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Artificial Limbs

*A Review of
Current Developments*

COMMITTEE ON PROSTHETICS
RESEARCH AND DEVELOPMENT

COMMITTEE ON PROSTHETICS
EDUCATION AND INFORMATION

National Academy of Sciences
National Research Council

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COMMITTEE ON PROSTHETICS RESEARCH AND DEVELOPMENT COMMITTEE ON PROSTHETICS EDUCATION AND INFORMATION

The *Committee on Prosthetics Research and Development* and the *Committee on Prosthetics Education and Information*, units of the Division of Engineering and Industrial Research and the Division of Medical Sciences, respectively, advise the Veterans Administration and the Department of Health, Education, and Welfare in the conduct of research and education activities in the fields of prosthetics and orthotics; they provide means for correlating Government- and privately sponsored research in those fields.

Artificial Limbs

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CONTENTS

VARIETY

William J. Erdman, II iii

LIMB PROSTHETICS TODAY

A. Bennett Wilson, Jr. 1

SOCKET FLEXION AND GAIT OF AN ABOVE-KNEE, BILATERAL AMPUTEE

Edward Peizer 43

THE LIMB-DEFICIENT CHILD

A review by Charles H. Frantz 50

NEWS AND NOTES 53

PATENTS, PATIENTS, AND PATIENCE

Eugene F. Murphy 69

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COMMITTEE ON PROSTHETICS EDUCATION AND INFORMATION

NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL

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Variety

WILLIAM J. ERDMAN, II, M.D.¹

IN virtually every area of knowledge, be it anthropology, engineering, psychology, or zoology, there is a need for dissemination of information at various levels of sophistication. Information in the form contained in research reports is necessary for further progress by other research groups but is seldom found to be directly useful by practitioners. Technical documents intended to assist the practitioner in carrying out his day-to-day responsibilities are of little value to the lay people or nonspecialists who, for one reason or another, have an interest in the subject. Limb prosthetics is no exception to this rule.

For example, a detailed report on the physical constants of various segments of the human body is of little interest to the chief of a prosthetics clinic team or to the practicing prosthetist, but is indispensable to the designer of artificial limbs. Definitive manuals on fabrication procedure, so essential to the prosthetist, are of little or no concern to the physician, patient, or rehabilitation counselor. Thus, information in a variety of forms is needed if all concerned with problems of amputation, including the amputee, are to carry out their responsibilities effectively and efficiently.

In the early days of the Artificial Limb Program, a lady amputee once wrote to the Mellon Institute complaining that, whereas she could obtain a four-page pamphlet on a new can opener, there were no printed instructions available concerning proper use of an expensive artificial leg. Similar observations have been made by other amputees in their desire to overcome their disabilities. Though in recent years there has been a great increase in the specialized literature pertaining to amputees, little information and no truly comprehensive documents have been prepared especially for the amputee, his family, or other nonspecialists. Accordingly, the Editorial Board of ARTIFICIAL LIMBS decided to devote the major portion of this issue to an article that might be of value to nontechnical personnel concerned with rehabilitation of the amputee.

Quite naturally, a patient has an avid interest in his condition which is not satisfied by his physician's sometimes cursory or too-technical explanation, or the patient may be embarrassed to ask questions that seem simple to others. There will be many areas about which he will not have the intellectual ability to raise questions until he has experienced the need to know. He may not quickly gain psychological insight adequate to ask realistic questions. It is hoped that *Limb Prosthetics Today*, by providing the patient and his family with early and ready access to correct, up-to-date information, will prevent them from arriving at erroneous conclusions or oscillating

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between unrealistic hopes and unwarranted fears, and thus will materially assist them all to meet their problems.

Though prepared primarily for use by amputees and their families, *Limb Prosthetics Today* may also prove valuable to others. The nontechnical approach should make it useful as an introductory text to future practitioners: undergraduate medical students, residents, students in physical and occupational therapy, and apprentice prosthetists. Rehabilitation counselors and administrative personnel responsible for the welfare of amputees might gain a more accurate picture of the problems and potentialities of the patients they serve. Where more technical information is desired, the documents cited in the bibliography accompanying *Limb Prosthetics Today* may be studied.

It is not anticipated that regular readers of ARTIFICIAL LIMBS will necessarily learn any new information from *Limb Prosthetics Today*, though some may appreciate a review or the updating of previous information. Present readers, however, are in a position to make a critical analysis of the level of the presentation, its clarity, and the appropriateness of various items for amputees and for the nonspecialist professional persons concerned with amputees; and the Editorial Board invites any comments that will assist in future revisions.

For the more sophisticated reader, this issue of ARTIFICIAL LIMBS contains an article by Edward Peizer concerning the effects of socket attitude on the gait of a bilateral, above-knee amputee. In addition to emphasizing the necessity for accurate alignment, this research report demonstrates how certain instrumentation can be employed to uncover facts previously hidden.

Both the specialist and the general practitioner in any field will always appreciate a thoughtful book review by a world-famous authority. Such reviews may well point out the many excellent features justifying purchase of a new book, yet note any aspect considered controversial or potentially misleading. For all readers, thus, we are happy to inaugurate signed book reviews as a new feature. As a first step, Charles Frantz has provided a thoughtful analysis of an important new book, *The Limb-Deficient Child*.

It is hoped a wide variety of readers will find this issue of ARTIFICIAL LIMBS interesting and useful.

Limb Prosthetics Today

A. BENNETT WILSON, JR., B.S.M.E.¹

Loss of limb has been a problem as long as man has been in existence. Even some prehistoric men must have survived crushing injuries resulting in amputation, and certainly some children were born with congenitally deformed limbs with effects equivalent to those of amputation. In 1958 the Smithsonian Institution reported the discovery of a skull dating back about 45,000 years of a person who, it was deduced, must have been an arm amputee, because of the way his teeth had been used to compensate for lack of limb. Leg amputees must have compensated partly for their loss by the use of crude crutches and, in some instances, by the use of peg legs fashioned from forked sticks or tree branches (Figs. 1 and 2).

The earliest known record of a prosthesis being used by man was made by the famous Greek historian, Herodotus. His classic "History," written about 484 B.C., contains the story of the Persian soldier, Hegistratus, who, when imprisoned in stocks by the enemy, escaped by cutting off part of his foot, and replaced it later with a wooden version.

A number of ancient prostheses have been displayed in museums in various parts of the world. The oldest known is an artificial leg unearthed from a tomb in Capua in 1858, thought to have been made about 300 B.C., the period of the Samnite Wars. Constructed of copper and wood, the Capua leg was destroyed when the Museum of the Royal College of Surgeons was bombed during



Fig. 1. Mosaic from the Cathedral of Lescar, France, depicts an amputee supported at the knee by a wooden pylon. Some authorities place this in the Gallo-Roman era. From Putti, V., *Historic Artificial Limbs*, 1930.



Fig. 2. Pen drawing of a fragment of antique vase unearthed near Paris in 1862 which shows a figure whose missing limb is replaced by a pylon with a forked end.

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World War II. The Alt-Ruppin hand (Fig. 3), recovered along the Rhine River in 1863,