sometimes in one region of the vertebral column a vertebral body with a single centre of ossification, while the neighbouring body showed two centres in the sagittal plane (dorsal and ventral) and still another with two centres in the frontal plane (side to side).

He emphasises the importance of the arterial circulation in the ossification process as well as in the shape of the ossification centres. These centres vary in shape; although the spheric ones are the most frequent, they can also be ellipsoid, ovoid and even sand-glass shaped.

With regard to the intervertebral disc the author discusses its evolution and concludes that they show marked changes in their structure while the vascularisation remains almost the same throughout old age as it was originally in foetal life.

The book includes a great number of references and the many photographs, especially those showing the vascular supply, are excellent. A detailed summary in Portuguese, English, French and German is given at the end of the book.

E. FONSECA.

STIGMA—THE EXPERIENCE OF DISABILITY: Edited by PAUL HUNT. Pp. 176. London: Geoffrey Chapman, 1966.

This book is a compilation of 12 essays written by twelve disabled men and women. These are really very interesting accounts of personal experience of what it is like to be severely physically disabled from childhood or at a later stage in life. The authors are not concerned with reporting medical details of their disablement but they discuss the psychological, philosophical or economic aspects of disability.

In an appendix of the book, Phillis Willmott, a medical social worker, gives a comprehensive survey of the social services in Great Britain concerning social security in disablement.

This book is highly recommended to anyone concerned with the treatment and rehabilitation of disabled people whether medical or otherwise.

Sir LUDWIG GUTTMANN.

ABSTRACTS FROM OTHER JOURNALS

ANGIOMAS OF THE SPINAL CORD: HOUDART, R. & DJINDJIAN, R. (1966). *Proc. R. Soc. Med.* **59**, 787.

The authors report about arteriographic studies on 23 cases suffering from vascular malformation of the spinal cord. Their study suggests that these malformations are arteriovenous aneurysms. Arteriography allows a clear picture of the afferent arterial supply of the malformation, furthermore of the arteriovenous shunt and of the draining veins. Morphological similarity of angiomas at identical segmental level of the cord were found, which allows an attempt to classify these malformations topographically:

(1) Cervical angiomas are of medium size and extend over 1-3 segments. Their afferents are multiple and bilateral and obtain all their branches from the sub-clavian artery. However, one case of angioma of the cervico-dorsal junction had a supplementary afferent from an intercostal branch of the aorta.

(2) Dorsal angiomas are the largest and extend over four segments or more. Their afferents come from the aortic intercostal vessels and are, as a rule, unilateral and less numerous (2-3).

(3) Dorso-lumbar angiomas are of small size and their arterial afferent supply appears to be single. They are difficult to demonstrate arteriographically. The nourishing pedicle appears single. Its origin and course suggests that it is often not more than the artery which supplies the lumbar enlargement or the artery of Adamkiewicz. However, certain angiomas are nourished essentially by the postero-lateral artery of the spinal cord.

These anatomical findings offer new possibilities of planned surgery with a view to obliterate the circulation of the angiomas by ligature of their afferent arterial supply.

CLINICAL ASPECTS OF SPINAL VASCULAR DISEASE: Wells, C. E. C. (1966). *Proc. R. Soc. Med.* **59**, 790.

This is a very comprehensive review of spinal-vascular disease starting with Niels Stensen's (1667) observation of reversible paralysis of the dogfish's tail produced by tightening a ligature around the descending aorta to modern publications of recent years. The author also reports five of his own patients suffering from various types of vascular occlusion resulting in complete and incomplete transverse spinal cord syndromes.

Sir Ludwig Guttmann.

ON TWENTY-ONE CASES OF TETRAPLEGIA THROUGH DIVING: Maury, M., Lacombe, M. & Dumur, J. (1966). *Revue Chir. orthop. répar. Appar. moteur.* **52**, 13.

Following experience on 21 cases of tetraplegia due to diving accidents the authors stress the following points:—

Hazards of Diving: This type of accident although not frequent, having regard to the enormous number of dives performed, shows 8 to 24 per cent. of all the causes of tetraplegia.

Significance of the Trauma: The lesions of the cervical spine are less severe than those produced by other causes (25 per cent. dislocations causing tetraplegia through diving as compared with 40 per cent. to 70 per cent. of cervical spine injuries through other causes), in spite of all the additional risks involved in the first-aid management after diving accidents.

Treatment: By permanent traction without operation on the broken spine. This is particularly satisfactory if there is special equipment available such as the Egerton-Stoke Mandeville tilting and turning bed with the special head traction unit.

