

Sensory Aids

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Twentieth-century developments in technology, particularly those related with World War II, in fields such as communications, sensing the environment at a distance, optics, electronics, and human factors engineering, have inspired inventors and scientists to work on sensory aids to help the visually and aurally impaired. The Veterans Administration was a supporter at the end of World War II of the National Research Council's Committee on Sensory-Devices (CSD) which guided government-funded sensory-aids research at a number of laboratories. A review of the field was published in 1950 in the book *Blindness*, edited by Paul Zahl, reprinted in 1962 (1). After the dissolution of this committee the Veterans Administration continued funding sensory-aids research projects aimed at developing, evaluating, or improving devices and services designed for easing the problems caused by blindness and hearing impairment.

The research projects reported on here are quite apart from the extensive medically oriented research conducted with VA in ophthalmology, otology, and other specialties having a clear relationship with visual and aural dysfunction. Here we are considering the device-oriented technologically based developments undertaken under the aegis of the former Research and Development Division, Prosthetic and Sensory Aids Service, and continued, after the reorganization of October 1, 1973, by the Research Center for Prosthetics under the Assistant Chief Medical Director for Research and Development.

Various devices and aids developed for the blind provide assistance in all sorts of pursuits a blind person may choose to follow. Many of these have existed for years, and a current display of what is available today may be seen in catalogs issued by the American Foundation for the Blind (2,3). Not available in the late 1940's were devices to enable a blind person independently to read an ordinary inkprint or typewritten page, and environment sensing device (suggested by the then dramatically reported sonar and radar systems) to afford mobility guidance to a blind person. Therefore, the VA concentrated its research efforts in these two

deficient areas, based partially on evaluation of CSD devices, further development reflecting new technology and insights, and further evaluation.

For more than 20 years the VA has funded a series of projects whose detailed histories may be traced by consulting the materials in VA's Bulletin of Prosthetics Research (4) and the Blindness Annuals (5) published by the American Association of Workers for the Blind (AAWB). These research projects have led to the availability at the present time of the "Stereotoner," an audible-output polyphonic reading device for the blind, usable by some after training to read independently a large variety of print, and the "Laser Typhlocane," a mobility aid providing the same protection as a long cane but having capabilities to examine the head-level zone out ahead for obstacles, the zone out ahead beyond an ordinary cane's reach for obstacles or landmarks, and the nature of the terrain beyond an ordinary cane's reach. Early warning indications are given of conditions in these three zones to help the blind traveler to negotiate his route safely, gracefully, and hopefully with reduced stress. The VA is currently conducting clinical application studies of these two aids and of similar devices developed elsewhere, the "Optacon," a reading aid with tactile output, and the "Binaural Sensory Aid," an ultrasonic environmental sensor used as an adjunct to a conventional long cane. Clinical trials are also underway of low-vision aids for the partially sighted such as closed circuit television (CCTV) systems.

The market for sensory aids for the blind has always been difficult to assess. Many inventors first entering the field are enthused over the apparent ease of building a sensory aid for the blind that they perceive will have major significance in alleviating some aspect of the disability. It is only with time that they begin to appreciate the difficulties which come from every part of the system. Discouragement ensues, particularly on the parts of those who may be supplying venture capital for research and development. Such capital has never been plentiful. This limitation is one reason why the VA has steadfastly, if modestly, supported several projects over the years involving both contractors and intramural activity. In addition to the devices noted above which have reached clinical application, a personal-type character recognition device and a library reading service are under development.

The VA has also long supported some hearing-aid research. With a myriad of makes and models of hearing aids on the market, there has been no dearth of venture capital in this highly competitive, commercial, and probably quite lucrative field. Basic information on acoustics and electronics and a variety of components (e.g., transistors, printed circuits, and recently integrated circuits) are also readily available. VA's research efforts with hearing aids have thus tended to leave engineering development of improved aids to the manufacturers, stimulated by

competition in the marketplace. The VA has emphasized studies to clarify the relations between the clinical value of an aid, its measurable physical properties, and the fitting methods used to select the best aid for each hearing-impaired person. VA's hearing-aid procurement system, developed over the years in part in cooperation with its research program, has had a salutary influence on the industry by pressing always for high quality but at reasonable cost. The routine use of audiology clinics to fit individual patients and a developing centralized repair program have also improved the quality of aids and services.

REFERENCES

1. Zahl, Paul A., ed.: *Blindness: Modern Approaches to the Unseen Environment*. Princeton University Press, 576 pp., 1950.
2. American Foundation for the Blind: *Ideas for Better Living*. Free catalog, 34 pp., 20th edition, 1974-1975.
3. Clark, L.L., ed.: *International Catalog, Aids, and Appliances for Blind and Visually Impaired Persons*. American Foundation for the Blind, N.Y., 214 pp., 1973.
4. *Bulletin of Prosthetics Research*, Research Center for Prosthetics, Veterans Administration. Available at normal cost from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402.
5. *Blindness 1973*. American Association of Workers for the Blind, Inc., Washington D.C., annual, 124 pp., 1974.