NATIONAL SEARCH WORKSHOP

Cosponsors:	JHU/APL, IEEE Computer Society, and The National Science Foundation
General Chairman:	Paul L. Hazan, JHU/APL
Program Chairman:	William Buchanan, JHU/APL
Arrangements Chair:	Lois Craig, JHU/APL

After the National Fair, The Johns Hopkins University Applied Physics Laboratory hosted a workshop at its Kossiakoff Center. Many competitors, including National Search finalists, representatives from the computer industry, disability groups, educators, and other interested parties, participated. This assembly of the National Search finalists and top leaders in the fields of disabilities and computing represented some of the finest talent in these areas in the country. The workshop format consisted of a talk by each of the panelists followed by lively discussion from the audience. This article presents representative comments and issues raised by the panelists and the audience. The two-day workshop was intended to help the inventors move their ideas toward the consumer and to address future directions. The first day was devoted to the first of these two issues—the road to the consumer. The second day of the workshop addressed future directions. Clearly, the National Search had accomplished its goals, but the organizers and competitors agreed that the momentum initiated by the National Search should be continued.

THE ROAD TO THE CONSUMER

THE ROAD TO THE CONSUMER WORKSHOP

Moderator
William Buchanan

Panelists	Title and Affiliation
Kenneth Anderson	Past President IEEE Computer Society
Mary Louise Beall	Intellectual Property Attorney JHU/APL
Jim Caldwell	Chairman IEEE Computer Society Technical Committee on Computing and Disabilities
Jim Magee	Past President Electronic Industries Foundation
Nancy Minghetti	Director Programs and Corporate Development American Speech and Hearing Association
Jean Petersen	Executive Director Learning Disabilities Association of America
Bud Rizer	Director Technology Resource Center Maryland Rehabilitation Center

Dissemination

BUCHANAN: An important issue is dissemination of information—getting stories in the newspapers, the technical journals, the magazines, and on national television. Our press people have done a good job this week. Many of you probably saw yourselves on CNN last night, and I think their effort will give many of you a start on being recognized [by providing] more clippings that you can show to potential supporters. Newspaper reporters are out there who will publish your story. Once you are ready to tell your story, try to tell it to as many people as you can.

Need for Standards

ANDERSON: As the past president of the IEEE Computer Society, I can give you some of the history of what has been occurring within the IEEE and within the Computer Society over the past decade.

Ten years ago, we conducted the First National Search for Computing Applications To Assist Persons with Disabilities. Right after that, two technical committees were formed within the Computer Society. One was on personal computing; the other was on computers and individuals with disabilities.

Another significant event occurred around 1982. Gordon Bell, a major developer of a computer system that is now used worldwide, gave a talk at a Computer Society conference. Gordon is the father of the VAX computer by Digital Equipment Corporation. He projected what should be done in the future with technology. At the end of his talk, people asked him what was the most important thing they should consider for the future, and Gordon said, "Standards!" All the new technology made it extremely important that standards be developed along with that technology.

Some important things have already been standardized. For example, there is a way to take a keyboard and connect it either to an MS–DOS system or a Macintosh computer. That's good. But the development of standards is far from complete, and much more work needs to be done.

How are standards developed today, and what is the life cycle? Most computer standards take three to five years to be developed, and it takes a large, heterogeneous group of people with a common interest to do the job. We have to organize a process whereby the inputs to a technical standard, for example, are not only defined by the technologists but are also shaped by the users, especially in the case of persons with disabilities.

An Association of Associations

ANDERSON: This process can begin by the establishment of an association of associations. A special thing about this workshop is that there are representatives from many different associations here—some having to do with the technology and others dedicated to assisting persons with disabilities. Out of this workshop, we might form the kinds of continuing associations and networking that will permit us to identify needs and priorities. Also, we may be able to set up a timetable for the implementation of programs of the new association of associations. This association should work in the best interests of not only the developers of technology but also for the end users—the people we all hope to serve by our ideas and inventions.

Intellectual Property

BEALL: Intellectual property is anything you create in your head. Intellectual property is a creation. Legally it is property as is your car, your house, and your jewelry. It belongs to you, and you can do things with it. It has value, and that value can be protected in several ways.

There are patents, copyrights, trademarks, and trade secrets, which many of you know of as proprietary technical information.

