the angle between floor and dorsum sellae was found. In the remaining four cadavers, although no secondary dural fossa was seen, the dura was adherent to the underlying bone in the described angle and the bone showed a shallow excavation, referred to as saucerisation.

The secondary fossa in the bone of the hypophyseal fossae varied in size as follows: side to side width 9 mm – 3 mm, antero-posterior width equal to or slightly less than the former, and depth from saucerisation up to 3 mm. In some of these secondary bony fossae, there was a hole in the base of varying size, resulting in a communication between the hypophyseal fossa and the posterior cranial fossa.

In the 30 hypophyseal fossae inspected, 18 showed similar secondary fossae for the posterior lobes of the hypophyseal glands, some with a hole through into the posterior cranial fossa, and four showed saucerisation.

As all except three were negroid cadavers, 50 dried caucasoid skulls were inspected. These showed secondary fossae in the hypophysal fossae varying from saucerisation to deep fossae, some with a hole in the base as described.

Embryonic Origin of Gut and Pancreatic Endocrine Cells

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Many authors are at present under the impression that gastro-intestinal and pancreatic endocrine cells are derived from the neural crest. However, evidence to the contrary is accumulating. In the rat, pancreatic B cells develop in mesoderm and endoderm cultured in the absence of ectoderm.¹ In chick embryos, in several experiments, neural tube incorporating neural crest from hindbrain and trunk levels has been replaced by isotopic, isochronic grafts from embryos labelled with tritiated thymidine or by grafts from quail embryos. Neural crest derivatives (various ganglia) arising from the grafts contained radioactively labelled nuclei or the quail nuclear marker, an exceptionally large nucleolus. Thus these crest cells had undergone normal migration, yet pancreatic islet cells present did not show a marker. In this way French workers² and our group^{3,4} have demonstrated that islets are not derived from trunk or hindbrain levels of the neural crest. We have recently shown that the major pancreatic endocrine cell types are embraced by this conclusion.

It was demonstrated some years ago that avian enterochromaffin cells, then the only type of gut endocrine cell known, did not originate in the neural crest.⁵ This was confirmed by the French school, which found no cells with quail nuclei in the gut epithelium of quail-chick chimerae prepared as above.⁶ These workers have since cultured combinations of ectoderm from the one species with endo- and meso-derm from the other. No cells of ectodermal origin were present in the gut epithelium, which contained enterochromaffin cells. They conclude that gut endocrine cells do not arise in the neural crest.⁷ We have demonstrated this for a number of specific gut endocrine cell types by combining quail endoderm and chick mesoderm (and *vice versa*) in the absence of neural crest and indeed of any ectoderm at all. The endocrine cells present in the cultured grafts prove to be derived from endoderm as revealed by the presence of quail nucleoli only when quail endoderm has been used. Endocrine pancreas found in a few of the grafts is also endodermal in origin.

It is apparent that at least the majority of gut and pancreatic endocrine cell types are not derived from the neural crest: the former and probably the latter are endodermal in origin.

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Cranial Capacity of the South African Negro

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The cranial capacities of the skulls of 50 male and 50 female Zulus were determined. The following linear dimensions were also obtained: length, breadth, basibregmatic height, transverse arc, horizontal circumference, the total, frontal, parietal and occipital sagittal arcs, and the frontal, parietal and occipital sagittal chords. Simple and multiple linear regression analyses provided formulae for the estimation of cranial capacity from linear measurements.

The cranial capacities are $1373 \pm 106 \text{ cm}^3$ ($\bar{x} \pm \text{s.d.}$) for males, and $1251 \pm 100 \text{ cm}^3$ for females. The female values are significantly smaller than the male values ($P < 0.01$), in keeping with the smaller body size of females.

The best regression equations use a combination of the horizontal circumference and transverse arc. In this equation the coefficient of correlation, r , is 0.83 for males and 0.87 for females. A series of other formulae were derived using various combinations of the linear measurements.

