



NEWSLETTER

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JULY 1970

**FOR BLIND
COMPUTER PROGRAMMERS**

**ACM COMMITTEE
ON PROFESSIONAL
ACTIVITIES OF THE BLIND**

ROBERT A. J. GILDEA, Editor

Dr. CHARLES E. HALLENBECK, Associate Editor

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The Blind in Computer Programming
Internat'l. Conf. Oct. '69

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ACM COMMITTEE ON
PROFESSIONAL ACTIVITIES OF THE BLIND

PROCEEDINGS
of
THE BLIND IN COMPUTER PROGRAMMING
AN INTERNATIONAL CONFERENCE


October 9-11, 1969

Sheraton-Cleveland Hotel
20 Public Square
Cleveland, Ohio

Sponsored by:

Association for Computing Machinery
Cleveland Society for the Blind
and
Social Rehabilitation Service
of
Department of Health, Education, and Welfare

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FOREWORD

The Blind in Computer Programming--An International Conference, held in Cleveland, Ohio, October 9-11, 1969, was sponsored by the Association for Computing Machinery, The Cleveland Society for the Blind, and the Social Rehabilitation Service of the Department of Health, Education, and Welfare. The planning and implementation of this international conference was made possible through funds provided by the Committee on Professional Activities of the Blind, of the Association for Computing Machinery, and its chairman, Dr. T. Sterling. The production of these proceedings was supported also by a Public Health Service supplemental grant to the committee from the Social and Rehabilitation Service (supplement to Grant No. RD-2689-S). The organizers of this conference express their appreciation for this support and thank all those who have made this conference possible.

The ACM Committee on Professional Activities of the Blind organized the conference to bring together blind programmers, employers and prospective employers of blind programmers, representatives from schools for the blind, rehabilitation counselors, members of agencies serving the blind, and colleagues. The conference provided a forum for presenting problems and solutions connected with selection, training, placement, and employment of blind persons as professional workers in computer programming.

The number of attendees at the conference was 161, 80 of whom were blind programmers. Thirty-four states and two foreign countries were represented.

General Electric Company was most prominent and generous in its publicity on the conference activities, and its direct support in providing computer time for the on-line demonstrations of parallel print and braille terminals. The G.E. Mark I Time-Sharing System, which is presently being marketed for educational applications, was employed to demonstrate not only the hardware, but the completely independent program developmental and operational capability afforded to a time-sharing terminal operator who is blind. With these terminals, a blind programmer has two outputs produced simultaneously: a regular printed copy for his supervisor and colleagues from the page printer on the teletypewriter, and a braille copy for himself.

Four hardware displays were exhibited which enable a blind programmer to obtain braille output in a time-sharing environment. The following comment is taken from the ACM Newsletter for Blind Computer Programmers, Issue 4, Vol. 2, No. 1, April 1970, under the section entitled "Braille Terminals Exhibited in Cleveland".

...While the conference itself was not primarily intended to place emphasis on hardware developments, nevertheless it does seem appropriate to provide some comment on the systems which were demonstrated.

The first of these devices was the M.I.T. High-Speed Embosser, which has been under development for some time by the Sensory Aids Evaluation and Development Center of M.I.T. Mr. George Dalrymple of that organization operated and demonstrated the device, which produces high-quality braille in a page format at rates compatible with remote terminal data transmission. The paper is fan-folded and sprocket-fed, as is paper for a line printer, but is the same size and weight as standard braille paper. Lines of 38 characters each are printed 25 to a page. The device employs the ASCII code, and was operated at the conference from a paper-tape reader. While it is intended for use on-line with a time-shared computer, it was not so used at the exhibit in Cleveland.

The remaining three systems produced braille on paper tape rather than in a page format. The first of these was shown by Mr. Ray E. Morrison, a retired Pioneer of the Bell Telephone System. The electronics and embossing head were used to supplement an ASR 35 terminal which was supplied for the exhibit by the General Electric Company. GE also contributed computer time for the period of the conference, so that Mr. Morrison's device, as well as the remaining two tape brailers, were shown in realistic operation.

The Arkansas Enterprises for the Blind of Little Rock, Arkansas, displayed a terminal braille embosser. It, like the University of Dayton one described below, is a Model 33 teletypewriter with the normal tape-punching mechanism crippled so that embossing of braille on the paper tape occurs rather than perforation of tape. Inquiries should be directed to Mr. Elmo Knoch, Jr., Director of Training, Arkansas Enterprises for the Blind, Inc., 2811 Fair Park Boulevard, Little Rock, Arkansas 72204.

Finally, a device designed and built at the University of Dayton was displayed in Cleveland. Mr. Chet Adair and Mr. Guy Carbonneau, under the direction of Dr. Martell J. Gee, were responsible for this device, which was completed only a few days before its unveiling in Cleveland. It employed an ASR 33 terminal, and produced a configuration of seven dots arranged in an expanded cell, with the addition of a seventh position below position six. That permitted all 128 characters of the ASCII code to be printed, half of which would then require that the added seventh dot accompany the usual six of the standard cell. Mr. Adair distributed plastic copies of the character set implemented by this device, in braille, to conference participants. Inquiries concerning this terminal should be addressed to Dr. Martell J. Gee, Manager, Science Systems Group, Office of Computing Activities, University of Dayton, Dayton, Ohio 45409.

It is hoped that the above review will serve to provide information to those readers who were unable to attend the conference in Cleveland. We might all take some comfort from the fact that efforts such as those outlined here are providing an increasing variety of solutions to the problem of access to computers which operate in a time-sharing environment. Time-sharing services are expanding with explosive violence and opportunities for independent work for blind programmers are here today--not a dream of the future.

In a recent discussion with one of the officials of the Teletype Corporation of Skokie, Illinois, the advantages of the Morrison configuration were presented to your Editor. If enough readers indicate their interest in braille embossing terminals by writing to the Editor, the official said that he would carry this interest to the administration to see if some positive steps could be taken to make such hardware more available for the blind. If you are a "ham" or an SWL, this kind of terminal can provide you with bulletins from the news services right from your communications receiver. Two friends can send braille letters over the telephone. Such braille communication can also assist in the sorely needed information exchange with the deaf-blind. Remember, if you like the idea, write to the Editor.

Press conferences were held with WKYC TV, the local NBC outlet, and the Cleveland Plain Dealer.

Among the papers presented was a report of a conference sponsored by the American Council of the Blind in Charlotte, North Carolina in July 1969, during which a session was devoted to the blind computer programmer. The entire proceedings may be obtained by writing to Dr. S. Bradley Burson, Argonne National Laboratories, 9700 South Cass Avenue, Argonne, Illinois 60439.

Conference participants met on Friday evening in "birds-of-a-feather" groups. These groups were for those interested in VIDPI, Honeywell computers, a unified braille code for computers, and hardware aids for blind programmers. VIDPI is the acronym for the name of a new organization for blind computer programmers--Visually Impaired Data Processors International.

The following members of the Association for Computing Machinery Committee on Professional Activities of the Blind were present at the conference:

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Cleveland Society for the Blind
Cleveland, Ohio 44106

The Cleveland Society for the Blind contributed significantly to the success of the conference. In addition to sponsoring the hospitality hour on Thursday evening, its personnel assisted in many of the "behind the scenes" activities.

The Conference Committee wishes to express its appreciation to the management of the Sheraton-Cleveland Hotel for their cooperation in contributing to the success of the conference by providing excellent facilities for the sessions, meetings, and social gatherings, and their courteous and helpful hotel staff. Of particular note is their willingness to cooperate and adopt some of the excellent suggestions provided to them by advisors from the Cleveland Society for the Blind. Not only was the hotel staff courteous, but they were also well trained in giving those few small "assists" to the blind guests which makes life just that much easier.

Special thanks are due to Miss Hilda Ketterer, who took care of the many secretarial tasks and did them in such an expert fashion as to make them look easy. It is so wonderful to have such dedicated and competent help.

The personal interest and invaluable assistance of Mrs. Doris R. Karkota and Mr. Norman B. Sutherland, both of The MITRE Corporation, are deeply appreciated, for it was with these ingredients that this documentation of the conference has been edited.

Thanks are due to friends, many of whom are anonymous. They are friends, not only of the ACM Committee on Professional Activities of the Blind, but also friends of blind computer programmers. Their contributions are extremely important despite the fact that, in so many cases, the contribution or its effect, is not visible to the public.

The next few remarks may be suspect by many, but only really understood by those who have conducted similar conferences. Many and sincere thanks are due to the corporations for whom the organizers of this conference work. Their publicly-concerned employees, on occasion, were permitted to reschedule and reassess priorities of the daily tasks.

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Cleveland, Ohio 44122

Some time during the regular working hours had to be spent in producing the conference and this has its measure in the enhancement of the public image of the corporations; yet much greater time taken off-hours and contributed by the four conference organizers and their families has its measure in their knowledge that the conference has helped people live better.

Robert A. J. Gildea
Lexington, Massachusetts
July 1970

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THE BLIND IN COMPUTER PROGRAMMING

AN INTERNATIONAL CONFERENCE

October 9, 1969

Session 1 - WELCOMING ADDRESSES, KEYNOTE ADDRESS

Mr. Collard

This is an ACM-sponsored conference. It is also sponsored by the Cleveland Society for the Blind, and the proceedings will be published through a grant from Social Rehabilitation Services, Department of Health, Education and Welfare.

In order to welcome you on behalf of ACM, I would like to present Dr. Theodor D. Sterling.

Paper 1-1

WELCOME FROM THE ASSOCIATION FOR COMPUTING MACHINERY
COMMITTEE ON PROFESSIONAL ACTIVITIES OF THE BLIND

Dr. Theodor D. Sterling, Chairman

Washington University, St. Louis, Missouri

Dr. Sterling

Thank you, Ladies and Gentlemen. I have had the pleasure of getting to know many of you through the years and some of us have only recently met. I am very happy to see you again. I will be briefer than the 10 minutes allotted to me but will not fill this time with platitudes of welcome. After all, the Association for Computing Machinery has been welcoming you since 1963. It would be somewhat silly to say now, "Welcome to Cleveland".

Somewhere around 1963 it became clear that there were openings in computing which were not filled because there were some people in the world who could not read computer printout. They could not obtain adequate training and they could not be placed in the profession because of the many prejudices which closed the doors of opportunity to the blind job seeker.

At that time, keep in mind, there were only a few programmers who were also blind. These were able people who had gotten into the profession and became programmers even though they were blind. They were Mr. Paul Duke, Mr. Robert Gildea and there was another blind programmer around whom I heard about but I did not know his name. Nevertheless, it was clear that if the obstacles that prevented blind persons from coming into the field could be removed, then it would be possible for blind people to move into programming as they have in all other fields because there is always room for able persons wherever some work has to be done.

The ACM appointed a committee in 1963 to study this problem and to remove, if possible, what obstacles existed, and I have had the pleasure to serve as its chairman. I am very happy to see that only six years later we have a large gathering of individuals who are members of the profession (even though many are not members of ACM - but that is not really important).

The committee has found a number of problems which were not in the form of temporary obstacles but rather they are obstacles that have to be removed constantly. They are with us always - like the poor or like a personal affliction.

Until now our Committee on Professional Activities of the Blind has done the best it can to take care of them.

There is a problem of information: In any fast-moving field there are so many changes occurring constantly that there is a frequent need to provide information to its professional members of what these changes are, what are the new problems coming up, what other new opportunities are developing, etc.

It is a difficult task to collect and disseminate such information. Because of the very able work of Bob Gildea and Chuck Hallenbeck, there now exists a Newsletter which is the beginning of an exchange system.

Then there is a problem of supervision of schools: I know that many of you have expressed a lack of enthusiasm about the schools you went to. Yet, despite their faults, they are the most superior institutions that offer training to the blind (and, for that matter, to the sighted) student. We have had to struggle because programming is a very profitable field and unsuspecting candidates are separated from their money by schools with few principles. I still get a letter once a week from some school that sees its future in making blind people happy by offering training on how to run a card sorter for \$5,000. Our committee has been successful in keeping most blind applicants out of the clutches of these predators, although often it has been difficult to do so.

Then there is the problem of aids and techniques: This, too, is a never-ending problem. For instance, recent software prints out long lists of diagnostics which are largely superfluous. Hardware and computer generations change, not from human generation to generation but from year to year. There are always problems connected with every new hardware development.

Finally, there is the problem of stimulation - plain stimulation: Rehabilitation counselors have to be kept aware of new opportunities. This country is not exactly friendly to the handicapped, not exactly friendly to the blind and employment opportunities have to be kept open more or less through constant stimulation. I remember how in past years members of this committee negotiated with Chrysler and General Motors management, who were running some 160 computing centers among them. I don't think we have placed a single blind person in any one of these computing centers yet. I am happy to say this is not true for the insurance companies. Mr. Nichols was one of the first leaders to open the doors for blind computer programmers.

Let me then emphasize this: As a professional organization ACM saw an obligation to the profession to provide free access to individuals who were barred from it. However, this is really as far as ACM's obligations go. It is the function of a professional organization to take care of the interest of its members. These interests are their professional interests, not their personal interests, and by helping to break down whatever obstacles did exist to the employment of one group of our population in this field, ACM has fulfilled the obligation of a professional organization toward its own members as well as toward other people in our society.

Now we have a large group of programmers who work actively in the field, know the problems at work, know the problems of the schools and training institutions, know the placement difficulties and prejudices, the problems created by changes in hardware and software. Perhaps it is now proper for this group to think of a way to express its own professional interests, the professional interest of the blind programmers.

ACM offers opportunities for that. ACM has within its confines a mechanism for special interest groups and if blind individuals and blind programmers wish to form a special interest group within ACM, they are welcome to do so. But it is not necessary that you avail yourself of that organization. Such a special interest group can exist within the confines of ACM or it could exist within the confines of some other organization that may be more conducive to work with blind programmers. Those are some of the problems which our conference will have to consider. One thought which should come out in this conference is, how do we go about expressing the professional interest of individuals who happen to be programmers and also happen to be blind? Let me assure you that my committee shall continue to extend whatever efforts are needed for the next three or four years until a group of blind programmers has carved enough organizational muscle of its own. In the meantime, we will make sure that the Newsletter will continue to be published, that meetings such as this will take place in the future and that the proceedings of these meetings will be printed. But what ought to be uppermost in your minds during this conference is that there do exist a number of professional problems, that there are

Dr. Sterling (Cont.)

avenues for dealing with these problems and that it is one of the major functions of this conference to see to it that you get the necessary muscle and organization and skill to deal with them. Thank you.

Mr. Collard

The blind and visually impaired in Cuyahoga County are very fortunate in the staff of people who make up the Cleveland Society for the Blind, headed by one of the most capable administrators and fund raisers in this field, Mr. Cleo Dolan.

It is with much pleasure that I introduce Mr. Cleo Dolan to welcome you on behalf of the Cleveland Society for the Blind.

Paper 1-2

WELCOME BY CLEVELAND SOCIETY FOR THE BLIND

Mr. Cleo Dolan

Cleveland Society for the Blind, Cleveland, Ohio

Mr. Dolan

Mr. Collard, Dr. Sterling, Mr. Nichols, members of the Association for Computing Machinery, guests. Over the years the Cleveland Society for the Blind has had the privilege of pioneering new concepts for the blind. It was our agency that first focused on the possibilities of industrial placement for the blind as early as World War I. Later, the agency pioneered vending stands and snackbar operations before the enactment of the Randolph-Sheppard Act in the mid-30's; also the agency was first to apply and to receive accreditation from the National Accreditation Council for the Agency serving the blind and handicapped, and now in a sense we are helping to pioneer a new field; namely, that of computer programming as an occupation for the blind.

It is a privilege for us to co-host this first conference with ACM, H.E.W. and others, thereby providing the opportunity for the employer and the employee to examine the technical aspects of the industry as those aspects relate to the continued employability of blind and visually impaired persons.

We at the Cleveland Society for the Blind are not experts in programming, but we are aware of the importance and the impact of the computer on our daily lives.

As recently as this past Monday, Case Western Reserve, the Subcommittee on Blindness of ACM, and our staff were in conversation relative to the establishment of a retrieval system that would permit us to review and to record the hardware and software research in blindness which has been completed, the research which is now in progress against the back-drop of which the value of proposed research would be measured.

We are now in the process of gathering together this library of information for the review in order to determine the magnitude of the problem and in a sense hopefully to determine the use to which certain information will be put.

On behalf of the Cleveland Society for the Blind, its Board of Trustees, and our staff, we welcome you to Cleveland. We are at your service and we trust that in the ensuing two and a half days this conference will point the way to answers, rather than as many conferences do, to unresolved problems.

Also we would like to extend an invitation to any of you that have an opportunity during this time or later, if you are staying over, to make arrangements to visit our Society Center. It is one of the nicest in the country, we have been told many times and we certainly agree.

Mr. Collard

Our third sponsor, SRS, will have its representative here tomorrow, and since it will be Dr. Douglas MacFarland, we could not have anyone better. On behalf of Social Rehabilitation Services, Department of Health, Education and Welfare, Bureau of Blind Services, why don't I say "Hello" for Doug MacFarland.

Mr. Collard

When we, we being Gildea, Hallenbeck, Sterling and I, first talked about this conference, we agreed that our keynote speaker should be from industry. We wanted a real committment from those in a position to commit. The choice fell upon Nationwide Insurance, an employer who was among the first to recognize the potential resource of the blind. Not only did they recognize this potential once, but a second blind programmer was added to their staff.

Our keynote speaker is a busy man, but then, that is the man you always ask to do the job that has to be done.

He is a native of Newark, Ohio; attended Ohio State University, has two children, a son who is a geologist, and a daughter who is a vocational counselor in Columbus.

He is a member of the Board of Trustees and past president of the Vision Center of Central, Ohio, a local community agency serving the blind. He is also Chairman of the Development Committee; a member of the Board of Directors of the National Accreditation Council for agencies serving the blind and handicapped, and also a member of its Development Committee.

He is the Secretary-Treasurer of the Columbus Downtown Lions Club and also Secretary-Treasurer of the Lions Sight Savers, Incorporated; a representative of the pioneer employers of blind programmers.

I am very, very happy to present to you Mr. William Nichols from Nationwide Insurance Company, Columbus, Ohio.

Paper 1-3

VISION FOR THE FUTURE

W. H. Nichols

Nationwide Insurance Company, Columbus, Ohio

Mr. Nichols

In our local agency we say that "blindness is the absence of sight while 'vision' is the presence of hope." There is no question but what the field of data processing has and will continue to provide vision for the future for capable blind people.

As I understand it, there are approximately 350 visually handicapped people now employed in data processing activities across the country. Considering the short period of time this occupation has been available to the blind, this to me is a major success story. As this conference proceeds, I know that others on the program will discuss both successes and failures as far as individual experiences are concerned. However, I think we, while acknowledging the possibility of individual failures, ought to keep in mind the over-all success in this area and the tremendous opportunity there exists in the future. We ought to look at these failures more in terms of who or what went wrong and thus keep them in the proper perspective with respect to these opportunities for the future.

In saying these things, I recognize full well there are problems in many areas that we have still not solved.

In coming here today I was asked specifically to talk with you about the attitude of industry to the blind in data processing with respect to "what it has been", "what it should be", and "what we hope it will be".

What Has Been the Attitude in Industry?

The Nationwide Insurance Companies were one of the early companies to employ a blind programmer. This has now been at least five years ago. From our experiences, let me say what I think the attitude of industry has been. I will cover this from the viewpoint of top management, middle management, and line management.

With the top personnel officer and his staff the attitude has, and continues to be, one of caution, reserve and being suspicious of the motives of anyone recommending a blind person for employment in a data processing operation. Generally they tend to say: "We have enough problems now, why would we want to take on more."

Unfortunately we, both lay and professional, have not yet eliminated the image of the blind as one who makes brooms, canes chairs, sells pencils on the street, or, at best, does routine transcription work in an office.

With this kind of attitude at the top level in companies it is most difficult for the blind person to get into the personnel department to demonstrate his or her abilities. I suspect that up to now the success we have had has been due primarily to dedicated people like yourselves, both lay and professional, who have known someone high enough in the organization to get into the personnel department as a personal favor.

Once we do get into the personnel department and get them convinced they have a potential candidate, our next problem is with middle management. Here we find a variety of concerns.

1. First, there is skepticism as to whether a blind person can do the job at all.
2. Next, they just can't see how a blind person can possibly perform as well as a sighted person.
3. Then there is the concern about the high risk of failure. In data processing operations the work load is heavy and everyone has to carry his share. Middle management, when considering a blind employee, can't help but feel there is a great risk of failure with such a person. He looks at the six months of training that's involved, pictures a failure, and sees another six months of training for the replacement, which means a loss of a year in the operation.
4. Then they try to visualize how one supervises a blind employee. Can you keep from getting emotionally involved? Is it possible to treat the blind person the same as others in assigning work, taking corrective action (including dismissal), and all the other things that go into supervision?
5. What about the attitude of the other employees? Are they going to accept the blind person and are you going to have the kind of rapport among all your employees that you desire?
6. There are concerns about the safety of the blind employee. Will he be mobile? Can he really move around without getting hurt?
7. Then there are many questions about the capability of the person. These have to do with:
 - a. How was he trained?
 - b. Are there additional training requirements?
 - c. How does he write his program?
 - d. How does he read punched cards?
 - e. Will he be able to read the program listings?
 - f. What equipment has he been trained on and what languages have been included in his training?

There are probably others, but I think these specifics serve to illustrate the attitude at this level of management.

Mr. Nichols (Cont.)

Now, as we move on to line management, the questions are geared more to the practical aspects of the day-to-day operation. Here are some of them.

1. How will he gather and record the requirements to be provided to a programmer?
2. How will he be able to handle the testing of programs?
3. How does he develop the necessary hard copy documentation so he can keep track of the input, the logic, and the end product being sought?
4. What about his technical understanding of the equipment and the ability to work with it.
5. Will he be able to do maintenance work on programs? Not being able to use flow charts and other printed copy, what will be his source of data for maintenance?
6. How do you teach him new program languages and train him on new equipment?

I am sure there are other areas of concern, but I think these serve to illustrate the problems at the line management level. All of this illustrates what the attitude has been in industry regarding the blind in EDP.

Now I see from your program your various panels will likely be discussing these and other concerns so I will not go into any detail about the solutions based on our experience.

From our experience I would like to comment on a couple of the initial concerns of line management. One is in the area of technical understanding of the equipment. We have found the blind programmers have a better understanding than the sighted ones. As things have evolved, our blind programmers are often the advisers to other programmers on complex technical matters.

A recent incident will serve to illustrate that rapport between the sighted and blind is quite normal. Recently, the division in which one of the blind programmers works was having a farewell party for another employee leaving the company. They had gone to a local restaurant for dinner. As the waitress was moving around the table, taking orders for cocktails, she eventually got to the blind man. Before he could order one of the sighted members of the group spoke up and said: "Don't let him have anything because he has to drive us home". This kind of kidding is routine and enjoyed by all.