I urge every inventor to see a qualified intellectual property practitioner. You have one year from the first display of your invention in which to file a U.S. patent application.

As for software, the minute you created it, it was protected by international copyright according to the Berne Union convention, an international treaty. So you already have the right to copyright protection. I urge each of you to protect your rights. Be careful. You invented your intellectual property; it's worth something. Take care of it.

Commercializing Inventions

BEALL: There are two basic ways of commercializing an invention. One is to become an entrepreneur. The other way, [to which] my experience applies, [is to find] someone who will buy your invention, or someone to license it to. If you sell it, you get some money right away. If you license it, typically you look forward to royalties. Royalties are not usually very big (somewhere between 1% and 6%), but you may receive a long-term flow.

As an entrepreneur, you must become a salesman. You sell yourself; you sell your invention. You have to learn how to approach venture capitalists, and you have to learn about other possible sources of financing, such as Small Business [Administration] innovative research grants. You have to become an invention champion. You can not make your device succeed commercially without becoming an invention champion.

[Another way of commercializing an invention is] to license, but you have to find a purchaser. Once again, you have to sell; you have to market. Uniformly, small business people don't want to hear from inventors unless there are special circumstances, because a design from an independent inventor is not usually in good enough shape to take on. [Small business people] would have to put too much into it. This does not generally apply to those of you who are already supported or sponsored by companies, [which] should be interested in commercializing what you have created and already have the right to do so.

Manufacturers often say they don't want science projects. What they want are things readily useful and reproducible. One of my favorite sources says "Fitness for a particular need at an affordable price."

An article appeared in the February 10 [1992] issue of *U.S. News and World Report* about some early actions under the Americans with Disabilities Act (ADA). There is a lawsuit against the Empire State Building because people cannot access the observation deck without climbing two flights of stairs. I think we're part of that—we're all climbing to the top of the Empire State Building one way or another, and we're going to get there.

An Organization to Help Inventors

BROWN [from audience]: We need an organization that will allow ordinary people to pick up the phone and say, "I have invented something, and I now need some assistance in determining how to get it to market." That is the most important challenge we face. That is why all of us are here— why all of the inventors are here. I am in a better position because I have some support in my organization to do this.

It would be extremely useful to create an agency that would be a conduit of information for researchers and inventors, rehabilitation specialists and experts, and private industry. An inventor could call to find out about locating a manufacturer, the legal issues, and so on. The agency would walk the caller through a step-by-step process to help bring the product to market. This agency would provide manuals, telephone support, and also workshops to reach out to the small inventor who may not know about professional organizations and may not have access to that kind of information. As a final idea, this agency should encourage manufacturers to handle orphan products.

A specific plan is needed to move these issues forward. It should be conducted by people who have the responsibility to lead because that is their job and that is what they get

paid for. With a group of volunteers, I don't think it will get done.

The IEEE Computer Society Commitment

CALDWELL: I'm here mainly in my role as Chairman of the IEEE Committee on Computing and Persons with Disabilities. We are thinking of forming three subcommittees of this organization. First, we need a standards committee to guide the design of computing hardware and software intended for use by people with disabilities. Then, we need an assessment subcommittee organized along the lines of disability specialties. It would consider the practical worth of various approaches. We also need a third committee on technology transfer. It would have a very important function termed "outreach" because we are going to have to recruit physical, occupational, speech, and vocational specialists as well as teachers into IEEE programs. This outreach committee would bring interdisciplinary work under the umbrella of IEEE.

The minority group known as people with disabilities is an equal opportunity minority. It's the only minority you can join. The baby boomers are reaching ages when they will be joining the minority group known as people with disabilities.

Many of the inventions are envisioned to help people who are profoundly disabled—people who can't function at all without such assistance. We haven't talked much about items that just make life better if you happen to have some loss—not total loss—but some loss in a functional area. In looking at the baby boomers getting older, we might ask how this or that device could be helpful to older persons who are losing this or that functional capability. The aging baby boomers could be a new mass market for our inventions. There's a lot of potential there.

A Standing Advisory Board

HAZAN: I intend to remain involved with the goals of the National Search, but I might also add that the entire Advisory Board of the Search decided at their last meeting that they would not disband, so the Advisory Board is being set up as a standing Advisory Board to continue its study and direction of effort. That effort includes the dissemination of information, and it includes pursuit of standards, ADA issues, government activities, etc. We will, of course, set up additional follow-on workshops, and tomorrow we will discuss some other potential initiatives.

