# Electrical Stimulation

Eugene F. Murphy, Ph. D.
Moderator

Director, Research Center for Prosthetics
Veterans Administration, 252 Seventh Avenue
New York, New York 10001

Electrical stimulation is of growing importance for a variety of fields, partly as a result of the SRS support of developments in Yugoslavia and partly as a result of both basic research and clinical trials under various sponsors in this country. Electrical stimulation not only is used for muscle activity but also has implications for providing sensory feedback, for tissue healing after amputation surgery, and for healing decubitus ulcers. Thus electrical stimulation may prove useful for spinal cord injury in addition to the possibilities of muscle stimulation.

Perhaps some day electrical stimulation also will have clinical applications for artificial hearing and vision. There is a clear interrelationship between these areas, which goes beyond any given narrow specialty.

Dr. Clippinger of Duke University was unable to come to the conference, but he and his associates have provided a paper. Dr. Clippinger has been active in providing a below-elbow amputee with electrical feedback via the median nerve in the forearm by means of an implanted electrical stimulator. The frequency of stimulation is proportional to the prehension force applied by a split mechanical hook.

In the electrical stimulation field, it is appropriate to know something more about surgically implanted electrodes—their longevity, their influence on the body, and the influence the body has on them. A small project with the UCLA Brain Information Service is making a critical survey of literature on surgically implanted electrodes, not only in amputees but also in all sorts of other applications. This survey has been done, under the guidance of Dr. Chase, by Dr. Margaret Babb of the Brain Information Service, with Dr. Anthony Dymond as a consultant. Dr. Dymond, formerly at UCLA-BIS, is now at the Brentwood VA Hospital, in the Los Angeles area. (Dr. Dymond will make the oral presentation. He and I also had organized two informal conferences on surgically implanted electrodes for the American Society for Testing and Materials.) The Los Angeles group found that vast amounts of

literature are available showing tremendous inconsistencies as well as diversity of designs and variety of applications. The real problem is to make some sense out of the various apparent disagreements.

Although Professor Pierre Rabischong of Montpellier, France, was unable to attend the conference, we are publishing a paper in two parts in this issue describing the experiments on electrical stimulation of muscle which he and his colleagues are conducting at the Biomechanics Research Unit 103 of the French National Institute of Health and Medical Research (INSERM). Professor Rabischong is professor of anatomy at the University of Montpellier with interests in biomechanics and spinal cord injury. Among his associates are orthopedists and neurosurgeons, as well as electrical and control engineers from the Unit and the Faculty of Sciences. While somewhat similar experiments have been conducted elsewhere, it is rather difficult to find results, particularly on isotonic loading; some results have been presented only in progress reports to sponsors or as abstracts of oral presentations at conferences. It is also illuminating to know of the French references he cites. The Montpellier carbon fiber electrodes appear novel. The work published represents independent study by these investigators, aimed at reducing the clinical problems resulting from spinal cord injury.

Dr. Cochran of St. Luke's Hospital in New York has been using electrical stimulation in experimental animals to try to accelerate bone healing after deliberate creation of defects in long bones. He is also associated with the Helen Hayes Hospital at West Haverstraw; he recently reported in BPR 10-20 (pp. 29-61), experiments on wheelchair cushions.