

## PERSONAL COMPUTING TO AID THE HANDICAPPED — THE JOHNS HOPKINS FIRST NATIONAL SEARCH: AN INTRODUCTION

The evolution of low-cost personal computing technology promises unprecedented educational and vocational opportunities for millions of handicapped citizens. Extending the reach and improving the quality of life of disabled people are among the most worthwhile achievements that will result from the expanding use of computers. A promising new alliance between the power of computing and the urgent needs of the handicapped is providing an impetus that is capturing the imagination of both the handicapped and the computer communities.

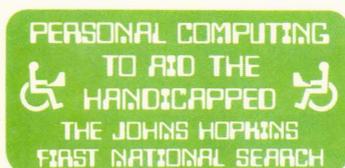
### INTRODUCTION

The United Nations designated 1981 as the International Year for Disabled Persons. In response to the need for relieving constraints under which many handicapped people live and for turning opportunities into reality, The Johns Hopkins First National Search was conceived as a competition to inspire computer-based applications aimed at meeting the educational, vocational, recreational, and daily living needs of disabled persons. It was deemed appropriate for the Laboratory to undertake this innovative national venture to coincide with the International Year.

### OBJECTIVES OF THE NATIONAL SEARCH

The objectives of the National Search were to:

1. Focus the power of computing technology on the urgent needs of millions of handicapped individuals;
2. Stimulate individual innovation and creativity in the general public;
3. Encourage individuals, professional societies, and academic, industrial, government, civic, and rehabilitation organizations to work together to meet a major human need.



### THE NEED

The number of people afflicted with mental and physical handicaps typically represents approximately 10% of a country's population. In the United States, for instance, this figure is over 25 million. It includes individuals with handicaps related to vision, hearing, language, mental retardation, learning disabilities, neuromuscular or neurological disorders, and limitations of movement.

There are, for example, millions of learning-disabled children whose education may be significantly helped through the innovative application of personal computing technology. The addition of standard modules such as voice synthesizers and voice recognition devices promises to extend the reach and scope of activities of many persons suffering from visual, communication, and mobility handicaps. Many entries submitted to the National Search offer innovative and practical solutions to educational and vocational challenges, promising to improve the quality of life of countless disabled individuals. Such solutions may convert dependence on others to independence and increase the productivity of handicapped people on an unprecedented scale. Individual innovation coupled with the leverage of personal computing can transform the dedication and drive of millions of handicapped individuals into a major national resource.

### THE COMPETITION

The Johns Hopkins First National Search sought entries from three classes of participants: computer professionals, amateurs (including professionals in noncomputer-related fields), and students. Team en-

tries were encouraged. Many team entries involved three participants (e.g., a computer professional, a rehabilitation specialist, and a handicapped person). Submissions were invited in the following categories: working computer-based devices, working computer programs, and paper designs (i.e., concepts not yet implemented).

The use of standard and general-purpose building blocks was encouraged to facilitate subsequent availability to handicapped users. It was emphasized that the general-purpose nature of computers, coupled with the flexibility of individualized software programs, could offer the handicapped user a range of personalized tools while retaining the advantages of mass production and distribution.

Fifteen introductory workshops were held around the country to bring together technologists (who had the potential tools) and the handicapped community (who had and understood the needs). The workshops were held at locations such as the Maryland Vocational Rehabilitation Center, Gallaudet College for the Deaf, NASA's Johnson Space Center, and the Trace Center in Madison, Wis. Participants ranged from computer scientists and hobbyists to rehabilitation professionals, educators, and the handicapped themselves. The public response to the national search and to the workshops was enthusiastic. Thousands of individuals and many institutions interested in problems of the handicapped responded supportively with a wide range of innovative ideas and applications.

Over 900 competition entries were received, and several hundred were exhibited at 10 regional fairs around the country. The fairs were held in August



Technologists, educators, handicapped, and the general public take part in 15 induction workshops held around the country to encourage participation in the Johns Hopkins First National Search.

1981 at major centers such as the Chicago Museum of Science and Industry, the San Francisco Exploratorium, the Boston Museum of Science, and the Maryland Science Center in Baltimore.

Competition entries were evaluated and judged on the basis of technical merit and functional promise. The evaluation was done by experienced judges from technical, academic, and rehabilitation organizations, as well as by many handicapped individuals. Over 100 regional awards, including 26 personal



Ten regional fairs nationwide attracted enthusiastic audiences, such as this one at New York's World Trade Center.