Sources of Information for Inventors

MAGEE: I've been very impressed by three things during this conference. First, the enthusiasm of the participants; second, the evident dedication of the participants; and third, the relative youth of the participants. Someone asked during the break, "How did they get so smart so young?" All of you know much more about the field of disabilities than I can ever pretend to know, but there have been indications of uncertainty about how to get industry involved. That's where I can come into the act.

The Electronic Industries Foundation (EIF) has a parent organization, the Electronic Industries Association (EIA). The EIA has an Assistive Devices Division made up of companies already interested in products to assist people with disabilities. Many of you know Larry Scadden, who has been active in this Search. It was his initiative that brought about the formation of this division. Larry, I, or a number of other people at the Foundation can provide leads on persons to talk with in the EIA, and specifically in the Assistive Devices Division. The EIA is not the only industry association that could be helpful. Most trade associations can steer you to those companies that might have interest in your ideas. Some examples are the Aerospace Industries Association, the National Security Industrial Association, the American Electronics Association, the National Electrical Manufacturers Association, and the Armed Forces Communications and Electronics Association. All have technical people, and many have genuine interest in doing things for the social good.

Outside industry, there is a great source of information in the area of rehabilitation engineering and development of devices, namely, the Rehabilitation Engineering Society of North America (RESNA). The RESNA people are familiar with just about everything going on in this area throughout the United States. They can be contacted directly or through the National Institute on Disabilities and Rehabilitation Research (NIDRR).

We have the challenge of making consumers, and the agencies who work with them, aware of what computing and electronics can do for the disabled population. Clearly, the message has to go out to the various advocacy groups. One of the jobs that Johns Hopkins, the National Science Foundation, and the IEEE have is to let industry, the government, and the advocacy groups know what this National Search has accomplished. I recommend that those of you interested in promoting your inventions make direct contact with these organizations.

When you go to industry with your invention, the first question they are likely to ask is, "What is the market?" We talk about 43 million disabled people in the United States, but we can't really define it much beyond that. With the help of the government representatives who are here, and with the resources of Johns Hopkins, we should attempt to quantify the characteristics of our disabled population better. Until we do that, we can't do a good job of market research, and without solid information it will always be hard to get industry to buy in.

The Value of Interdisciplinary Collaboration

MINGHETTI: I work with the American Speech and Hearing Association's foundation, and like many foundations, our missions are basically research and education. But a major element of our program plan is fostering special initiatives, generally in areas of most pressing needs. We promote applications of advanced technology and have recently conducted a number of novel technology projects.

508

Our association has been fortunate in receiving project grants both from Apple and IBM. One project [involved the development of] clinical software for use with clients. In other cases, we have done efficacy studies with various disability populations using commercially available products. What I have learned from these projects, and what I hope you remember from these brief comments, is the value of collaboration—the partnerships we have created.
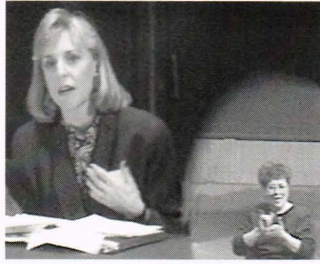
When we first started with our computer-related projects, I think there was a basic notion that we had a shared vision. I say shared because it wasn't developed in isolation—we conducted a number of conferences and contacted professionals. We hoped to fill existing needs and anticipate technology's future impact on the field of communication sciences. To do this, we were joined by field professionals, and we had the good fortune to come in contact with industry because of our corporate sponsor program. We began working together. We did a lot of talking and a lot of brainstorming—developing good working relationships—and basically we achieved our results through shared vision. We developed some concrete strategies.

We have had to assess the level of technology required for these projects. I am a big advocate of technology. I get excited about it, but I want to stress that it is really a tool; it's part of a bigger picture when you get out into the real world.

In the health and education fields, not only are you going to be affected by funding issues as you market your product, but you will be confronted by cost benefit evaluations. In everything we do we're talking about helping people, but we can be carried away by the technology itself. Sometimes the best solution to a given problem is a different kind of technology—lower or higher—a solution that we might not have thought about originally. This is one reason why our foundation has become interested in helping our field professionals and industry look at the efficacy of technical products in doing the intended job for people with disabilities.

