

RESEARCH ENGINEERING CENTER  
TERRACE LEVEL  
1224 W. MAIN STREET

*Spring 1967*

# Artificial Limbs

*A Review of  
Current Developments*

COMMITTEE ON PROSTHETICS  
RESEARCH AND DEVELOPMENT

COMMITTEE ON PROSTHETIC-  
ORTHOTIC EDUCATION

**National Academy of Sciences  
National Research Council**

## COMMITTEE ON PROSTHETICS RESEARCH AND DEVELOPMENT

### Division of Engineering

- Herbert Eftman, *Chairman*; Professor of Anatomy, College of Physicians and Surgeons, Columbia University  
630 West 168th St., New York, N. Y. 10032
- Colin A. McLaurin, *Vice Chairman*; Prosthetic Research and Training Program, Ontario Crippled Children's  
Centre, 350 Rumsey Rd., Toronto 17, Ontario, Canada
- George T. Aitken, M.D. (Orthopaedic Surgeon, Mary Free Bed Guild Children's Hospital), College Avenue  
Medical Building, 50 College Ave., S.E., Grand Rapids, Mich. 49503
- Robert L. Bennett, M.D., Executive Director, Georgia Warm Springs Foundation, Warm Springs, Ga. 31830
- Cameron B. Hall, M.D., Assistant Clinical Professor, Department of Orthopaedic Surgery, University of  
California, Los Angeles 90024
- Robert W. Mann, Professor of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge,  
Mass. 02139
- J. Raymond Pearson, Professor of Mechanical Engineering, West Engineering 225, University of Michigan,  
Ann Arbor, Mich. 48104
- James B. Reswick (Professor of Engineering), Director, Engineering Design Center, Case Institute of Tech-  
nology, University Circle, Cleveland, Ohio 44106
- Charles W. Rosenquist, Columbus Orthopaedic Appliance Company, 588 Gay St. W., Columbus, Ohio 43222
- Robert N. Scott, Associate Professor of Electrical Engineering, University of New Brunswick, Fredericton,  
New Brunswick, Canada
- Howard R. Thranhardt, J. E. Hanger, Inc., 947 Juniper St., N. E., Atlanta, Georgia 30309
- Bert R. Titus (Assistant Professor of Orthotics and Prosthetics), Director, Department of Prosthetic and Ortho-  
paedic Appliances, Duke University Medical Center, Durham, N. C. 27706

#### STAFF

- A. Bennett Wilson, Jr., Executive Director  
Hector W. Kay, Assistant Executive Director  
James R. Kingham, Staff Editor  
Enid N. Partin, Administrative Assistant  
Nina M. Giallombardo, Secretary

## COMMITTEE ON PROSTHETIC-ORTHOTIC EDUCATION

### Division of Medical Sciences

- Roy M. Hoover, M.D., *Chairman*; 3118-B Middlebrook Circle, Tallahassee, Florida 32303
- Charles O. Bechtol, M.D., Chief, Division of Orthopaedic Surgery, University of California Medical Center  
Los Angeles, Calif. 90024
- William M. Bernstock, Assistant Chief, Research and Development Division, Prosthetic and Sensory Aids  
Service, Veterans Administration, 252 Seventh Ave., New York, N. Y. 10001
- Clinton L. Compere, M.D. (Professor of Orthopaedic Surgery, Northwestern University Medical School),  
Suite 600, 737 N. Michigan Ave., Chicago, Ill. 60611
- William J. Erdman, II, M.D., Director, Department of Physical Medicine and Rehabilitation, Hospital of the  
University of Pennsylvania, 3400 Spruce St., Philadelphia, Pa. 19104
- Geneva R. Johnson, Director, Physical Therapy Curriculum, Western Reserve University, 11418 Bellflower  
Rd., Cleveland, Ohio 44106
- C. Leslie Mitchell, M.D., Chairman, Department of Orthopaedic Surgery, Henry Ford Hospital, Detroit, Mich.  
48202
- Alvin L. Muilenburg, President, Muilenburg Artificial Limb Company, 3900 LaBranch St., Houston, Tex. 77004
- Herbert E. Pedersen, M.D., Chairman, Department of Orthopaedic Surgery, Wayne State University Medical  
School, 1401 Rivard St., Detroit, Mich. 48207
- J. Warren Perry, Ph.D., Dean, School of Health Related Professions, State University of New York,  
16 Diefendorf Annex, Buffalo, N. Y. 14214
- Jacquelin Perry, M.D., Orthopaedic Surgeon, Rancho Los Amigos Hospital, 7601 East Imperial Highway,  
Downey, Calif. 90242
- Ruth A. Robinson, Colonel, Army Medical Specialist Corps, U. S. Army (Ret.), 1325A Worcester Rd., Framing-  
ham, Mass. 01701
- Charles W. Rosenquist, Columbus Orthopaedic Appliance Company, 588 Gay St. W., Columbus, Ohio 43222
- Charles D. Shields, M.D., Chairman, Department of Physical Medicine and Rehabilitation, University of Ver-  
mont College of Medicine, Burlington, Vt. 05401
- Walter A. L. Thompson, M.D., Chairman, Department of Orthopaedic Surgery, New York University Medical  
Center, 550 First Ave., New York, N. Y. 10016