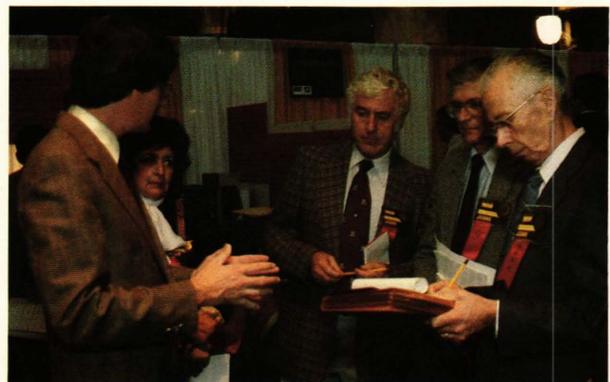
Preliminary evaluation of entries at APL, conducted by a panel of judges. Each entry is reviewed against functional as well as technical criteria.



Roy Campanella, Brooklyn Dodger great, makes a presentation to 8th grade student Joseph Terpenning at the New York Regional Fair.

computers and many cash prizes, were awarded to winning regional entries. From these, the national finalists were selected and invited to exhibit their inventions in the Great Hall of the National Academy of Sciences in Washington, D.C., and to compete for the national awards, including a \$10,000 grand prize.

Twenty-eight finalists exhibited their inventions at the National Fair. Handicapped persons, educators, rehabilitation specialists, technologists, and the general public attended the fair in large numbers, and extensive media coverage took the event to radio and television audiences.



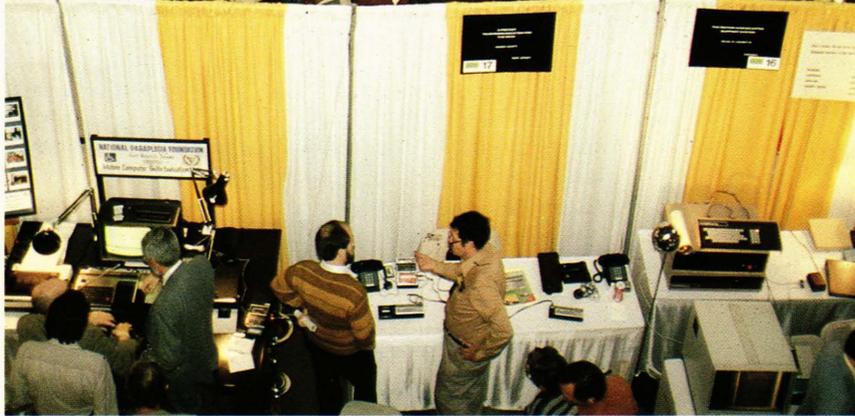
The 19 national judges represent technical, academic, and rehabilitation organizations in final judging held at the National Academy of Sciences in Washington, D. C.

The national judging was held on November 1, 1981, one year after the program was launched at the National Press Club by Ross Jones, vice president of the University. The 19 national judges were faced with the task of making a final selection from an impressive array of innovative and practical entries. Professionals, amateurs, and students were represented among the national finalists. The awards banquet, held the next evening, was attended by 300 guests, who were addressed by leaders of the handicapped, educational, technical, and government communities.

A two-day workshop at APL brought together the inventors, potential users, industry, government agencies, educators, and professional organizations interested in the problems of the handicapped. The



A group of Johns Hopkins First National Search finalists is shown during a visit to Senator Edward Kennedy's Washington office. Mr. Paul Hazan of APL, who directed the search, is shown at left next to Dr. Lewis F. Kornfeld, Jr., president of Radio Shack, Inc. and Mrs. Kornfeld.



View looking down on the displays and crowds in the National Academy of Sciences Great Hall exhibit area.

workshop was highly interactive and included working exhibits as well as presentations by the national finalists. Topics ranged from a reading machine for the blind to portable telecommunications for the deaf using a pocket computer that couples to a standard telephone. Some applications involved computer-aided instruction for the learning disabled. Others provided a quadriplegic with an ultrasonic head control for a wheelchair or an electronic keyboard with word-processing capability.