Our projects evolved over time. We are sort of the conduit or the catalyst between what industry can offer and what field professionals have as their need—we bring them together. We are working now on a situation with expandable opportunities. We developed prototype software and are working with two or three companies that weren't involved in the original project but are interested in those prototypes and will help us bring them to market. So you can see the strength of collaboration.

You have to do your homework, know your causes, and know your market. You have to have data. You have to do measurement and follow-up.

A Database for Learning Disability Solutions

PETERSEN: The Learning Disabilities Association of America (LDA) is a 50,000-member organization composed primarily of parents. We do have many professionals associated with us, but we are primarily a parent volunteer organization. We are advocates for individuals with learning disabilities, [who constitute] the nation's largest disability population. You will find statistics claiming that anywhere from 10% to 20% of our citizens are learning disabled.

Our involvement with technology has been primarily at our international annual conference where we draw about 5000 people. Thanks to Dr. [Gilbert] Schiffman, and others from Hopkins, we have presented some wonderful preconference symposia and workshops at our conferences. However, as wonderful as these conferences are, it doesn't help my office in the day-to-day routine.

On any given day, we receive at least 100 pieces of mail, and more and more of this mail asks for technology assistance. [The mail] comes from parents; it comes from teachers. It would be wonderful to have a database from which we could draw answers to their questions.

A teacher might write and say she has a very bright learning disabled student in the sixth grade who is having trouble with mathematics and ask if we can suggest software and hardware programs. When we were getting one or two of these inquiries per day, we could turn to the professionals we know in the field. However, now we are getting so many inquiries that we need a database, and we need your assistance. There must be many wonderful programs out there, and we would like to know about them. We know there are computers in schools, but we also need in-service programs for teachers as well as parents to utilize this equipment.

Educating Service Providers

RIZER: I operate several different technology projects at the Maryland Rehabilitation Center and have been involved in applications of technology for the past ten years. I am not a creator of technology; I use your products—that's my role. So from that role, I would like to talk about several different needs or concerns. Some are global, and there's not much that any one person can do about them. You should be aware of them, however. Others are more specific and have to do with issues that you can address.

Let's look at the issue of education. Recent graduates in occupational therapy frequently did not have an opportunity to study adaptive technology while they were in school. We have various professionals from special education, rehabilitation, occupational therapy, speech and language pathology—even engineering—who were not prepared upon graduation to work with adaptive and assistive technology—not so much the technology as the adaptation of it. There is a void we haven't quite caught up with yet, and we need to do so.

The professionals working in the disability area lack, on the whole, sufficient computer training background. This does not imply that all people who work with assistive technology must be computer engineers, programmers, or systems analysts, but they need a basic understanding of the potential that technology can provide. In order to understand how to apply a tool, you have to know a little about the tool's best use and potential.

Serving Both the Professional and the End User

RIZER: Market channels are another concern. Certain products, including some of the National Search entries, should be marketed directly to the consumer. This applies whenever the consumer can benefit immediately from the product. Other products require significant amounts of professional knowledge and orientation. These products should go to consumers via professionals who are applying the technology. We need to be very careful in deciding which channel is appropriate for a given product. Is it something that can go straight to the consumer, or is it something that really should be in the hands of the professional, who then will make a recommendation to the individual consumer?

My advice is to make your product usable as quickly as possible—something that can be up and running quickly. Give the professional as many different options to work with your device as possible. But don't limit the professionals. Enable them to be as creative with your product as they possibly can.

My next point has to do with direction of your product. I do not look favorably upon products that claim to solve everyone's problems. We should all have a conservative outlook with regard to products intended for people with disabilities. Exaggerated claims are not helpful. I tend to favor manufacturers who are straightforward about the populations their products are developed for. For example, if a device is intended for a person with good head control (fine motor control), the claim should not be made that it will work for a person with cerebral palsy. If [a manufacturer has] a population [that a device] works well with, they should promote it within that population.

All products should be subjected to some measure of applied research. Prove that your thing works. There are numerous clinics, centers, and schools willing to work with you and your product to let you know if it does the intended job. The more well-thought-out the research, the better.

Remember who your consumers are, particularly when you are dealing with the rehabilitation and special education professions. They are working with large populations of people with disabilities; they need all the help they can get.