These formulae indicate the potential accuracy of any of the measurements for assessing cranial capacity. For example, the traditional

measurement in paediatrics for assessing head size is horizontal circumference. This is shown to be less accurate ($r = 0.67$ for males and 0.76 for females) than several other formulae, notably those using the transverse arc (measured from porion to porion through bregma). The latter measurement might thus be considered for use in the assessment of cranial capacity, either together with horizontal circumference or as an alternative.

Identification and Siding of Metacarpal Heads

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Although metacarpals are easily identified and sided if the bases are present, isolated heads of metacarpals 2 to 5 pose a more difficult problem. Such a problem was recently encountered in a study of fragmented fossil hominid metacarpals from Sterkfontein, Transvaal. An accurate method of identifying and siding heads of metacarpals 2 to 5 was devised.

The fourth metacarpal head is bilaterally symmetrical, and the metacarpus tends to be symmetrical about metacarpal 4. Thus the second and fifth metacarpal heads are approximately mirror images of one another, although the second is more asymmetrical. The degree of symmetry of the third metacarpal is somewhere between that of the second and fourth metacarpals.

Five characteristics of the metacarpal head were selected for the assessment of the degree of symmetry. While only the features of metacarpal 2 will be reported here, the features of the metacarpals 3 to 5 may be inferred from the pattern of symmetry described above.

The first characteristic is the relative proximal extension of articular surface processes on the medial and lateral sides of the ventral surface of the head. The lateral process extends more proximally in metacarpal 2. The second characteristic is the relative proximodistal position of the medial and lateral tubercles for the origins of the collateral ligaments. The medial tubercle is the more distally positioned in metacarpal 2. The third characteristic is the relative distal extension of the medial and lateral collateral ligament grooves. The medial groove is the more distal in metacarpal 2. The fourth characteristic is the relative dorsal extension of the medial and lateral collateral ligament grooves. The lateral groove extends more dorsally in metacarpal 2. The fifth characteristic is the angle of deviation of the long axis of the head articular surface from the sagittal axis of the head. The axis is deviated dorsomedially in metacarpal 2.

Functional Anatomy of the Baboon's Foot

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In this paper the anatomy of the baboon's foot in relation to locomotion and prehensibility was described.

The baboon's gait is symmetrical as either a diagonally spaced or a laterally sequence gait. It is asymmetrical only with running. During the stance phase of walking, body weight is transferred from the heel to the lateral three digits with the great and second digits taking very little part. The baboon's foot is very mobile. This mobility depends on the presence of large bursae surrounding the tibio tarsal ligament and tendons of gastrocnemius, plantaris, tibialis posterior and peroneus longus. The long plantar ligament is broad and thick and separated from the plantar aspect of the bases of lateral metatarsals by a bursa. An interosseous nutrient foramen exists between the adjacent surfaces of the cuboid and the lateral cuneiform bone.

The osteology and arthrology of the baboon foot confirm the degree of mobility. Thus, while it resembles the mild *talipes equinovarus* of man, it moves easily in dorsiflexion, plantar flexion, inversion and eversion. Sesamoid bones over all the metatarsophalangeal joints increase the power of the tibial and fibular flexors. The first metatarsophalangeal joint is a condyloid joint with the articular surface on the first cuneiform set on a laterally deviated pedestal.

All the lower limb muscles are involved in walking but soleus, tibialis posterior, gastrocnemius, plantaris, flexor digitorum tibialis and flexor digitorum fibularis provide power for the thrust of the foot.

The foot grip is a power grip. The hallux is abducted and rotated into pseudo opposition at the joint between the first cuneiform and the first metatarsal bone. The flexor element of flexor digitorum fibularis and peroneus longus provide for flexion of the hallux. Flexor tibialis and fibularis with the intrinsic foot muscles complete the grip.

