BIOLOGICAL ENGINEERING SOCIETY MEETING REPORT

LONDON & STOKE MANDEVILLE

Following the A.G.M. in the Engineering Department of University College, London W.C.1. on the 21st October, members and guests attended the fourth Woolmer Memorial Lecture. This was delivered by Sir Ludwig Guttmann, retiring director of the National Spinal Injuries Centre at Stoke Mandeville. In his introduction, Professor A. C. Dornhorst mentioned that Sir Ludwig had practiced neurosurgery in Breslau prior to his arrival in Britain shortly before the war. Since then, he had devoted himself to the treatment and rehabilitation of spinal patients, and had received many honours for his pioneering work on their behalf at Stoke Mandeville.

The 1966 Woolmer Memorial Lecture—The Spinal Man

Sir Ludwig Guttmann.

Up to twenty years ago, the treatment of spinal defects was the most depressing and neglected branch of medicine. As late as 1941, a meeting on the rehabilitation of patients with damage to the nervous system completely ignored the para- and tetraplegic. Apart from the immediate paralysis and loss of sensation below the lesion, disturbed circulation, loss of skin and muscle tone, and impotence accompany the injury. Damage at higher levels involves the respiratory system and disturbs homeostasis. Tissue becomes less resistant to external pressures, leading to bed-sores that frequently become septic. Because of incontinence, infection may spread via the bladder to the kidneys, resulting in death.

Antibiotics and plastic surgery now help to combat skin damage, but skilled treatment and nursing can do much to prevent it. Many more patients now survive the initial trauma, and these must be re-integrated into society and given the will to live. The isolated cord does not die, but when stimulated it generates a mass response; thus increased bladder or uterine tensions raise blood-pressure and lower the pulse-rate. Headaches, sweating and flushing, in patients with cervical lesions, may indicate a full bladder. Most patients have enlarged hearts and a slow pulse, and their skin temperature above the lesion is higher than below it.

Local reflex arcs remain functional and may be adapted to control posture. The positioning of paralysed limbs is important in the early stages; treatment and exercise must follow to develop muscles and improve their tone. With training, the latissimus dorsi, which normally abducts the arm, can be used to tilt the pelvis and aid locomotion. This action on the paralysed area stimulates spindle activity in the leg muscles, which initiates reflexes in the isolated cord segment: the brain can therefore learn to by-pass the lesion. Massive development of the upper muscles enables the paraplegic to stand without splints and sit-up without corsets. Eventually a new sensibility develops and he knows his posture even when visual clues are removed.

Sports, such as swimming, certain ball games and archery, do much to develop new skills, strengthen muscles, provide enjoyment and increase self-confidence. Wheel-chair basketball is a popular and valuable activity. Training can restore some vasomotor control, and even improve bladder, bowel and sexual functions. The spinal man remains homo sapiens; his intellect can overcome physical disabilities.
Thanking Sir Ludwig, H. S. Wolff said that this lecture should prove salutary to all professed bio-engineers. They had been humbled by the knowledge that man could be re-engineered from within, without transistors or any other technological hardware.

On Saturday 22nd October, 26 members and guests travelled to Stoke Mandeville Hospital, Aylesbury, Bucks., to attend the Society's 24th scientific meeting at the National Spinal Injuries Centre. Sir Ludwig Guttmann met the party and conducted them on a tour of the Centre, starting at the swimming pool, where patients were swimming efficiently and enjoying themselves with little regard for their disabilities. Facilities for hydrotherapy, including electric stretcher hoists, were demonstrated, and the sterilization plant, designed to deal with pollution resulting from incontinence, was inspected.

In the physiotherapy department, para- and tetraplegics used artificial aids to locomotion, such as calipers, walking frames and wheel chairs, under the supervision of Miss I. Bromley and Miss J. Hanson. One youth, able to use only his triceps brachii, demonstrated his skill at archery. During a brief visit to the Biochemistry Dept., studies of the effect of paralysis on the body's protein, cholesterol, calcium and phosphorus were described. Apparatus for studying the E.M.G. and the neuro-mechanism of sweating was displayed in the physiology dept.

The latter part of the programme consisted of lecture-demonstrations given by staff of the National Spinal Injuries Centre, presided over by the new Director, Dr. J. J. Walsh, and Sir Ludwig.

RESPIRATORS

J. J. Walsh and H. L. Frankel.

Damage at C4/5 was usually fatal because cord oedema occurred within hours, pushed the lesion up one segment, and paralysed the diaphragm. Tracheotomy and positive pressure respiration now keep patients alive until oedema subsides and natural breathing returns.

The East-Radcliffe respirator is simple compared to the Barnet machine; nurses are easily taught to operate it and may even rectify some faults. Pressure is governed by added weights' and rate is variable over a wide range, but expiration length cannot be altered. A humidifier is necessary to prevent tracheal crusting.

Discussion. Commenting on the absence of negative pressure, A. H. Bottomley asked whether this phase was important.

After mentioning the need for rapid rate adjustment, Prof. A. C. Dornhurst suggested that built-in sighs would make machine breathing more natural. He added that triggered respirators sometimes resulted in patients breathing too rapidly.

The relevance of steam engine valve gear to control of inspiration-expiration ratios was noted by D. A. Bell.

W. J. Perkins said that complexity resulting from increased redundancy could lead to greater reliability.

The problem of training nurses with limited mechanical aptitude was mentioned by H. S. Wolff.

Replying, J. J. Walsh said that the negative phase was unnecessary for young patients with elastic chest cages. He agreed that adjustments to respiration rate were required during the first few days. Referring to apparatus complexity, he said that too often this resulted in unreliability.

THE TALLEY ALTERNATING PRESSURE PAD UNIT

J. J. Walsh.

Paraplegics must raise themselves frequently from their chairs to prevent the formation of sores; as they become 'sore conscious', these movements become automatic. Tetraplegics, who rely on others to lift them, would be helped if the pressure acting on their bodies could be continuously varied.

The alternating pressure pad consists of a cushion of six rubber tubes attached side-by-side. A pump repeatedly inflates these, one at a time, in sequence across the pad, producing the necessary continuous variations in contact pressure. One patient has used the pad for nine hours without complications.