Interdisciplinary Involvement

SCHIFFMAN: Think of Jean Petersen saying we have 50,000 parents crying for help. Let's bring groups like the IEEE and other creative organizations together with the parents of children—as well as the youth and adults—who have relevant disabilities. Let's not just talk about it. Let's do it.

WINKLER: We already have the germ or the seed of an existing organization. We have the Johns Hopkins National Search. It has a centralized organization, and it has the makings of ten regional organizations. It is already in existence, and what is left to do is to formalize it.

Contributions from the Workshop Attendees

Bringing Groups Together. There are many parents who need help. There are engineers who know all about technology but little about the needs of the populations we are talking about. Occupational therapists and physical therapists do not know enough about technology. There are standards to be developed. This is where it should all come together. This is where the associations are already together.

There are many users' groups; there are many engineering groups; there are many educational groups; but there is nothing like this convocation, where they are all represented in one room at the same time. I have learned a lot from the different people I have met here.

Rehabilitation Engineering Centers. I would like to address the idea for an agency to help transfer ideas from concept to the market. The NIDRR group sponsors rehabilitation engineering centers, with two centers for technology transfer. One is headed by Don McNeal, and the goal of his project is to increase the impact of NIDRR-supported research on the commercial market. The project will establish support services to individual rehabilitation engineering centers, perform technology transfer outcome surveys, prepare a technology transfer handbook, produce a plan for facilitating the delivery of technology, measure the continuum of consumer services, and investigate methods currently used by service providers in assessment, prescription, and training.

Lawrence Scadden is Principal Investigator of the other Rehabilitation Engineering Center (REC). It conducts research and disseminates knowledge to improve the flow of technology through the transfer process to persons who might benefit from its use. The REC is committed to promoting active involvement of persons with disabilities in the planning, conduction, and evaluation of all center activities undertaken to achieve its goal. Twenty-four products with written descriptions, findings, and recommendations have been produced. Subjects include alternative funding and financing of assistive technology, and planning and implementation for providing assistive technology.

FUTURE DIRECTIONS: WHERE DO WE GO FROM HERE?

FUTURE DIRECTIONS WORKSHOP

Moderator
Paul L. Hazan

Panelists	*Title and Affiliation*
Kenneth Anderson	Past President IEEE Computer Society
Susan Brummel	Director General Services Administration Clearinghouse on Computer Accommodation
Lawrence Oliver	Consultant
Gil Schiffman	Professor Emeritus The Johns Hopkins University
Glen Solomon	Director Industry Relations Electronic Industries Foundation
Stanley Winkler	President The Winkler Group

ANDERSON: It is important for technologists to be better integrated into the issues of public policy and also into the educational process. Technology development can be better positioned in areas that are not usually thought of by people working at the leading edge.

The application of computers to persons with disabilities could serve as a fine example of how technologists can help

510

those who are disabled to live more productive and satisfying lives. What we have accomplished here in the last week can serve as a framework for further activities and further networking of concerned groups to sensitize others to this important area and to establish the priorities for the future. My suggestion is let's take the torch and pass it along. Let's see where it takes us in the next five years. Let us not wait for ten years.

BRUMMEL: My ideas stem from what I have heard over the last couple of days, coupled with experience over the last few years at the General Services Administration.

An important rule applies to this whole area: the rule of inclusion. Information environments should be designed to be useful to all individuals.

We are beginning to appreciate the dual and multiple benefits of that type of approach. With the Americans with Disabilities Act, we can anticipate that the rule of inclusion and equal opportunity for participation is going to become an important principle of all our organizations.

It is important, wherever possible and as much as possible, to work within existing structures. Within the General Services Administration, when I was frustrated with the service delivery limitations and utilization of existing tools, I went to the organization within the federal government that assists agencies to improve and advance their information environments. I started out as an infiltrator, but as inclusion and accessibility become part of an organization's mission, basically my role and the role of my counterparts become one of education.

For this group, it means there are a number of industry associations, rehabilitation organizations, and individuals who are facilitating utilization of the tools. We have an obligation to inventors and to the developers of the tools. I would like to see this new group, whatever it might be called, give information back to the participants, particularly contact names and numbers in associations that can be helpful to them.

DIPNER [from audience]: A unique role that the Johns Hopkins National Search might perform in the future would be to support assistive technology inventors in reaching the market. It is a role that is not performed by any of the other associations, and I belong to a number of them. That's really not the charter of most of the associations that serve the disabled population, so it is something that we ought to incorporate into the future goals of the National Search: to help inventors in their struggle to take a wonderful idea and actually get it accepted by the market.