Just let me say that the general attitude about the blind programmer, from top management on down, is now excellent in our company. Let me say also that many of these areas were problems. However, in retrospect, our folks now say that none of them was the major problem they thought it would be. Also, in all fairness, there are still problems, but they are minor and they are no longer of any serious concern to management or supervision.

What Should the Attitude Be?

While I am sure there have been some individual failures, I suspect that over-all experience has been comparable with ours. We, of course, are thoroughly convinced that the employment of capable blind people in our data processing operation has been a good thing for all concerned. We know that we are getting our money's worth from the standpoint of quantity and quality of work and, of course, the blind person has benefited in terms of a better paying job, greater use of his talents and abilities, and the vision of a promising future. He has the satisfaction of competing in a challenging and growing area of business operations.

As we move along, I suppose the most we can hope for with respect to what employer attitudes should be is just to get over the hurdles we have had and still have.

From a recent experience in our own community in trying to find employment for a blind programmer, I found the attitudes that existed in our company five years ago are quite common in other companies today.

This means we've got to keep doing all the things we have been doing to provide job opportunities for the capable blind person. We've got to do this to the point where there are equal employment opportunities for them as well as for others. We must be realistic and accept the fact we still have a long way to go to get to the point where a blind person can walk into the personnel office and be accepted as an applicant.

To help this we need to get that first blind EDP employee into more and more companies of all kinds.

We are going to have to continue using our friends at high levels of management to get a foot in the door.

We also need to encourage companies that do employ blind programmers to take advantage of every opportunity in every media, both industry and public, to let people know about the achievements and successes. All of these things will be a great help in further documenting the fact that the employment of capable blind people is just simply good business for all concerned.

There is also a serious responsibility with regard to the support agencies of all kinds serving blind clients. They must learn more about industry needs and then maintain high standards in seeking out qualified blind people to be referred to training centers. They must resist the temptation to recommend some of their problems just to get them out of the way for another six months until they can think of what to do next.

They must also seize the opportunity, especially in the high school systems, residential, public and private, to counsel and encourage qualified students to prepare themselves by going on to a university or a qualified technical institute.

Support agencies must also be prepared to provide fast quality service, when necessary, to braille or tape manuals, instructions, etc. that are needed by the blind EDP employee to keep up on changes in all areas of the technology.

The present specialized training facilities must be sure the training in all areas is in tune with the needs of industry. They must be sure the blind person is qualified in all the machine languages necessary and that they have the technical know-how for the various makes of equipment used in industry. It is not enough, for example, to train everybody on IBM and then expect easy placement with a company that uses another vendor's equipment.

The blind EDP job candidate must, of course, sell himself to the employer. He can help by going to the first interview prepared to demonstrate what he can do. This can include, for example,

- A program or programs he has written.
- A demonstration of how he can record instructions in braille.
- How he reads punched cards.
- An offer to show how he can mount tapes and operate machines, including keypunching.
- A demonstration of his ability to prepare documentation.
- Anything else that will demonstrate his ability.

What Should We Hope for in the Future?

For the future, we should not only hope for, but work to make sure, that all of the problems we have today are eliminated. We need to get to the point where a handicap is no more a valid criteria for doing a job than race, creed or sex.

We hope it will not be too long until the blind applicant is looked upon as just a normal part of the employment market, with industry hiring and training the qualified blind employee routinely as we now do with sighted employees.

Mr. Nichols (Cont.)

Our successes so far have dealt primarily with getting the blind into the production jobs in data processing. In most organizations today, the ambitious and capable employee must eventually move into supervision if he is to get ahead.

I suppose many of you have thought about this and have been asking yourselves the question - what about the blind programmer's future, where do we go from here?

I can assure you our people have thought about this and despite the fine, general attitude, they have a "hang up" with regard to moving a blind person into supervision in EDP. When they look at all of the researching, digging into past information, the need to check other people's work, and all such things that are part of supervision, they just can't see how the blind person can do it. I suppose a lot of this is due to the fact that we as well as our business processes are geared to the "paper track". With all of the sophisticated communication facilities that exist, surely we can find a way around this. All of us in industry and in the training areas should be working to solve this one so the blind person has the same opportunity for advancement as anyone else.

In technical areas, like EDP, we also ought to have compensation programs that give the person a choice as to whether he wants to go into supervision or stay in the technical area. Our company has recognized this in some other areas and is beginning to recognize it in the EDP area.

Our activities so far have been concerned primarily with the most capable of the blind people. This means they've got to be average or better on the job to succeed. What are we going to do about those people who can only be 75% effective? Realistically, today's industry cannot retain this kind of employee. As far as these blind are concerned, they can probably get a job, but it probably will be the routine, repetitive kind of thing we are trying to get away from.

Can we find a place in industry for the person who is only 75% effective? The economic facts of life in business say we can only pay 75% of the going rate for the job. With the laws we now have, we cannot do this.

I challenge the lay and professional people as well as industry and the blind themselves to find solutions to these problems so we can provide the maximum employment opportunities for the blind in EDP as well as other functions of the business. We must increase the opportunities to utilize the talents and capabilities of more blind people so as to provide them with the opportunity to be contributing members of society.

Summary

In summarizing, there is much to take satisfaction from and be proud of in the area of the blind and EDP. I commend all of you for what has been accomplished. I really think it is a great success story to this point, but we really have just gotten started.

As I said, we must get to the point where the present attitude and concern in all levels of management are no longer a problem.

From there we must move on to be sure the blind have the same opportunities in supervision and management as others.

The success we've had is proof that employment of the blind in data processing is a good, sound business proposition.

From a selfish point of view, there is tremendous public relations value to the company that employs the blind in data processing. The story of our success has spread far and wide. We have probably received as much favorable publicity on this as any other thing we have done.

We regularly get calls from all over the country where others are considering the employment of a blind person. We have had feature stories in our local papers, the University of

Mr. Nichols (Cont.)

Cincinnati Alumni Magazine, The Ohio Bell Employee Magazine, The Wonderful World of Ohio Magazine, and others.

There has also been a positive effect on our own employees all over the company. It is one more thing that has given them pride in their company.

Also, we happen to have a lot of foreign visitors at our place and this has aroused a great deal of interest among them.

Ladies and gentlemen, it's been a good proposition for all - it can be even better, so let's keep up the good work to make this a bigger, better and brighter "Vision for the Future".

Mr. Collard

Mr. Nichols, I thank you on behalf of this group. May I express our admiration for you and your company for its faith in the visually impaired of this country.

Before we adjourn, I would like to express a few of my personal convictions.

The age in which we live is one of unbelievable technological advance, and we cannot afford to waste the resources that we have available.

The physically impaired, the visually handicapped are ready to add their capabilities to the needs of this country in the now and the near future.

Our concern in the State of Florida right now and in the year to come is going to be with returning veterans from Vietnam, who need to be as productive as you people sitting here in the audience.

Let us then make this conference together a worthwhile proposition. Let us make it meaningful not only for today, but for those who will be following us.

Thanks to SRS, the proceedings of this conference will be published in both ink-print and braille. The inspiration of your efforts may very well give strength to a victim of this or some other cruel war we have to face in the future and perhaps help produce another Einstein, Rutherford, or Helen Keller, or perhaps a Gildea or Paul Duke, and I say that not lightly.

In the audience we have some rather illustrious figures.

I think the first and most important one I must introduce is a Clevelander who has just been awarded the Able Man of the Year Award, Mr. Ed Satz. Will you rise?

Mr. Collard

We are now getting to the part of the conference that promises to be or should be exciting.

What we would like to have you do is listen to the panelists present their argument. If you have any comments, criticisms, even praises, we will get a microphone to you and, before you do anything, please state your name, your company or agency affiliation, and the location from which you came.

The chairman of our next panel and I met two years ago at a conference and I discovered him to be a very enthusiastic and energetic individual. That conference was his introduction to opportunities for blind people in the field of computer programming. Since that time a school for training blind programmers has been established in the State of Florida. The school has just graduated and placed all of its initial class. I think that much of the credit for this lies with him. The subject of his panel is "The Training Activity". I am extremely proud to present to you Mr. Philip Gilbert, Bureau of Blind Services, Florida.

Mr. Gilbert

The members of the panel today are representatives of the ACM Approved Training Institutions, and I know that all of you have been looking forward to being with them.

From MEDCOMP is Dean Wilbur, from Systems Development Corporation is Raymond Stewart, from Lear Siegler Institute in Oklahoma is C. T. Chandler, from Rochester Business Institute is Anthony Castronovo, and from Computer Systems Institute is Nancy Snyder.

The first member of the panel I would like to introduce is from MEDCOMP. He is Dean Wilbur. He is a native of Ogden, Utah. He lived and worked in Salt Lake City for one year prior to applying and being accepted for computer programming and training at the University of Cincinnati Medical Computer Center in September, 1965.

Upon completion of training he was employed by MEDCOMP Research Corporation in a programming and public relations capacity.

He is now responsible for all software contracts and activities within MEDCOMP and is an instructor in their training project. He has a major role in deciding policy for both the training program offered and the software business. Dean.

Paper 2-1

THE TRAINING ACTIVITY

R. Dean Wilbur

MEDCOMP Research Corporation, Cincinnati, Ohio

Mr. Wilbur

Since I am most familiar with my own installation, it is only logical that I direct my remarks to you as they relate to that installation: Our present practices and future plans.

The goal of our training program is to turn out people who are completely capable and confident in the use of the digital computer languages most commonly in use and those that we feel will soon be in wide use. We make every attempt to produce people who are as independent in their work as possible, and we try to give them directions on how to best use any

sighted assistance they may require. We try to assure that, as one of our previous students worded it, "A blind programmer must do more for his installation than his installation does for him".

The tools and materials used by our students are the same as those used by the staff: Typewriters (with tabs) for coding programs and documentation, braillewriters for initial notes and charting and for any sort of information vital to the student or staff member and which is too complex or too frequently used to be kept on tape. We use tape recorders to read manuals supplied on tape and to keep lectures, program specifications and error listings for jobs being debugged. We also use card readers to locate information of interest in punched decks. We discourage the use of computer braille as much as possible, but are familiar with how to get it. Each student is assigned the task of writing a braille program as one of his problem assignments, but is free to choose the language in which it will be written.

The first few weeks of the course are devoted to determining the programming and logic abilities of each student and to weeding out those whom we feel will not be capable of completing the course. We use Turing machines as a logical tool in this evaluation process. From this point on, all of our class time is devoted to programming and computer fundamentals and such topics as peripheral equipment and supervisory and control systems, with the exception of a review course in mathematics for those students whom we feel require such a review. The languages we teach and their order of presentation are: ALC (System/360 Assembly Language Coding), COBOL, PL/1 and RPG. All of the above languages are System/360 oriented since this is the system we test and debug on, and secondarily, because they seem to be the most prevalent and hence the ones our students are most likely to work with. While this is the normal order and orientation of our course, it can and does differ for those people who will be working with other systems and languages once we know the machine or language to be used. You may wonder at our choice of ALC as a first computer language. We still feel, in spite of some industry comment to the contrary, that a programmer has to know the basic functions and abilities of the machine if he is to be a really good programmer, regardless of the language he uses to program. To a beginning student in programming, it is not really more laborious to write a DTF or DCB than to use, for example, the read instructions of 1401 SPS, since he is not at first familiar with either and in his initial work is told "this is the way it is done". If he knew the ease of SPS or once he learns the ease and power of COBOL or PL/1, he will be reticent to use the more laborious ALC regardless of its more compact results. COBOL is second in line because it is probably the most common language in use today and has application to a wide variety of machines without too many variations. It is also a very easy language for a student to express his logical abilities with the least alteration in the syntax of that logic. By the time we reach PL/1, those students who will be working with different machines or languages will have had the opportunity to determine this fact and they can start working toward their own goals. For all others, PL/1 offers the opportunity to expand their power of expression and gives them knowledge of a language that will likely be finding wider usage in the near future and thus broader job opportunity. It also is close enough to FORTRAN to make learning that language a simple matter. We teach RPG because it is popular in many areas and is probably the third most likely language to be required of a programmer. Throughout the training period, lectures are given on all facets of hardware and software and documentation techniques. About the same time that we start COBOL, we begin to explain the "why" of many features of the operating systems we use and the Job Control Language.

We spend three to four months in the introduction and programming with ALC, about ten weeks in COBOL, eight weeks in PL/1 and the remainder of the time in RPG. There are about 30 problems assigned and in approximately the same proportions for each language as the time spent in each. The problems, in general, are not oriented to any special field of programming but concentrate instead on the features of the language being taught and of technique. Thus, for example, a PL/1 assignment to find all the ways of making change for a dollar serves no purpose toward commercial programming in the language, but is an excellent program for developing techniques in working with loops. In addition to the assigned problems, students are encouraged to try programs and ideas of their own. All programs are run on the machine and are complete only when they produce the proper results. Each student uses on the average seven hours of System/360 Model 40 CPU time.

Mr. Wilbur (Cont.)

Students are not given a letter grade when they complete training at MEDCOMP. Instead, we send a final evaluation to the sponsoring party and to any potential employer who requests one. The student's weaknesses, when they exist, are not glossed over but are expressed the same as his strong points. A student's work is judged as to quality and quantity with the former being by far the bigger factor. All programs, as mentioned earlier, are complete only when run on the machine and produce proven accurate results. Many students take the final listings of these programs as examples of their work to potential employers who desire to see such work.

We rate students in two ways. First, each student is rated against his class as a whole, and secondly, against his own past performance and our evaluation of his capabilities. These ratings are reflected in the monthly reports submitted upon request to the sponsor. These reports, together with the final evaluation, serve as the measure of the student's work and ability as a computer programmer.

We feel that we have an added advantage for training programmers, as opposed to standard schools, in that we keep our classes small and our entire staff available for consultation so that there is a high staff to student ratio, usually one staff member per two to three students with two active classes and counting only those members of the staff who are qualified to program and explain programming problems.

We have two class starting dates each year (January and July) which allows a three-month overlap in classes and provides the benefits of senior students to help the newer ones and at the same time, keep the older students current in all phases of their work.

We are also an active software house which allows us to keep current with what is being done in the industry and in many cases provides a practicum for those students desiring to work on actual as opposed to assigned problems.

We must, of course, keep current ourselves and we intend to see that our classes do likewise. Should new languages come along that show signs of becoming widespread, we will endeavor to teach these to our classes (for example, USASI COBOL).

Whenever new and better teaching methods come along, we intend to change our procedures to make the best use of them. It is also hoped that we may institute a few such new ideas ourselves.

We will try to take every advantage of new tools as they are developed and to do our part in the development of needed tools, as for example, a better and faster card-reading device, at a reasonable cost. We also intend to remain active in the development of suitable software for aiding the blind programmer to better serve his installation.

Mr. Gilbert

Mr. Stewart received an undergraduate degree in General Science from Jackson State College in 1956, a Master's Degree in Education Administration from the University of Kansas in 1961, and he is currently a doctoral candidate at the University of Southern California in Education Administration.

He has a wide experience both as a civilian instructor at a technical school based in Mississippi and as an active participant in the military service.

Mr. Stewart has been with Systems Development Corporation over six years. He was originally assigned to classroom instruction. In addition to his teaching duties, he has been responsible for monitoring the student testing programs, maintaining student training records, and preparing curricula changes in the training program.

In July, 1964 Mr. Stewart began serving as Training Administrator for professional and technical employees, exercising direct supervision for the programmer and human factors instructional staff, and the Corporate orientation program. He is currently Manager of Professional and Technical Training.

Mr. Gilbert (Cont.)

Mr. Stewart is a member of ACM, Phi Delta, Men's Honorary Education Fraternity, the Reserve Officers Association, The National Urban League, The Association for Women's Active Return to Education, and the Southern California Industry-Education Council. He is a consultant to the Economic Development and Employment Committee of the Western Regional Office of the National Urban League, and a member of the Visual Handicaps Committee of the California Rehabilitation Planning Project. Ray Stewart.

Paper 2-2

TRAINING THE VISUALLY HANDICAPPED IN COMPUTER TECHNOLOGY

Mr. R. Stewart

System Development Corporation, Santa Monica, California

Mr. Stewart

Introduction

System Development Corporation became involved in the training of the visually handicapped in the field of computer technology in April 1966. We have since presented comprehensive training to groups selected and sponsored primarily by the California Department of Rehabilitation.

SDC's three plus years of training programs for the blind have clearly indicated that the powers of memory, concentration, and analysis possessed by the intelligent blind are equal to the rigors of a thorough, comprehensive, and technically complex training program in computer programming.

The Program

The current project involves approximately 120 classroom hours per month at a rate of six hours per day, five days per week and extends over an eight-month period.

Initial training in the broad fundamentals of information processing technology is deemed essential to career progression. The first module we present has been shortened to five weeks by moving some of the theory, previously given in this module, into the subsequent module where the understanding of theory is facilitated by practice. The students receive an introduction to systems and basic concepts identified with system design and analysis, detailed review of hardware--its capabilities and limitations, and problem-solving techniques using natural language and simple symbology.

The educational concept "transfer of learning" which previously encouraged us to follow programming fundamentals with the introduction of a large-scale, general-purpose, digital computer, has created some minor distractions through the vehicle selected. Although all of the concepts of programming for a digital computer could be ably demonstrated, many students were inhibited from learning as much as they should because of their knowledge that the first generation machine being used as a training aid by us, was unlikely to be encountered by them in the world of work. We have modified our program to approach a third-generation computer as the initial system to learn.

Twelve weeks are devoted to learning the IBM System 360. The time allocation is as follows:

Architecture (2 Weeks)
Basic Assembly Language (3 Weeks)
Translation Workshop (2 Weeks)

Mr. Stewart (Cont.)

Software Systems (1 Week)
Operating System Workshop (2 Weeks)
Applications (1 Week)
Disc Operating System Workshop (1 Week)

The third module has been organized to take advantage of the knowledge gained about the operation of a third-generation computer and to apply the instruction on higher-order languages. During the eight-week period of this module, full attention is given to two programming languages: COBOL and FORTRAN. Knowledge of the languages as well as a familiarization with assemblers and compilers--how they are designed, how they work and the restrictions and limitations that affect program design--are the desired learning objectives.

The next module, of two-weeks' duration, is spent in a specific survey of computers and an explication of the appropriateness of the programming techniques and concepts they have mastered to the engineering conventions of the various manufacturers.

The final five-weeks of the course are devoted to laboratory and workshop. Each student selects a project and pursues it on his own under the helpful direction of the staff. All phases of his project are tagged and at the end of the module, each student has a work sample which demonstrates to him that he can proficiently perform in a realistic work environment.

Conclusion

On June 13, 1969, we graduated our third full class of visually handicapped students. In less than three months, 64 percent of the class was employed at an average salary of approximately \$700 per month.

We are encouraged to maintain a training program of considerable integrity. There is a placement market for those well-trained visually handicapped programmers who are capable of graduating from a program of the type just described. These graduates are competitively compensated.

The present emphasis of the SDC program should help, through placement of highly qualified blind trainees, to open the door to blind persons trained for lower-level programming jobs.

Mr. Gilbert

Our next speaker, Mr. C. T. Chandler, is from Lear Siegler Institute in Oklahoma, where he is an instructor for the visually handicapped.

Paper 2-3

TRAINING PROGRAM AT LEAR SIEGLER INSTITUTE, OKLAHOMA

Mr. C. T. Chandler

Instructor, Lear Siegler Institute, Oklahoma City, Oklahoma

Mr. Chandler

I am from Lear Siegler Institute in Oklahoma City. Lear Siegler was just formed in June 1967, so we are relatively new.

Their first class of the visually handicapped graduated in May 1968. We only had two students. We are starting on Monday with the visually handicapped.

Mr. Chandler (Cont.)

I have to agree with the other two speakers so far. Our school teaches assembly language coding first at this time. The two previous classes were taught COBOL.

I wasn't there then, so I can't explain the reason for it. We now feel that if we can give them a thorough understanding of the one-for-one mnemonics in assembly languages, it will help them to understand the higher level languages at a later time.

We teach approximately 13 weeks of assembly language coding. We do have a model 25 IBM 360 computer because it is the demand in the area in which we are located. There are more 360's around and it seems the best way to place a person in our area is to teach him the most popular machine. This is subject to change.

We will teach what is in demand. Hopefully, we can expand a little more. Starting Monday, October 13, we will have eight classes. We are hoping to be able to teach a broader range of languages in computers.

We teach assembly language coding, COBOL, and in the two previous classes we taught PL/1. The course is approximately nine months, which is 1020 hours. We do use the braille outputs.

Our last class combined and wrote a very good braille program, which up to now, from what I have seen, is the fastest braille program around. We have seen about six different programs including some Honeywell and RCA braille programs. It seems to be the fastest, and I believe they did this without too much assistance from their instructor at the time.

We also meet six hours per day, from 9:00 a.m. to 3:30 p.m., with a 30-minute lunch break. We have tape recorders furnished by the rehabilitation services for the students. They each have typewriters and braillewriters, and all lectures are recorded so they may, on their own time, take the most important notes for important information.

Most of our manuals are on tapes, and we are trying to get those completely up-dated at this time. We have reference cards on tape, and braille textbooks.

Thank you.

Mr. Gilbert

Our next speaker is Anthony Castronovo from the Rochester Business Institute.

He attended their first data processing course in 1958. After graduation he began working at Stromberg-Carlson Corporation as a unit record operator. He became a computer operator and then a programmer. He then moved to Strassenburgh Pharmaceuticals as their operations manager, assisting in the installation of their 1401 system. He went from there to Rochester Business Institute and was involved with their first class of blind students. He enjoys teaching the visually handicapped. He holds the CBT Certificate.

Paper 2-4

THE "BLIND" IN PROGRAMMING

Mr. Anthony Castronovo

Rochester Business Institute, Rochester, N.Y.

Mr. Castronovo

Rochester Business Institute is a school that has been in existence as a business school for over 100 years. The school not only teaches data processing, but also one and two-year business courses, secretarial courses, medical secretarial courses, and so forth.

Mr. Castronovo (Cont.)

The course length for the visually handicapped is 1200 hours. We cover four languages, beginning with COBOL, then RPG, PL/1 and finally, BAL.

Our basic philosophy is that a computer is a tool. We attempt to teach data processing.

We have a two-semester class during which we teach a course in business organization and a course for one semester in major sciences to give the students a background in management control. Our course is a full year and our students are full-time students.

We encourage the visually handicapped students to get involved, not only in the curriculum, but also in the school.

We have three blind students in the current class who are members of three fraternities at the school. RBI has three fraternities, four sororities, and many social organizations. One of the blind students competed for student engineer which he won, and he is now an honor student in engineering.

We issue regular quarterly grades to students and do no class ranking within a class.

I am a firm believer that if you take away a printed listing you cannot take away a braille listing. Our coding produces one instruction per card, a brailled and typed instruction on a card which can then be sent for keypunching, or the student may keypunch if he wishes.

We have brought many demonstrations into the school, such as IBM, NCR, Control Data Corporation, GE, and other major industries.