Severity of the Sequelae: 11 patients out of 20 have been able to walk eventually, that is to say 55 per cent. as compared with 20 per cent. of the total of our tetraplegics, but there were only two complete recoveries while nine patients are still suffering from complete tetraplegia.

Frequency of Brown-sequard Syndrome: They are considered as proof of the vascular disorders in such cases.

Mechanism of Injury: Hyperflexion or hyperextension are often impossible to determine. Most of the compression fractures occur probably when the head is in line

with the cervical spine supported by the contraction of the cervical muscles. In all the cases where there was damage to the spino-thalamic tract we assume that ischaemia in the area of the anterior spinal artery had occurred. The vertebral injuries were of such variety that hyperextension could not be accepted as the only mechanism.

It would be interesting to perform arteriographies in such lesions. The vulnerability of the vertical artery at C5-C6 level is in our experience the most frequent in cervical fractures as a result of diving.

MAURY.

INTERMITTENT ISCHAEMIA OF THE CAUDA EQUINA DUE TO STENOSIS OF THE LUMBAR CANAL: JOFFE, R., APPLEBY, A. & ARJONA, V. (1966). *J Neurol. Neurosurg. Psychiat.* **29**, 315.

Since Verbiest (1954, 1955) has drawn attention to ' claudication of the cauda equina' in patients with or without any developmental anomaly or without bone disease being present, more cases of this symptomatology have been reported in the literature.

In their present paper the authors report two cases of so-called 'intermittent claudication' of the cauda equina due to stenosis of the lumbar spinal canal. They suggest that the formation of sclerotic bone posteriorly, probably as a result of degenerative disease, may result in narrowing of the spinal canal sufficient enough to produce intermittent ischaemia of the cauda equina resulting in 'claudication'. Laminectomy of the affected vertebrae with decompression of the theca proved to be successful.

CHRONIC SPINAL MUSCULAR ATROPHY: PEARCE, JOHN & HARRIMAN, D. G. F. (1966). *J. Neurol. Neurosurg. Psychiat.* **29**, 509.

In this paper the authors, in analysing the literature, draw attention to the overlap which exists between classical amyotrophic lateral sclerosis and spinal muscular atrophy. In describing their own four cases both clinically and histologically they attempt a classification of spinal muscular atrophy. They discuss the histological feature of prolonged neurogenic atrophy and suggest that changes simulating a primary myopathy may result from this process.

Sir LUDWIG GUTTMANN.

LES COMPLICATIONS OSTEO-ARTICULAIRES DES PARAPLÉGIES TRAUMATIQUES (Bone and joint complications in traumatic paraplegia): PELOT, G. & POUSSE, G.-P. (1965). *Bull. Soc. Chir. Paris*, **55**, 7.

Bone and joint complications were found in 12 per cent. of the 500 paraplegics treated at the Invalides Spinal Centre in Paris during the last 10 years.

Emphasising the great variety of lesions seen the authors divide them under four headings:

(1) those caused by lack of mobilisation of joints;
(2) those connected with spastic contractures;
(3) those due to 'trophic disturbances';
(4) those of infective origin.

The first group yields in some cases to conservative treatment, combined with peripheral operations (tenotomies). The second shows joint-damage due to continuous

violent flexor-spasm, particularly at the hip. Subluxations, dislocations and even fractures are seen.

The third includes those cases of heterotopic ossification the origin of which is still unexplained.

The fourth contains the cases of septic arthritis, again particularly at the hip, but seen by the authors also at knee, ankle and spine, where infection derives from pressure sores or blood-borne infection (staphylococcal pyaemia).

The rapidity and extent of bone and joint destruction in the absence of clear localising signs are emphasised. Seven per cent. of their patients suffered from infected joints.

The need for a careful search for these complications in patients who are cachectic, anaemic and suffering from severe urinary infection is the greater, since the site of the lesion may not be obvious.

X-rays are essential to discover and assess the extent of the bony lesion.

Treatment of all groups is based on raising the general condition of the patient by blood-transfusion and antibiotic therapy, in the first group by passive movements, in the second often by the Alcohol block or by the myelotomy 'en croix' as carried out by Professor Pourpre. His results are consistently good in cases in which the power of erection is to be maintained while spasticity is being made to disappear.

The surgery of the third group consists of attempts at the removal of the para-articular bone-bridges, which, in some cases are removed together with the upper end of femur. This operation is also of use in cases of extensive septic arthritis of the hip. In some cases amputation and disarticulation were needed to save the patient's life.