We had a comment on this yesterday, and it was "work, work, work." If any of you think that your invention is simply going to reach the market because some magnanimous person out here is going to take it and put it there, you are mistaken. As a business person, both now in the assistive technology world and previously in the aerospace world, and

as an entrant in the first National Search, I found, and continue to find, that you have to work, work, work to get any product to market. It's going to take some effort.

You also need to be aware that there is always competition for funds. Universities are looking for funds; nonprofit organizations are looking for funds; big companies are looking for funds; individual inventors are looking for funds. You have as much right to funding as anyone else, but you will have to fight for it. Before you go out and decide to actually start a company, however, make sure you have a good network already established and that you have built up a background of understanding.

A good business deal is going to benefit both parties. You might decide to try a licensing arrangement, but if you think that someone is going to pay you $10,000 for your idea and also give you a 20% royalty on sales, think again. It doesn't work that way. The deal has to be good for the business you are working with as well as for you. It should benefit both sides.

Every state is funded by the Small Business Administration to have what are known as small business development centers. These are sometimes organized by chambers of commerce; some are operated by community colleges. The centers exist all over the country, and they can give you good ideas on who to talk to about marketing, about business financing, and so on. The Economic Development Council, if you have such a thing in your city, can also help you. There is an organization called SCORE; it is a group of retired executives, people with as much as forty years of experience as marketing executives, for instance. They provide free advice, and they also put on seminars in some of the major cities.

Whether you are one person working out of your garage or go and do what I did and form a corporation, you should recognize that you are functioning as a business, and you should behave accordingly. When you talk to a bank or to someone who might manufacture your product, you should approach [it] as if you were a business person, because you are. You will need to set up credible business and accounting procedures right up front, particularly if you hope to take advantage of any government contracts or grants. Government people insist on good accounting practices.

There was a question about sources of statistical information. When you seek funding from various sources, they will inevitably want to know how many people your invention might benefit. How can you estimate this? One source is *The Chart Book on Work Disability*, produced by the U.S. Department of Education. You can get a free copy by calling them. It provides statistics about work-related disabilities. There is also a publication called *The Chart Book on Disability*. It is more general, but it gives you some important numbers. Another publication is *The Disability Statistics Abstract*, also by the Department of Education. An example of the contents: there are 12.8 million people in the United States who have difficulty seeing words in newsprint. If your application is something that helps people who are visually impaired, you can talk about 12.8 million people being helped.

The U.S. Census Bureau publishes a lot of information of this nature. They offer a report called *County Business Patterns*. It will tell you how many of what kind of businesses there are in each county in the United States, and how many people are employed by each of those businesses. These reports cost about three dollars for each state; they also have one on the national level. The Harris Company has done three different surveys on disability, and those are readily available. The National Council on Disability, in Washington, D.C., offers a lot of good solid information—

numbers and statistics. Also look to the National Organization on Disability, and don't forget the many disability associations such as The American Federation for the Blind and the American Speech and Hearing Association.

On disability-related products, we talked about doing good research up front. We mentioned resources like the Trace Center, which has a system called Hyper-Able Data with 17,000 products listed for people with disabilities. We should not forget the Rehabilitation Society of North America because that is the one national organization that has rehabilitation engineering and assistive technology as its charter.

Finally, there are grants on assistive technology to most of the states now. If you call your state government, you will most likely find a state assistive technology grantee somewhere in the state.

My last item is funding, and there are many ways to turn. Don't forget that you may be able to self-fund your invention; you may be able to work it on a shoestring, just a little bit at a time, and actually go out and do it on your own. You might build five prototypes for a small amount of money; take those out on the road and show them around and maybe get a few orders; build a few more; and maybe eventually have a business.

Don't forget about Small Business Innovation Research Grants: $30,000 for six months, followed by a two-year grant that is typically $200,000; that is the Department of Education funding, but recognize the competition. The Department of Education gives about twelve to fifteen of those grants per year, and there are typically 200 to 300 applicants. Also, the Health and Human Services Department gives similar grants of $50,000, followed up by $250,000 to $300,000. Small Business Administration loans are another possibility. I would suggest as a last resort, after you have expended all other options, that you look to venture capital brokers, or as they are sometimes called, vulture capitalists. They will definitely get their share of a good deal, but that may be your only possibility. You have to have a pretty sophisticated presentation to go to a vulture capitalist. They want to know that they are going to make a 30% per year return on their money.