Members of the faculty are instructors who must be able to teach. This is the criteria set. One instructor has a Master's degree, two of the other instructors are graduates of the University of Rochester.

I want to mention one thing--where we are going in the future. I think we have proven there is a future for the blind in programming just by the attendance we have here and all the dedicated people involved.

I now have on my desk four proposals from four corporations. We are now going into a time-sharing environment. We do have a computer in sight and dedicated strictly for educational purposes. I probably would not have made the statement three or four months ago without having knowledge of available equipment that is being produced to handle returning braille in a time-sharing environment.

It is evident, and has been proven "500" times over, that a blind person can function as a computer programmer and system analyst. He brings with him to a job the qualities of pride, determination to succeed, ability, excellent employment potential, and the willingness to learn in his chosen field and compete as an equal with his fellow employees.

The title of this text expresses "The 'Blind' in Programming". The "Blind" are the people who have yet to be convinced of the qualities of a non-sighted person. The "Blind" are we who have given much to make a programming course for the non-sighted work, and yet meet each other again and again about the age-old problems we face in training non-sighted people.

Many methods have been developed by various people, and yet we fail (including myself) to forward these innovations to each other. For example, we have an excellent System 360 brailler which will work under any operating system. We are developing a Honeywell brailler.

Have you ever used a 402 accounting machine panel to help a non-sighted person draw a mental picture of what a report off the computer looks like?

Do you use "Tinker-toys" for flow charting?

Or metal walls with magnets for flow charting?

Mr. Castronovo (Cont.)

Have you used aluminum column indicators for the braille card reader?

Have you used pre-formatted data processing cards for braille computer programs?

These are a few of the many ideas we are applying. I am sure other effective ideas are in the works now from various schools or individuals.

My ideas have not been communicated to you (outside of Lear Siegler schools), just as yours have not been communicated to me.

The most serious problem we face today is the lack of communication. Let's not talk about it any more, but let's do something about it.

Why not set up a method where we can have a clearing house for new ideas, innovations, or problems we might encounter. This clearing house could analyze and send out new materials and ideas to a select few for their opinions on their validity and use.

We can exchange many good methods with each other. We can pool our brain resources together and develop new methods. We can help each other and the non-sighted programmers in the field by keeping in constant touch via a newsletter, telephone, mail or through some type of clearing house.

Lack of communication is the most serious failure in training or working with the blind, and it requires our immediate individual attention to solve.

I was very thrilled, and I offer a lot of support to Bob Gildea and Charles Hallenbeck for this issue of the Newsletter. I think this is the first connection in the communications problem among ourselves.

Communication is the most serious area in data processing. We are not only looking into the effectness of the school, our time-sharing environment in our school, but we are looking hard into this area because we feel that they (the schools) can function in all areas.

Mr. Gilbert

Miss Nancy Snyder is the Vice-President and Director of Education for Computer Systems Institute, Pittsburgh, Pennsylvania.

She holds an undergraduate degree in mathematics from Ohio Wesleyan University with minor credits in English and Education. She has also attended the University of Cincinnati and is presently pursuing a Master's Degree in Mathematics from the University of Pittsburgh.

Miss Snyder's career started as a programmer with Pittsburgh's major banking firm. She has done in-house systems work, contract programming and consulting and is conversant in a wide variety of computer languages spanning IBM, Honeywell, RCA and NCR equipment.

She belongs to several major computer industry organizations including the Association of Systems and Procedures, the Association of Computing Machinery, and the Data Processing Management Association where she has been a director of the Pittsburgh Chapter for three years.

QUESTIONS FOR COOPERATIVE SOLUTION

Miss Nancy M. Snyder

Computer Systems Institute
Pittsburgh, Pennsylvania

Miss Snyder

By your presence at this meeting of programmers, employers, trainers, counselors and members of support groups, you are demonstrating your interest in the blind in computer programming. You are obviously interested in where we've been and interested in where we are. But, even more, you're probably interested in where we're going.

About seven years ago, people began to recognize that the blind had considerable talent in the area of computer programming. So, we started training; we started placing; we started developing methods, techniques, tools, and so on. We also started developing problems--ones which were unique to this specific effort. I want to discuss the future in terms of these problems.

What problems? The counselor wants to know who does the best training? What does DOS mean? What is the difference between an IBM System/360 and a GE 425? The trainee wants to know who gives the most beneficial training for getting and keeping the job. Who provides the best learning tools? The graduate wants to know where to go to get the braille manuals quickly. What is the best approach to retraining with the company? The schools want to know why counselors sometimes shove unqualified people at them? What additional services are expected of them? What actual on-the-job problems can they help to solve? The employer wants to know where he can go with a problem. The auxiliary services want to know things like which manuals are most important to be put into braille.

Each and every one of you has a complaint, an idea, a problem--something I am sure that you would like to have set forth in the name of improvement or progress. Even if you are not directly involved in the blind endeavors or in computer programming, you should want to know why so much money is being spent on committees, boards, advisory groups, planning associations, and so on with no results, no meetings, no publications, no progress.

At the same time, we've seen the generation of many problems and questions. Now it is time to channel our efforts to solve the problems and answer the questions. Our total future will be the product of how well we do here. While the problems will always exist, unless we make some substantial progress as a body, they will swallow all of us.

Computer Systems Institute suggests that this progress and the future to which we so fondly refer is embodied in one concept: co-operation. The future of the blind in data processing is a delicate subject--to be further developed with enthusiasm but to be tempered with respect on all sides.

We can help ourselves by helping each other. The blind community can realize continuing placements in a professional area adjudged to have the greatest employment potential for them of any single field. The counselors can have the guidance and support for which they have expressed a need. The training facilities can share ideas and can receive the minimal support necessary to sustain their efforts. The prospective employers or present employers can exchange ideas and solutions to some of their own problems. Auxiliary facilities will have guidance regarding the services which will benefit the greatest number.

It would seem that we desperately need the participation and expertise of outside, authoritative agencies who can evaluate, co-ordinate, and suggest. Perhaps the two accrediting agencies now recognized by the United States Office of Education can aid in evaluating. Perhaps some arm of HEW can help in disseminating information to counselors. Perhaps the ACM can co-ordinate employers or can conduct fact-finding studies.

Miss Snyder (Cont.)

At any rate, if you're a counselor, you've got clients to worry about. If you're an ACM member you've got a professional stature to worry about. If you're a graduate, you've got your job to worry about. So it is high time that we all got up off our chairs and produced some action. I ask you: What can you contribute???

Mr. Davis

I am Phillip Davis. I am from the Massachusetts Commission for the Blind.

None of you have addressed yourselves to the qualifications you have placed on incoming students, and I would like to ask one specific question: What kind of educational background do you require a student to have before admission?

Mr. Gilbert

Do you want to direct your question to one person?

Mr. Davis

Mr. Stewart.

Mr. Stewart

In our program we ask that the individual have a BA degree or equivalent. We are not particularly concerned about the field of endeavor. We are concerned about employment after training because we are concentrating at the level of a potential systems programmer position for the graduates of our program.

We take advantage of this capability, asking that the person have a degree or equivalent. We would prefer a person have as his background mathematics through differential calculus. That doesn't happen.

We get the young people who have had algebra and trigonometry.

We have had a number of other tests. We try to have individuals who score 125 and above, using an intelligence test developed by Science Research Associates owned by IBM. We don't use the regular IBM selection test that you see floating around. These are ordered through our psychologist in our personnel department. They have run validation studies against parts of the examination, and norms have been established for programmers.

This doesn't say again that a person who can score at a certain cutoff level is capable of being a programmer. It says that a person who can score at this level is capable of learning information processing at the level and rate at which we teach.

Other than that, we have the standard medical test. Attendance is important. We expect the person to be there.

Mr. Davis

Can I ask the same question of Mr. Castronovo?

Mr. Castronovo

RBI requires that the student have a high school diploma, but it is always nice to have more than that.

Mr. Castronovo (Cont.)

We have a full-time counselor who does the screening and interviewing. In the present class, we selected 11 out of 37 applicants.

The students are given a series of tests including the programming aptitude test in braille. We used a braille test, but found this was nothing more than a revised PAT test.

The students then go through extensive counsel. We have on file all our reports from the psychologists and counselors, and we then make a determination as to whether we feel the student will or can do the job. He does go through some extensive selection procedures.

Dr. Ingham

I am Kenneth Ingham of the Massachusetts Institute of Technology. I noticed an appalling lack of comment concerning job placement. I wonder if training schools who solicit blind students shouldn't be responsible for and take an active role in the job placement of the graduates.

Should, for example, students looking for schools make this one of their criteria for choosing?

Mr. Gilbert

To whom do you wish to direct the question?

Dr. Ingham

I think it is appropriate for the whole panel.

Mr. Castronovo

RBI has a full-time placement office. The problems we have encountered in the first blind class were very evident in the city of Rochester because it is a conservative city.

We do take an active part. I am scheduled to go to Corning, New York, to place another student at Corning Glass.

I have been in New York City on three occasions to place three students there. I work with my placement office strictly in the area of the visually handicapped. I do not get involved with placement of the sighted.

The reason I am in the handicapped area is because of the lack of knowledge between educator, counselor and potential employer. It is a serious problem, but we are attempting to do everything we possibly can.

I went through a three-week indoctrination with Xerox and broke the ice at Xerox. We are working very close and hard to place one of our students there.

Mr. Gilbert

In summing up your answer, you do have an obligation?

Mr. Castronovo

Yes, we do to the student, for placement of the student.

Miss Snyder

I have to agree with Tony. There is an obligation but I am going to throw it back at you.

I don't think you will find that any of the schools are unwilling to do this. They want to place them as badly as the next guy does. I think the schools are willing to do whatever has to be done, but it is very difficult for a school in Pittsburgh to place somebody halfway across the country when the counselor is right there on the spot.

What the counselor has to do is ask. Our problem is that they don't come back and ask when they have a problem. They say, "why don't you read our minds?"

Mr. Gilbert

Does that answer your question?

Mr. Stewart

I would like to take a crack at that.

We have modeled ourselves on some of the work Nancy has done in the State of Pennsylvania. We do our work under a letter of agreement with the State Department Rehabilitation of California.

We say that placement is not our responsibility, that placement is the responsibility of the State of California.

We don't really mean that. That is one of these legal things with which we operate.

We have spent considerable effort in the placement of the graduates of our visually handicapped class. Witness the brochures that are published by the company, by the corporate communications office of the company, not under the contract itself, because they get publicity from the company as a result of this.

We had an open house with the employers primarily in the southern California area, but we have never had an open house at which we haven't had representatives from northern California and from many other states.

For instance, at our last placement open house, we had representatives from a corporation in Minneapolis fly out for this one-day presentation. We had cooperation of the television and radio stations and newspapers in our areas, and we found that we were doing a lot of placement on Monday morning of the next week at 8:00 o'clock.

We have 60 people coming in to hear more about the program. In their contacts with their customers they will talk about the program so these young people who have not been placed will have more opportunities for jobs.

As Nancy has indicated, every school is particularly interested in placement because that is how you get additional students to come into your program.

I feel that we are all working on this problem. It is a problem and there is an education that has to take place on the part of companies in general.

Mr. Wilbur

I would like to add a comment. I think most of the information that has been put out in response to this question has covered our stand.

We feel with Nancy that it is sort of difficult for a company in Cincinnati to place somebody in Montana, but at the same time I think the best results for us have been the students

Mr. Wilbur (Cont.)

that have been placed from our institution. These in turn have resulted in the placement of others.

We do feel a need to take part in employment and we do locally try to find employment for those in our area.

The majority of the employment, as far as we are concerned, has been carried out either through counselors or through the students themselves doing a good enough job that other people have been interested.

Mr. Gilbert

Do you have a question?

Mr. Gildea

Bob Gildea. I would like not to pass over this opportunity to comment on the work that Nancy Snyder's group has done in trying to cooperate with counselors. That was done some years ago with Ralph Beistline and seven of his counselors.

They were brought in for a one-week course in programming so they, at least, knew some of the meaning of the words and could go forth and make a far better presentation to potential employers than the counselors who were completely ignorant of data processing problems and terminology.

I think this is something we might want to encourage other commissions and divisions to consider as a possible approach to technical problems.

Mr. Hagemann

Larry Hagemann of the Teletype Corporation, Skokie, Illinois.

I would like to address Mr. Stewart. Mr. Stewart, you mentioned partially sighted students. What do you consider when you mention large type?

Mr. Stewart

I said large print. What we do is to reproduce. We don't use the normal typewriter that is used in the elementary schools. We actually have our people on linotype and I don't have the specifications of the actual letter sizes that we use for producing this.

Mr. Hagemann

Is it an inch, a half inch?

Mr. Stewart

It is approximately a half inch.

Mr. Hagemann

The second question is to the representative of Lear Siegler Institute.

You mentioned braille program. What is a braille program? I am new to this entire field.

Mr. Chandler

Our last class wrote it and it is a program, basically, that will transform information from tape, disc or card at your option, from English--what you would normally print out for a regular listing--into the braille dot patterns.

From what I found out from some students of mine, there is no problem involved. They take a little piece of elastic, mount this on a 1403 printer, and without removing the ribbon, this embosses the printed patterns. That gives them a braille output that they can interpret.

Mr. Zuvers

My name is Roy Zuvers. I am with the United States Department of Agriculture in Kansas City, and a graduate of Lear Siegler.

If the man wanting to know about a braille converter wants to see any of us that were involved in the writing of that brailer, there are a couple of us here available.

What it is, is a one-for-one character conversion from print to braille. I would imagine any programmer in the room has it.

The question I have is oriented toward the braille. I wanted to ask this of Dean Wilbur, who mentioned in his presentation that MEDCOMP is discouraging the use of computer braille output to their classes.

What I want to know is what do you encourage them or the programmer who is on the job to get for his listings, his diagnostics, and so forth in a form which he can use for his own testing and debugging?

Mr. Wilbur

We do discourage the use of computer braille for the purpose that I'd better state. In many cases we found that employers are reticent to take from eight to ten times the amount of machine time for a programmer listing as it would take to get a print listing.

So we try to show other means of getting this information. Where an employer is willing to allow time for braille listings, we feel that a listing is by far the best tool.

With the lack of a listing what we would suggest is that the programmer be extremely familiar with the print configuration of the listing, cross reference listing, and the COBOL procedure division map.

He has to know the print format so that when he needs this other he can go to a person who has a set of eyes and who perhaps knows nothing about programming, and can say, "Turn to page so and so, and tell me what is in column three at about line ten," and get his information this way.

Braille in the sense of non-computer braille, braille notes, braille documentation is encouraged. The sighted person taking the information from the computer for the blind person reads this into a tape recorder. His services are required only once and the blind person can play the tape again if he needs further information. Sighted assistance is kept to a minimum, but we feel sighted assistance is necessary.

At some time or another, even if you have a braille listing, you are going to need sighted help.

I am not sure I answered your question to your satisfaction, but this is the best I can do right now.

Mr. Collard

I would like to address a question to Mr. Wilbur.

Do you have IBM equipment installed at MEDCOMP?

Mr. Wilbur

No, sir, we rent our time in the city.

Mr. Collard

What piece of hardware?

Mr. Wilbur

IBM 360 Model 40. We have two different services we rent. We do have access to braille. We could get braille.

Mr. Collard

I would like to address this generally to all the training institutions:

Are you aware that IBM has recently provided an RPQ providing ten lines to the inch? This would have a great deal of impact on the output problem.

Secondly, there is available a program which has condensed braille in the same way that we drop zeros, that also very much reduces the volume of output.

Mr. Wilbur

I will answer it first. No, I was not aware of this. That is one of the reasons for this conference, and we appreciate the information. We will look into it and apply it if feasible to our system.

Mr. Castronovo

As I mentioned before, we encourage the use of computer braille.

I was aware of the RPQ. Our program also deletes zeros and we go right back to the same problem, the training institutions can only do what they know.

This is where the big word of communications comes in. This is where I will have to give Mr. Gildea another first.

Miss Snyder

Did you know that if you put in the ten line, you have to take out either your six or your eight? Do you know you have to purchase that RPQ which is very expensive?

Mr. Chandler

I just had heard of this and also a couple of my students told me about an attachment that will fit any printer of IBM which they will put on for free.

Mr. Zuvers

That is just your elastic.

Mr. Chandler

There is an attachment that goes with it. Is that the same thing?

Miss Snyder

No.

Mr. Chandler

In reference to the braille program, I think it is approximately three times slower; is that correct, Roy Zuvers? I heard it mentioned that it took eight to ten times longer to print braille.

Mr. Zuvers

Not our program.

Mr. Chandler

It is about three times.

Mr. Wilbur

You can't possibly do it in less than that.

Mr. Simms

Gary Simms, Charles Mason Company, Incorporated, Amarillo, Texas.

Talking about how long it takes for the braille print, I am almost completely naive in this field, but it has been my experience that the speed of braille is not more than three times as slow. We have quite an extensive printout and it does not take much more than three times as long to produce the braille.

Another question on the braille printout concerns the various ways of debugging the program.

As an employer it is very difficult for me to see, considering the problems that are encountered in the braille printout, but then considering the alternatives, it seems to me for each full-time blind programmer you hire, it appears to me you would almost have to hire a half-time sighted programmer to help.

It appears to me by the braille printout you are getting very close to severing this link of dependence that the blind programmer would have on someone else.

I've heard it mentioned that with the braille printout the blind programmer would still have to occasionally have the assistance of a sighted programmer. It seems to me it would be very seldom, it would come very close to making the blind programmer independent, much closer than if he requires a sighted person to convey information from the normal printed list.

Mr. Sumner

I am Wayne Sumner with State Service for the Visually Impaired in South Dakota.

I was most interested in Nancy Snyder's comment to the effect that the counselors are wondering what criteria they should use in helping their clients select a training program.

In our agency we have a history major, a guidance counselor, a bachelor in psychology who works with the Health Department, one man trained in vocational rehabilitation and an economics major and most of us were raised in South Dakota where they haven't had computers until recently.

What criteria do you use?

Miss Snyder

I think your best bet is to obtain the materials from the institutes and look to see what is hard, cold fact in terms of supporting their claims of quality.

I think that the national accreditation associations are a great place to start. I think your ACM approvals are a second source.

I think that it is foolish to go and spend your money at an institute that is untried and untrue and say, well, we will take a crack at it when there are six schools that have had experience at it.

Mr. Sumner

Which one of those six?

Miss Snyder

We will get information from all six and let that choice be yours.

I can tell you what makes mine quality and all I can do is suggest that you ask the others for the same information.

Miss Schmitt

My name is Mary Jane Schmitt. I am a June graduate of the Rochester Business Institute. I am here representing the American Council for the Blind.

I want to address myself to this placement business. Unfortunately it seems that the supply of blind programmers is exceeding the demand of employers looking for same. The trade schools have discussed this here today and Mr. Castronovo said that the school felt an obligation to the students. I think it does.

However, I don't know about other states but in the State of New York there is no legal obligation of any type. There is a moral obligation.

Since the supply of blind programmers coming out of training institutions seems to be beginning to exceed the job potential, I am interested in knowing and I would like to know from anyone who is willing to answer it, have you ever given it any consideration to sitting down with counselors and deciding whether this course should be given year after year?

I was talking to kids the other day, I guess there are sixteen of them, and most of them are youngsters who don't have any other job experience of any type, nothing else they can turn to if they are not placed. They are just full of shining ideals and I feel there is a moral problem here.

Miss Schmitt (Cont.)

Is it right to train people for jobs that they may not get, or if they do get them they will have to wait a year to involve themselves in?

You talked about communication and I think this is a real serious thing. I think there ought to be some close communication between the schools and the counselors to decide whether these courses should be given each year or a year skipped between them until the people who are well trained and ready for the job market are placed.

Mr. Castronovo

I agree with you and I also disagree with you. You cannot guarantee a job regardless of what educational institute you attend.

I think that the problem is not that the six educational institutions are not teaching well. I know they are.

It is a question now of breaking the back of the industries. For instance, we have a couple of representatives from industry sitting right in the audience now and one mentioned he was very naive in hiring the blind. Why doesn't he have one in his company?

Industries have got to be broken. It is a difficult problem. I think there is a limitation on it too.

Mr. Chandler

I think I heard the total of 350 blind programmers mentioned, is that correct? If there are only 350, I don't feel that the needs for blind or just plain programmers has been filled.

We believe in the quality of the people whom we have turned out and the big problem is that we have presented our blind programmers to the DPMA in Tulsa, and they say this looks great. They look at our documentation examples and say, "I just wish I could get documentation".

And yet, we still have to convince the employer that the blind programmers will do a good job.

Mr. Gilbert

Doctor Yoder.

Dr. Yoder

Dr. Norman Yoder.

Over the years I had a bit to do with the training of blind people. There is a very simple answer to determine the quality of the schools. Ask the state agency in which the school is located. They will give you a clear-cut analysis.

I would like to ask the panel a question. You do a fine job of training technically and I disagree with my friend that there are not a sufficient number of jobs. There are.

You do a fine job of training technically, but what are the schools really doing about preparing this individual to go out and do a creditable job?

Miss Snyder

We have a placement facility and all of the students in the school, blind as well as sighted, are personally interviewed three times by the Director. He lectures to them, and we have speakers in from industry. I think it is unfair to over-prepare somebody for a job.

I also want to comment that, as you all know, placement is a function of many things. It is not just a grade but it is attitude, it is appearance, motivation, how well you sit down in that interview and sell yourself to an employer, and if you are not motivated it will be very difficult for you to fake the fact that you are.

Mr. Castronovo

In one of our classes we held a mock interview session. I think it taught the students some of the things that they should look forward to in an interview but I don't think it did that much good.

We brought our placement director into the classes and we let him explain what these students should look for.

Once that door closes between the student and the interviewer, the student has to sell himself and if his qualities are not there, he can't.

We attempt to give him the basics of an interview and we encourage going to more interviews.

Mr. Stewart

We do have a counselor assigned to SDC, so that all of the clients in the school have the assistance of this counselor.

We try to give them such confidence in their technical ability that they are real tigers when they walk out of that door and start to get jobs.

We have a very brief Easter vacation, and we have students who go out during that period of time before they have graduated and get jobs.

We have had to accelerate graduation so that we could have half the class there at graduation time.

Another thing that we try is to help them in preparing their own resume. We try to get the student to stop underselling himself. When they prepare the resume we know (because we are also employers of programs) what we are looking for. We keep a dialogue going until they have prepared a realistic, but reasonable resume they can send to employers before the class starts.

We have 3,000 people in the county at the present time, 2,000 professionals, a thousand of those people are programmers. We have our own recruiting office that screens individuals for programming positions. Professional recruiters come into the class and explain to the class the kind of things for which they look, the authority that personnel has, and also their experiences with the line organizations who, in our particular case, make the final decision. We expect that is quite true in many other organizations, that it is line programming management who makes the final "yes" or "no".

We try to equip our people with the information they need, to know what process is taking place, and which of these screening devices is being applied to him or to her.