Y-Chromosome Fluorescence as a Means of Sex Identification in Human Teeth

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Often in cases of homicide, mass disasters and at archaeological sites a single tooth is the sole remains. Until recently such a tooth has yielded very little useful information. In 1973 Seno and Ishizu¹ proposed a method of sex identification for human teeth. They claimed that sex can be determined with certainty from a single tooth. The success of this method is dependent on a fluorescent F-body being observed in the Y chromosome of interphase nuclei of dental pulp cells in male teeth after staining with quinacrine dihydrochloride. The fluorescence is due to the uptake of the quinacrine dye by the distal portion of one of the long arms of the Y chromosome. Sex identification of a single tooth has been considered virtually impossible from morphological characteristics. Thus the development of a specific technique for the identification of sex would be invaluable. Obviously the value of this method when only a single tooth is available lies in its reproducibility in any laboratory.

In the present study, carried out on a mixed South African population group, Seno and Ishizu's method proved unsuccessful. No fluorescence was obtained with quinacrine dihydrochloride, the components of the tissue were greatly distorted and it was impossible to identify with accuracy actual cells, either when staining routinely or for fluorescence.

Seno and Ishizu's technique was thus modified. The dental pulp was extirpated, fixed in Carnoy's fluid and embedded in paraffin wax. Sections were cut at 10 µm intervals and stained with quinacrine mustard. An F-body was demonstrated in the cells of dental pulp of male teeth, but not those of females. Using this technique, sex identification has been made on the dental pulp of teeth up to 5 months after extraction.

It appears that this modified technique can be adopted as a simple laboratory routine, making sex identification of human teeth a certainty.

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The Developing Poison Fang Canal of the Puff Adder (*Bitis arietans*)

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The formation of the poison fang canal in the Puff adder has not been adequately described in the literature. The development of the fang is unlike that of any other tooth.

Two juvenile Puff adder heads were decalcified and serially sectioned in the coronal plane, stained with haematoxylin eosin and Masson's Trichrome.

The primary tooth bud is partly attached to the buccal epithelium. At the next stage, the start of the development of the poison canal by a process of invagination and the development of two projections on either side deepen the groove or trough. The dental papilla is enclosed by odontoblasts and ameloblasts. Two projections indicate the anterior fang surface. During further development the paired projections become hornlike, resulting in a deepening trough. Around the developing fang is a connective tissue sheath and lying between the sheath and ameloblasts a loose fibrous type of tissue which could probably be a form of stellate reticulum for nutrition and protection of the secreting ameloblasts. The hornlike processes elongate and subsequently curve over, meet and fuse forming the venom canal.

The canal is filled with a large amount of fibrous type connective tissue which subsequently disintegrates. Owing to this form of development the pulp cavity becomes semi-circular or horse-shoe shaped. In addition the external tooth surface and internal canal surface are both lined by enamel and dentine resulting in the dental pulp lying between two layers of enamel and dentine.

The Puff adder has double fangs and in seven adult specimens dissected paired fangs on each maxilla were always found and in one or two heads two operative or functional fangs and one replacement fang found on each side.

This particular species and probably the majority of snakes have a magazine of replacement fangs in various stages of development. These lie behind each functional fang and move into position throughout the snake's life to replace the discarded functional fangs. This form of venom canal development makes an extremely efficient injection mechanism when seen together with the fang sheath and pressurised venom apparatus.

Gastrin-immunoreactive Cells in the Crocodile Stomach

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A source of reptilian gastrin was sought by other workers for studies on the molecular evolution of gut hormones, so the crocodile was chosen as a large and common species of reptile which would provide sufficient tissue for this purpose.

A pylorus is not obvious in the crocodile. To locate it, or any other part of the stomach rich in gastrin, we applied immunocytochemistry to detect cells storing this hormone.