I would like to see the National Search become a venue for allowing us to find ways to bring our products to market—to provide support that we couldn't otherwise find in any organization.

OLIVER: When I became interested in this project and was attempting to see it funded, it triggered the common denominator of much of my thinking now: education. We had a problem in trying to get National Science Foundation personnel educated. We put on a conference at Boston University to inform the National Science Foundation on the directions it should take to get into supporting activities for the disabled, and education was the primary recommendation.

Applications, Stimulating Creativity, and Searches

OLIVER: Let me address three areas. The first area is applications. All of these applications are products of keen imagination, but some of them need completing, some need upgrading, and nearly all need marketing.

The second area is motivating the public to produce more and effective adaptive technologies, in other words, to stimulate creativity methodically.

I am the executive program coordinator for the Association of Department Heads at Minority Institutions—all minority institutions! I also deal specifically with a group of institutions that belong to the the Computer Research Association—a large group of Ph.D.-degree–producing institutions in computer science and leading manufacturers in computer research. I asked myself why haven't we gotten to the students at these institutions—these young, brilliant, creative minds. We are going to have to stimulate creativity methodically.

The third area has to do with the searches. I recommend there be not only regional and local searches, but also national and international ones.

The Next Priority

OLIVER: We should do a survey that would include all CAPD (Computing To Assist Persons with Disabilities) National Search participants to ask what they see as the next step in terms of priority. From that, this standing committee would formulate a plan. We should hold workshops to bring not only private industry persons who are interested in this research, but also the federal government agencies that will support this type of research [through funds such as] the Small Grants for Exploratory Research (SGER). There are some people here who could use $30,000 immediately because they have very good ideas.

At the National Science Foundation there is a program across all disciplines where a program director can spend X amount of money just on SGER activities. I am talking about bringing together the people who created these applications with the people who fund these types of activities.

Continuing the Program

OLIVER: Remember, it takes something extra to run a program of this nature. You have to have it in your heart. Don't let the fire go out. Things are hot now. Look what we have been doing, look what we have accomplished! Let's take advantage of that right now.

SCHIFFMAN: I want to get you really involved with the mildly disabled, which includes the learning disabled, the dyslexic, and the mildly mentally retarded. It is a field where we desperately need help.

Effective Use of Technology in Schools

SCHIFFMAN: Hank Becker, a research scientist at the Center for Social Organization of Schools at Hopkins, said his research indicates that teachers are not using computers effectively. Although he is optimistic about the potential of computer use in the schools, he is skeptical about the ways they are used now.
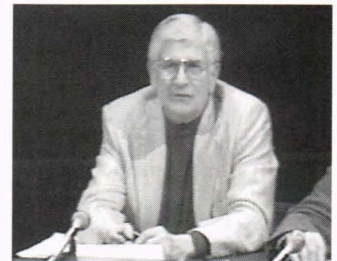
For the foreseeable future, the effects of technology on instruction will undoubtedly be more than the critics expect, and less than the advocates hope for. More than 95% of the students in the United States attend a school where there is at least one computer for instruction, and more than 60% of all school-age children have some access to computers.

Focus on Content, Not Technology

SCHIFFMAN: We need your help. The first thing we should do is to get a new mindset and know the state of the art. We are talking now about expert systems, hypercard, voice inputs, and so on. These terms are great, but most educators do not understand what is really out there. They need help to learn that.

Secondly, we have to focus on what we want to teach. We have to focus on our expert domain. As educators, we have to look at our content, look at good instructional management, and know what we want to teach. We have to break the mold and develop demonstration training centers, evaluate new products, and then disseminate the results.

There is no question that electronic technologies can expand the horizons of the mildly handicapped. We are talking about a large population. Technology represents the potential for being a truly normalizing agent so that these youngsters, wherever they are, in elementary or secondary schools, community colleges, or any of these programs, can work with their peers.

The potential can be achieved, but we realize now we can not do it alone. The goals only can be achieved when all of us—the inventors, engineers, programmers, parents, clinicians, educators, advocates, and the disabled—work together in a multidisciplinary approach to meet educational needs of children with disabilities.

