

## PROCEEDINGS OF THE FIRST SCIENTIFIC CONFERENCE OF THE ANATOMICAL SOCIETY OF SOUTHERN AFRICA

The First Scientific Conference of the Anatomical Society of Southern Africa was held at the Medical School of the University of Natal, Durban, on 16 and 17 May 1969. A welcome was extended to the delegates by Prof. L. Gordon, Dean of the Faculty of Medicine of the University of Natal. The President of the Society, Prof. P. V. Tobias, delivered the Opening Address.

### TEACHING TRENDS OVERSEAS

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Information was collected from 27 Departments of Anatomy overseas and correlated with that from 6 departments in Southern Africa. The disappearance of the general practitioner in densely populated areas of America was noted and the resultant alteration in university curricula for medical students studied with reference to the training of specialists in 3 years, consisting of a short basic curriculum taken by all students followed by a selected specialist pathway. The implications of this were considered in relation to registration and reciprocity and the effects of teaching anatomy on a systematic as opposed to a regional basis and without dissecting the cadaver at all.

Consideration was given to the effects of substituting for 'anatomy' other terms such as 'human morphology', 'biological structure' and 'cell biology' and to the teaching of medical students by heads of departments who are *not* themselves medically qualified.

Experimental work on computer-assisted instruction (CAI) was described and its future implication considered.

### A NEW APPROACH TO THE PELVIC FASCIA WITH SOME COMPARATIVE AND SURGICAL APPLICATIONS

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Current accounts of the pelvic fascia proving unsatisfactory, a scheme is outlined which aims at accuracy and clarity and to show the functional importance of this tissue. The pelvic fascia may be considered as three independent entities whose functions include standing in for pelvic musculature, welding and strengthening, support, allowing gliding of viscera upon one another and discouraging spread of pathology across the fascial barrier of Denonvillier. Their vital concern is to carry and protect all the vessels, nerves and ducts of the pelvis.

1. Parietal fascia forms the epimysial fascial sheaths clothing the pelvic muscles: levatores ani with extension to the pelvic brim covering obturator internus, coccygeus and piriformis. These sheaths form a truly parietal layer and reinforce only two ligaments of the pelvis: the puboprostatic/vesical, and the lateral 'true' ligament of the bladder. The superior fascia of the levator is the most significant component of the parietal layer and its following features are described: blending with prostatic capsule; blending with the superior fascia of urogenital diaphragm; reflection in lateral ligament; attachment to perineal body; contribution to conjoined longitudinal coat of the anorectum; and continuity with fibrous ligament of Treitz.

2. Septal layers are made up of the sub- or extraperitoneal connective tissue (endopelvic fascia) which contains much smooth muscle and varies in amount from a gross bulky mass to a membranous web, in which are contained the visceral vessels (blood and lymphatic), autonomic nerves, ducts—vas and ureter—and remaining ligaments of the pelvis. The septal layers may be subdivided into a peripherally sited part and two transversely directed septa, blending peripherally with one another. The peripherally sited part is always *medial* or within the parietal layer and consists of an anterior curved septum, interrupted by the bladder and

called the umbilicovesical fascia, and a posterior 'hammock-like' curved septum known as Waldeyer's layer of fascia, which is fully described. These septa meet on the side wall of the pelvis, an arbitrary dividing line being the ductus deferens in the male and the round ligament of the uterus in the female, running from the deep inguinal ring to their separate destinations within the pelvis. The umbilical artery, patent and obliterated, passes from the posterior to the anterior septum. The two transversely directed septa are the rectovesical septum of Denonvillier (or rectovaginal septum) and a condensation of the uterovaginal fascia passing between the bladder and vagina. Its analogue in the male is the false capsule of the prostate. The smooth muscle and fibro-elastic tethering ligaments formed by the septal layers are outlined in the female and male pelvis with illustrations of these and of the ducts, autonomic plexuses and vessels conveyed by septal layers.

3. Visceral pelvic fascia consists of the intrinsic covering of the viscus, which varies in different parts of the same organ, with accessions from parietal and septal layers. In the case of the anorectal junction, the fascial component of the conjoined longitudinal coat derived from tela subserosa, superior fascia of the levator, Waldeyer's fascia and the fibrous ligament of the Treitz is emphasized. Relevant comparative features are briefly described.