In a pilot study we used two juvenile crocodiles, 1.5 m long and approximately four years old. Tissue from four regions of the stomach was subjected to an indirect immunoenzyme technique. Cells showing gastrin-like immunoreactivity were found in only one tissue sample. This had been taken near the outlet of the stomach. To increase the chance of finding a localised population of cells the smaller stomach of crocodiles three weeks old was used. A bulbous region, not evident in the juvenile, was found between the corpus and the duodenum. Tissue was sampled from the bulbous region and adjacent corpus of three specimens. No cells showing gastrin-like immunoreactivity were found in the samples of corpus, but a reasonable number were detected in the small glands in the bulbous region. Some cells with somatostatin-like and a few others with motilin-like immunoreactivity were found in the same glands. The bulbous region in recently hatched crocodiles thus corresponds to the pyloric antrum of mammals, in which gastrin and somatostatin cells are plentiful. In the juvenile the corresponding region, which is tubular not bulbous, would be suitable for extraction of reptilian gastrin.

We gratefully acknowledge the assistance of Mr J. Kuhlmann in providing recently hatched animals from his crocodile farm.

Somatotype of South African Men with Ischaemic Heart Disease

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Myocardial infarction subjects submitted to stress testing with a view to sport participation have been somatotyped since 1976. Mean somatotype of South African men admitted to the programme was found to be 5.0–5.4–1.8 (Fig. 1). This point as well as the scatter of individual points derived from calculating each participant's endomorphic, mesomorphic and ectomorphic components, fell into the top, left-hand triangle of the somatogram, which corresponds closely with the somatotypes of myocardial infarction subjects from other countries. These are West Germany¹ (4.0–5.5–1.0), Sweden¹ (4.6–5.0–1.6) and North America² (estimated at 5.0–5.0–2.0 from a graph).

Later South African figures show that subjects who were not taking beta blocking agents ($n = 17$) had a mean somatotype of 5.1–5.3–1.7 and those who were taking such agents ($n = 9$) had a mean somatotype of 5.7–5.7–1.4 before embarking on the programme (Fig. 2).

Children of 146 myocardial infarction patients in West Germany¹ were studied and their somatotype was found to average 4.0–4.0–4.0 ($n = 64$; Fig. 3). Of the patients' children, 10 were older than 25 years and their somatotypes had moved closer to those of their fathers (Fig. 4). Children of South African myocardial infarction subjects are at present being somatotyped.

The uses of somatotyping are numerous and include evaluation procedures affecting exercise programmes and dietary guidance. Somatotyping offers a unique way of describing morphological risk factors in ischaemic heart disease. The likelihood of a predominantly selective onslaught of ischaemic heart disease in endo-mesomorphs (that moiety of the population represented by the upper, left-hand corner of the somatogram) should be seriously considered by health authorities and cardiology workers.

Fig. 1 (see opposite). Somatotypes of South African myocardial infarction patients, with expected shift following rehabilitation (1976 to 1978). Fig. 2. Somatotypes of South African myocardial infarction patients before and after rehabilitation (1980). Fig. 3. Somatotypes of 64 children of myocardial infarction patients from West Germany (1974). Fig. 4. Somatotypes of children aged 25 years and older of myocardial infarction patients from West Germany (1974).

