A few years ago at an International Congress, a world renowned surgeon occupying an endowed chair at a great university said to me, "How do you manage to have such a deep interest in amputations? It's such a dull field." This attitude still prevails among many learned and skilled surgeons. It stems from a lack of understanding and insight into what is one of the most exciting, vital, and challenging areas of all of surgery today.

As the surgeon severs and discards the affected member, so must he ablate from his mind, the destructive nature of the operation. Then with a resipiscient attitude, he can proceed to that first all-important step in rehabilitation, the forming of a dynamic and functional end-organ, i.e., the amputation stump. Effective surgical consummation of this responsibility requires thorough knowledge not only of the local anatomy, but also of the precise functional physiology of the extremities and trunk. He must also be fully familiar with the appropriate limb substitute for each given circumstance, a large and rapidly growing area of engineering and design expertise. At the end of this road, often a very short road, is the patient, young or old, effectively restored to useful social status. How can such surgery be dull?

The amputation presents the surgical investigator with many areas for study. First of these is wound healing. The totally terminal nature of the amputation wound is unique in major extremity surgery. Here the effects of physical, chemical, thermal, and electrical factors can be analyzed objectively. Much is known of the nature of wound healing yet there are many remaining gaps in our knowledge. Among the physical factors to be studied are pressure, tension, immobilization, and graduated forms of wound stress plotted against time. Tissue temperatures, both indigenous and applied, can be monitored and the effects observed.
The amputation stump lends itself to the study of both the rate and volume of tissue fluid exchange. Such information is more difficult technically to obtain in linear and other body wounds. This is of great clinical significance in edema control. Microcannulation at the time of surgery placed with tissue selectivity will add to basic biochemical knowledge about the fresh and healing surgical wound.

The amputation stump is a veritable neurophysiological laboratory. This applies, not only to remaining stump muscle activity as recorded by surface and muscle implant electromyographic leads, but also equally to the afferent side. Is the skin of the stump an available source of pressure receptor feedback for the transmission of topographic information for induced automatic muscular reaction? How much gamma source input does the stump provide and how can it be augmented surgically and by training to improve limb control? Socket transducer studies in immediate postsurgical and definitive limbs can measure effective levels of afferent pressure signaling. Does selective suppression of skin sensibility by local anesthesia alter the exteroceptive control level? Dr. Rabischong of Montpellier, France, has developed delicate intra-neural surgical techniques to more completely understand the functional anatomy of the nerve bundle. This fundamental information might be harnessed to provide an effective feedback to the amputee particularly with externally powered prostheses.

Implant surgery for the amputee is just now becoming productive. Joint replacement techniques, particularly total hip replacement, reinforces our confidence in the body's tolerance for large amounts of relatively inert material. Increasing numbers and types of implants will be developed in all areas of surgery. For the amputee both voluntary and involuntary electrical potential thus obtained can initiate a host of useful prosthetic functions. Might it be possible to assist limb suspension with implanted magnetic devices? Can that wily, resistant organ, the skin, be more effectively bridged to permit uncomplicated long-term exteriorization? These are but a few of the areas of surgical research relevant to the amputation.

Education of the surgeon! Rehabilitation of the amputee would be vastly improved if presently available surgical and aftercare techniques were in more widespread use. Awakening of interest and the teaching of modern methods command a high priority. A major worldwide educational thrust is now underway. This program should be accelerated. A watershed of humanitarian and material benefits will follow the modernization of amputee services. Single concept audiovisual aids of the type now available from the Prosthetic and Sensory Aids Service of the Veterans Administration provide one useful teaching tool. These last few years have seen a reawakening of interest in amputee rehabilitation. I am convinced that this is only the beginning.