A wide range of pelvic and perineal surgical manoeuvres make use of the pelvic fascia along with, and sometimes as a substitute for, muscle fibres. Three operations yielding highly satisfactory results are referred to in some detail to illustrate the extraordinary importance of the pelvic fascia and the need to preserve it because of its very special functions: (a) the operation for complete rectal prolapse employing ivalon sponge to reinstate the anchoring mechanisms of the anorectal junction; (b) sacro-abdominoperineal pull-through for high anorectal agenesis, in which the blind pouch, with or without its fistula, lies above the levator ani, allowing the pouch to be drawn through the anorectal ring into the perineum while carefully preserving sphincters and the perineal body; and (c) Soave's highly ingenious technique for the treatment of Hirschsprung's disease, which not only spares the internal and external sphincters and the levator ani muscles, but preserves the perineal body and all the vital anchoring mechanisms of the anorectal region and allows the septal layers to carry their autonomic nerves and middle rectal vessels to the bowel wall.

### A COMPARATIVE STUDY OF THE SOLEUS MUSCLE IN RELATION TO ITS FUNCTION AS A MUSCULAR PUMP

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The human soleus consists of a mass of muscle divided anteriorly into medial and lateral parts by a central tendon and muscle mass. The anterior surface of the muscle is covered by an aponeurosis which attaches it to the tibia and fibula. The posterior surface of the muscle is covered by an aponeurosis which becomes progressively thicker as it proceeds distally to form part of the tendo calcaneus. The arrangement of the muscle fibres is such that their contraction would shorten the muscle, flatten it anteroposteriorly and cause the medial and lateral edges to be rolled towards each other.

Since the muscle masses are permeated with large valved veins and sinuses, the soleus muscles would appear to be constructed to enable them to exert great pressure on these sinuses to extrude blood from the lower extremities.

It seems possible that the degree of development of the soleus muscle as a pump would be an indication of the hydrostatic height of an animal. A study of the soleus muscles of the baboon and chimpanzee revealed no convincing evidence of a specialized pumping mechanism.

### STUDIES ON THE PHARYNGEAL PITUITARY OF THE CHACMA BABOON (*PAPIO URSINUS*)

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The presence of adeno-hypophyseal tissue in the mucoperiosteum of the human nasopharynx has been recognized for some six decades. Lately it has been indicated that this tissue may be of functional importance, which could be very significant in special circumstances, such as the failure of hypophysectomy in patients suffering from cancer of the breast.

This paper presents a preliminary report on studies of the 'pharyngeal pituitary' in the Chacma baboon (*Papio ursinus*).

The sellar hypophysis and a flap of mucoperiosteum centred on the vomerosphenoidal articulation were removed from 11 animals and examined histologically. Sections were stained with haematoxylin and eosin and with PAS-Orange G.

Although the tissues were somewhat degenerated, it was nevertheless possible to diagnose clearly the presence of typical adeno-hypophyseal tissue in the nasopharyngeal mucoperiosteum of several of the animals.

### FORM AND FUNCTION OF THE CHIMPANZEE MASSETER

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The mammalian masseter muscle has a succession of layers or laminae with alternating tendons. Not surprisingly this pattern is observed in the chimpanzee (*Pan troglodytes*). Superficial masseter (*sensu* PNA), the 'superficial-intermediate complex', from superficial to deep consists of three layers: lamina prima, lamina secunda, and intermediate masseter. Deep masseter (*sensu* PNA) is subdivided into a pars posterior and a pars anterior by the passage of the nerve to the masseter. Both parts are bilaminar. Pars anterior differs from pars posterior in having no tendons and arising from the medial surface of the zygomatic arch in intimate association with zygomaticomandibularis.

The mechanical qualifications of each layer are assessed for rotation and translation at the temporomandibular joint. The superficial-intermediate complex is best qualified for sagittal rotation, enjoying the largest force magnitude (physiological cross-section area) and the longest moment arm. It is poorly qualified for translating the condyle as its action line intersects the condylar path at almost 90°. Deep masseter (pars posterior), having the largest force component up and back along the condyle path, is best qualified for upward-backward translation during mandibular elevation. Pars anterior and zygomaticomandibularis perhaps function as stabilizers.

### A PRELIMINARY REPORT ON THE MACROSCOPIC AND MICROSCOPIC STUDY OF THE URETER IN A SERIES OF ABORTED BANTU FOETUSES

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A total of 460 Bantu foetuses were examined and tortuosity and dilatation of the ureter were found in 22.2%. The incidence of male to female was 3:1. The age-weight group in which the highest incidence was found was 200-400 g. In the vast majority the tortuosity and dilatation were found in the middle segment of the ureter. In none of the cases was mechanical obstruction found. Microscopic sections were taken of the proximal, middle and distal third of the ureter and controls of the same age-group, both male and female. The analysis of the histological sections is to be undertaken. All sections were stained according to haematoxylin and eosin, Gomori's and PAS methods. The literature on the morphogenesis of the ureters is reviewed, as well as the problem of hydro-ureter and megaloureter.