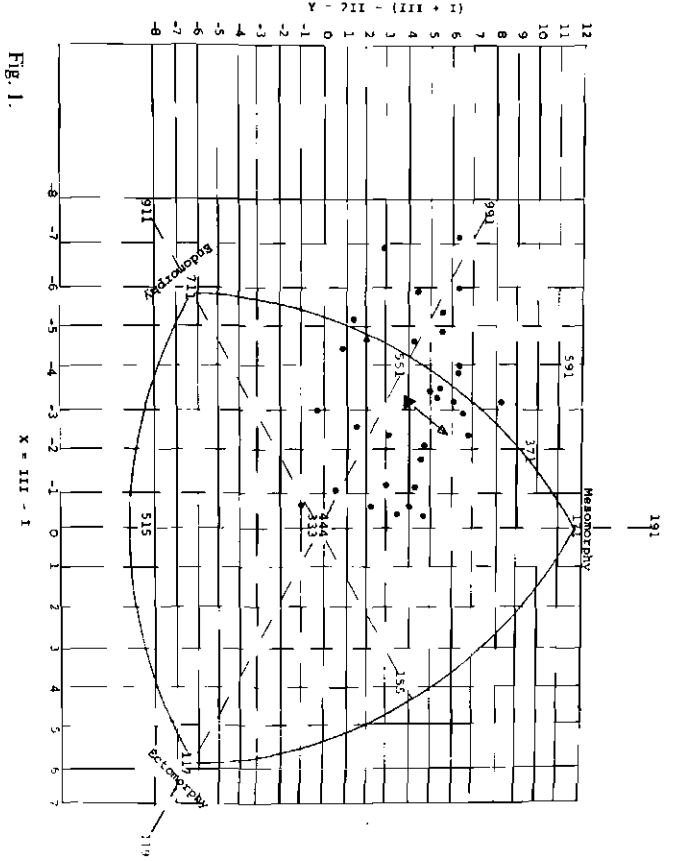


Fig. 1.

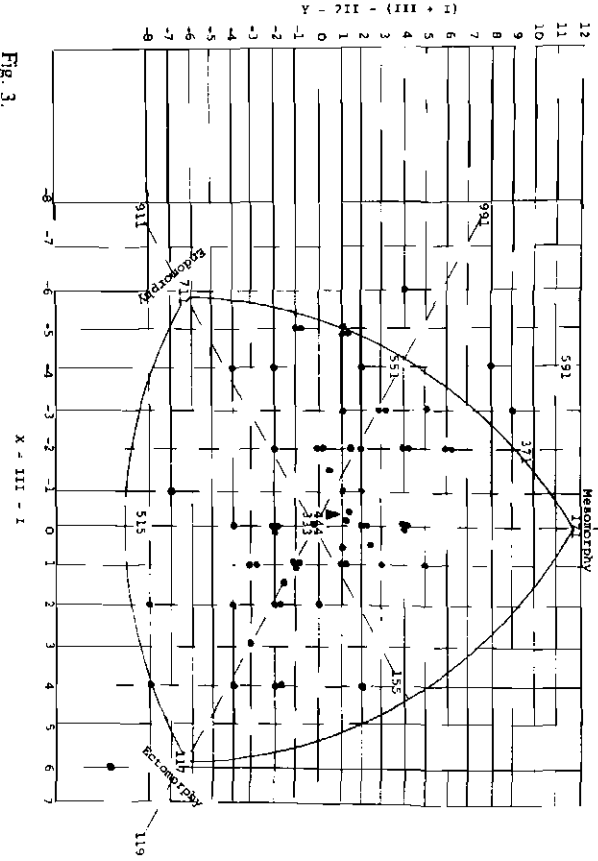


Fig. 3.

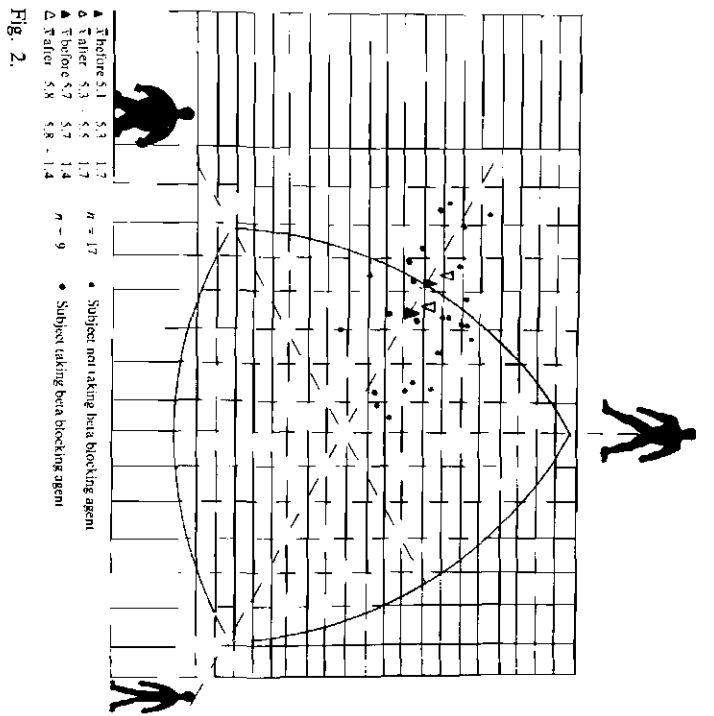


Fig. 2.