Mr. Chandler

Our placement director has been with us for fifteen months. He gives them a talk and helps them with their resumes. He tries to instill confidence. The student is going to be on his own at an interview.

Mr. Chandler (Cont.)

Up until this time in our sighted classes, our director has a 92 percent placement percentage, but we are very sorry to say that the last class that graduated placed themselves.

We wanted to be able to help, but our hands were tied. He asked me to direct this question: We need help from the State rehabilitation agencies and we would like to get help from anybody, any suggestions on placement, but our last people did place themselves.

Mr. Wilbur

We provide our students help in working up a resume. We do very little by way of providing a sort of mock interview. We do this with students who have not been previously seeking employment.

However, at our installation most of our students are people who have been employed previously, and know what it is like to go out and get interviews. Being blind hasn't changed this fact. They still have that knowledge.

We should do more than what we are doing. However, we feel that there is nothing that can be done in addition to this without going into more work with rehabilitation agencies and with industry, throughout not only our local area, but nationally.

One thing we did do I think has helped, but was a little rough on a few of our students. We have a company in our locality that definitely will not, under any circumstances, hire handicapped. We sent people who wanted interviews to that company saying, you are probably not going to get in but you are going to get one good interview.

This probably won't work too much longer. It looks like we might place with that company.

You can't always do it by mocking it up. You can psych them into it. When our people go out they are aware of their capabilities. We tell them, and most frequently, they come back to us and say, "I was amazed at how much I knew as opposed to what I thought they knew."

I think psyching them into it has a lot to do with it, and getting out there and doing it themselves a few times is what helps them.

Miss Snyder

Dr. Yoder, there isn't one school here that would not be open to any suggestions that you or any of the counselors could make to them. We would appreciate that sort of help.

Dr. Ingham

This is Kenneth Ingham, MIT. I have a couple of comments, more in the way of suggestions than questions.

Obviously your school representatives have a fund of knowledge and experience which should be shared. I think a special issue of the Gildea Newsletter consisting of your contributions according to what you have learned as practical techniques and aids would be very appropriate.

The second comment I would like to make is that I have been asked to head up a group to complete a computer braille code system by the National Braille Authority, and in line with this I would like to give you all my address in the hopes of soliciting contributions and suggestions.

I am sure this is going to come up over and over again in this conference. We are totally open minded to the codes and all the rest of it; techniques, aids and all will be investigated and the results published.

My address is Kenneth Ingham, 20-B-207 MIT, Cambridge, Massachusetts, 02139.

Mr. Smith

My name is Roger Smith from the United States Naval Avionics Facility in Indianapolis.

I would like to address my question to the gentleman from RBI.

You stated in your talk your feeling of the time-sharing system becoming of importance. What have you done to make output available to blind persons?

Mr. Castronovo

I have personally on my desk four proposals to go into a time-sharing environment, stimulated from the fact that places are available to produce return output in braille, not only to find out what devices are available and the cost but to find other information in this area.

Mr. Mick

My name is David Mick. I am employed by the Air Force Weapons Laboratory at Kirtland Air Force Base, Albuquerque, New Mexico.

I am a sighted mechanical engineer inventor. I am working on devices, hopefully, which can increase the output of a blind computer programmer by 25 percent so he can make a salary of a 100 percent of his sighted colleague in an eight-hour day.

I will be talking on some of my ideas and inventions at the idea swapping sessions tomorrow evening or Saturday morning. I think these devices will be of interest to the people here and I want to take the time now to go into detail on some of them.

I would like to direct some questions to the panel on the devices that they mentioned they have. I would like to start with MEDCOMP.

You mentioned that you are working on an inexpensive device to read cards. Would you elaborate on that?

Mr. Wilbur

You mean the device itself?

Mr. Mick

Yes.

Mr. Wilbur

Apparently the most common card reading device in use is what we know as the Stubing Card Reader, the slide with the rubber pad underneath it, and you drag a stylus up and down and hope you find the little dots.

In the absence of anything else this is fine, but the device we are working on is one that would allow the card to move under twelve star wheels, the same type used on a keypunch, and would allow a two-cell configuration to indicate what dots are present in that column.

We feel this device can be produced with at least the same or possibly less expense than the present reader currently in use, and would be a much faster device because you would actually dial your column on something like a television channel switching knob.

Mr. Mick

How would this be accomplished in the coding?

Mr. Wilbur

Mechanically by a pin which would act as dots in the two cells. The twelve pins are in a two braille cell matrix and the orders are actually open to change the direction, but essentially dots one, two, three, four, five and six of the first cell would represent the top six rows of the card and dots one, two, three, four, five, six of the second cell the bottom six rows of the card.

Mr. Mick

I would like to ask the man from SDC. On the front cover of your brochure, you have a picture of a blind programmer. It shows him reading braille produced by an IBM 407 machine. Can you tell me how that was done?

Mr. Stewart

What we have done is, we used the programs that were developed by Seymour Pollack at St. Louis for our braille output.

Mr. Mick

How did you modify the 407 to produce braille?

Mr. Stewart

We are using a 1403 printer for output.

Mr. Mick

I would like to ask a question of the gentleman from Oklahoma.

You started on a card reader some time ago. What is the status of that?

Mr. Chandler

I don't know about this reader. I am sorry.

Mr. Mick

The gentleman from Rochester, what is your output technique, strictly from the high speed printer?

Mr. Castronovo

High speed printer and a card reader about which I will not divulge information at this time.

Mr. Mick

I am developing an inexpensive output device which I call UNIBRL, that measures 12 inches by 8 inches by 2 3/4 inches. It takes input of punch cards and perforated paper tape and produces an output of two braille cells. The first braille cell consists of dot 6, the second braille cell consists of the full compliments of dots 1 through 6, it also counts the columns of the card as well as the columns of the perforated tape from 1 to 9,999, which is a mechanical counter device consisting of four reels and a reset push button.

The end coding is done with an electromechanical disk which revolves at 300 rpm. It will take any combinations to the 12th power, 90 of them, and give an output in 128 combinations.

I have examples worked out for any codes in existence in the computer industry today, and it is being built and used by the Air Force Laboratory where I work, for \$150 or less.

Another device I will work on after that is done will be an audio/braille device which will be on-line with the time sharing to give an output of 30 characters a second in braille as well as compressed speech. This will use the same principles of the UNIBRL device.

It is indeed unfortunate that there is such secrecy in designs of devices. Our device will be produced, a report will be made on it, all the drawings for the device will be put in that report, and it will be published by the Air Force Laboratory. It will be available through the government printing house at a purchase price probably of \$1. Anybody who buys that will readily be able to follow through.

We would like to see them mass produced by any enterprising outfit in the United States. It will have a patent on it. I will have manufacturing rights reserved and this will allow me to select the firm that will so desire to manufacture it. In this way the blind person will be protected by making sure it will be a reputable firm that will manufacture and service it.

I have ideas on other devices and I would like very much to get inputs from the blind community. I don't know your problems as well as I would like to know them. I think there are other ideas to which you can contribute greatly. Thank you very much.

October 10, 1969

Morning Sessions - OPENING REMARKS

Mr. Collard

This morning as you entered you were greeted by Dr. Norman Yoder and a charming lady who gave you two braille sheets. I would like to call upon Chet Adair from the University of Dayton to explain what it was all about.

Mr. Adair

I apologize for not having this enclosed within your packets, but I wasn't aware that the opportunity was available.

These are pages one and two of the braille code that the University of Dayton is using with its time sharing. It has a second cell shown between the full blocked cells to indicate the use or non-use of a "seven" dot, which is available on the system we are using. We distribute it merely to indicate that this is what we are using and that we would like, if possible, if the opportunity is available with all of us here together, to have some agreement on a computer braille code.

It seems that it might aid in communication between all of us. We are not hung up on this code. If everybody can agree on something else, that is fine with us.

Thank you.

Mr. Collard

I am delighted to tell you that the American Council for the Blind held a seminar in Charlotte, North Carolina, in July. Dr. S. Bradley Burson is here to talk about it and also to tell you that they have their proceedings published and available to us.

Dr. Burson

A year ago at our convention, the American Council convention, we talked about having such a seminar and it was sort of on the shelf. Nobody did anything about it until late spring.

The similarities are rather striking in the areas of interest we tried to cover. We had about 40 people present. There were 21 blind programmers present.

The American Council was to orient the entire seminar around the programmers and their concerns. I think we did that.

We worked very hard to get these proceedings out, primarily motivated to get them out and into your hands before this meeting. We do have a limited number. There are no braille copies yet. We are going to get it brailled. Some of you on the programmer's mailing list have received them.

I would like to request that if you already have one, let the people who don't, have these copies. If there are still enough to go around, let me know. We are going to get more printed.

I do hope later on to have an opportunity to talk a little bit about the findings and results. Our proceedings are not in the form of a verbatim transcript, but rather the collective conclusions of the entire group. Thank you very much for this opportunity.

Mr. Collard

In the course of the last eight months since this conference was first publicized, I received some interesting mail.

The first letter I received was from a Dr. G. Van Der Mey, from the University of Delft, in the Netherlands. Actually, it is from his wife.

Dear Mr. Collard:

Thank you for your invitation to attend a conference on the blind in computer programming.

My husband is not at home this moment and I will answer in my bad English with many mistakes.

Since 12 years my husband is a programmer and works at the University of Delft in the Netherlands. He is deaf and blind and works at home with a teletypewriter braille system so it is not necessary for him to live in Delft.

I think he can give you all the information you want.

Unfortunately, it is not possible for us to attend your wonderful conference. The expenses of plane and hotel in Cleveland are too high for us and the Netherlands does not have any organizations for helping.

We both wish you all the best for this conference, and I hope the future will give many productive blind programmers.

Sincerely yours,

Mrs. E. Van Der Mey

I had another letter from Budapest, Hungary.

A. F. Collard
Conference Chairman
Eastern Airlines, Inc.
Miami, Florida

Dear Sir:

Thank you for the invitation to the Blind in Computer Programming, An International Conference.

I'm much interested in the subject being active already over five years in the same field. I'm sorry to say that I'm not able to attend this conference on account of financial matters.

I want to send my best greetings to all of the participants, regretting not to be among them. I hope the conference will put forward the essential case of the blind programmers, employment. There work blind mathematicians and programmers here in Hungary, too. I personally deal with problems concerning the computer solution of economics and technical questions.

The most forstanding problem we have is how to obtain software support and there isn't available an universal mathematical braille notification. Another problem is that the recent issues of the special literature is very difficult to get at for the blind.

I think that our connection could be profitable in the future, too.

Mr. Collard (Cont.)

If it were possible, please send me an extract of the proceedings about the discussed questions.

Yours very sincerely,

George Hodi

Mr. Collard

In our business applications area at Eastern Airlines, we have a constant need for programming talent.

I was made responsible for the finding out whether it is really true that the blind can program computers.

My research took me to Washington University at St. Louis and there I met the chairman of our next panel.

He is Associate Professor of Computer Science at Washington University at St. Louis. He has worked with Dr. Sterling for a considerable number of years both in Cincinnati and Washington University at St. Louis, and he helped form the Professional Activities of the Blind Committee that ACM sponsors.

He is one of the most entertaining speakers that I have heard and one of the most entertaining people I have ever talked to. I am delighted to have with us Mr. Seymour Pollack.

Mr. Pollack

I think it is appropriate to have an opportunity to examine training methods, techniques, and attitudes at this particular time in the development of the field. The conference was planned to occur at what I consider a fairly crucial time.

When we started the training program in Cincinnati in 1963, the field was comfortably ensconced in the middle of what has since become sentimentally known as the second generation of computers. Interestingly enough, our very first trainee, by now an old grizzled veteran, is here in the audience. In those days, everyone looked with a certain degree of warmth toward a steady, controlled development of the field. People interested in keeping abreast of the dynamically changing training methods could look forward to some type of steady planning.

The situation was completely upset on April 7, 1964, when IBM decided to let loose the 360. Developments since then have occurred in two directions.

One is that changes have been coming on top of each other so rapidly that it became very difficult to define what in the world a generation is, and there are all sorts of definitions. If you get three people in one room, you will get five or six definitions of what a second generation is.

Right now I personally know of four computer manufacturers, each of whom claims to be the seventh largest. One measures it by weight, another measures it by the number of computers that he has delivered to customers, neglecting to mention that each computer itself is precious small, and one IBM Model 40 will balance off his whole production.

These things are fairly arbitrary. The fact that the developments are coming so rapidly has profoundly influenced the attitudes of people who do training and people who design curricula. These people have to move a lot faster than they did in 1963-1964.

The second thing that has happened is that there has been a tremendous proliferation of computing systems. With their growing degree of education, the users of computer products are acting a lot more independently. I don't mean this next remark to be offensive to any particular manufacturer, especially to IBM, but the truth of the matter is that people are veering away from the tendency of automatically consulting IBM when it becomes necessary to look at the possibilities of getting a computer. Not only is the choice wider than it ever was, but it is no longer clear-cut that a training program need be oriented toward a particular group of machines.

Both of these factors have caused people in training to take a more critical look at the type of training they are providing.

Mr. Pollack (Cont.)

As I say, it is quite appropriate for us to try to summarize where we are at this point, where we came from, and to get some insight as to where we should be going.

For this reason, I am particularly happy to have on this panel three people.

At my extreme right is Mr. Guy Clawson who is a member of the staff at the MEDCOMP research organization. This organization has been training blind programmers for several years and is a direct outgrowth of the training program that we started in Cincinnati.

Mr. Clawson will provide us with a definitive statement of the present state of the art in these training activities so that we have some kind of basic point from which we can explore these questions of where we are and where we should be going, and so on.

To his left is Mr. Robert Crook from Indiana. He is a member of the systems team at the Indiana Bell Telephone Company. He has some very interesting comments to make as a working professional and is taking two rather interesting perspectives on the training picture.

First are some comments in retrospect as to what a training program should bring to the aspiring programmer; and second, what the aspiring programmer should bring to a training program.

Training is not all superimposed on the individual. The individual must do some training on his own that a formal program cannot give him.

Our third panel member is Mr. John White and we are particularly pleased that Mr. White is here. He is a welcome visitor from the United Kingdom where he is employed as a programmer/analyst at CAV.

It will be most interesting for me, and I am sure for all of you, to hear his comments about training attitudes, philosophies, and techniques in the United Kingdom, so that we can contrast them with the type of approach that appears to be propounded in this country.

Mr. White is very interested in problems of blind programmers and almost single-handedly acted to form a society of blind computer programmers in England.

He is the Secretary, and recently convened a meeting of such programmers attended by approximately 50 individuals.

We can get from this panel a very broad spectrum and they all invite your participation.

Paper 3-1

SOME ASPECTS OF TRAINING AND ORIENTATION

Mr. Guy Clawson

MEDCOMP, Cincinnati, Ohio

Mr. Clawson

Thank you, Sy. First of all, let me say that I consider this a real privilege to be on this panel and to be a functional part of this conference. I believe that there is and has been a real need for this conference for some time now, and I hope that this won't be the end of it, that this type of endeavor can be continued.

My discussion this morning should involve everyone who is in the audience. It will involve the rehabilitation people, those concerned with training centers for the visually handicapped, successfully employed blind programmers, and any blind individual who may be considering programming as a career.

Mr. Clawson (Cont.)

The first topic I would like to consider is selection. I mean selection of applicants for training, and this very definitely involves the rehabilitation counselors and staff of the training centers.

I don't have to prove the feasibility of programming as a career for blind individuals this morning. This has already been very well proven. The problem that we are concerned with is employment for the blind, and this is a severe problem no matter what the area of concern is.

As far as programming is concerned, I wish that every blind individual could seek a career in programming because it offers a very brilliant future for certain blind individuals. Since this is not possible for everyone, we must employ selection.

The first point I want to consider is emotional stability. Due to the nature of programming, there is a considerable amount of frustration and anxiety. If an individual does not have the ability to cope with ordinary anxieties and frustrations, then programming is apt to present considerable problems.

The training courses for computer programming are very stringent. In order for a computer programmer to be adequately trained, he must complete a number of assignments and gain as much experience as possible. There is a considerable amount of academic material to be learned, and the individual must keep himself on an even keel to even get through the training.

Attitudes: This is one point that I am especially concerned with when I interview or correspond with individuals who are interested in becoming computer programmers. I think that attitude is a very important factor to consider when selecting an applicant.

What is the basic reason why an individual is interested in a career in programming? Is he interested in simply increasing his present salary, is he interested because there doesn't appear to be any other employment possibility, or is he interested in programming because he feels that he has a knack for this profession? An individual's attitude is very important.

Independence: When a trainee is in the process of being interviewed for a job, the very first concern of an employer is, "Oh, my God! A blind person!"

"How can he possibly succeed in my installation? How will he be able to take care of his personal needs? How will he be able to orient himself with the rest of the staff?" In our training program, we try to develop the idea that an individual must be independent and that his orientation is good. Another factor of independence is involved with this problem of how much sighted help an individual is going to require. As far as this is concerned, a blind programmer should never require sighted assistance of anyone in the staff of equal basis or higher up. What we want to establish here is that a blind individual only needs to borrow another person's eyes and not their minds. A blind person shouldn't have to rely on someone else to analyze his work and to advise him as to what should be done.

Education: Now, it would be nice if every individual who is interested in computer programming had a college education. It would help him to obtain a job once his training is completed. Our advice to rehabilitation people who are considering applicants for computer programming is first of all to encourage the individuals to go to college. Many employers are not even considering applicants without a college degree.

We have two points of view here. An employer when considering an addition to his staff must consider both a programmer's ability as a technician, what he knows about the machine, languages, operating systems, and so on, and also what he knows about the particular problems with which he is involved. Again, educational background is a tremendous advantage.

Intelligence: Computer programming is an intellectual activity and therefore, it does require a good mind and above average intelligence.

We have found that there seems to be a limit of how high intelligence may range for an individual to be a well-adjusted programmer. We have determined that as far as putting it in black and white, a range of IQ's from 120 to 135 appears to be most suited. We have

Mr. Clawson (Cont.)

concerned ourselves with individuals at both ends of the scale above and below this range, and have had success in both cases.

The next topic I want to consider is training. Anyone who is involved in training blind programmers has to be concerned with giving his trainees the very best advantage he can. This is essential. The field is still young and it is detrimental to place individuals in the field who haven't been adequately trained. A training program must conform to teaching its students all phases of data processing. The first phase of any program is the initial communication. This appears to be another problem that employers are concerned about, because they have their ways of presenting job assignments to their programmers, and in many instances they feel that they may not be able to communicate job specifications to a blind person.

Of course, there are some instances in which this may be true, but we have found that the problem with initial communication and the job assignment can be eliminated if the blind person is resourceful.

We found that a portable tape recorder is a tremendous asset for collecting information. If there are any written documents, these documents can be read once and recorded, and the blind individual then has a permanent record on tape to which he can refer.

Documentation: Employers are emphasizing documentation more and more. The student must be trained to prepare adequate documentation. This is hard to teach because every installation has its own ideas of what documentation should contain. Documentation really isn't very well standardized at this time.

Logic construction: This involves the resources of the individual himself. An individual has to have a natural ability for constructing logic, the ability to grasp abstract ideas, the ability to conceive logical constructions. There is a part to be played by the training centers themselves as far as program technique is concerned.

Programming languages: As far as teaching the skills in programming itself is concerned, any language would do, but the schools themselves should become involved with those languages that are most current and most widely implemented.

Operating systems: In third generation equipment, the programmer is at a loss without a knowledge of operating systems. The training centers should spend a considerable amount of time in this area, especially in the later months of the training course. The student should be aware of what an operating system is and what it has to offer, and the actual techniques involved in making use of the operating system.

Peripheral devices: The training should prepare the student to be familiar with a large variety of peripheral devices. Again, since it is impossible to predict the environment in which the student will be employed, the student should be familiar with the operations and the techniques of as many peripheral devices as possible.

Coding: If a blind programmer is going to be successful, he must have the ability to prepare the initial run of a program as accurately as possible. We are all aware of the difficulties that will be involved if the program is not initially well written. The programmer is going to have to rely upon at least a certain amount of sighted assistance as far as his debugging is concerned, and if the program can be written close to a running program, it is going to eliminate a lot of these difficulties. This involves both good logic and meticulous coding.

As my last topic I want to consider methods and devices. The tape recorder: The conventional magnetic tape recorder is an essential device to the visually handicapped programmer. It has many applications.

First of all, as I have already mentioned, the tape recorder can be used to eliminate most of the difficulties in the initial communication phase of the data processing problem. The tape recorder can be used by the blind individual to maintain and accumulate the documentation. He can make braille notes himself from the tape. Once the documentation has been

Mr. Clawson (Cont.)

completed, then he can use the tape recorder and the notes that he has made to complete the typed document.

One of the most serious problems is that the blind programmer is handicapped by the lack of manuals and specifications in a form he can use. In a rapidly changing field such as programming, this almost makes braille completely unfeasible because by the time all of the efforts have been put into brailleing a particular manual, that manual has probably been updated.

One thing I would like to see come out of this conference is an effort in the direction of acquiring recorded information as far as manuals and specifications are concerned.

The ordinary typewriter is necessary for completing the final coding so that the program can be keypunched and also for preparing documentation.

We have already heard some discussion about card readers. I think that we can expect something in this area in the near future.

There are several benefits to be acquired from an efficient and rapid card-reading device. First of all, an individual could read and check his own source programs.

Secondly, an individual could read other programmer's source programs. It would provide a means for the individual to modify his own source program and perhaps the most important feature of all, computer output can be produced on punched cards and it would provide a means by which a blind individual could read the computer output itself.

In conclusion, I want to readvocate the three points that I have attempted to bring out here:

First of all, that selection of individuals for blind programming be done on a realistic basis.

Secondly, that individuals involved in training programmers should present their trainees with the best advantages possible for employment.

Third, there are a number of methods and devices currently available that the blind person can use to advantage. We should be developing the areas of new devices and new methods.

Mr. Pollack

Our next speaker is Mr. Robert Crook.

Paper 3-2

OBSERVATIONS ON CRITICAL FACTORS

Mr. Robert Crook

Indiana Bell Telephone Co., Indianapolis, Indiana

Mr. Crook

My purpose here today is to present some points that have come directly from my personal experience, both as a trainee and as a working professional.

In my opinion, the key to success is knowledge. We get our knowledge basically from three sources, formal education, specific training, and work experience.

Mr. Crook (Cont.)

As Guy has pointed out, there are many prerequisites to programming, one of which is basic intelligence; another is formal education, as much as you can possibly get; and then, of course, the training. Assuming that you can get through all of these and manage to convince some employer that you have what it takes to do the job, you will then get the work experience.

I have chosen throughout my life a method of achieving what I call my success by setting goals and then attempting to reach these goals.

First of all, looking at the Cincinnati program, I found the staff was very capable. Also, the curriculum extremely demanding. It has been favorably compared to 30 hours of college credits which was given in six months. I can say it was successful because everyone taking part in this program in 1965 and 1966 was employed very quickly. I think this is a mark for the training program itself. We were well trained.

