

TECHNOLOGY TRANSFER

Eugene F. Murphy, Ph. D.

Editor

Bulletin of Prosthetics Research

Rehabilitative Engineering Research and Development Service

Office of Technology Transfer

252 Seventh Avenue, New York, N.Y. 10001

... an editorial

In recent months there have been a number of changes in form, titles, personalities, and functions in the Rehabilitative Engineering Research and Development Program.

In August 1977, Mr. Earl Lewis, formerly the Editor of the Bulletin of Prosthetics Research and Assistant Director of the Research Center for Prosthetics, was transferred from the research program to the Office of the Assistant Chief Medical Director for Academic Affairs. Mr. Lewis became Director of the Rehabilitation Engineering Education Program, physically located at Wadsworth VA Hospital in Los Angeles but responsible for a nationwide program of education for many disciplines in the various aspects of rehabilitative engineering. In his new post, he continues the same functions regarding the educational program which he had carried out effectively in the Research Center for Prosthetics. These include assignment of VA employees, primarily doctors and therapists, to the organized Prosthetics Education Schools at the University of California, Los Angeles, Northwestern University, Chicago and New York University, New York, as well as organization and conduct of periodic intramural intensive educational programs, and organization of new and special courses to meet VA needs. By agreement with the Driver Education Program in the Rehabilitation Medicine Service under the Assistant Chief Medical Director for Professional Services, he is organizing a major program to train VA driving instructors in the special problems and opportunities offered by the newly emerging types of automotive adaptive equipment, to enable severely handicapped patients to drive cars or vans.

On October 1, 1977, Dr. Vernon L. Nickel, formerly of Rancho Los Amigos Hospital at Los Angeles, became Director of the Rehabilitative Engineering Research and Development Service, under the

Assistant Chief Medical Director for Research and Development, Dr. Thomas F. Newcomb.

Effective April 22, 1978, the Chief Medical Director announced that the Administrator approved the reorganization of the Research Center for Prosthetics as the Office of Technology Transfer, with myself as its Director.

The principal function of the Office of Technology Transfer is to expedite the transfer of research results in Rehabilitative Engineering R&D to clinical practice. This is a somewhat different use of the term "technology transfer" from that in some other agencies, which transfer novel technology from their own field, such as space, to applications in other fields. There *have* been a few examples of transfer of rehabilitative engineering research and development results to other fields. One rather amusing example, many years ago, was the development of a special high-strength but very flexible chain for control of certain artificial arms by the Sierra Engineering Company. While rapid evolution of artificial arms at that period eliminated the need for the chain for its original purposes, we were fascinated to learn that considerable quantities were used in control systems for rockets. It was an early example of "reverse technology transfer" from a mundane application to the aerospace field. That was years before NASA was given the charge of transferring its space-age technology to other applications.

There has, of course, always been an emphasis throughout the Prosthetic and Sensory Aids Research Program upon rapid transfer of research results to widespread clinical practice, not only for veterans but also for others. Public Law 729 of the 80th Congress, passed in June 1948 and later recodified in various forms, not only authorized research in prosthetic and sensory aids by the Veterans Administration but provided that the Administrator might make the results available so that all disabled might benefit. The participants in the program have always interpreted this provision vigorously—it was not enough to deposit a copy of a report in some public library, or make a few prototype models available to a small number of patients. In addition, on a much broader scale, they disseminated research results through publications, scientific papers, exhibits at professional meetings, appropriate motion picture films, and development of early prototypes through successive evaluation models into routine mass production. Continuing education was provided, not only to VA clinicians and VA orthotic laboratory supervisors, but to the private practitioners, therapists, prosthetists, and orthotists who served civilians as well as veterans.

The VA has also always been interested in making its results available to foreign nations, through assisting in the organization

and conduct of international courses, participation in conferences, and special teaching assignments in foreign countries in cooperation with the State Department, WHO, foreign governments and voluntary organizations. VA staff and contractors have traveled extensively, both to impart information and to learn of new developments elsewhere. These have been further applied in this country, or have served as the basis for still further improvements for the benefit of all disabled. This active role in the dissemination of information led to support of a variety of books and journals, including the *Bulletin of Prosthetics Research*, and to the varied educational programs, now transferred to Academic Affairs.

Any division of functions is bound to be relatively arbitrary, since ultimately the functions are again combined and coordinated under some higher official such as the Chief Medical Director or the Administrator of Veterans Affairs. Thus, the organizational structure, hopefully, is more a reflection of a policy that permits each individual office and participant to exercise his best talents and energies in the fields at which he is most effective. Unfortunately, none of us are omniscient nor omnipotent, able to know all aspects and perform all functions equally well—certainly the task of replacing human parts and functions calls for more knowledge, ability, and energy than any single person can possibly possess. Individual experts must work in coordinated fashion.

