A BRIEF HISTORY OF BIOENGINEERING IN EDINBURGH

The initial stimulus for the advent of Bioengineering in Edinburgh was the Thalidomide tragedy which had resulted in a significant number of children being born with gross limb abnormalities. In 1962 discussions took place with the late Dr Sandy Wilson of the Scottish Home and Health Department and Dr. (now Professor) David Simpson on the scientific and engineering aspects of the provision of upper limb prostheses for the Scottish (and Northern Irish) children affected by Thalidomide. Mr Douglas Lamb, Consultant Orthopaedic Surgeon, had already been asked to look after the clinical aspects of their prosthetic management. Together they formed the beginning of the Scottish team in this field, based at the Princess Margaret Rose Orthopaedic Hospital (PMROH).

At the time the children were tiny and nothing could be done right away except to study the problem. In May 1963 the team visited Professor Ernst Marquardt in Heidelberg to see what was being done in Germany where the number of affected children greater than anywhere else. Marquardt had developed a system of externally powered prostheses, using carbon dioxide gas, which he had been using with rather older children with similar deficiencies for some time and he was now applying it to their Thalidomide casualties. It looked very promising and Dr Simpson spent a few days in Heidelberg in order to study the operation and control of the prostheses. It was quite clear from the visit that the idea of using an external source of power to operate an artificial arm was indeed promising, but it was equally clear that the system was at a very early stage of development and that it would not be possible to obtain the parts in sufficient quantity to allow the provision of a service to the Scottish children who might need this form of management. Professor Marquardt, however, generously allowed the team to obtain some sets for fitting to enable a start to be made.

In 1963, therefore, the Scottish Home and Health Department provided funds to set up a small workshop in the basement of 12 George Square and to engage the first mechanical technician. A start was now possible on the design and provision of the powered limbs. In time, three more technicians were appointed and the nucleus of the present unit was formed and given a name - The Powered Prosthetics Unit.

Thereafter the unit grew in response to the growing service load and the need for ongoing research and development. However, with its expansion came further difficulties, mostly connected with space and its location - it was too little and in the wrong place: the technical resources were in George Square and the patients were in the PMROH, five miles away.

The appointment of a Deputy Director in late 1963 improved the situation and in 1965 there was a major step forward when the Unit moved to premises at PMROH. In addition to a mechanical workshop there was a plastics and an electronics workshop added. The responsibilities of the unit still far outweighed the resources and facilities which were available, and this presented many problems because at that time the work was being carried out in an atmosphere clouded by pressure group emotion and sensational press reporting.

After a period the Powered Prosthetics Unit changed its name to the Orthopaedic BioEngineering Unit. At this time the Medical Research Council and the Scottish Home and Health Department agreed to provide and equip a new building. In 1969 the new BioEngineering Centre was opened by Kenneth Allsop. There was some further expansion in staffing to approximately 25 with funding being obtained from several sources. As the staff increased and the work of the Centre widened, the building had to be extended, particularly when the Centre became involved in special beds and other large equipment.

Over the next few years the Centre was involved in a range of patient service activities and related research and development programmes. These included responsibility for the provision of the prosthetic service for the children and the development of the prosthetic arm systems themselves, but activities broadened to include the development of a low-pressure air bed, tilting beds, wheelchair modifications and other body support systems.

However the early years of the Centre are best remembered for the development of the prosthetic arm systems for the children affected by Thalidomide. Like other international centres working in this field it was necessary to conduct the research and
development simultaneously with the provision of the patient service while trying to keep ahead of the requirements of the children. Arguably the most notable contribution to the upper limb prosthetic field was the concept for control of the prostheses - that of Extended Physiological Proprioception (EPP) - whereby the person's natural awareness of the position of their body is used to control the position of the prosthesis. This concept has stood the test of time and is now being utilised in the development of an electrical version of the arm system for eventual routine clinical services use.

In 1976 Professor Simpson resigned as Director of the Centre in order to take up the post of Assistant Dean of the Faculty of Medicine at the University of Edinburgh.

The beginning of the 1980's signalled a change in direction for the Centre: although pneumatically powered prostheses were still occasionally being fitted and serviced, the work was sporadic and declining. The Centre still possessed a healthy R&D programme in body powered prosthetics and was branching out into electrical powered devices and control systems. In addition the Centre was responsible for the technical and administrative facets of the Scottish trial of the "Swedish" hand prosthesis.

The Centre's activities in aids for activities of daily living were mostly on a one-off service basis with the noticeable exception of the Simpson Edinburgh Low Pressure Airbed. This device had successfully completed a SHHD clinical evaluation and was being commercially manufactured. The Centre was also involved in providing a specialist service in surgical instrumentation, developing and testing equipment to the specification of surgeons and clinicians. From the early 80's the Centre began to establish close links with the Department of Orthopaedic Surgery at the University of Edinburgh, specifically in the area of fracture fixation and healing. The Centre was also working in the fields of mobility aids for children and in wheelchair seating and control system modification. Work also began on various grant funded projects in the files of functional electrical stimulation, measurement of spasticity and computer interfaces.

One of the effects of the various research and development programmes and ad hoc patient services was that the Centre was beginning to accumulate a significant number of patients with a broad range of unusual or difficult physical problems who looked to the Centre for their ongoing care. In 1987 the decision was made to emphasise the Centre's patient service activities by formalising patient referral procedures and by continuing to develop working relationships with referral sources.

Patient service and the associated research and development activities have expanded in breadth over the past decade in addition to increasing in volume. Much of the work can be categorised as rehabilitation engineering and includes specialised upper and lower limb prosthetics, seating systems, wheelchair modifications, mobility aids, communication aids, functional electrical stimulation and aids for activities of daily living. The Centre is also active in the field of clinical measurement, notably gait analysis.