I have only one thing that I could offer as criticism. I was asked in my initial interview if I knew braille and with my tongue in my cheek, I said yes. It was not a lie. I knew braille, grade one, and I had memorized the dot configurations. I had absolutely no skill in using it. They didn't ask me that. I found out very quickly that every person attempting to be trained as a blind programmer needs braille as a basic skill.

This was pointed up rather quickly in the first week when we were going through a review of our algebra, and they presented us with log tables in braille. Our instructor was going around the class asking each of us to look up certain information. We were seated around tables and my assignment was given to me. I took the book and labored with it for a few moments and finally my roommate, who was a most capable individual, reached across and took a puff on his pipe and said, "First of all, Bob, you have to get the book right side up".

Somehow I managed to get through that class and I have been struggling with braille ever since. This is my big difficulty in the whole business of being a blind person. I have not become proficient in the use of braille. I can read it and I use it, and I know it much better now than I did when I started. As soon as a better way comes along, I am in favor of it.

That is the main reason I am here.

I have given you an insight into the Cincinnati program and now let us examine the practical problems of looking for a job and the working conditions that I have had.

I started running scared. I had sold my business, all my eggs were in the computer basket and I knew I had to get a job. I had four children and a wife. We were used to living well and we wanted to continue to do so, so I applied myself to the task of finding a placement that would continue to give us the income we needed.

I was very fortunate. After 40 or 60 phone calls, I got 15 interviews. Out of 15 interviews about six realistic opportunities developed. I received four actual offers and I took the one that offered the most money.

It was better in many other ways, too. I went into an excellent environment in a university research computer center and I had the opportunity to work on a 7040, working in several areas of scientific as well as school computer applications for business programs. My basic background in education had been in business.

Then another opportunity developed offering a chance to be trained on a newer model machine: getting into a business application where the computer was used for accounting purposes. I applied, and was accepted by the Indiana Bell Telephone Company in the accounting department. This indeed is a challenge.

Along with all of this I feel that we must be, as programmers and as trainees and as people responsible for training other people, aware of the fact that it is a two-way street. The training staff is doing the best it can to impart the knowledge necessary for the success

Mr. Crook (Cont.)

of the trainee and the trainee has an obligation of its own. He must set his goal and do what he can to achieve it.

I have outlined a few things that I call "training your intangible assets". This may sound a little trite. It is rather obvious that we all have certain traits, but I think some of these traits can be enhanced by training.

First of all, I think there must be a willingness to work hard and to complete the job. I went to Cincinnati with three goals in mind. First, I wanted to lose 25 pounds, second, learn how to program a computer, and the third was to learn how to play the banjo in my spare time.

I lost the 25 pounds in the first two weeks, I learned to program the computer in six months, and the banjo is still hanging in the closet.

Set your goals, work hard toward completing them. This is something we all have to do in life, and perhaps we should strive to do better.

One aid in doing this is learning a little more of self-discipline. Budget your time. A blind person is plagued with the fact that it takes him longer to do anything than it does a sighted person. So time is important, especially after you become a programmer. You are competing with sighted programmers. They have a distinct advantage in being able to read quickly. Self-discipline and good use of your time is very important. I have trained myself to do a little better but I am not doing as well as I should, yet.

The third factor is frustrations and how to deal with them. We always have them with us. As a programmer trainee, they seem to come thick and fast and it doesn't get any better the more involved you become with your work environment; in fact, it gets worse.

I started my frustration as a blind person rather early when my eyes began to fail and I was still working in the restaurant business. I had to give up driving and in order to not overtax the generosity of my wife as a chauffeur, we bought a tandem bicycle. I had one of my boys go to town with me on the bicycle to do the shopping that I needed. One day the older boy wasn't available, and I asked the younger one if he would come along and ride Dad to town. He hops up on the front and I get on the back and we shove off.

Returning, we were coming up a rather sharp incline and it became obvious we were not going to make it. We finally stopped and, puffing very hard, I said, "Randy, can't you push a little harder? We aren't going to make it."

Randy said, "Sorry, Dad, the seat is too high. I can't reach the pedals." Without a doubt this was one of my first frustrations. They have been coming thick and fast ever since.

I was explaining to my present supervisor some of the problems that we had had at the other installation. I was describing different things that I considered to be problems. Bruce said, "Bob, here at Indiana Bell we don't consider those to be problems. We have the same things that come up. Every installation does. These are opportunities."

This is great. It is a good philosophy and I agree.

It is tough to decide when you are frustrated whether it has been a problem or an opportunity. I am sure that many of you have gone through the thing of brushing your teeth with Brylcreme. Every day there is a new frustration.

Being accepted in your work environment is easy enough to do. You meet people, you learn to make friends. Pretty soon you are accepted as an individual and they forget that you can't see.

Going on with the things that we must do as programmers, I think we must train ourselves to keep an open mind. I learned early that there is always a better way, even though I built this program and I am sure it is the best, there is very often a better way. If you are

Mr. Crook (Cont.)

willing to listen and learn, you can pick up good hints. This doesn't mean that you should plague people for ideas. Do your own work, but keep an open mind and be receptive to new ideas.

Another point, and this one has been a big frustration, is learning to accept change. A trite phrase that I have heard used quite often is, "nothing is more constant than change", and especially in our computer applications. There is change of hardware, changes of software, change of job control systems, change in personnel, they are always with us. It is difficult to accept, but it is a fact of life.

So we can learn to roll with the punches, accept the change, make the best of it and be willing to continue.

I have a note here that says organization and documentation. Certainly organization is important to any blind person. If you don't keep your books, your supplies, your desk, your tools, your tapes well labeled, organized so that you can find them, you are wasting time.

Documentation is extremely important and I can add emphasis to this from my work environment. I have found it important to document during the development of a system that we have been working on for the past two years. Many ideas change, and if not documented, it is difficult to keep track of everything.

The last point I have here is that we should develop confidence. This confidence will come from knowledge. Knowledge comes from training, education, and work experience. If you don't have the confidence that you do know what you need to know, it is extremely difficult for you to convince anybody else that you can do the job. I think this is one reason why the group that I trained with found it easy to get employment. They did know, in many cases, more about programming than some of the people that they would be working with who had years of experience.

In summing up, we must be aware of other goals. We are here as professional programmers. The whole idea is to develop new training ideas and share our work experiences. I have another thought: I think we must continually revise our goals. What good is a goal after it has been achieved unless it is used to build on?

I hope that I will not remain a programmer for very long, only long enough to get the knowledge to use as a stepping stone to something higher.

This, then, is one of the basic reasons why I wanted to come to Cleveland. Braille is a tool, it is a useful tool, but I sincerely hope that something better can be developed that will allow all of us to have access to the printed matter that comes across our desks in such increasing amounts, and the printed matter that is so necessary to constantly keep upgrading your training.

Braille again is a tool; it is great. The recording device is also wonderful, but it does not give us the random scanning possibilities that we would like to have.

So I sincerely hope that there is more work being done for developing some sort of a print reading device that will give us instant access to printed matter. This again will not only be of benefit to the programmer, but it will indeed be a boon to all blind persons.

At present, we have opened to the blind person a new field of professional employment, and with a print scanning device that would give us instant access to all printed matter, certainly any world can be opened to any blind person.

I am hopeful that more work and more research can be directed toward this endeavor.

TRAINING, PLACEMENT, AND EMPLOYMENT OF BLIND PROGRAMMERS

IN THE UNITED KINGDOM

Mr. John N. M. White

CAV Ltd., London, England

Mr. White

In this paper I am going to deal firstly with the background and training of blind programmers in the United Kingdom.

Secondly, the length of, the structure, and the content of courses today including some suggestions for the future of employee training; thirdly, with the requirements of blind programmers and the facilities available to them.

Finally, with the British Computer Association for the Blind which was formed last March.

First, then, I shall summarize the background of the training of the blind programmer in the United Kingdom. In 1963 the RNIB was requested by the Ministry of Labor to establish a service to open up new careers for blind people. It was thought that programming might offer prospects for a career to some people, some blind people in the United Kingdom.

Mr. George Willson, who is with us today, therefore visited the USA and spent a week at the University of Cincinnati learning of the development in this field over here.

Dr. Sterling visited the UK in 1965 and explained his training program to the RNIB. The RNIB, though interested, felt that they had neither the equipment nor the expertise to enable them to run such a course.

However, RNIB attempted to enlist the support of the computer manufacturers. They also approached the Treasury in an attempt to place any newly trained blind programmers who were not civil servants as programmers within the Civil Service. The Civil Service Clerical Workers Association would not agree to this. However, the Organization and Methods Training Department of the Treasury agreed to train blind people already working in the Civil Service to fill posts as programmers in other government departments. English Electric Leomarconi, Ltd., the Treasury and the RNIB, together with some assistance from the Ministry of Labor, who had by then renamed themselves the Department of Employment and Productivity, devised and ran a basic language course for 12 blind people, nine Civil Servants and three from outside the Civil Service. Of these three, two had already been taken by Shell-Mex & BP, Ltd., and the third obtained a place with CAV, Ltd. at the end of the course. The course ran for seven weeks and was held again in the summer of 1966. Financial support was granted by the RNIB, the Treasury and/or the employer together with the Department of Employment and Productivity.

In the early summer of the following year, a dozen more blind people were trained; however, on this occasion, the RNIB and the Treasury ran separate courses which were parallel and which were organized on similar lines to the previous course.

Later in that year, IBM, UK, Ltd., ran a pilot course at their Hursley Laboratory, which was attended by a further dozen blind people.

International Computers and Tabulators, Ltd., ran a course in 1968 which, like the IBM course, was attended both by Civil Servants and by non-Civil Servants. This year ICL, that is, International Computers, Ltd., the result of the merger between ICT and English Electric Computers, Ltd. (who themselves were an amalgam of English Electron Marconium, Ltd.), have completed one course arranged with the RNIB. They are in the middle of the first course for blind people in the U.K., which has its main emphasis on learning a machine-oriented language, and this case, the language is PLAN.

At the end of just over three year's training, therefore, there are 60 blind people who have passed through the official sponsored courses, and a half dozen more who have entered programming by other means, although they are registered blind. By the end of this year then, there will be between 75 and 80 blind programmers in the United Kingdom, the majority of whom will be working for the Civil Service, and, with only a very few exceptions, all of whom will be working in batch-processing environments on commercial applications.

The main criterion in planning the courses to date has been that the novice blind programmer should join his installation soon after the completing of his basic course and should, with subsequent training specific to that installation, become a fully productive programmer as soon after joining as possible.

This is in line with the principles adopted in the training of sighted programmers. Computer manufacturers in the U.K., as part of their customer services, offer training facilities for computer staff. It is usual for an employer to select potential programmers by interview and by having applicants do the aptitude test of the employer's choice, usually that test recommended by the manufacturer. Successful applicants then join the company and are sponsored by the company on the training course which is selected.

In the case of the Civil Service, the newly trained programmer is accepted on a training course only when he has a guaranteed post to fill, that is, a job to go to from the course. However, in the case of non-Civil Service training of blind programmers, it has become the practice for the person to be trained, and as soon after his course is ended as is possible, to find him a job. This practice is a direct result of the skepticism resulting from ignorance which exists at all levels of management, and which Mr. Nichols outlined yesterday in his keynote address. Any novice trainee programmer is trained in one language and on one machine during his basic course.

Bearing all these factors in mind, all courses which have so far been conceived in the UK have the following points in common:

- a. They are based on the equivalent course for sighted programmers.
- b. They set out to cover the ground in greater depth than in the equivalent sighted course, thus making the blind programmer a more attractive proposition to his employer.

All courses consisted of some pre-course study material up to a fortnight's introduction to programming, detailed study of the specific language, and finally writing and testing programs and learning the operating system. The course length varied from six weeks to ten weeks depending upon the type of machine which the programmers were being trained on. The courses have all been residential, being held at one of the manufacturer's training or research establishments.

The E.E.L.M. courses in 1966 and 1967 were based at Bradley House, Ealing, London, and were six weeks in length, and students were taught to program the LEO 3, second generation machine, using a high-level language, CLEO.

The course consisted of a fortnight's introduction, the reference material for which was circulated to students about one month before the start of the course. The CLEO training manual was used as a text for the main part of the course and E.E.L.M. had written basic brailers so that the blind programmer could obtain program listings, store dumps (core post mortems), and tape post mortems (tape edits).

Each course member was provided with a workbook for interim exercises and the course was terminated with a model job. The specification for this was read onto tape, and the students working in two's and three's, wrote the programs in the way with which most of you are familiar. Each course member was provided with a typewriter with a modified keyboard to suit the language.

Mr. White (Cont.)

On the first course, students were provided with spool-to-spool battery-operated, semi-professional, portable tape recorders; on the second, with cassette recorders designed for the office environment. The latter in my opinion are greatly to be preferred.

CLEO is a paper-tape oriented language and the LEO machine is a paper-tape oriented machine. It is the rule that most installations using paper tape that perforating and verifying are the job of the data preparation section. Students, therefore, were not instructed in the use of paper-tape punches. Students on these courses took notes of the lectures to amplify the reference material with which they were provided. Each student's progress was evaluated by the lecturer who submitted a report on completion of the course.

The IBM course in October 1967 incorporated a new approach. A feasibility study was begun in the previous year, and the course finally agreed to in April 1967. The pre-course material was far more comprehensive than on any of the other courses, being circulated to students seven weeks prior to the start of the course. It included an elementary math course and recommendations as to which of the available books the student should read before arriving at the course. A technical hitch prevented the students from receiving their talking-book cassette machines so that much of the value of the pre-course material was lost. The course was based on IBM U.K. Laboratories, Ltd. It lasted for nine weeks. The main teaching medium was API (audio programmed text instruction).

Students were instructed to program the IBM 360 in COBOL. A great deal of time on the course was devoted to instructing the students in the operating system and in the job-control language. Toward the end of the course, a lecture was included by the chief programmer for an IBM user on the setup of a large installation. API was found by the course organizers to be a thoroughly satisfactory method of instruction. It allowed for flexibility in the different rates at which different people learn and allowed the lecturer to play more of a tutorial role in the running of the course.

For those interested, this course is fully described in the technical report, TR-12-073 by Messrs. R. E. D. Love and N. A. C. Hooper, who devised the course.

The three courses which have been run most recently, one of which is in progress at the moment, are on the ICL 1900 range of machines. The first two courses taught COBOL and the third is concentrating on the low-level language PLAN. Again, the 1900 is a third-generation machine and the length of the courses have been nine weeks with the COBOL courses and 10 weeks for the PLAN courses.

In the two courses with which the Civil Service Department have been involved, Mr. Derek Croisdale, the O and M training officer, has placed great emphasis on each student having practical experience in writing at least three jobs on the computer before completing the course. The course organizers have not used API. Instead, they prefer to maintain a higher staff-to-pupil ratio to insure that there is sufficient personnel supervision.

The chief failing of all these courses is that they all require from half-dozen to a dozen possible candidates to be selected before the course could commence.

I would like to suggest the preferable arrangement might be for the blind programmer, who has been selected by the RNIB or by his employer to go into programming, to pursue a more intensive course of home study under tutorial supervision, followed by attendance at the manufacturer's ordinary courses. During his course of home study, the student could be acquainted with the course material. While attending the course, he could meet and mix with fellow trainee programmers, an arrangement which I am sure could not fail to be beneficial to both parties.

Actually, I believe it is the training of sighted programmers which needs to be increased and not that of blind programmers to be diminished. I think it is tremendously important for each student coming off his initial training course to be actively encouraged to place himself in a job. I sometimes feel that colleagues of mine back home are too often prepared to burden the placement department with this problem, sometimes unnecessarily. I think that in order to achieve this most satisfactorily, the training courses for blind people might have included in them a special section indicating how to go about meeting the employer.

I also believe that experienced programmers could provide an invaluable source of information when course organizers are arranging and planning new courses for training blind programmers.

Now to my third point on the four I listed at the start of this paper: the requirements of the blind programmer and the facilities available to him. The chief requirement of the blind programmer is that he sets out with every prospect of becoming fully operational and that he remains that way. At present, in the U.K. this depends to a great extent on the initiative of the individual programmer, that is, he has to ask his sighted colleagues to update each day on the software alert, release notices, and new features that become available in the language or in the operating system. The blind programmer should not be bashful in using the assistance of his sighted colleagues provided he does not abuse it.

In the U.K. at present, if a basic course is organized, then the relevant manuals and documents are made available through the RNIB and the talking book service of the blind. They are working on the principle that it is preferable to have reference material in braille and training material on tape. However, once the programmer requires further training at work, there is no means yet by which he can obtain the relevant documents in braille. The best he can achieve is to have them read onto tapes. It is a solution, but I trust, only a temporary one.

If the blind programmer has the misfortune to work for a company which changes its system completely, then, unless he can obtain reference material for a similar language or a machine, he will find it difficult to maintain his level of productivity.

The company for which I work has rented an ICL system machine, a machine very similar to the RCA Spectra 70-40. The COBOL compiler is similar to that of the IBM 360. It so happens that the IBM COBOL Reference Manual is available and I am using it as a reference manual. The same applies to brailers.

It is not the practice in the U.K. for each blind programmer to write his own brailer. This is partly because employers would not release their blind programmers to do so, partly because the manufacturer accepts the responsibility to provide their customers with certain tailor-made packages, and partly because until now it has not seemed necessary. However, I feel greatly stimulated as a result of this conference and I would like to reverse the position.

The programmer uses his typewriter and tape recorder to communicate with colleagues inside and outside his department, and his Perkins Braillewriter for coding, and retaining hard copies of specifications. A Banks Braillewriter or some more portable form of braillewriter is useful for carrying when it is required for the programmer to go outside his department for information. The blind programmer needs to be mobile, and above all, to be articulate both verbally and literally.

Finally, I should like to include a paragraph on the British Computer Association of the Blind. A year ago last March, a group of us who had been trained by E.E.L.M. met informally in a pub and I proposed the idea of an association of blind programmers with the general aims of exchanging information and experiences, and of looking to the future to obtain further support from the manufacturers.

In October last year we met. A steering committee was elected to draft a constitution, and this committee had completed its work in time for a further meeting to be held on March 15th last to form the association. Every blind person who has entered into ADP is assumed to be a member and has our services. From time to time the list is reviewed and appropriate action is taken if any member has been found late in his payments.

Our first project to get under way is a fortnightly tape of extracts from DP journals which is produced by the computer department at Essex University, copied, and circulated on five-inch 900-foot tape, recorded on two tracks. At present I think the tape magazine serves chiefly to inform the programmer on topics of general interest in his field so that he is more able to converse with his colleagues. We also include advertisements for vacancies on the tape. The BCAB has had some publicity in the computer press. We are affiliated to the

Mr. White (Cont.)

British Computer Society, and we have, so far, produced two newsletters but have found difficulty in obtaining satisfactory service from the braille printers. I hope now that this problem has been resolved with the cooperation of the Scottish Braille press.

At the end of next month, we are holding a one day seminar with the title, "Software and General Aids to the Blind Programmer", to which we have invited contributors from International Computer Limited and from the RNIB.

In the United Kingdom then, there is still a great deal of hard work to be done in making the training of novice blind programmers a more routine event, and in providing the blind programmer with the support he needs. The outlook is not bleak but the problems are by no means solved.

Mr. Pollack

John, thank you very much once again for giving us this opportunity to gain some first hand insight on the status and approaches to blind programmer training, placement and professional maintenance in the UK. I would like to throw the proceedings open for discussion and feel free to address any individual member of the panel with questions or to direct questions at the panel as a whole.

Mr. Falter

My name is John Falter. I am from UNIVAC in Philadelphia. I would like to address my question to the British fellow.

I wonder, based on the problems that you have been having getting satisfactory braille for your Newsletter, if a taped Newsletter might prove to be quicker, cheaper and easier to spread around?

Mr. White

This is a good point and we certainly have considered it, but the chief problem at present is that we haven't standardized the equipment sufficiently so that we are certain that each of our members has the same kind of machine. Some, but not all members have their own personal spool machines. But as to the equipment that has been issued in the training courses, in one case it was a Ficord 202 Model A, in the next course was a Grundig Stenorette machine, and in the next two courses there have been Clark and Smith's talking machines. All three machines have completely different specifications. This is the main problem and is the main argument against circulating the Newsletter on tape.

Mr. Thompson

Russell Thompson from the Michigan Blue Cross. I have a question for Mr. Clawson.

I notice in the British U.K. that the materials are distributed a little bit ahead of class time so that the student can become somewhat familiar with what he will be facing in the future. Mr. Clawson, when I went to school here, I didn't receive it ahead of time. Is MEDCOMP, for instance, doing this now for its prospective students?

Mr. Clawson

Yes, there have been several instances in which we have sent out our fundamental computer course to students who were anticipating entering in the next class. We have done this on several occasions.

Mr. Thompson

This doesn't mean for everyone, in other words, the student would have to have enough initiative to ask for it on his own. Is that correct?

Mr. Clawson

In many instances the students are involved in going to school or other activities which would limit something like this, and in other instances the red tape is cleared just prior to entrance time.

Mr. Pollack

Chuck Hallenbeck has a question and then the difficulty is that we have to cut this discussion short. The panelists will be available afterwards for informal discussion.

Dr. Hallenbeck

My name is Chuck Hallenbeck from the University of Kansas. I have a question that I would like John White to comment on. All three of the speakers have talked about tape recordings and about hand-transcribed braille as the main source of training materials and reference materials, but none of them has commented on what seems to be an important trend, that the computer manuals of many manufacturers are maintained on magnetic tape and can automatically be generated into braille. We have here another entire area of reading material which many people find valuable.

I wonder, John, whether this kind of automatic braille printing is available in England?

Mr. White

There is the RNIB and the IBM 1130 and its main use is to facilitate the transcribing of printed matter into braille. There is as yet no standard procedure for producing programming material through this method.

Dr. Hallenbeck

Can I amplify my question? If the support programming were provided, would it be possible for programmers in England to obtain magnetic tape? I am talking about computer tapes, copies of the manufacturers' manuals, so that they could be processed into braille?

Mr. White

In the case of IBM this is possible, but in the case of ICL they do not as yet hold printed matter on computer tape. Preliminary negotiations or discussions have started with ICL and they certainly are considering for their own purposes changing this situation, but certainly there is nothing hard and fast which has been decided as yet. We did think of considering the use of paid readers, but here again, there is no hard and fast decision being made.

Session 4 - WHAT PREPARATIONS SHOULD THE EMPLOYER MAKE AND WHAT,
IF ANY, ARE THE ADDED COSTS OF EMPLOYING A BLIND PROGRAMMER?

Mr. Collard

This panel is made up of four employers and a placement expert. The purpose of our being on this platform is to talk a little bit about our experiences as employers, particularly in terms of what are the added costs, if any.

Dr. Yoder is sitting up here because I think that we, as employers, we as human beings, do not give our counselors enough guidance. We in the employer position in the data processing field have a very good idea of what our needs are. We have counselors dealing with many different occupations that are possible for a blind or physically impaired individual to enter and become productive. I think it is our responsibility as employers to assist all of the state agencies in defining our requirements more clearly than we have. I would like to see this conference produce from this session a subcommittee that will work on a package that would be a guide to all of the state agencies in determining the requirements of an employer of data processing personnel.