The Office of Technology Transfer, in attempting to accelerate transfer of research results to widespread clinical practice, will have a variety of functions. The immediate top priority is to accelerate the publication of this *Bulletin of Prosthetics Research*, an important function though sometimes increasingly delayed due to regrettable but often uncontrollable circumstances. The Fall 1977 (10-28) issue was due out about the first of July. It is anticipated that this Spring 1978 (10-29) issue will be issued about September 30th. Every effort is being made to issue the Fall 1978 (10-30) issue shortly after Christmas 1978 and to continue to accelerate future issues until the actual issue date is recognizable within the nominal period. This course seems preferable to arbitrarily redating an issue and seeming to miss a semi-annual period.

For some years there have been increasingly formal efforts to provide more intensive review of manuscripts submitted for publication in the *Bulletin* before acceptance. This has involved increasing use of external reviewers knowledgeable in the field but used on an anonymous basis. It is expected that these informal reviews will continue on an ad hoc basis as necessary, but that an Editorial Advisory Board, representing a broad variety of disciplines in the many fields of interest, will eventually be set up.

The box on the front cover, below the title *Bulletin of Prosthetics Research*, has tended to show the agency component publishing the magazine. Originally it was Prosthetic and Sensory Aids Service, then Research Center for Prosthetics. With this issue it is being changed to Rehabilitative Engineering Research and Development, indicating both that the Office of Technology Transfer is an agency of the Central Office RER&D Service, the real sponsor, and also, perhaps, serving as a subtitle to the term *Bulletin of Prosthetics Research* to indicate the broad field covered.

There have been occasional suggestions that the title should be changed from *Bulletin of Prosthetics Research* to any of a variety of other possible names to indicate something broader than the narrow connotation of prosthetic devices as “artificial limbs” alone. The term *prosthesis* can of course represent a wide variety of other artificial body parts: for years the Veterans Administration has interpreted the term to cover a wide variety of other devices including orthoses, cosmetic restorations, sensory aids, automotive adaptive equipment, spinal cord injury equipment, etc. Indeed, the General Counsel of the Veterans Administration many years ago ruled that a law permitting the Administrator to provide “prosthetic devices without regard to other provision of law” could be used to cover a very wide range of devices—not just artificial limbs. In this sense, then, “prosthetics” is used as a short title for the science and art of replacing or supplementing any of a variety of missing or defective body parts and functions, rather than listing a long and almost inevitably incomplete catalog of possible devices in various documents including the title of this magazine. Similarly, “research” has been interpreted to include not only basic and applied research but also the much longer process of development, evaluation on an increasingly wide scale, and various efforts toward application of research results to practical use.

One of the functions of the Office of Technology Transfer is to maintain a Reference Collection, originally organized over 25 years ago and containing items still older, including some relatively rare foreign language documents from World War I and earlier, and reports not only of the Veterans Administration but of other agencies. A note describing the Reference Collection is published in the Notes and News section of this issue.

The predecessor office, the Research and Development Division of the Prosthetic and Sensory Aids Service, was active in the preparation of a variety of films and manuals, both for professionals and in some cases for the patients themselves. Many of these are now obsolete and need to be revised. It is anticipated that films will be updated in coordination with the Medical Media Division, Learning

Resources Service, Veterans Administration, Washington, D.C. Some types of manuals directed to patients are anticipated for revision, and ultimate availability both through VA field stations and for sale to the public at the Superintendent of Documents office of the Government Printing Office. Similar information intended for patients will be prepared to cover other types of disabilities which had not been served in the past.

It is anticipated that the Bulletin will continue to provide both scientific and technical papers appealing to a broad interdisciplinary audience interested in a variety of devices, and also a variety of information of VA-related and supplementary kinds, such as news and notes, brief reports on VA research projects, listing of Publications of Interest from current literature, Recent Patents, and a Calendar of Events.

Papers are solicited from both VA and non-VA investigators and clinicians. Long-term readers will remember that the Bulletin has frequently published reports on projects sponsored by other agencies, notably the Rehabilitation Services Administration of the Department of Health, Education, and Welfare with which the VA Rehabilitative Engineering Program is carefully coordinated. There have been articles appealing primarily to any of the variety of disciplines, whether doctors of different medical specialties, engineers of various types, prosthetists or orthotists, therapists, rehabilitation workers, etc. Because the Bulletin's audience is interdisciplinary (and because many of the major articles in-and-of-themselves are interdisciplinary) we have felt a special obligation to present even the most highly technical material with the clarity and precision needed to make it accessible to any intelligent reader—whether or not he or she happens to be another specialist in the particular discipline, area, or device being discussed.