### THE SYMPATHETIC END-FORMATION IN FROGS

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In frozen sections fixed in cold (4°C) 4% formol or formol-calcium, in pH 7 - pH 7.2 tris malleate buffer, 0.1M, hydrolysis of ATP, TPP and  $\beta$ -glycerophosphate is localized by a Pb capture reaction in the network of Bethé in the palate of *Xenopus*. The reaction is not inhibited by the presence of either Ca or Mn ions, fails in the absence of substrate, and is inhibited by uranyl acetate or previous heating of the sections, or at pH values usual for acid or alkaline phosphatase studies.

Special attention has been paid to a prominent raised ridge of mucosa lying immediately posterior to the internal nasal aperture. In this situation localization of neutral phosphatase occurs in taste-bud-like end-organs. Immediately deep to these organs a typical sympathetic end-formation replete with cells of Cajal is revealed by the histochemical method. Both sub-epithelial and perivascular components constitute the network of Bethé, and communications with medullated fibres derived from the palatine branch of the 7th cranial nerve are revealed.

If the palatine nerve is severed where it enters the palate, marked reduction in localization ensues in the corresponding mucosal ridge within a few hours of the operation.

These facts support the view that the Bethé network is interposed between the sense organs and their somatic nerve supply, and apparently functions as a part of the sensory pathway.

### THE NERVE SUPPLY OF THE LOWER MOLAR TEETH

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Dissections of 8 mandibles, to which the muscles of mastication were still attached, demonstrated neurovascular bundles leaving the muscles and entering foramina in their areas of insertion. Examination of dry mandibles revealed numerous foramina in the retromolar region and near the condyles, as well as in other insertions, though less frequently. The nerves were found to join a plexus in the cancellous bone of the body and ramus lateral to the molar roots and the inferior dental nerve; the plexus in turn joined the main nerve or its molar branches.

The pattern of distribution of the inferior dental nerve was examined in the 8 dissections, and compared with the X-ray anatomy of 80 other mandibles.

The view is put forward that the facts discovered might offer alternative routes for pain fibres from molar teeth.

### ONCE AGAIN, THE PROBLEM OF SKEWFACE

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At the first anatomical colloquium the problem of skewfacedness (campylognathy), as occurring in Jersey cattle, was presented and illustrated by macerated skulls from cases. In the ensuing discussion many stimulating suggestions were made. The present report serves as proof of the value of the colloquia. In collaboration with F. N. Bonsma and J. G. Boyazoglu, the various suggestions were followed up.

Defects of teeth or of the temporomandibular joint do not appear to have a causative effect; neither does horn weight. The muscles, blood-vessels and nerves associated with the area of bone deviation were anatomically and histologically normal; admittedly, no detailed analysis of muscle mechanics was undertaken.

Nine directly related cases were investigated and compared morphologically with 3 non-related skewfaced individuals. The complex may be considered of wider anatomical extent than originally thought and termed 'campyloprosopey', affecting either the nasal region (campylorhiny) or the jaw region (campylognathy in *sensu stricto*), which in turn may express itself mainly in the maxillary region (campylognathus superior) or in the mandibular region (campylognathus inferior). Both the last two forms are probably variants and due to a single

autosomal recessive gene according to the available data. Non-hereditary phenocopies presumably also occur, as one of the authors (F.N.B.) had previously observed the condition in one of a pair of identical twins and a similar case has been reported in the literature.

#### ISCHIOFAGUS: AN ANATOMICAL STUDY OF TWO CASES OF TRIPUS AND TETRAPUS\*

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Two cases of ischiopagus were reported. One case was a Bantu female conjoined twin of the tripus variety. The anatomy of the various systems of the two individuals was described. One twin had gross anomalies of the heart which were incompatible with life, and only lived 2 hours. The other case was also a Bantu female conjoined twin, but of the tetrapus variety. They survived 7 days and were registered as 'Pot-en-Pan Mathse'. All cases of ischiopagus—tetrapus, tripus and bipus—reported in the literature were reviewed, including the first case of successful separation of ischiopagus tetrapus. The latter had a close external resemblance to the second case reported here.