Our first speaker is an employer in Warren, Pennsylvania, the National Forge Company, and he has one of the more interesting stories to tell of how he became an employer of a blind programmer. Mr. Don Davis.

Paper 4-1

PREPARATIONS FOR THE BLIND PROGRAMMER

Mr. Don F. Davis

National Forge Company, Warren, Pennsylvania

Mr. Davis

My remarks are based upon our experience with Bud Kennedy who is a very capable National Forge Co. employee. In all honesty, I cannot say that Bud is typical because blind or sighted, Bud is a very exceptional individual.

I will now go through our steps in hiring Bud and in integrating him into the company. Emphasis will be given to the special aspects of being blind although these steps are not very different from the steps of introducing anyone into a company.

The Interview

In response to an ad in a Pittsburgh paper, Bud approached us about two years ago for an interview. The initial interview was over the telephone. The resume was right, the personality sounded good over the telephone, so I invited Bud to Warren for an interview. In the resume or during the telephone call Bud did not mention the fact that he was blind. He did say that he would be taking a bus to Warren. At this point, I thought that he was another driver who had lost his license.

We met Bud at a local motel. I must confess that I was initially quite surprised to find that he was blind. Bud's strategy, however, soon proved itself. He put us at ease at once and we had an enjoyable evening. I think that his confidence in coming to Warren and his confidence in his general ability is a key factor in his success.

The next day at the company Bud was interviewed by many different people. We always use this method with any candidate and then take a composite impression of the person.

Mr. Davis (Cont.)

After the interview, we evaluated Bud's ability to handle our job. Naturally, emphasis was put on any effect blindness would have in meeting the requirement of the position. Our evaluation was as follows:

1. Personality. On several occasions Bud met an office full of people, was able to carry on a conversation, look them in the eye, and call them by name. Blindness was no problem and his basic personality was quite outgoing and superior. Bud's confidence is another key factor in his personality.

2. Mental Ability. While we did not give Bud our usual intelligence test, his college record was impressive and acceptable. His ability to remember a large number of names and general quickness in conversation were impressive. In a more general case I would recommend giving intelligence tests to blind candidates, if this is a normal policy of the company. There is no good reason for deviating from a normal testing policy, except that the questions should be read by a sighted person.

3. Experience. Bud had gone through a computer programming school and had about one year actual programming experience for a large company in Pittsburgh. His experience was very adequate for our purposes.

4. Can a blind person program? We directed many questions at Bud as to how he could program with his handicap. For every technique that a sighted person would use, Bud had an equally good substitute technique. I will cover more on these techniques later, but during the interview we were satisfied that his handicap was not a serious limitation in programming.

5. Mobility. In observing Bud during the interview we were satisfied that he could get around the office and function in his job. It was obvious that he could not drive but this was not considered to be a problem as there were hundreds of people making the same trip each day.

After several days an offer was made to Bud in the normal manner. Bud accepted and reported to work about a month later.

Pre-Employment Preparation

What preparation did we make in housing and transportation? I cannot honestly say that we made any more preparation than we would for any other employee. It is our normal practice to show an employee around to a certain extent. This was done, and Bud and his wife were able to select from several possible rental situations.

Likewise, transportation was no problem. The share-the-ride pools were common. We are in a small city. However, I am sure Bud could easily navigate in a large city with public transportation. I might add that he navigates his way around Warren in every manner with the exception of driving. He frequently walks downtown by himself without any aid.

First Day at Work

On his first day of work, Bud was introduced like any normal employee. His phenomenal memory for names and voices enabled him to become acquainted faster than the normal person. By the end of the first day he was making his way through the several floors and many offices of our building by himself. I do suspect that some effort in walking the blind employee through the geometry of the office layout is a good idea. I suspect that they memorize these office geometries and distances.

Programming Methods

I feel that some discussion of my understanding of how the blind programmer operates will be of value. It will first show that I am satisfied that blind people can program. And it will next suggest certain preparations that may facilitate this programming.

Mr. Davis (Cont.)

In Bud's initial composition of a program he uses small braille cards to represent each program or each logic step. These can be arranged in sequence to follow the logical flow of the program and at the same time he can easily compose and make changes by discarding one card and substituting another. The only equipment necessary at this point is a small inexpensive stylus.

Transferring this information to punched program source cards can be done in a number of ways. Firstly, I have noticed that Bud quite often prefers to punch his own program. I assume that this is because he feels that this is efficient. Another method is for the blind person to type on a regular typewriter. This information is then transcribed by a keypuncher into punch card. The third method is to dictate the program into a recorder. This is then transcribed by a keypuncher into punched cards.

The source cards are then read into a computer and a regular compilation is obtained.

How can the blind debug a compilation? There are several methods. One is for a sighted person to read the diagnostics and make corrections at the instructions of the blinded person. A more efficient manner is to have the computer print out a braille listing of the compilation.

In our case one of Bud's first programs was to adapt a translator which allowed the computer to translate from regular alphabetic to a braille pattern. This pattern is deposited on the paper using the regular periods in the type bars. These periods make a depression in the paper which is read as braille.

With the braille printout, blindness is virtually no handicap in programming. As Bud explained on his initial interview, he is not input/output bound.

Test data and tape dumps can be handled in the same way as the program compilation. That is, the printout is translated by the computer to a braille pattern.

Other Programming Aids to the Blind

In addition to the computer braille printout, there are several other aids worth mentioning. An inexpensive tape recorder is of value. This can be used for recording systems definitions, recording memos, or recording meetings. We have found the Norelco Cassette to be handy for this purpose. In fact, they are so handy that many of our sighted people have them for their work.

Recording of manuals for the blind is a good idea. The blind have many sources for this, mostly volunteer. In our case and due to the value of Bud's time to us, we pay high school girls by the hour to do recording which Bud needs in a short period of time.

Again, because of the value of Bud's time to us, we purchased a braille typewriter. This allows Bud to make notes directly on the typewriter. It also allows a typist to transcribe written material into braille sheets. At this point I am not sure that a braille typewriter is an essential piece of equipment in hiring a blind programmer. This point could stand more discussion.

Documentation

There is a constant drive in all computer departments for better documentation. How does the blind programmer stack up with respect to this important aspect? Again, I say there is no limitation. The compilations of programs are printed in regular alphabet as well as braille. Program narratives and general logic are dictated by the blind person and typed for permanent documentation. Layouts and even flow charts can be dictated.

Good documentation is more a matter of attitude and desire, and the techniques are certainly available to allow the blind programmer to prepare superior documentation.

Mr. Davis (Cont.)

Promotion Opportunities

So a blind person can program. What are the promotion opportunities? I would say that from a technique standpoint, the handicap has been principally overcome after the person learns to program successfully. What is needed for promotion beyond this point are the right personality, the right drive, and a good conceptual mind. These points have nothing to do with being sighted or blind.

In our case Bud supervises three other programmers. In doing this, he designs systems and coordinates their work. A principle job is to coordinate between the user and the programmer. He spends hours with the user in determining his requirements. He gives the user an estimate of time and delivers his products. All these things he is doing and in a superior manner.

Conclusion

Systems programming is a highly intellectual process and requires the right personality and the right drive. In hiring people we must be very discriminatory in these attributes. But these attributes have little to do with being sighted or blind. Therefore, I feel that it is an excellent place for a blind person with the appropriate intellectual abilities and an adequate personality to make a contribution, and to obtain the rewards of this society.

Mr. Collard

I have on the panel a representative from Nationwide Insurance Company, Mr. Paul Cherry, and as we heard yesterday from Mr. Nichols, they have successfully hired two blind programmers.

Paper 4-2

OUR CONCERNS AND CONCLUSIONS AT NATIONWIDE

Mr. Paul Cherry

Nationwide Insurance Company, Columbus, Ohio

Mr. Cherry

In view of the success we have had with the two blind programmers on our programming staff, it is a pleasure to share this experience with you. Before we cover the topic of how Nationwide Insurance Companies insured that our blind programmers would be effective and productive in a corporate environment, I would like to give you a little background concerning our programmers.

When first approached about employment of blind personnel, we were also concerned about the problems that might occur and our doubts whether they could handle the programming assignments, but after an interview with Vern Blatz, many of our fears were alleviated as to educational background.

Both Bill Cool and Vernon Blatz are college graduates with excellent scholastic records. Following graduation from college, both attended the special programming training program for the blind conducted at the University of Cincinnati Medical School. This program was about six months in duration.

Vernon Blatz has been with us almost 5½ years; Bill Cool about 3½ years. The very fact that we employed the second blind programmer is an indication of our satisfaction.

Mr. Cherry (Cont.)

At this time I would like to speak to you about the following items:

1. Productivity - From the standpoint of productivity, we find that the absence of sight has little or no effect. After the specifications have been furnished, the blind programmer proceeds at a pace equal to, or perhaps even faster than, the sighted programmer. We attribute this partially to fewer visual distractions, and the ability to exercise more concentration on the problem. We have noted that both blind programmers require less program debugging time than sighted programmers.

2. Acceptance - In respect to acceptance, we have had no problem whatsoever. In fact, the problem is to restrain sighted associates from offering too much assistance. Our practice has been to ignore as much as possible the fact that they are blind. In connection with work assignments, the only assistance we give in addition to orally providing program specifications, is the check-out of any printed output that may be included in the program output requirements. Also, assistance is given at lunch time getting through our cafeteria lines.

3. Program Assignments - We have not been selective of programming assignments to blind programmers, although initially, assignments involved new developments, as opposed to assuming maintenance of programs written by another individual. Work assignments now may be either new or maintenance of existing programs. Complexity is not regarded as a factor.

4. Special Aids - We have not found it necessary to develop any special aids or tools for blind programmers; however, we do provide typewriter facilities for them to prepare the code sheets. We also increase the printer tension and insert a folded sheet of paper over the platen, so that when preparing braille assemblies, the dots will be firmly embossed.

We have also used a tape recorder for communicating program specifications, whereas this previously was given orally and recorded by the blind programmer in braille shorthand. The tape recorder permits the supervisor to prepare the specifications at his convenience, and requires less time.

5. Salary - We have not adjusted our salary structure in any way to account for the extra costs or efforts, if any, that might be involved in employing our blind programmers.

6. Further training requirements - We were concerned about the method of instruction to be used in the training of our programmers in both insurance and equipment courses. This problem was overcome by having a sighted programmer read the material aloud as he was taking the course. We use P.I. (program instruction) for both assembly language and COBOL courses.

Since both Bill and Vern have an excellent knowledge of the programming language used, we have found it to our advantage to assign them to work with new programmers. Whereas a sighted person would tend to solve the problem by showing the new programmer what action must be taken, a blind instructor would force the individual to communicate the problem and then, after consultation, he must do the actual problem solving himself.

In closing, I believe the one thing that must be done in the future is to expose more companies to the talents these individuals have to offer through seminars similar to this one.

Thank you.

Mr. Collard

Our next speaker has graciously responded to my plea to pinch-hit for us on this spot in the program. He was not forewarned because I asked him to help only an hour ago. I am pleased to introduce Mr. Norris B. Gordon of Peterson, Howell & Heather, Inc., Baltimore, Maryland. Mr. Gordon.

MY THOUGHTS ON A FEW PROBLEMS AND A FEW NON-PROBLEMS

Mr. Norris B. Gordon

Peterson, Howell & Heather, Inc.
Baltimore, Maryland

Mr. Gordon

Thank you. This has got to be off the cuff. I was requested a few months ago by the gentlemen in charge of our information services to write a paper dealing with this hiring with the help of some of the people in the company. It was to include what we can expect, what we should expect, but I didn't bring the paper with me. I didn't know I was going to be in this position. So I would like to add a few things from my own experience to what the gentlemen have already said. We have a 1200 and when I left the other day they were installing a 1250 three-disk job, with 131 K. We use the 1200 to produce braille lists. It works very well. It does take a little bit longer. We think it is necessary that the programmer have this list.

We don't know if this high speed printer will work or work as well. We will have to try when we get back next week. We are phasing out of EASYCODER and going into COBOL, and in doing this most of our output is in an image type on tape. So we can do a few programs that Mr. Grubb has written for himself and produce anything that we have in braille listing. Again a little extra time is needed, but at times we must make that time available.

Now, I have heard discussed here about giving work to the blind programmer. Well, we require that for each program written a new program and a program description must be generated first. I think this is pretty standard.

We do have a typewriter that prints in braille. We do have two secretaries who can use this typewriter, and when a program description is given to them, they are told to make a regular copy and also make a copy in braille if this program is to go to Mr. Grubb. It doesn't take that much longer. They do it and we get it back in a matter of hours.

He then has the same tool to work with plus tape layouts that we put in braille, card layouts, anything that he would need as a regular programmer. Maybe this is a little tough, but because of this I expect the same results and so far I have not been disappointed.

Maintenance is a problem. In our business we do a lot of maintenance to existing programs. We deal with the motor companies, we deal with investors and their requests, and the clients' requests sometimes automatically mean changes.

To perform maintenance properly on any program you have got to have a list and it has got to be up-to-date, and it is understandable we cannot keep all these programs in an up-to-date braille list. So if it is his program to change, he will need a pair of eyes to help him if it has to be done in a hurry. If we have time on it we will get him a braille list and he takes care of it all by himself.

There are times when we need special programs. We have a few little things that we can do especially quickly. Again he gets part of it, the other programmers get their share. If it requires that we have to braille something, then again we have to by-pass him if it is in a hurry. Sometimes, there is a time element involved.

The few blind programmers, and I have worked with only three or four, have been exceptional people -- above average -- and they have proven that they can be very highly skilled and very competitive in this field.

We have a format that we use to go to keypunch where they can keypunch any new program. This has worked successfully. If it is a few cards, we expect him to do his own punching.

Mr. Gordon (Cont.)

There is one big hang-up that I have run into and I guess a lot of you have run into it, and that is promotions. You talk top management into hiring some of you, but we have a terrible time sometimes, getting these promotions through although you should get them.

I don't have the answer. I wish I did. Mr. Grubb came on board as a trainee, he is now a junior programmer. It took a little while to get him this far because of management, not because of his capability, but because of upper management. He has proven himself, and I think they are finally realizing this.

How far can you go? I don't know. I don't think we can answer that question. That depends on you, it depends on the company, it depends on who you work for and their ideas and their opinions. I think it also depends on the type of work that your company is doing and how your shop is set up.

We are set up as a team consisting of analysts, project analysts, and programmers with a supervisor. We have two such teams. I see no reason, in our situation, why somebody couldn't work up at least through the analyst level, probably into the supervision level.

Recently, we moved our programming staff from one area to another. We had taken over the whole floor of the building, the information services section, and it didn't cause any problem. We made a tour of the building, showed him where his desk was, a new area, and he is on his own.

One question asked me was how many blind programmers could we handle, or can any shop handle. I don't know. I can't answer that. I think that one out of three or four is a feasible answer, but I can't prove this.

In our shop at this time, I think Mr. Grubb is doing a tremendous job. I expect him to continue doing the job, but until we get settled with the new disk environment and things like that, I don't think we can consider hiring another.

I am hoping that in the near future we might be able to do this. We have what we need. The first one is on board. There should be no extra expense for the second one. I have to sell this, and it is a little tough. Thank you.

Mr. Collard

Thank you very much, Mr. Gordon.

When I started this session I said that I was interested in the placement aspects. From the assistance that the employer and we professionals in this field can give to the rehabilitation people, so with this in mind I invited our next speaker to join this panel, although not technically an employer, he is an expert in the placement field.

He is certainly a pioneer in the program of training the blind to compete effectively in the data processing world. In fact, his interests are so broad that he is the author of several books on the professional activities of the blind, one of which I own. He is probably well known to most of you.

I would like to present to you, Dr. Norman Yoder from the Cleveland Society for the Blind.

COST, COMPUTATION AND CONSCIENCE

Norman M. Yoder, Ph.D., Director

Program and Staff Development
Cleveland Society for the Blind
Cleveland, Ohio

Dr. Yoder

The State Agency Problem

We have been asked to address ourselves to the problem of expenditure on behalf of a blind person who seeks to become trained in this or any other field of technical or professional competency. It seems to us that the state rehabilitation, rehabilitation agencies for the blind must meet head-on two inter-related problems. First is the problem of agency perspective, and second, one of attitudinal posture. These two propositions have a direct bearing on the matter of expenditures for training, or in the vernacular of the rehabilitation agency and its counselling staff, the "cost of the rehabilitation."

Let us therefore examine each of these problems in proper focus and then turn to the very basic questions and issues involved in preparing a blind person for the field of computer programming. We have heard much in respect to problems of job placement for blind people in a highly automated society. The rehabilitation agencies for the blind, in general, have been pleased with themselves because somehow they have been successful in playing the federal numbers game in the production of rehabilitation. Realistically, most state agencies are operating under unimaginative, uninterested leadership. Counsellors are saddled with the burdens of case loads, pseudo-supervisory and managerial responsibilities, frequently unnecessary and/or duplicated reporting, and on occasion, the pursuit of other interests.

Let us make it clear this is not a condemnation. It is a simple statement of fact. In most of the employment efforts on behalf of blind people, our state agencies have continued to follow the demand of the labor market rather than knowing its requirements for the future and preparing its clientele accordingly. Too frequent we have taken pride in yesterday, popped our proverbial buttons on the success of today, and we have completely ignored the potential of tomorrow. In the ever-increasing competitive labor market of the future, neither the public nor the private agency can continue to afford this luxury approach to the solution of employment problems of the blind. Thus our perspective has tended to be retrospective at best, which brings us to the second point -- the attitudinal posture of the rehabilitation agency.

As you know, many of the state agencies for the blind have been buried in departments of public welfare with all that that word connotes. As a result of this departmental apron string, we have exhibited the complete "welfare attitude", going around with hat in hand, begging for the crumbs, and for some undetermined reason, fearful that the application of sound business principles in such a program will secure nothing for us but the proverbial evening ride out of town on a rail. The most charitable act in the entire welfare scheme that we can perform is to apply some business principles.

To you who are engaged in applying computer sciences to business, how long could your respective companies survive if they failed to know customer requirements and market demands of the future? How long could they survive if they failed to invest in research, laboratory testing, and new product development? How long could they survive if their product is not quality merchandise exceeding that of their competitor, properly and attractively packaged? Certainly you would agree that the life span of any company who fails in any or all of the above is not long for the business world, and to add some frosting to the cake, they must also be willing to spend some money in good advertising. Can any organization, literally dealing with the lives and the future of hundreds of people in any state, afford to do less? We believe that unless the rehabilitation agencies come to grips with both their perspective and

their attitudinal postures, so traditional in character, they are not long for the world of competitive employment for the blind.

We suspect we hear some murmurings from our friends in this conference who come from or who represent state agencies for the blind. We think we hear, "The taxpayer won't stand for it." To this we respond, "What taxpayer?" A taxpayer is no more or no less than in investor in governmental stock and in governmental business. Incidentally, you and I fall into that category. Why should we expect any less from governmental agencies than we do from those businesses in which we may have our funds invested? No taxpayer in his right mind will object to research if we learn by it and apply it. No taxpayer in his right mind will object to advertising (public relations) if it means we convert blind people into fellow investors in government by the taxes they pay from their earned income. No taxpayer in his right mind will object to the costs of producing the best possible product to meet customer demand. But he has every right to object if his investment in taxes is going down the same old drain, being washed away in the oblivion of antiquated perspective, and sifted through the rigidity of attitudinal postures of fear and indifference.

The Cost and Computation

By no stretch of the imagination are we suggesting that public agencies serving the blind are indifferent to costs. They cannot afford that luxury anymore than can competitive business. We must recognize that in the training of blind individuals a major input source has been eliminated, thus training may be more individualized with alternate methods introduced to secure the kind of results acceptable to the consumer; namely, the data processing departments of research institutions, businesses, and government. Realistically, because our product requires some additional processing to be an acceptable unit on the market, we must be prepared to meet the cost, and in so doing, compute it against the anticipated end results.

In providing computer programming training, we are purchasing three major components for the blind person: 1. An education which must be sound in every detail, complete in its broadest scope, and continuously adaptable to the demands of the computer field. We have a responsibility in the purchase of this education for the blind person to determine that every school which offers training meets these criteria. Self-satisfaction with things as they are is not a hallmark of continued success. The educational facility has the responsibility of determining that the blind student has acquired the necessary technical knowledge, can apply it, and can meet the acceptable standards of employment. Training blind people is not a financial bonanza for a training facility, but by the same token the agencies must be prepared to meet the going rate for services rendered. 2. For those blind individuals who are capable of accepting the training, completing the course, we are buying economic stability. Each of you attending this conference are only too well aware of the need for competent programmers on a day-to-day basis, and if we are to believe the literature, this vacuum of trained personnel will not be obliterated in the foreseeable future. 3. In our training investment we are buying a stake in the future. As our clients grow with the industry they keep us alert, and at least in this one field, they have demonstrated the thesis that if we know what is required in advance and if we are prepared to meet the demand of the labor market, we can secure unlimited placements. In my years of experience I know of no field which, from a training point of view, has shown itself to be so adaptable and so available to the blind.

However, if we are to practice good business procedures, there are two things we are not purchasing, both of which must be righted by the training facility if this program is to move ahead. Placing a blind person means selling his services as a unit of labor to an employer. In the technical and in the professional fields the rehabilitation counsellor can open the door with the employer, providing he has the technical know-how in the field to talk intelligently. Most of us are, have been, and continue to be completely ignorant in respect to computer science parlance as well as in the technical workings of the industry. The state agencies have done a pretty miserable job in assisting the counsellor to become adequately prepared so that he can open the doors for the technically trained client. Most of the schools have been indifferent to this need and believe that because they hand a client the certificate of graduation, doors in the industry will automatically open. This is nonsense.

Dr. Yoder (Cont.)

I submit to each of you who represent employers, you had to be sold, and sold on cold, hard facts; namely, that a blind person could do a job for you just as well as his sighted competitor.

To the blind programmers in attendance, you in a sense are pioneers. You either open the door on your own, or have sufficient personal skills if the door is open for you, to succeed in convincing the employer. Today our training facilities must incorporate in their curriculum, courses in the art of interviewing together with the art of presenting and selling oneself. These are necessary not only for the blind but for the sighted student as well. Yes, they must get to the very basics of how to write and how to speak effectively. The rehabilitation counsellor with minimal knowledge can more than likely open the door, but the adequately trained blind person must walk through that door and complete the sale based on his demonstrable knowledge and his personal adequacies.

Conscience

Those of us who are responsible for public and private funds are constantly engaged in cost and in computation. On occasion, we completely forget that we have a conscience. Yes, our conscience hurts when we come to the realization that we have invested funds and that we have received inadequate returns. Our conscience should not hurt when we think in terms of the future possibilities in this field for the blind, provided we are flexible in our thinking and amenable to changing our attitudes and overviews in respect to training and training needs.

