UNITY IN DIVERSITY

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This issue of the Bulletin further broadens the areas which we hope to cover. Several of the major papers consider the amputation aspects of the broad field of prosthetics.

We have the pleasure of reproducing the pamphlet "Amputation" by Dr. Knud Jansen of the Orthopedic Hospital, Copenhagen, Denmark. Dr. Jansen originally prepared this material in Danish for the guidance of Scandinavian surgeons. There has often been emphasis upon the fact that in peacetime very large numbers of amputations are performed by general surgeons who have so many other responsibilities that they are unable to make detailed studies of amputation techniques or to keep in close touch with research results. Dr. Jansen attempted to outline the best current accepted practices, to emphasize the need for total rehabilitation, and to suggest rather briefly some of the areas of current research.

An international meeting of experts, convened jointly by the World Veterans Federation and the International Society for Rehabilitation of the Disabled, recommended that Dr. Jansen's essay be translated into a variety of other languages. We are pleased to publish this English translation prepared by the WVF. We have deliberately retained some of the Latin medical terms, with precise meanings understood internationally, and some English forms of spelling rather than attempting a further "translation" into an American version of English.

One of the current areas of vigorous research involving amputation techniques, management of the amputee, and fitting of prostheses is the subject of a report by Dr. Ernest Burgess and his colleagues. Interestingly enough, the concept of immediate post-surgical prosthetic fitting first came to the attention of many of us during a lecture by Dr. Marian Weiss of Poland, given in Denmark in 1963 during the Sixth International Course in Prosthetics under the chairmanship of Dr. Jansen. Dr. Weiss' lecture was largely devoted to electromyographic studies of the stump muscles in an attempt to determine the proper length at the time of reattachment during a myoplastic amputation, but he also spoke about fitting patients with a plaster of Paris socket and temporary prosthesis which allowed very

early ambulation with assistance and support. Several of those who attended this lecture recall that Dr. Weiss had mentioned French work on early fitting. Many of those who have heard Dr. Weiss, either in Copenhagen in June 1963 or during his visit to a number of United States research centers in November 1963, have tended to emphasize his role in the aggressive development and application of this concept. As reported in an editor's note herein, we have recently received a communication stating that Dr. Berlemont of Berck-Plage, France, had developed immediate post-surgical fitting in 1958. Apparently be used a simple pylon.

Somewhat confusing as the history of immediate fitting may presently appear, perhaps this situation is common not only in prosthetics, but in science in general. There is frequently a need to attribute credit to proper sources, in proportion to their respective contributions. Someone may have the germ of an idea, another the ability and facilities to develop it, and a third the executive capacities to put it into wide scale use or the writing talents to bring it to wide attention. Several key elements may be the work of different individuals. The almost simultaneous invention of features of the telephone by Bell and by Edison, the Langley-Wright Brothers-Curtiss controversies about the airplane, and the numerous patent interferences illustrate the problems of determining originality.

In prosthetics, before the suction socket became widely and successfully used, it was repeatedly reinvented and modified at widely separated times and countries. Advanced concepts of alignment and of interdisciplinary teamwork were factors in ultimate success, as well as the original idea.

Cineplasty is generally attributed to Vanghetti, though the idea of using muscles and tendons repeatedly had been suggested earlier. Stodola, the famous Swiss turbine engineer, likewise reinvented the idea of direct application of muscle and offered to construct an artificial hand to be manipulated by the muscles. Sauerbruch, the German surgeon, in cooperating with Stodola, was likewise without knowledge of the previous work; he then developed the concept of a skin-lined tunnel through the muscle belly itself. Even this concept has had both advocates and critics, both recurring periods of enthusiastic use and long periods of substantial rejection. Some feel that the only presently practical method is the biceps cineplasty in a below-elbow amputation when performed with the features modestly suggested by Lebsche. (A loyal pupil of Sauerbruch, Professor Lebsche was embarrassed to have them called Lebsche's modifications.) Nevertheless, there are attractive features at other levels, e.g., the dexterity of the finger-flexing muscles remaining in the below-elbow stump or the very high forces and excursions available in the pectoralis major muscle for the above-elbow or shoulder-disarticulation cases—if only there were practical ways to use those sites!

Possible modifications of the basic concept of all the talented contributors to cineplasty, namely, direct use of remaining human muscles to improve

both dexterity and sensory feedback as well as to reduce harnessing, may ultimately prove fruitful for the control of external power for prostheses. Miniature cineplasty tunnels with special transducers, surgically created fascial defects to allow muscle hernias for greater muscle bulging, direct use of muscle bulging against a valve or switch, and pickup of electrical activities of muscles as control signals are among the many control means for auxiliary power. Each has fascinated many investigators. Mr. Wilson, of the National Research Council, provides a brief survey of this problem in this issue.

Dr. Holscher, who has been concerned with amputee veterans since heading a World War II amputation center, and his colleagues, report on a survey of hip-level amputation cases. At the time of World War II, the available prostheses were cumbersome and required locking of the hip and generally of the knee. The introduction of the Canadian-type hip-disarticulation prosthesis after 1955 has allowed a lighter and more functional prosthesis with motion at both the hip and the knee. Nevertheless, further development would seem desirable to minimize tilting of the socket about the pelvis, to assure adequate toe clearance during swing phase without excessive knee flexion, and perhaps to provide more positive correlation between hip and knee motion. Though the survey illustrates the great influence of habit, it shows the high acceptance of the improved prosthesis by relatively recent amputees. Comparable distributions of acceptance have been apparent with other novel devices and techniques. This phenomenon must be considered in planning tests of new ideas and in evaluating the results.

Impedance plethysmography, the subject of Dr. Thompson's paper, has repeatedly been suggested for measurement of the blood supply in the lower extremity. Some observers have considered the technique useful both in determining the level for amputation in cases with circulatory problems and in assessing the blood supply to the opposite leg, a circulation often likely to be overloaded when the rehabilitated amputee attempts either to walk upon crutches and the remaining leg or to use a prosthesis on the amputated side. Others have pointed to the importance of the circulation in the skin in relation to wound healing and to resistance to further damage, so they have suggested that collateral as well as arterial blood flow should be studied. Impedance plethysmography is but one example of the way in which the broad field of prosthetics involves physiology, clinical practice, engineering, and a number of other disciplines.

The editors are happy to note the diversity in this issue. Numerous contributions were made by workers in a variety of fields. For the first time we have an author from abroad. Some of the contributors have been closely related to the artificial limb research program, but Mr. Grimm has conducted his own preliminary investigation unaided. While this issue is devoted largely to papers relating to amputation and prostheses, a variety

of other topics are covered in the reports from the VAPC and from the contractual research program. (It is expected that some future issues will include discussions on sensory aids.) A broad diversity of details is unified by our common interest in all aspects of devices to aid the severely handicapped.