This issue of the *Technical Digest* includes papers describing a sampling of the winning entries. Proceedings describing 97 regional winning submissions were published in cooperation with the Computer Society of the Institute of Electrical and Electronics Engineers.<sup>1</sup> These Proceedings have been widely publicized in magazines, newsletters, and conferences, and through many data bases.

The contents of the IEEE Proceedings are grouped by category of handicap: Section I — Hearing, Speech, and Language; Section II — Learning Disabilities and Mental Retardation; Section III — Movement, Neuromuscular, and Neurological Disorders; Section IV — Vision. Brief abstracts of the regional winning entries are included on pages 273-277 of this issue of the *Technical Digest*.

Section I includes entries varying from "A Communications Aid for the Non-Oral Severely Disabled" to "Computer Finger Spelling." Section II includes such papers as "Computer-Assisted Instruction in Special Education." Section III ranges from an "Electronic Keyboard" for quadriplegics to "An Ultrasonic Head Position Interface for Wheelchair Control." Finally, Section IV covers a broad spectrum of submissions to aid the visually impaired.

## THE FUTURE

The National Search has come to a close but not to an end. Its momentum has opened up several new opportunities for our technology to help meet a wide range of human needs. Cooperative efforts are being initiated between APL and the Special Education Division of the University, as well as with several Maryland county school systems. The Maryland Vocational Rehabilitation Center has asked APL to assist in a pilot program that will eventually provide vocational training to 100 individuals with multiple sclerosis or cerebral palsy through the application of personal computing technology.

The Laboratory is collaborating with the Association for Retarded Citizens in setting up their national demonstration project, which will feature applications of computing technology to aid severely and profoundly retarded people. Another promising program inspired by the Johns Hopkins Search involves the use of public libraries as a network for exposing handicapped citizens to the world of personal computing and its potential for extending the reach of people with disabilities. The pilot program, inaugurated in October 1982, has installed two personal computer systems at the Montgomery County Public Library in Rockville, Md.

APL is also conducting a preliminary study to assess the feasibility of setting up a national distribution network that would make available a wide range of application programs to handicapped people in their homes and schools, and through other outlets. Numerous follow-up activities are also being undertaken by many of the competition participants around the country.

The National Search has done much to help focus public awareness on the needs of the handicapped. That increased awareness, together with the rapid advances in, and applications of, personal computing technology, suggests that bold initiatives will offer significant educational, professional, and recreational opportunities for the handicapped in the near future.

## CONCLUSIONS

The personal computing community has been accused by some of producing little more than expensive games. Others have predicted far-reaching opportunities and implications for a broad spectrum of society from this ubiquitous technology. Much has been said about the potential of personal computing for helping the handicapped, and some successes were achieved in the past. For many, however, The Johns Hopkins First National Search provided an exceptional opportunity to translate creative ideas into reality. Over 1000 innovative individuals rose to the challenge.



Sequel to the National Search: Dolly King is one of a hundred handicapped trainees at the Maryland Vocational Rehabilitation Center who will eventually undergo training for employment. Advising Dolly on the use of the personal computer as a word processor are Bud Rizer, Project Ace Director, and Rick Henle of APL.

Perhaps the central message emerging from the National Search is that a multitude of individuals with unique and widely varying disabilities can be greatly assisted through the use of general-purpose, mass-produced personal computers. The private sector may now find a market of several million handicapped people to be a viable business prospect. This is a significant development that promises eventually to put the production, distribution, and financial leverage of the computer industry to work for the handicapped.

The task of improving the quality of life, as well as educational and vocational opportunities, for the millions of handicapped people is awesome indeed. But then, so is the power of individual creativity. We believe that the store of individual ingenuity and dedication coupled with the creative leadership of our educational, technological, and rehabilitation communities makes this ambitious goal not only attainable but inevitable.

## REFERENCE

<sup>1</sup>*Proceedings of the Johns Hopkins First National Search for Applications of Personal Computing to Aid the Handicapped*, Publication Number 392, IEEE Computer Society (1981). Other recent conferences or sessions on computers and the handicapped were held by Infotech in 1981 and AEDS in 1982.

**ACKNOWLEDGMENTS**—The Johns Hopkins First National Search was cosponsored by the National Science Foundation and by Radio Shack, a division of The Tandy Corporation. Numerous other organizations, participating as program associates, helped make this a highly successful venture.