We are told that free advice is frequently worth no more than just that, but for those who are fearful of the occasional outcry in respect to expenditures and the results gained from such expenditures, there is one question which you can raise, "What price tag do you put on a human life and its future?" Let them compute the cost in their conscience.

Mr. Gilbert

Let me take this time to offer before the start of the next session, an opportunity for Mr. Robert LaGrone to describe a computer programmer organization.

Mr. LaGrone

In his address before the conference, Dr. Ted Sterling referred to a proposed organization which he invited participants to possibly form. It is my pleasure to tell you that there is in existence now an organization, and it need not be formed because it was incorporated October 1 of this year. Its name is "The Visually Impaired Data Processors International". It was conceived at a meeting of blind programmers and their associates in Charlotte, North Carolina. At that meeting, it became more and more apparent that such an organization was needed and that it could do many things, accomplish many goals which need to be conceived and worked on.

A committee of three was appointed to form the organization, to write the constitution and get it incorporated, and get things on the road. The members of the committee were Mr. Ray Jones of Oklahoma City, Mike Mady of Amarillo, Texas, and your chairman, Robert LaGrone of Gaithersburg, Maryland. The constitution has been written, or I should say, a rough draft of the constitution has been written. The organization, as I said before, is being incorporated and a meeting will be held later to promote interest in the organization and to seek members. As a matter of fact, we already have our first member. He is, in fact, an associate member, and his name is Dave Mick, whom I think you have already heard speak, so I would say to all of you that let his example stimulate the rest of you. Mike Mady will be at the registration desk and he will be soliciting dues. The dues are \$10, and as I said, we will be meeting tonight. I asked John Seeley to read for you the constitution.* It's not long, but it sets forth the aims, goals, and purposes. You may not all agree with it, but like any other constitution and by-laws, it will surely be a measure.

*Editor's Note: The VIDPI Constitution and Bylaws are contained in Appendix II.

BLIND PROGRAMMER NEED TO KNOW ABOUT HIS NEW JOB AND EMPLOYER?

Mr. Gilbert

The topic of your next panel will be, "What does the blind programmer need to know about his new job and employer?"

It is my pleasure to introduce the Chairman of the Panel, Dr. Charles Hallenbeck, who is a psychologist. He received his doctorate from Western Reserve and worked in rehabilitation at Highland View Hospital and had a two-year fellowship with Washington University.

He is currently teaching at the University of Kansas, and I notice that he is not a stranger to most of you. So, I will present Dr. Charles Hallenbeck.

Dr. Hallenbeck

We are beginning this afternoon a pair of panels which will be devoted to problems arising "on the job". Bod Gildea and I have had some discussions as to how to divide this piece of pie, and I am not sure we have arrived at a definitive distinction that we can make between the early part of the afternoon panel and the part coming on later, but what I think we would like to achieve is to shift the orientation now from selection, training, and placement problems to those which arise on the job in one form or another.

We have a set of papers or brief presentations which will be delivered to you, but what we would like to do is have the papers form a rather small part of each of the panels so that we can get to the comments and interactions which I know we are all anxious to reach.

I would like to make a few comments myself, and then introduce the other members of this group.

My only experience in computer science, and data processing, has been fairly recent. In my career I have not been employed as a computer programmer, but I have had much of the same kind of training and experience that many programmers have had through the good fortune of the post-doctoral fellowship which I recently completed. I have returned to my own basic field which is rehabilitation psychology in the form of a teaching and research position at the University of Kansas.

What I would like to do now is find a way to maintain communication and contact between the schools which provide technical training for programmers, and rehabilitation personnel.

I have been concerned for some time that there is often a great gulf between the technical people and the rehabilitation people which is a problem for both sides. I have some of both skills in my background. We have heard a lot about communication problems. What I would like to move toward during the course of our discussions is the recognition that communication is not primarily between machines and men, but between people, and I think that we will have to come to grips with some communication problems that can't be solved by devices. Devices are important and the ability of the blind programmer to interact with machines also is important, but the communication problem exists primarily between people some of whom are blind and some of whom are sighted, some of whom are employers and others employees. I think to broaden the context of communication by recognizing this fact will take us a long way toward providing a framework for further discussions.

There are a number of myths in the area of blind programming which have arisen from time to time and which are still pursued in some quarters. One is that the blind person is a better programmer than his sighted colleague. I know of no evidence for that and I don't think it's a defensible position. I think there is very little advantage in being blind. It doesn't help you in recognizing voices, although you need to do it more. You don't have a better ability to do that simply because you are not able to recognize faces.

As we have heard discussed in earlier panels, I think it's clear that many training programs provide training which is clearly competitive with that provided for normal sighted persons, so if a blind programmer is a whiz at programming and performs in a superior fashion on the job, I think the credit belongs to the care and attention provided during his training. Imagine what he would do if he were sighted and had the same training.

There are very few advantages in blindness. The thing that is of interest in the area of computer programming is that many of the techniques which blind programmers have used to minimize the handicapping aspects of their disability illustrate many of the principles in data processing. The computer, in other words, comes more than half way toward meeting the special problems of the blind person. That is not true in all respects because the blind programmer on the job has many of the same problems and many of the same potentials, I guess the same problems and the same opportunities, as his sighted colleagues. These things are as common for the blind programmer on the job as they are for the blind person with other kinds of training. I think that our attention really ought to turn to some of the broader problems.

I have heard two philosophies expressed from time to time over the past few years, and in recent days. One of them is that with the proper devices and with the proper training a blind programmer can perform every aspect of his work completely independently of help from other people around him. I doubt that this is true. I doubt that it is true of the blind person any more than it is for a sighted programmer. People need to interact, and many things take place between people that are mutually helpful. In the case of the blind programmer, some of these have to do with the fact of his blindness, but others have to do with a more general kind of thing. Two heads are better than one, and so the kinds of relationships which arise between workers have to be considered. I think that is a very important point, and the total independence of the blind programmer has been over-sold in some ways.

The other philosophy related to this is that in order for the blind programmer to perform his tasks, he needs special assistance from sighted people around him. He ought to be clear about the requirement as he approaches the employment situation. I suppose there is an advantage in pursuing this point of view. What it says at the outset is, "Here I am. I have certain skills, and there are certain advantages to you in hiring me. I am blind, and because of that there may be things which you ought to know at the outset. Namely, reading is a problem for me and it's often helpful to have another person lend me a pair of eyes".

This is an advantage because in many ways it puts the cards on the table, but it also has a disadvantage which should be clear. That may be precisely the fear that the employer has in mind, and may cause a termination of the negotiations for employment.

I don't know what the answer is to these two philosophies. I think each has its drawbacks, and I think these are the areas which we could profitably discuss. I think the point I would like to make is that the blind programmer who is properly trained can perform an important function. It may not be that he can perform independently, but there are very few functions that people in general can do independently. There is no doubt we have demonstrated a clear fact that the field is open. There are contributions to be made. There are still problems, but there are people still working at them, and I think there is much more progress to be shown as we proceed.

I would first like to introduce David Schwartzkopf to you. David is a graduate of MEDCOMP Training Program. My notes are rather skimpy on the speakers and if I have made errors, I would like to apologize for them.

David is employed by IBM, Rochester, Minnesota, and brings to us an interesting aspect of the area which has not been commented on before by other speakers, to my recollection, and it underscores the fact that blind people are not all alike. David's topic will deal with the special problems which exist in partially sighted blind programmers for whom techniques that have received most attention may not be especially useful.

Mr. Schwartzkopf

There is no advantage to being legally blind or blind despite the fact that most of the people one works with never let one forget the fact that one gets an extra \$600 tax exemption which is an advantage.

Paper 5-1

PROBLEMS OF THE PARTIALLY SIGHTED IN COMPUTER PROGRAMMING

David A. Schwartzkopf, Associate Programmer

System/3 Card Programming Development
IBM Systems Development Division
Rochester, Minnesota

Mr. Schwartzkopf

A partially-sighted programmer encounters problems in every phase of programming. In most cases, however, these problems can be overcome.

The large amount of reading required, both in training and on the job, is the most difficult problem. Generally this problem is solved by using tape recordings, magnification aids, and photo enlargements. Reference materials, such as manuals, can be read visually with magnification aids. Material with print too small to read, such as the IBM "green" card, can be read after it is photo enlarged.

If it is impossible to use the standard flow charting template and forms, larger ones can be used for rough drafts. A flow charting program can then be used to produce final copy flow charts. When writing programs, oversize coding sheets can be used. Program listings and dumps can be read with magnification aids.

A partially-sighted programmer should be familiar with both blind and sighted programming techniques and develop his own techniques from these.

Partially-sighted people encounter problems with every phase of programming. Probably the most serious problem is the large amount of reading that is required. This problem can partly be solved by using a tape recorder, magnification aids, and photo enlargement. In the training environment, tape recordings are the best tool for obtaining information needed for the basic ground work for programming. I attended both a course for the blind and a sighted programming course. A partially sighted person trained in a blind environment can keep well ahead of the other students who were blind. However, in the sighted training programs, a partially sighted person relying on magnification aids cannot possibly handle all the reading that is required. As a result, I attended lectures and relied heavily on my memory as the prime source of information. Also, attending the blind training program first was a great help because a trainee is not going into the sighted program cold -- he has a basic understanding of computers and programming.

On the job, tape recordings lose their importance. It is very hard to use a tape recording for reference. Magnification aids (strong magnifying lenses) are a better tool on the job. References can be made with magnification aids. Also, if there is material that is too small for a person to read even with magnification, the material can be photo-enlarged to make it possible to be read. This should be done with material that is used quite frequently.

Flow charting presents another problem to the blind or partially sighted person. Because the flow chart templates are too small to see and follow, hardboard forms -- in the shapes of programming symbols -- can be made, but about four times larger than the standard template size. These templates, when used on large grid-lined easel pads, provide a satisfactory solution to flow chart preparation. After the rough easel-size flow charts are complete, they are coded to be run on a flow charting program to obtain final-copy flow charts. I am not able to use standard coding sheets. While attending the programming course for the blind,

Mr. Schwartzkopf (Cont.)

I wrote a program to produce larger ones. Because the coding sheets are oversize, keypunch operators find them easier to use than the standard forms.

Magnification aids are used for reading computer program listings and dumps.

A partially-sighted programmer must be familiar with both the blind programming techniques and the sighted programming techniques, and from knowing both well, he can establish techniques of his own.

A partially-sighted programmer should be trained first in programming techniques for the blind (except for braille) and, if possible, be trained in a sighted programming course. He is kind of like a guy walking up a creek with a foot on each bank. If he is not sure of his footing on either bank, he may find himself in the creek.

Dr. Hallenbeck

David reminded me of a feeling I have from time to time. Someone describing himself as being legally blind has always made me feel a bit guilty as though perhaps I am not entirely legal. I describe myself as being really blind rather than legally blind.

Our next speaker, Bob LaGrone, is with IBM. Bob is going to talk to us about some of the things with which he has had contact over the last several years in the field, and I think we look forward to hearing his remarks; but first, I want to express my warm endorsement of the VIDPI organization. The acronym is terrible, but I think it is a very fine name for your organization.

Mr. LaGrone

I just can't resist responding to Chuck's last comment about VIDPI. We had to compromise between the nice acronym and a very long terrible sounding name or a terrible acronym and a fairly decent name. I have to attribute it to John Seeley, in an hour of solitary contemplation in a quiet place on some Sunday afternoon he came up with the acronym of DATAVIP, Data Assemblers Association of the Visually Impaired Programmers. We did come up with the Visually Impaired Data Processors International, which I think is a good sounding name.

Paper 5-2

METHODS, PROBLEMS, AND APPLICATIONS OF ON-LINE BRAILLE PRODUCTION

Mr. Robert R. LaGrone

IBM Corporation, Gaithersburg, Maryland

Mr. LaGrone

The subject I am going to talk about this afternoon is something which I am sure most of you are familiar with. There seems to be quite a bit of controversy about it, and I want to try to set the record straight and briefly describe the methods, problems, and applications of on-line braille production. I wanted to define on-line braille production either rightly or wrongly as braille which is embossed directly onto a printer, the braille having been translated by a program stored in a computer's memory. The computer reads the input. It may be punched cards, paper tape, whatever we choose. This program can be a simple card braille to printer, or it can be a system of programs like the grade 2 translators that are around.

I would like to talk in terms of two types of printers. The printer, which is easily adaptable and which the blind programmer uses, and the other printer, which IBM has marketed

and which is used mostly for text processing purposes. When somebody asks me, "Can we have one of these printers for a blind programmer?", it's not economical. If you want it, there is nothing to stop you from getting it. It's really not for the blind programmer with the table look up type routine. You can use any possible combination of dots, and you can center the tape in it or divide it up any way you want to. We can increase the complexity of the program. We can put in formatting. We can take the input from the tape and we can format the tape records. For example, the IBM System 360 braille utility program actually takes a print tape which is created from a system which is called Text 360 which IBM uses to create their computer publications. The Text 360 system puts it out and a print tape is inputted to the braille program and then we can throw out the garbage that we don't want such as some of the editing characters, some of the blank records, and we make ourselves a manual.

We had the other routines which create the three by three matrix braille. Dr. Hallenbeck never said anything about it, but he has written the so-called PL-1 brailier which creates either the standard six dot braille or a braille which he calls box braille, which is for a three by three matrix braille that he uses, and for all the other 256 combinations which are necessary to interpret the code used in the hexadecimal or other type systems.

I'd like to talk about some of the problems of producing this type of braille. The George Washington brailier, to my knowledge, was the first one that was ever written, and was written in 1963 at MEDCOMP for Mike Lichstein. The brailier uses as its dot, the minus sign. The minus sign, however, was a little hard to read. It was somewhat elongated in nature, and even though we had eight lines per inch, it didn't seem to produce braille at a fast rate. Then we went to the period. The period was a nice dot. It was high, however, it was sharp, and the listings didn't seem to be quite so durable. It was still fast, however.

Then in 1964-65, we came up with another dot. We came up with the asterisk. The asterisk is a star and the middle of the star will become a dot, if it's embossed enough. The asterisk braille was much better. It was just about as fast. I have some of the listings of the period type braille, and the asterisk type braille which I have saved from the MEDCOMP days, and the asterisk is holding up much better. However, I tried to use the asterisk on the 1100 line printer, and it didn't seem to produce as well as the period.

Another dot which we can use is the apostrophe. The apostrophe makes an excellent dot. The disadvantage of the apostrophe is that on chains or trains in the impact type printer, the apostrophe is sparse when compared to the period. So you have to come up with the compromise between what is fast and what is high and what is fairly durable. For the IBM System 360 braille utility programs, at least, we are using the period. I created some manuals when I was on contract to NIH in 1965, and they are still quite readable.

That leads me to the next problem in creating braille listings for the programmer; the storing of the listings. I find personally that the storing of the listings can be done in two ways. One is a binder for burst listings where you take the listings down to the machine and have them torn apart, and then you store them. By putting the holes in the listings on the left side and putting another vinyl piece on the paper and storing them that way, if the listing is pretty big or a manual that is bulky, you can pick it up and find that the entire listing gives way on the left and goes all over the floor, and the pages aren't numbered, except every fourth page, so that can be a problem. The best type of storage seems to be the binder for non-burst listings. This binder is available in various places. We get ours from a place in Chicago, and from Jenny Beck at Volunteer Services for the Blind. She can supply most of you with the information or I can also supply you with this information.

Now for the applications. As has been stated so many times at this conference, the programmer needs a method of getting his listing so that he can be independent of everyone else. There are two ways to do it. You can read a tape which is already made up from the previous compilation or assembly, or in some cases (I understand that this is true at Kroger's and also at Group Hospitalization Insurance in Washington, D.C.) they have taken a braille routine and have incorporated it into the operating system. Instead of writing a line you say "braille" a line, and you get braille.

Mr. LaGrone (Cont.)

The other application is the production of manuals. In cooperation with Volunteer Services for the Blind, The Insurance Company of North America, Mrs. Beck and Harry Bassler of the Colonial Penn. Insurance Company in Philadelphia, we have undertaken the production of manuals for customers. There will be a report in the Newsletter for exactly the procedure you should go through should you be interested in getting the manuals. I understand that the Insurance Company of North America for the Volunteer Services for the Blind have produced about 15 copies of the manuals, and this includes about seven or eight titles of IBM publications. They are willing to do it for you, but you have to supply to them a blank tape so we can send off and get the Text 360 print tape to get your manual.

I have been working with this for about five years. I am available at anytime during the conference if there happen to be any questions. I thank you for your attention.

Dr. Hallenbeck

The availability of the materials and techniques that Bob has been speaking about is the kind of topic which can be reported on and described again and again. It's always important to keep the information current.

Our final speaker comes to us from the United Kingdom, and I am especially pleased to welcome Geoffrey Bull to this conference. Geoffrey works for Shell-Mex and BP, Limited, and is in a position which until recently has not been very common in the field of blind programmers. He has a position which brings him in contact with other programmers in a supervisory capacity, and he will talk to you about the unique situation of the blind programmers who supervise other persons in a programming environment.

Mr. Bull

Thank you Dr. Hallenbeck. I am pleased to have the opportunity to speak to you. Chuck said, "You can go last", and now I know why. It's three-quarters of an hour after lunch, and everyone goes to sleep. If this is the case, I trust you will not be too easily disturbed, and the rest of you who are interested, please sit up straight because we are short of time and I will have to move along, I am afraid.

I am going to speak on the problems of the totally blind person supervising sighted staff.

Paper 5-3

THE PROBLEMS CONFRONTING A TOTALLY BLIND PERSON ACTING AS SENIOR
PROGRAMMER IN CHARGE OF SIGHTED STAFF

Mr. Geoffrey Bull

Shell-Mex & BP, Ltd., London, England

Mr. Bull

Introduction

Programming for the blind has been established in England for just over three years, and for a slightly longer period in the United States. (My knowledge of other countries at the time of writing is limited, and points perhaps to one of the great needs for calling this international conference.)

In the United Kingdom, during the past three and a half years, more than fifty visually handicapped persons have received training in computer programming: a large percentage of

these have been totally blind. One only such totally blind person has received promotion to senior programmer, with the duties of supervising a team of programmers and organizing the running of trials and operational work.

This insignificant percentage receiving promotion, is way out of line with any comparison made with our sighted counterparts. (I shall be surprised, but may I add very pleased, to find this percentage in the United States or elsewhere more encouraging). This trend cannot continue, if computer programming is to remain an attractive employment prospect for the blind.

My paper today therefore, must have three main objectives:-

- (i) To bring the problem into the limelight, and face up to the fact that there is indeed a problem in having our ability recognized and rewarded.
- (ii) To attract the attention of prospective employers, and employers already employing blind staff, and indicate to them that a blind person can in fact handle a supervisory post.
- (iii) To make the blind in computer programming aware that the barrier has been broken, that the door to promotion is not closed, and possibly to give him or her a few useful tips should the opportunity of promotion arise.

Background

Many of us work in widely varying environments: whether it be commercial, scientific, a small or large programming department. Many of the problems are common to us all, thus in order to put my comments and experience into perspective, allow me to delay for one moment to give you some knowledge of the environment in which I work, and experience to date.

Working for a large commercial organization, Shell-Mex and B.P., Ltd., my programming experience to date has been purely commercial. The large programming section of approximately one hundred, is broken down into teams usually of from four to six programmers, often each team having a sub senior programmer to assist the senior in his duties. On occasion, as in my case, a senior will have charge of two programming teams working on two completely separate projects hence more the need for a sub senior.

Specifications are compiled by the systems analysts, working in close consultation with the senior programmer, and passed on completion to the programmer allocated, by the latter, to program the job. Systems analysts and programmers are responsible to a project leader. In this setting, the main duties of the senior programmer are to supervise and organize the work of his team, and to co-ordinate closely with the analysts and project leader.

I was appointed in June 1968, to supervise the maintenance of a suite of programs dealing with personnel records, (a suite I knew intimately, having been involved in its inauguration twelve months earlier). In addition, I was to assist in establishing the firm's payroll on the computer - a suite of which I had no previous knowledge. Entering the latter in the midst of it becoming operational was no easy undertaking: the Company here showed great confidence in what others may have considered a risk.

Two months prior to this conference, the payroll suite commenced transfer to a third generation machine, involving a new language and different hardware configuration. The documentation of the payroll suite, (due to factors unnecessary to discuss here), was at variance in parts with the operational programs. This has resulted in some extra time during the last two months being spent in assisting the analysts to specify the new suite based upon existing programs. This slight loss of contact with my staff will have particular bearing on observations I am about to make.

This background is given to show that I have so far had experience with the maintenance of two suites, and am fast learning how to cope with launching a project from the outset.

First Steps

There is no question in my mind, the blind person must put extra effort into the first three months of his new post as a senior programmer, probably involving initially many hours of overtime. You will see throughout this paper, that success depends upon the blind person gaining rapport and communication throughout his team and other work associates. He must ensure that as early as possible, his contribution is both worthwhile and sought after. The more people consult him for advice and confirmation, the more he will learn about the minute day to day running of the work.

In the first three months of my appointment, I made stringent efforts to gain all-round knowledge of the payroll project; obtained braille printouts of the major programs in the suite; and made sure that I was familiar with what each and every programmer in the team was involved in. This is work that any programmer sighted or blind, must do when promoted, but it is essential that a blind person gets a 'flying start', so that he more rapidly becomes part of the hub of the wheel, from where it is easier to gain an overall perspective and control.

To gain access to printed documentation, the married ones amongst us will probably call, if possible, upon the services of a sighted wife, but we bachelors have our means, as we all know, of gaining the invaluable assistance of girlfriends, work associates and other colleagues.

Programmers' Problems

This is where a sound knowledge of the programming language and a rapid grasp of the suite is invaluable. Inevitably, the cause of a member of staff's programming problem is the result of one, or more, of three shortcomings: misuse of the programming language, misinterpretation of the specification or lack of overall knowledge by the individual, as to how his particular job affects and is affected by other programs in the suite. This type of error is soon amended or clarified by a competent leader after brief verbal discussion.

A problem from a programmer has to be explained in detail to a blind supervisor, and herein lie many advantages: In order for an individual to explain a problem adequately, he must thoroughly understand the problem. More times than I can remember, I have sat down with a programmer to assist with a query, and while he explains the problem one step at a time, some idiosyncrasy strikes him, leading him to his own solution. Very rarely does it take the two of us in consultation, more than ten or fifteen minutes to reach a satisfactory solution - either, we hope, through the supervisor's better all-round knowledge, or a careful explanation leading the programmer to his own solution. Once a programmer discovers that consultation with his senior is beneficial, confidence and consequent collaboration increase to everyone's mutual advantage.

This close verbal collaboration also produces the additional benefit of surreptitiously giving one an overall knowledge of that person's ability. The way in which the problem is explained gives a good indication of the programmer's knowledge of language and job in hand and points out any deficiencies. A steady feed-back through this communication with each individual programmer, acts as an excellent barometer of progress.