Finally three cases of metastatic vertebral abscesses were treated by an anterior approach without grafting. The formation of firm bony bridges between the affected vertebra and its neighbours is shown.

A material of 60 cases with wide experience of the effect of surgical measures deserves more detailed description in which, in particular, the results of operative removal of ectopic bone should be given together with the period of post-operative observation.

L. MICHAELIS.

INNERVATION OF THE SPINAL DURA MATER: EDGAR, M. A. & NUNDY, S. (1966). *J. Neurol. Neurosurg. Psychiat.* **29**, 530.

The authors draw attention to the controversy which still exists amongst anatomists and other workers regarding the nerve supply of the spinal dura mater. They found that the nerve fibres innervating the spinal dura mater are all derived from the meningeal rami and reach the ventral surface of the dura by three main courses which are described in detail. No nerves were traced to the dorsal aspect of the spinal dura. The authors conclude that their studies explain on the one hand the absence of dural pain on lumbar puncture and on the other, the wide distribution of back pain often experienced following protrusion of a single intravertebral disc.

Sir LUDWIG GUTTMANN.

DIE TRAUMATISCHE QUERSCHNITTSLAESION MIT PARA- ODER TETRAPLEGIE (Traumatic Paraplegia and Tetraplegia): VOGEL, K. & STEINMANN, B. (1966). *Z. Unfallmed. Berufskr.* p. 197.

From his department at the Inselspital in Berne Professor Steinmann and his co-author report on 56 Traumatic paraplegics and tetraplegics treated since 1954. Over half had upper thoracic and cervical lesions. Almost all were admitted several months after

the accident, five months on average. The average period of treatment extended to 25 months. In the end less than a quarter were fully fit for work, another quarter did part-time work or were still in training.

In his detailed analysis Professor Steinmann contrasts his results with those achieved in some centres abroad. Being fully aware of the causes behind the delay in the patient's return to fitness and work, he pleads for a Swiss Paraplegic Centre to which, in future, patients could be sent at once. He knows that by immediate expert treatment complications can be prevented. The patient can be spared deterioration, physical, mental and spiritual, and society the appalling waste of time and money. One suggestion: In future the level of the neurological lesion, not that of the fracture or fracture-dislocation of vertebrae should internationally be accepted for classification of spinal cord lesions.

L. MICHAELIS.

REHABILITATION DER PARA-UND TETRAPLEGIKER (Rehabilitation of Para and Tetraplegics). Post-graduate Course organised by the Swiss Rehabilitation Commission. *Chairman*—Professor B. STEINMANN, Bern, Insel-Spital.

Steinmann in an introductory paper discussed the problematic of traumatic spinal cord lesions based on a statistic of 70 cases. The author refers to the unsatisfactory conditions prevailing in Switzerland regarding these patients only 15 years ago which, however, has improved in recent years. He emphasised the necessity that only clinicians who are familiar with all aspects of paraplegia and tetraplegia should undertake the management of these patients and that they should be treated from the onset in a Spinal Injuries Centre.

Rossier in a paper on the initial treatment of traumatic lesions of the spinal cord amplified Professor Steinmann's plea and gave a comprehensive survey on the methods of initial management of the broken spine, the paralysed bladder and bowels and the physical and metabolic changes as practised in his Spinal Centre at Geneva, the first to be set up in Switzerland. Rossier gave examples of the very excellent results obtained by postural reduction in profound fracture dislocations of the spine and explained his views against untimely laminectomies.

On the other hand, Markwalder and Weber favoured early operative management of the broken spine. Weber has replaced open reduction and stabilisation by metal plates as revived by Holdsworth by a combined fixation of the fracture-dislocation with wire and artificial resin, with which he fixed both the spinous processus and laminae. However, Weber's statement that vertebral fractures resulting in acute traumatic transverse cord lesions are *nearly always unstable* is quite unfounded and this view will hardly be shared even by the most ardent advocates of immediate and early surgical intervention.

Garnier reported on effects of transverse spinal cord lesions on the cardiovascular system and von Rütte on the patho-physiology of the paralysed bladder. Rossier, in discussing the reconditioning of the bladder, drew attention to the difficulties experienced in various types of spinal bladders. Schumann reported on the electrical stimulation of the paralysed bladder but emphasised that this method is still in an experimental stage. In his opinion patients with cauda equina lesions are more suitable for this type of electrical stimulation by implantation of a stimulator than those with the automatic cord bladder. Having regard to the fact that as a rule, in conus-cauda equina lesions, restoration of micturition is successful by less hazardous procedures, one may ask whether the implantation of an electric bladder stimulator is really justified.