Interdisciplinary Collaboration

SCHIFFMAN: I used to be Director of The National Right to Read Program. I remember testifying in 1984 before a congressional committee, where I pointed out that we had fifty-five programs in the Office of Education spending millions of dollars a year on some aspect of literacy, and not one program [was coordinated with] any other. We have a history of not really working together in an interdisciplinary way. That is what we have to achieve if we are going to make it. I believe that is our goal, our charge, and our commitment.

There is an advertisement for the United Negro College Fund in which there is a picture of a young man sitting alone in a room with a sign above saying, "A mind is a terrible thing to waste." That is what I believe the Second National Search was all about. We cannot afford to neglect or lose the mind of any one disabled child, youth, or adult.

SOLOMON: The National Search program is certainly an unqualified success. The Johns Hopkins University Applied Physics Laboratory and Paul Hazan, in having this great success, also have a big problem.

The National Search program has a strong link with organizations that represent the sales management of the electronics industry. The National Search has revealed some products that are mature enough to market, and some that are ready for the sophisticated development that established companies can complete to make them marketable. There are a number of organizations that the Laboratory might link with to expedite this marketing process.

I am suggesting that sales management needs to be brought into the picture. If you have an engineering idea that has progressed to the point of public exhibition, it is ready for sales people to see, not just other technical people.

In technology you often confront the "not invented here" syndrome. So you might not get the interest from engineering staff people that you could get from the management and sales force of an organization—people who are looking for potential additions to their product lines. We need to link with industry sales managers. We will work with Paul Hazan and see if we can move on that.

In large metropolitan areas, there are informal groups that review good ideas—ideas that have been reduced to practice, working models, and so on—to see if they are ready for investor capital and management techniques to put them on the market. There is a strong group in the Washington area that can be reached through the Virginia Technology Center and the Montgomery Technology Center.
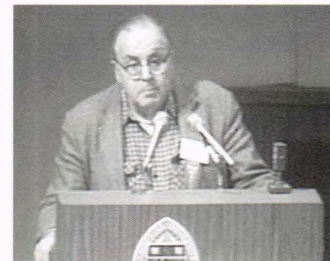
In every major metropolitan area there are similar quasi-public organizations that perform this service. I would urge each participant to look to such organizations to get funds, or to get venture capital, or to get some company to become interested in marketing his or her product. The worst that can happen is that you will get some good advice on what you need to do to make your product ready to meet the market.

Dealing with Recognition

SOLOMON: In the forest, everyone knows there are foxes, and every fox knows a little something. But there is a head fox that knows one big thing. That one big thing is you have to deal with recognition. Each person who participated in the National Search could do the program immeasurable good with a simple, short letter written to each of the program sponsors.

Each of the people exhibiting is represented in Congress by two senators and one representative. It would be very helpful to this program for you to write a simple letter to each of those three people telling them how you have benefited by participating in the National Search and recommending their attention to it.

WINKLER: The National Search, although focused on assisting persons with disabilities, is aimed at improving the quality of life for many persons. There are an enormous number of needs, many of which are not yet well articulated. A large intellectual force in our country, including parents, teachers, and professionals, wants to help in ways aligned with the National Search. The desire of parents and friends to help their loved ones to overcome disadvantages is a very strong motivating factor for invention, innovation, and development. There is a continuing requirement for technology to improve the quality of life for a large and growing segment of our population, the senior citizens. Despite the increased availability of computing power, or perhaps because of it, there is an urgent need for computer literacy everywhere in our society. More research at the leading edge must be conducted to better understand the requirements, particularly of those with mentally based impairments such as learning disabilities. More research, again at the leading edge, must be conducted to develop techniques in neurophysiology. We must have better communication, information exchange, and networking among the communities and disciplines that have supported the National Search. We want

an organization, be it a foundation, a council, or an association, to nurture the spirit, to continue the inspiration that the National Search has unleashed.

Paul Hazan told us that the National Search is a journey, not a destination. That journey must continue. More travelers must be enlisted. More than a decade ago, Paul lit a candle that has now become a torch. It is for us here to carry that torch forward until beacons are lit throughout the land. I suggest that the National Search continue indefinitely. We must have additional activities, conferences, workshops, seminars, tutorials, fairs, contests, databases, information exchanges, and bulletin board referral services. Let us not forget, as we do that, what this is all about: human beings helping human beings.