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#### SUPPRESSION OF THE SPINOUS PROCESS OF THE ELEVENTH THORACIC VERTEBRA

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Absence of the spinous process without concomitant spina bifida has been observed in the human eleventh thoracic vertebra both as an isolated anomaly and, though more rarely, associated with combined spina bifida and absence of the spinous process of T.12. While spina bifida is apparently due to a barrier of fibrous tissue or degenerated cartilage separating the neural arch ossifications, absent spinous process implies the absence of mid-dorsal growth cartilage in continuity with these ossifications. In cases of absent spinous process without spina bifida, bone growth appears to have overtaken cartilage growth very soon after union of the arch ossifications, at latest by the third year of life: it is not yet known whether this is due to the growth cartilage failing to proliferate normally or to previous degenerative change in the cartilaginous spinous process. There is evidence that functional stresses in the growing vertebral column appreciably influence the amount and orientation of growth cartilage in the spinous process, but the suppression of the process appears to originate before the erect posture has been assumed. The apparent frequency of isolated absence of spinous process in T.11 may be linked with the position of this vertebra at a functionally transitional level in the column.

#### A STERILE BULL, CO-TWIN TO A 'FREEMARTIN'

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An infertile bull with bilateral hypoplastic subcutaneous testes is described; it was co-twin to a 'freemartin'. When killed at 21 months, it had a chimeric ratio of 77% 2A-XX to 23% 2A-XY cells in its haemopoietic tissues. Although alluring, the thought cannot as yet be accepted that this was the primary aetiological factor. Adrenocortical and hypophyseal changes, indicating a hormonal imbalance, and the possibility of a fortuitous coincidence of a genetically determined cryptorchid as complicating aetiological factors are considered.

#### A NOTE ON TASTE-BLINDNESS IN VENDA MALES

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This investigation on taste-blindness in 348 Venda males formed part of the research programme of the Department of Anatomy, University of the Witwatersrand, in the Human Adaptability Section of the International Biological Programme for 1968. The results of taste tests with PTC, using the 1949 sorting technique of Harris and Kalmus, are presented. These results, when considered with the resemblances in blood group

patterns, lend support to the view that Bushmen and Bantu are genetically more alike than their somewhat divergent morphology had suggested.

#### THE DISTRIBUTION OF PHAGOCYTOSED INDIA INK PARTICLES IN THE BODY

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The observations recorded here were made in the course of investigations on the question whether the reticulo-endothelial cells, if saturated with phagocytosed carbon particles, would still be able to induce the lymphocytes to change into antibody-producing immunocytes, or into rejection cells.

India ink particles were injected intravenously into the ear veins of rabbits, using 0.5 ml commercial Pelican India ink diluted in 10 ml physiological saline solution and sterilized by boiling. The organs of some rabbits were fixed 24 hours after the injection. Others received similar injections 11 times at 3-day intervals and their organs were fixed 33 days after the first injection.

Most of the India ink particles are phagocytosed in the spleen, the remainder in the liver, lung and bone marrow. In no other organs could phagocytosis be established.

The spleens of a few rabbits were removed. A week later they received the same amount of India ink as the non-splenectomized rabbits. The carbon particle content of the bone marrow had increased.

It was concluded that the main organ responsible for the clearing of the blood of particles is the spleen, and that in splenectomized animals the red bone marrow takes over this function.

#### THE SPRINGBOK FLATS SKULL

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The cranium and mandible of the Middle Stone Age Springbok Flats skeleton were reinvestigated. In the new reconstruction the cranial vault of the skull shows characteristics which fall well within the range of the South African Negro. In contrast to previous restorations it is not chamaecranial but orthocranial; it is not pentagonoid but ovoid; there is no frontal narrowing; and the parietotemporal suture rises well above pterion. The skull has a few features characteristic of the Khoisanoids: the great length of the cranium; low orbits in an apparently long face (total facial length estimated at 128 mm); and the mandible, although it has a low, squat ramus, is long and heavy.

#### SOME ASPECTS OF BRAIN SIZE IN PAST AND PRESENT MAN

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An increase in the capacity of the brain-case has been one of the most sustained and most marked features of hominization. It has been achieved by the sharp increase in brain-size following birth: in this respect the graph of modern human brain growth is clearly distinguished from that of the modern great apes. While the former rises steeply after birth, before it begins to 'plateau off', the latter rises only gently towards the plateau. In modern man, the measured weight of the brain has been shown to vary with sex, stature, nutritional state in early life, the source of the sample, the occupational group, the age at death, cause of death, lapse of time after death, temperature of storage after death, drainage or non-drainage of cerebrospinal fluid, and inclusion or non-inclusion of meninges. In addition, indirect evidence suggests it may vary, too, with the level of severance of the brain from the spinal cord, and with the non-nutritional, educational environment in early life. No studies of population differences to date have taken all these variables into account, or made allowance for them. Hence, up to the present time, all statements on inter-population or inter-racial differences in brain weight are insecurely based.