#### STAFF

- Harold W. Glattly, M.D., Executive Secretary  
Barbara R. Friz, Staff Officer  
Jean E. Perrin, Administrative Assistant  
Gladys B. Armstrong, Stenographer

# Artificial Limbs

---

VOL. 11

SPRING 1967

NO. 1

---

## CONTENTS

### SURGEONS AND SOCKETS

Anthony Staros . . . . . i

### LIMB PROSTHETICS—1967

A. Bennett Wilson, Jr. . . . . 1

### NEW CONCEPTS IN THE MANAGEMENT OF LOWER-EXTREMITY AMPUTEES

A. Bennett Wilson, Jr. . . . . 47

### EXPERIENCES WITH THE TOTAL-CONTACT PROSTHESIS

Georg Bakalim . . . . . 51

NEWS AND NOTES . . . . . 58

COMMITTEE ON PROSTHETICS RESEARCH AND DEVELOPMENT

DIVISION OF ENGINEERING

and

COMMITTEE ON PROSTHETIC-ORTHOTIC EDUCATION

DIVISION OF MEDICAL SCIENCES

of the

NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY OF SCIENCES

2101 Constitution Ave.

Washington, D. C. 20418

*Artificial Limbs* is a publication prepared under the cognizance of the Committee on Prosthetics Research and Development and the Committee on Prosthetic-Orthotic Education, National Academy of Sciences—National Research Council, issued twice a year, in the spring and in the autumn, in partial fulfillment of Veterans Administration Contract V1005M-1914, Vocational Rehabilitation Administration Contracts SAV-1051-67, SAV-1053-67, and 65-73, and a contract between the National Academy of Sciences—National Research Council and the Children's Bureau. Copyright© 1967 by the National Academy of Sciences—National Research Council. Quoting and reprinting are freely permitted, providing appropriate credit is given. The opinions expressed by contributors are their own and are not necessarily those of either of the committees. Library of Congress Catalog Card No. 55-7710. Liaison with interested Government agencies is maintained through Arthur J. Lesser, M.D., Deputy Director, Children's Bureau, Department of Health, Education, and Welfare; Eugene F. Murphy, Chief, Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration; and Loren A. Helberg, Executive Secretary, Medical Research Study Section, Division of Research and Demonstrations, Vocational Rehabilitation Administration, Department of Health, Education, and Welfare.

## EDITORIAL BOARD

- Eugene F. Murphy, Chief, Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Ave., New York, N. Y. 10001
- Herbert Eftman, Professor of Anatomy, College of Physicians and Surgeons, Columbia University, 630 West 168th St., New York, N. Y. 10032
- William J. Erdman, II, M.D., Director, Department of Physical Medicine and Rehabilitation, Hospital of the University of Pennsylvania, 3400 Spruce St., Philadelphia, Pa. 19104

# Surgeons and Sockets

ANTHONY STAROS, M.S.M.E.<sup>1</sup>

AN APT, alliterative appellation for this introduction to the Spring 1967 issue of ARTIFICIAL LIMBS might have been *Wilson's Way with Words*, for the writings of A. Bennett Wilson, Jr., Executive Director of the Committee on Prosthetics Research and Development, comprise much of the issue. Mr. Wilson's literary talents are documented—and acknowledged—but the primary concern of this editorial is with surgeons and prostheses.

Mr. Wilson has set himself a continuing task. The difference between *Limb Prosthetics Today* and *Limb Prosthetics—1967* is four productive years of the Research Program. Many new items are covered. But the Program can be expected to continue to produce significant developments that should be made known to the world, so that four years hence that which is published as representing the state of the art in 1967 will require updating.

Comprehensive summaries of prosthetics technology are an essential part of an efficient information-dissemination system. Typical articles reporting developments in prosthetics research assist the day-to-day practitioner with technical details of design, fabrication, and fitting. They serve an important purpose. But also needed is comprehensive, accurate, nontechnical information in a form that is readily understandable to amputees and their families and the large number of clinicians who are too busy to digest all the detail underlying prosthesis design. The summary coverage is appropriate; as one would attempt to highlight important and even complex matters for a busy Board of Directors, so must there be occasional briefings for those concerned with prosthetics. Not only busy clinicians but equally busy and technically deprived administrators currently or newly responsible for prosthetics programs in the United States and abroad can also obtain an excellent overview from Mr. Wilson's offering. For those surgeons who have never attempted to gain such an overview—and, unfortunately, there are too many—this article represents a real opportunity.

Significant developments of recent years are reported in the other two articles of this issue. The total-contact concept represents a major contribution to improved socket design. Founded upon the very sound principles of the quadrilateral and PTB sockets, total-contact sockets became accepted

---

<sup>1</sup>Director, Veterans Administration Prosthetics Center, 252 Seventh Ave., New York, N.Y. 10001.