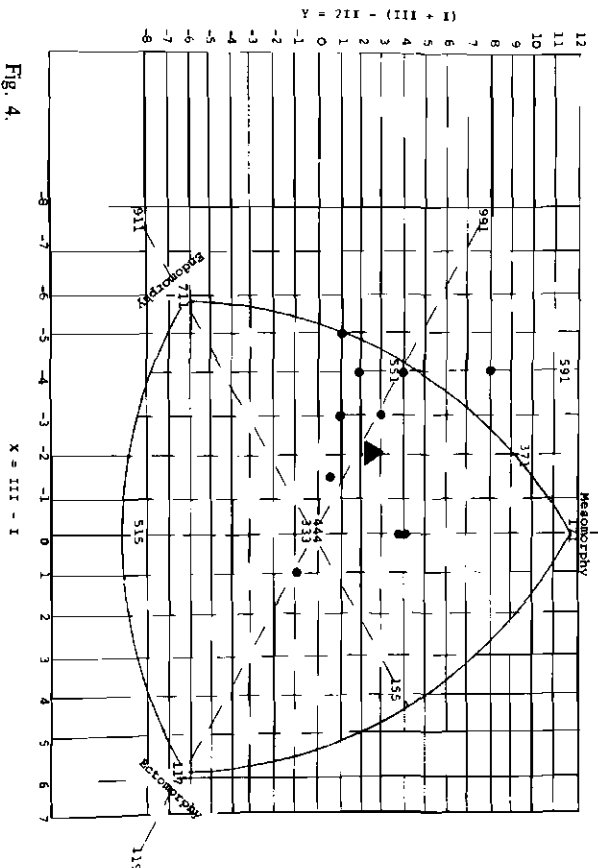


Fig. 4.

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Significance of Langerhans Cell Granules in Dendritic Epithelial Macrophages

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Langerhans cells of the epidermis, formerly considered to be worn-out melanocytes, are now known to be antigen receptors forming the first line of immunological defence of the body. They are characterised by peculiar pentalaminated discs known as Langerhans cells or Birbeck granules. These granules are postulated to originate from the Golgi apparatus or as invaginations of the plasmalemma. As a result of insufficient evidence, these explanations have never really been accepted, however.

In studies on the epithelium of the ruminant forestomach some evidence has now been obtained indicating that the Langerhans cell granules may really be intercellular desmosomal discs of the more superficial layers of the stratified squamous epithelium that have been taken up and enclosed in the plasmalemma of the interdigitating dendritic processes of the Langerhans cells. They should therefore be considered as a type of phagosome whose only significance, when found in migrating cells, is in indicating that their hosts had traversed one or other of the various types of stratified squamous epithelium of the body.

When seen in this light their variable presence in Langerhans cells of stratified squamous epithelium, their occasional presence in melanocytes or in keratinocytes or their rare occurrence in monocyte-like cells in lymph-nodes, spleen and lymphatics can be satisfactorily explained.

Owing to scarcity of lysosomes in these Langerhans cells, these granules are not readily digested and may persist for long periods. They cannot therefore have any immunological significance, as has been postulated by some authors. Owing to former lack of understanding of their origin, undue significance has been allotted to these granules.