We intend to try to improve our approach to this difficult style of editing, working closely with our authors and reviewers. The goal will be to organize, within the presentation of a paper, that relatively informal and basic description of the material needed by readers trained in disciplines other than the authors'. With this concept established early in the paper, it should be possible to introduce more highly technical nomenclature where it is needed to achieve precision in concept. Mathematical derivations, if needed, may be supplied as appendices. Obviously, providing to each reader real accessibility to new knowledge without loss of detail in reasoning or fact is not easy. However, in a field so interdisciplinary as this, it seems surely necessary.

The Bulletin has often printed articles of a considerable length without imposing the tight space limitations appropriate to spe-

cialized journals, which can assume a great deal of knowledge on the part of their readers within a highly specialized field. There has also been generous use of illustrations in order to make the material moderately intelligible even at a glance and, incidentally, in order that the illustrations and their captions might help to serve as dictionary or glossary for any term which may not be familiar to the reader.

We have been grateful for our foreign readers and have tried to be aware of the special need for clarity of material by those whose native language is not American English. It has also been apparent that the same word is often used with different connotations either in different fields or in separate countries: thus, "fatigue" has quite a different meaning in physiology and in the engineering study of strength of materials. Similarly "stress" has a different meaning to physiologists or psychologists than to civil and mechanical engineers. There are names for parts or terms in prosthetics and orthotics which have been used differently in the United States and in the British Isles. To a non-English-speaking reader, attempting to translate a difficult word with the aid of a dictionary may well cause confusion. In editing an attempt is made, not always of course successfully, to help avoid a misunderstanding.

The Bulletin is fortunate in having gained, early in its publication, recognition by the Engineering Index and then by the Index Medicus. It is also being indexed in the Rehabilitation section of *Excerpta Medica*. Thus we hope major articles come to the attention of specialists in a variety of disciplines and countries. It is hoped that further vigorous efforts to accelerate and further improve the Bulletin will continue to justify such widespread indexing and abstracting.

There is sometimes an unfortunate tendency for researchers to believe that, in a rapidly changing field, nothing older than 5 years or so is worth searching. The tendency to use online computer searches such as Medline (Medical Literature Analysis and Retrieval System On-Line) perhaps accelerates such a trend. Unfortunately, such a limitation may well lead to unwitting duplication of past efforts, or to overlooking obvious possibilities for revival of old-but-good ideas which somehow were not successfully reduced to practice when first proposed.

One famous example is the suction socket, patented by Dubois D. Parmelee of New York City in 1863. There were a number of later attempts at the same basic idea, as shown by the patent literature. Finally there was an extensive trial, started immediately after World War I in England, but abandoned because some 26 of 28 users had rejected the socket. Years later, however, two were

still successfully wearing theirs. Presumably, this was because their stumps had retained essentially the same shape, so of course their sockets continued to fit. The suction socket concept was revived at two places in Germany in the 1930's and independently on a very small scale by a limb maker in New York City, who apparently fitted only a few cases. Use in some, but not all, parts of Germany expanded rapidly during World War II.

The suction socket technique was brought back to this country as a proposal for evaluation by a commission sent to Europe by the Surgeon General of the United States Army, in March 1946. After extensive trials coordinated by the National Research Council's Committee on Artificial Limbs, the suction socket concept was recommended to the Veterans Administration as a worthwhile form of fitting provided that each was prescribed by a qualified surgeon and fitted by a specially trained limb fitter. The Chief Medical Director of the Veterans Administration, in October 1947, then asked the National Research Council to arrange for such specialized training for both surgeons and limb makers. This training, pioneering rehabilitative engineering education, led not only to specialized continuing-education schools but to certification of the qualified limb makers. That was an important step toward the upgrading of limb makers into the more professionally oriented prosthetics profession of today. From the introduction in the Spring of 1946, there were intensive and coordinated efforts. There was a vigorous program by the Spring of 1948, and soon afterward an increasingly widespread chain of clinic teams composed of physicians, therapists, prosthetists, and prosthetic representatives to follow up not only the rapidly increasing number of suction socket cases but other types of patients as well.

The whole concept of the Orthopedic and Prosthetic Appliance Clinic Team in the Veterans Administration had been tried first at San Francisco and then in New York in 1949 and was widespread throughout the country by the 1950's. Some years later a National Research Council survey indicated at least 400 clinic teams, mostly in private medical centers and other institutions, throughout North America. The concept of the clinic team was, in turn, widely taught at international prosthetics courses beginning in 1957, leading to worldwide acceptance of the concept.

Lessons from this and many other examples of attempts at transfer of research results through evaluation into wider dissemination will be used in the entire Rehabilitative Engineering R&D Program, with the Office of Technology Transfer as a key element in promoting expeditious transfer. It is anticipated that this Bulletin will be an increasingly effective tool in such efforts.