Schäfer reported on the physiotherapy in restoring independence of the paralysed. He emphasised the importance of an early start and the inclusion of sport in the physical readjustment of the paralysed.

Nigst's paper was concerned with the occupational therapy where he discussed artificial aids and stressed the proper choice of wheelchairs and adjustment of the kitchen for the paraplegic woman. The necessity and usefulness of prescribing artificial aids should be considered carefully.

Vogelsang discussed occupational and industrial rehabilitation. Whilst stressing the value of dexterity and intelligence tests he also emphasised the importance of inclination and character for the industrial reintegration of these patients.

Finally Steinmann made a catamnestic study on 53 patients who were still alive, in the majority eight years after injury, of whom 46 answered the questionnaire. Although the results regarding occupational resettlement were, in general, satisfactory, there was room for improvement; in particular these paraplegics and tetraplegics are in need of a better after-care. He suggests that Spinal Injuries Centres should not be just places for in-patient treatment but should be information and control centres for these disabled people after their discharge from hospital (something which actually is a well-established practice for many years in Spinal Units of other countries).

SURGICAL MANAGEMENT OF CONGENITAL SPINAL LESIONS ASSOCIATED WITH ABNORMALITIES OF THE CRANIO-SPINAL JUNCTION: DELONG, W. BRADFORD & SCHNEIDER, RICHARD C. (1966). *J. Neurol. Neurosurg. Psychiat.* **29**, 319.

Two cases of Arnold-Chiari malformation associated with lumbar symptomatology resulting from fibrous stricture formation surrounding and compressing the lumbar region of the cord are described. In reporting the death of one of the patients at operation due to acute cerebellar pressure cone and the same operative complication in the other case which was only overcome by immediate ventricular tap and decompression of the brain-stem the author emphasised the risk involved in dealing surgically with these children who may also have unrecognised hydrocephalus.

EXTRADURAL SPINAL CYSTS (A Literature Survey and a Case of Multiple Extradural Cysts): KRONBORG, OLE (1967). *Dan. med. Bull.* **14**, 46.

Cases of extradural spinal cysts are very rare and up to now approximately 75 have been described in the literature and only 6 have been cases of multiple cysts.

The author described a case of multiple extradural cyst involving the spinal canal between the 4th to 12th thoracic vertebrae in a 13-year-old girl suffering from juvenile kyphosis due to Scheuermann's disease. The girl had an incomplete transverse spinal lesion below T8 with normal bladder function and only partial block by Queckenstedt's test. Suboccipital air mylography showed a complete block at the level of T6 vertebra. At operation the epidural fat tissue was absent and the ligamentum flavum was atrophic. Four extradural cysts were found communicating with the subarachnoidal space. They were removed and the dura defects sutured. Four weeks after the operation the patient walked normally and only hyperreflexia was found in the lower limbs.

The pathogenesis is briefly discussed and the theory of the origin of juvenile kyphosis as a result of venous stasis in the vertebral body is questioned.

KOMPLIKATIONEN NACH CHORDOTOMIEN (Complications after Cordotomies): BISCHOF, W. & SCHUTTE, W. (1965). *Zentbl. Neurochir.* p. 233.

This is a comprehensive and very interesting report on complications resulting from 125 cordotomies performed on 91 patients. The indications of this operation was intractable pain in patients suffering from malignant tumours and other chronic painful afflictions such as phantom pain, etc.

The disturbance of the bladder function was found to be a most frequent complication following 50 out of 130 thoracic cordotomies performed on 65 patients. In particular, this was found following bilateral cordotomies, furthermore 25 unilateral or bilateral spastic paresis of the lower limbs was the result of 67 cordotomies. Although there is no doubt about the great beneficial effect of this operation in relieving intractable pain, especially in patients with malignant processes, only in 45 patients was complete relief of pain achieved, as found by reviewing 64 operated cases over a period between 1 to 13 years. Segmental irritation at the level of the operation was found not infrequently following cordotomies at T4 level, and its mechanism is discussed. Hypotension was seen in 11 per cent., irreparable respiratory arrest only in one case following bilateral high cordotomy. Reference is also made to sexual disturbance, intestinal paralysis, paradoxical temperature sensations and pressure sores, although these were less frequent sequelae. The immediate mortality rate was 2·2 per cent., the final 7 per cent.

Sir LUDWIG GUTTMANN.