Evolution of Limblessness among Scincid Lizards of South Africa

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Correlated trends in the morphology, behaviour and habitat of those skinks displaying gradual degeneration of limbs may be summarized as follows: (a) As the limbs and girdles gradually atrophy, the body axis hypertrophies. (b) As appendicular locomotion declines in importance, there is a reciprocal shift to axial progression. (c) Limb regression, which in skinks is correlated with a switch from a mainly terrestrial to a largely subterrestrial habitat, is, thus, probably an adaptive response to crawling on soil.

As limbs regress the trunk elongates due to an increase in the number of precaudal metamereres. The more numerous vertebrae become relatively shorter and more uniform in length. Furthermore, they become wider relative to the diameter of the body. In partially or completely limbless skinks, the ribs are more numerous, more uniform and stronger, but of smaller radius than those of their quadrupedal counterparts. This increase in the number of vertebrae and ribs enhances the flexibility and strength of the body wall, which transmits propulsive thrust to the substrate during axial progression.

Appendicular devolution is accompanied by an increase in the relative cross-sectional area of the epaxial muscles compared to the hypaxial muscles. Furthermore, the transversospinalis and longissimus systems

spread nearer to the sides of the trunk. This hypertrophy of the epaxial muscles means that the lateral flexors of the body axis are strengthened.

In the quadrupedal *Mabuya capensis*, the limbs are the most important propulsive organs. However, a weak axial component serves to increase stride length. In *Riopa sundevallii*, the axial component is more prominent than in *M. capensis*, while the miniaturized limbs are less important. Both axial and appendicular components are used for progression above the soil. The bipodous species of *Scelotes* (*bipes*, *gronovii* and *brevipes*) progress by lateral undulation above and below the soil. Above the soil the vestigial hind limbs may strut perfunctorily. The limbless *Acontias* relies exclusively on axial progression. In brief, the approximately reciprocal relationship between appendicular atrophy and axial hypertrophy is correlated on the behavioural level with a shift from appendicular to axial locomotion. These transformations are associated with entry into a subterranean adaptive zone.

Early Nasal Development in the Domestic Pig

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Olfactory placodes arise as bilateral ectodermal thickenings on the craniofacial margin of the stomodaeum and initiate formation of the nasal cavities. Cavitation in the dorsally proliferating placodal epithelium creates blind nasal sacs which subsequently communicate with the stomodaeum through the posterior nares, thus creating the primitive nasal cavities. The primary palate is the result of mesenchymal infiltration of the tissue separating the primitive nasal and oral cavities. The exact mechanism of the above events is controversial.

According to Streeter,¹ the epithelium lining the nasal sac retains a connection ('nasal fin') with the oral epithelium. The ventral part of this fin becomes secondarily infiltrated and replaced by mesenchyme, thus establishing the primary palate. Warbrick² states that the dorsal part of the fin becomes thinned (bucconasal membrane) and ruptures to create the posterior nares.

According to Hamilton and Mossman,³ however, the nasal sacs communicate for some distance in their floor with the mouth and adjacent embryonic processes make contact alongside this slit before fusing. Stark⁴ maintains that no epithelial continuity exists or epithelial fusion occurs but that the primary palate region is initially a bilaminar epithelial structure. It is merely expanded by mesenchyme. The posterior nares result when the area behind the primary palate thins and ruptures.

The present investigation was undertaken to evaluate the above two views with reference to development in pig embryos. Standard procedures regarding fixation and processing were followed and serial transverse sections of embryo heads at different developmental stages were studied by means of light microscopy.

Findings in this study support the following conclusions:

- 1) There is no evidence to support the view of an initial anterior epithelial discontinuity between the nasal and oral cavities as proposed by Stark.
- 2) No signs of initial epithelial apposition and fusion of adjacent processes in the floor of the nasal cavity, as suggested by Hamilton and Mossman, were found.
- 3) On the evidence of the findings the author agrees with Streeter that a "nasal fin" exists, that it become infiltrated ventrally by mesenchyme to establish the primary palate while its dorsal thinned portion ruptures to establish the posterior nares.

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