If a member of staff is having undue difficulties, a braille print-out of his work is best obtained, and more detailed and lengthy assistance given.

Control of Program Compilations and Trials

Some employers may query how a blind supervisor maintains adequate control over the flow of work to and from the computer room. This, in my experience, is routinely and simply done.

The submission of work in Shell-Mex and B.P. is only permitted when accompanied by a form signed by the supervising programmer - an automatic work-flow indicator to me. I also

Mr. Bull (Cont.)

make a point each morning of checking what work has been returned together with results - successful, ended in error, etc. Any such control must be maintained whether the person concerned is sighted or blind.

Programmers are encouraged to check one another's work; and at the time of submitting work to the computer room, I put in a few memory jogs on points that a particular programmer is apt to overlook. A quick word on what his trial aims to achieve, or the purpose of the program amendment, both provide a quick, but accurate check on job progress to date.

What has been said about programmers' problems, and the control of work-flow has been fully brought home to me recently. As I explained, so much of my time during the past two or three months has been taken up with systems work, at a crucial transitional time, that I have not been in such a good position to assist with programmers' problems, not so involved with their successes and failures, and for the first time I have lost the minute day to day feed-back which is so essential. I hasten to add that this has not been a problem of blindness, merely one of prevailing circumstances, but it does emphasize how much a blind person depends upon this day to day communication with the members of his team.

Control of Operational Work

This area to my mind is the non-sighted person's forte, or certainly could be. Re-runs of operational work are expensive luxuries; no installation will ever exist without the necessity for such 'red-faced' occurrences, but how often they are due to small careless slips; failure to inform the computer operators of some vital change; a program amendment not properly checked with a trial; small details in themselves, but costly and devastating if overlooked. We by the nature of our disability must attend to small detail.

I feel confident, that the amount of machine time lost on my two projects during the past year, is below average. I say this, not as a self-appraisal, but as a comment worthy of note by prospective employers - this could be a surprise bonus when considering promotion of blind staff.

Communication with the System Analyst

When discussing communication with the programmer, I mentioned some of the advantages which occurred from close verbal interchange - how true this is when working with the systems analyst.

I, and others similarly disabled, cannot afford to pass the specification to a programmer without first thoroughly absorbing its contents: (a) because it would be too difficult to catch up with problems arising in late stages of development, and (b) it would quickly reflect an inadequacy to handle the job. The only practical solution is to gain the full co-operation of the analyst, and go over the specification in detail with him immediately.

This has the advantage of the senior programmer knowing exactly what the analyst requires, and immediate discussion can take place on points arising. No time is lost with the spec. lying on the desk awaiting attention, and later awaiting on the analyst's desk for possible amendment. Once the analyst finds that he can clear up points of discussion immediately, and get the job 'off his plate', I find him more than willing to go over any specification in detail.

Irrespective of the documentation used by an installation, no difficulty should be experienced in transcribing necessary information into braille. Decision tables have their braille equivalents, and the diagrammatic form of flow-chart most commonly used is readily transferred into braille; merely numbering the boxes or statements on a diagrammatic flow-chart leads it to immediate translation. It might be suggested that the analyst's time is not well spent going over the specification in detail with a non-sighted colleague; my experience has shown that it can in fact be a great time-saver in the long run. These concentrated verbal 'get-togethers' can so often produce necessary amendments at an early stage.

Memoranda and Other Circulars

We are all familiar with the host of memoranda which continually flood our in and out trays. A careful categorization of these diminishes the problem. They are soon classified into three groups:-

- (a) Those needing no further attention.
- (b) Those merely containing some salient point to be memorized or noted.
- (c) Those that have direct bearing upon one's project.

My method, and my advice to others here, is to exclude the first variety from one's mind completely. Quickly sort the wheat from the chaff in the second type, if the third category cannot be dealt with immediately, carefully note one corner in braille with a precis of the contents, so that a pile of papers does not cause confusion at a later date.

As the information on such circulars is normally for the attention of the whole office staff, I usually obtain the services of my sub senior or other staff member to go over the details with me, thus our mutual digestion of the contents need cause no inconvenience.

Where Can We Go From Here

Computer programming for the blind is as yet in its infancy: can anyone at this point in time, confidently predict the limits of promotion. Two roads to promotion are normally followed by programmers in my installation, and others similarly structured: progress on the managerial side, or software programming.

A senior programmer may be considered to have his foot on the bottom step of the managerial ladder; why should a blind person not indeed progress to project leader and beyond -- the restriction to my mind, is the individual's ability not his handicap! The same is also very true of software programming -- after all, this is merely an extension of the programming we have already mastered.

Conclusion

The following are the realistic words said to me at the time of my promotion: "You will have problems; we don't intend advising you how to cope with such problems, we are confident you can do that for yourself".

This very honest and pioneering attitude by my Company, I hope will not go unnoticed by others. If one blind person gains promotion as a result of an employer gaining confidence through reading this paper, then the time taken to gather my thoughts, and put them down, has been well spent.

In collecting those thoughts, it has made me fully conscious for the first time, how I function as a senior programmer. No pre-conceived, carefully laid plans have been involved; each apparent obstacle is treated on its merit as it presents it itself. It cannot be emphasized too strongly, that I am no special being with exceptional talents! Many blind individuals can handle a supervisory post within programming equally well, and many, most probably better.

May I finally say: first to the blind programmer:-

"Once you have gained the respect and co-operation of your team and other work associates, the job will become, still a challenge, but a manageable challenge, and enjoyable."

Mr. Bull (Cont.)

To the employer:-

"What do you look for when considering a programmer for promotion? A sound knowledge of both machine language and configuration, maybe, personality and poise to handle the job; probably qualities other than these besides. If a blind programmer meets these pre-requisites - are there after all insurmountable problems?"

Mr. Gilbert

As Chairman of this afternoon's panel, I would like to introduce Bob Gildea who most everyone knows. Bob is with The MITRE Corporation in Bedford, Massachusetts. He received his BS in Physics in 1945 from Boston College, and his Master of Science in Applied Mathematics in 1950 from Brown University. He worked for three years in the Sheltered Broom Shop in Massachusetts. He worked for 10 and a half years at RCA as supervisor, and later as Manager of the Engineering Programming Section. He has worked three years at The MITRE Corporation in Systems Engineering where he has the responsibility as project leader.

Mr. Gildea

I wanted to speak on one point of procedure. We have omitted questions temporarily for Dr. Hallenbeck's group. I hope we can get to them with time permitting, at the end of our session, and at that time we will entertain questions for both groups. Both groups are presently on the platform, and I was impressed by Dr. Hallenbeck's discomfort when thinking over the alternatives for himself when he hears the expression "legal blindness". When someone says he is legally blind, I think Chuck should answer, "But legitimately blind".

I would like to introduce the four speakers for this afternoon.

Our first speaker is Philip Coleman of England.

Our second speaker is Bud Kennedy.

He will be followed by George Bartram of Canada. George had one year at the Ingersole School District Vocational School in Canada, and then he went to the University of Manitoba programming school for a year and has been working for two years now.

Our last speaker is believed by many to be an ancient man of the 19th century, he is usually regarded as a contemporary of Louis Braille, Dr. Abraham Nemeth. I think he has a long beard. Louis Braille was around in 1832, and so Abe Nemeth must be pretty ancient by now. He is so well known, at least here in the United States, that we have to refer back to the early expression one of my colleagues used, the blind look so young for their age.

I would like to turn to the first afternoon speaker, Philip Coleman.

Paper 6-1

MAN-MACHINE COMMUNICATIONS FOR THE BLIND PROGRAMMER

Mr. Philip W. F. Coleman

IBM United Kingdom Laboratories, Ltd.
Hursley, Hampshire, England

Mr. Coleman

In this paper, I propose to outline a project on which I have been engaged at IBM United Kingdom Laboratories Ltd., Hursley, Hampshire, England. I shall show how it began, how it was handled, its results, and the implications to the blind programmer; I shall also give an indication of how we are thinking for the future.

During the course of this talk, slides will be shown; this is merely the usual aid for the sighted among us, and the blind will miss nothing.

History

From the early work in braille translation programs at M.I.T. and at the American Printing House for the Blind, in which IBM had a part, the difficulties of writing in assembler language for complex systems like Grade II braille became apparent, as did the problems of these programs being interpreted by other programmers and laymen.

At a conference in February last year, Bob Gildea made a reasoned plea for the use of high-level languages in these programs, but, even before this, the University of Munster in West Germany had been running a program written in the general-purpose language PL/I, producing a fortnightly newspaper for the blind.

Origin of the Hursley Project

In July last year, Bob Love, at Hursley, suggested to me the writing of a braille translation program in PL/I, making what modifications to rules and contractions seemed reasonable in the interests of space-saving, readability and ease of programming: These were the criteria suggested by Gerald Staack in a Master's Thesis on Braille Revisions at M.I.T. in 1962, which recommended a number of important changes in braille, and suggested a path for future research in this area. PL/I is a good, high-level language for the purpose, combining flexible input/output and a multitasking capability with useful text-processing and string handling facilities. With the increasing use of large machine configurations, particularly in commerce, advantage may be taken of the large memory sizes to avoid constant time-consuming subroutine calls. Many here will see the need to rationalize braille rules, this being indeed a common topic of conversation among professional blind people, and it was decided that if changes were to be made, they should be done on as rational a basis as possible, and a major part of research both before and during the project, has been devoted to ascertaining what has already been done in this field, and in furthering this research.

Program Philosophy

What is believed to be a novel approach was taken to eliminate constant character comparisons, and the technique evolved is extremely efficient. Other features include the use of interleaved multitasking for the handling of input/output, the use of a high blocking factor for output, and a generalized input file description -- the record type being defined in the job control statement, and the program thus being transparent to input record type.

Versatility

This program is extremely versatile, and can be influenced in many ways both at the commencement of execution and during it. It will optionally provide sighted printout with the braille, taking account of carriage control characters; if requested, it will eliminate multiple blank lines and multiple blank spaces between words; either computer braille or Standard English Braille symbols can be specified; it will produce braille in any of three grades -- I, II, or a technical grade II. Apart from sighted printout, any or all of these specifications can be changed during program execution by the insertion of control records, which are not reproduced with the braille output. Also, at the start of execution, a parameter can be passed specifying TEXT90 input, and another which will result in the production of a card deck for running on plate embossers. At this point too, hyphenation can be requested; in this case, any nonblank character string broken at the end of a line has a hyphen inserted at that point.

If all this sounds complex, if no parameters are passed, the program will run with a set of default specifications.

The program is open-ended in concept, the source text being easily modified for the inclusion or exclusion of contractions as desired; this is one big advantage of a high-level language.

Information Source Evaluation

In my search for information, a lack of coordination became apparent in documentation of research on behalf of and by the blind. Despite a plea, which reflected this, by Leslie Clark of the American Foundation for the Blind, there is still apparent a reticence in some quarters to divulge information on current development of braille software, and I have even had letters completely unacknowledged. This can only lead to unnecessary duplication of effort, waste of time, and ignorance of the existence of programs by those who most need them.

Implementation

This type of program gives rise to large portions of repetitive coding, and I, very early, designed a statement generator making use of the PL/I Macro language. It consisted of a macro procedure which enabled up to eight statements to be generated by specifying a procedure name followed by up to seven arguments, defining the letter configuration and its contraction, their lengths, and the rules governing the contraction's use. Not only did this increase overall speed of coding, but errors inherent in repetitive work were minimized. Taking into account the time to code and debug the statement generator, a coding rate of some 500 statements per week was achieved with little effort.

The program was aimed to run within 100K core size, and an overlay structure was used to achieve this. The effect on run time is small, a program segment being brought into storage every time a change in grade occurs, not more than once or twice per run; the space saved is a useful gain.

Braille Revision

In my examination of braille I was guided very much by Gerald Staack's own observations and findings, which were compared with word frequency analyses of three sources of material: PL/I keywords -- from work already done; the IBM Data Base with upwards of two million words; and nearly a million words of PL/I manuals. Previous reviews have usually been of the order of 100,000 words, so this was pretty exhaustive.

Applications

After all this you are doubtless asking, "What will this do for me?" Firstly, listings can be produced with great control over the braille -- e.g., grade II for source statements and diagnostics, but grade I for program output and dumps, etc.

Incidentally, how many present using card decks put them up on disk, and manipulate them using system utilities? I find this an extremely efficient method of working, dealing with small card decks, even with the largest programs.

Because of its TEXT90 handling capability, current and new manuals can be brailled down in a very short time, and at less cost than at present, provided the braille publishers have the embossers to cope. In the conference of 1968 previously mentioned, Gunther Lamprecht advocated greater cooperation between the braille publishers of the German-speaking world. In my recent dealings with the RNIB in London, a similar need for the English-speaking world has made itself felt. I would, in particular, urge that the American Printing House and the RNIB get together to common facilities, thus minimizing (one would hope eliminating) wastage of funds, duplication of publishing effort, and delay or other hindrance to the publication of braille technical material.

Whatever happens, once a programmer's establishment have obtained the print tapes, the blind programmer could get his own copies of manuals as listings in the normal way.

This program also offers the possibility of brailling down documents in grade II from ATS and similar terminal systems, thus making readily available to the blind programmer,

Mr. Coleman (Cont.)

company reports, memoranda etc. hitherto inaccessible to him. The same terminals, when inactive, could be used by sighted volunteer typists for the brailleing down of other material -- articles, books, symposia reports, and even course material and examination papers. I shall presently discuss conversational terminal programming.

I am also looking at the possibility of brailleing data base material, e.g., abstracts. This is a reminder that, if he has access to such a system, a blind programmer who can, should have a data base profile, -- a system whereby one specifies one's professional interests, and is then automatically kept informed of the latest material concerning them. I find this invaluable.

This program should be found an economic proposition, as, although it takes much core, it is fast. However, at any rate at first, Version 5 of the PL/I (F) Compiler will probably be required.

The Future

What of the future? The first task must be to rationally limit the differences between English, computer and mathematical braille symbols. One would hope this program would lead to maths and music translators written in PL/I, using single 8-bit characters for each symbol, -- the advantage of the large scope of the 8-bit system; these might be slower running than the present programs planned in this field, but easier to maintain and change, -- e.g., for the adaptation of new print editing techniques to braille publishing.

Conversational use of terminals by the blind presupposes the existence of a conversational braille-print translator: this would be easier to develop than the reverse has been, requiring less core space, and being faster in execution.

There then exists the possibility of a terminal with braille as the input medium and digitally-improved speech as the output, the programmer listening on headphones to the output, and simultaneously recording it on an ordinary tape recorder plugged into the terminal. Using pressure keys for the braille writing, the terminal would be silent in operation.

Leading on from the remarks on the use of data bases, might I make a suggestion? That it would be very useful if all blind programmers, the world over, could enjoy the benefits of a data base and profile system, getting abstracts in braille, and with access to braille or taped copies of the material held. I envisage such a system being established either by the ACM or some joint international organization, including the various computer associations and blind welfare bodies concerned with this problem and willing to participate. The benefits to the blind programmer would, in my view, be incalculable.

Without wishing to raise a hornet's nest, one thing we are looking at, in the long term, at Hursley is the feasibility and the need of nine-dot braille, and we started work on this, ignorant of the concept's history in the States. This is something the blind are going to have to come to grips with: the limited information that can be carried by a six-dot matrix, as opposed to the increasing multiplicity of print symbols.

There are some to whom this futuristic look may be terrifying, or just a joke: but it is my firm belief that, if we go out to use it, computer technology will benefit the blind far more than the sighted, and that is saying a great deal.

The BCAB

Before I finish, I have been asked to say a very brief word about the newly-formed British Computer Association of the Blind. First mooted last year, a couple of meetings then culminated in the inaugural meeting in March this year. Its object is the widest concern with the impact of computing on the blind, and has, as a prime interest, the needs of the blind programmer. It has become affiliated to the British Computer Society, and it has started a tape journal with articles from the leading data processing press, and circulates, some three to

Mr. Coleman (Cont.)

four times a year, a braille newsletter. It plans to hold symposia on subjects of special concern to the blind programmer.

With a potential membership of between sixty and eighty, it already has the full backing and cooperation of the Royal National Institute for the Blind in London, and has representatives at this conference.

Acknowledgements

I should like here to acknowledge a great debt to the many who have made my work possible. Bob Love not only stimulated this work, but has given constant help and encouragement. The Laboratory Manager at Hursley, and the Supervisor of the Creative Development Project made the funds available, and I am grateful too for their interest and patience. My Manager, R. W. J. Parsons, besides releasing me for this work, has shown real interest in it, and contributed helpful comments. To Reg Crompton at Hursley I owe much, for his making available the data base statistics, and his broad knowledge of current trends, and also, together with Sheila Greene of the RNIB and Leslie Clark of the AFB, for the wealth of information provided. And to all those many whose brains I have picked, and who have helped with the preparation of papers and reports.

Finally, but not least, I thank my wife, who has endured long absences in evenings and weekends, and who has yet not dared breathe a sigh of relief!

Thank you all for your patient attention!

Mr. Gildea

I would like to turn to our next speaker, Mr. Bud Kennedy.

Paper 6-2

SOME PRACTICAL APPROACHES FOR PREPARATION AND DEBUGGING OF PROGRAMS

Mr. William R. Kennedy

The National Forge, Irvine, Pennsylvania

Mr. Kennedy

My remarks today will be extremely basic. I am intending to aim this discussion at people who are just breaking into programming. My talk is going to be oriented toward somebody who uses braille, and also oriented toward IBM equipment, with a touch on PL/I operating under DOS.

The first necessary thing to be done by a programmer, if he is ever to get a project, is to organize his communication with the systems analyst. I am not going to get involved in the methods of doing this. There are different concepts as to how much a programmer should become involved. My method of receiving this information is to use the Norelco tape recorder. I found in dealing with an analyst I can talk over the problem with him, and I can record it. I then go back to my desk or wherever I happen to be working, and I re-listen to it, taking off the valuable plans that I feel are necessary, and also the definition of the problem. I haven't found any systems analysts who are bashful and refuse to talk into the recorder. So far it has not become a problem.

I am then faced with the responsibility of coding the program. When I came out of school, I was so certain that I could program correctly the first time that I used long sheets of braille paper. When I made a mistake, I would frequently have to throw out these long sheets

Mr. Kennedy (Cont.)

of braille paper and re-write. Someone suggested, "Perhaps you should find another technique" and he proposed that I take pieces of paper to the secretary, which I suppose could be classified as using sighted help, and ask her to cut them to fit my slate. So consequently, I now do this, and I use a lot of little pieces of paper, but I don't find myself wasting as much time in correction as I used to.

The next step, once I have coded the program, is to prepare for keypunching. Again, there are several ways you can do this. Some people can write the regular code sheets. I have to type. I find that if I have my sheets with the column numbers where I want them to start, I can type my program and submit it to keypunch. One thing I find that made coding easier is taking the notes that I made on small pieces of paper and making sure they're up-to-date before I start to type. For example, I may get halfway through the program and change my mind, and when it comes time to type it I will remember it the way I wanted it instead of the way it is. Instead of going back and changing all the entries in braille programs, I often type the changes. This varies again depending on what language you use. I obtain an 80-80 listing in braille of the source cards for the higher-level language. The reason it's more important in higher-level language is that I can correct the keypunching mistakes and in the higher-level language this can cause all kinds of errors that I would never be able to prove. It saves me a tremendous amount of time. With an assembly language, it may be easier to let the assembler find the mistakes.

I have not written in RPG. Judging from the exhibits, the RPG has standard coding forms. It makes it a little difficult to keypunch. If I ever use RPG, I will probably end up keypunching by myself and having the assembler do the test and debugging.

Quite a bit has been said about braille and braille compilations. I just want to touch on the mechanics of getting one in DOS on the IBM 360. The compilations are acquired by running a standard assembly and putting the listing out on tape or disk. It depends on what has happened at system generation time. This can be done by assign lists and executing a braille utility program. The only thing I found out that must be done in using your other devices like the electronic tape unit, you must make sure that the logical units that are assigned to it are unassigned. Every once in a while, you will get a message that says "Invalid label setting". I am not certain what causes that, and you just type "Ignore" and that is exactly what it does.

I think the next step will be the assembly and debugging. Everybody knows what goes into that, I think. Then comes time for your big test. You test the program and it does not execute, and you say, "Gee, I am probably going to have to reassemble". Sometimes if you are orderly, with assembler programs, you can catch errors quite easily. This approach can save you a lot of time. You might have to reassemble only every 20-25 tests.

One thing should be noted. As you make patch cards, you make accompanying source corrections. You stick them in the source deck. This way when it comes time to catalog the program, you don't have to spend another two days debugging the patches.

The next thing has to do with cutting out the braille output. I can see the reason for cutting it back as much as possible. One of the things I found is that if I make my IO routines common and just call them or use label variables or some method of executing them, I can easily suppress the printout. I have some idea before I get a massive printout whether the program is working. I will count the records. I can see that I am getting output. I may read the records through and add them up, and see if the amount comes close. Much of this depends on the computer situation. It eliminates braille output, but it runs on the computer. This has to be appraised at your own installation. The most important thing for eliminating braille output or cutting down is the proper organization of test data. That is not only the blind programmer's problem. Test data should be concise, and cover as many cases as possible. There are in some cases nearly infinite possibilities, and it would not be feasible to test a program to this extent; nevertheless, test data should be prepared with as much care as possible. It's not a very romantic task to sit down and prepare test data, but it happens to be one part of our job which, I guess, along with documentation, is probably rated as the lowest.

Mr. Kennedy (Cont.)

The standard PL/I and COBOL debugging features are available in the DOS. These debugging features are three. One is called TRACE. TRACE will do a couple of things. One of the most important things is that it will trace branches through the program. If you are processing a file of several accounts, you might want, by programming, to assign the call traces and trace through it and see what statements are being executed in what order. Sometimes I found that as long as you don't trace every account, you're better off. TRACE can be called on and called off to avoid voluminous data. You can read the DOS Programmer's Guide, Release Number 20.

If you can specify a field, it will printout every time the field changes, so you might use this when you are getting a field that isn't supposed to be changing. This comes in handy.

The third is called the Dyn-Dump. This has been available for quite awhile in the PL/I. You string out the field you want to dump, and every time this statement is executed, this field will be dumped on a list. This can get voluminous. You should probably exercise a lot of care in placing your Dyn-Dump statements. I want to impress upon the people that I am not trying to say that if you do things this way you are going to be successful. All I am saying is that these are my ideas for programming, and I would be more than happy to listen to somebody else's ideas. I have a couple of programs that I have applied these particular techniques to, and they still don't work.

Mr. Gildea

You brought up a point that ties in nicely to another thought, and that is when you conjectured about letting an assembler find errors. One of our employers earlier mentioned that debugging time for computer programs written by a blind person is usually considerably less than for a sighted colleague. I think that is because of the horrendously expensive and sloppy approach that so many programmers have in letting the compiler or assembler find the errors. The blind programmer has enough difficulties. If he is just a little bit more careful and a little bit more meticulous, he gets an awful lot of errors attended to before compilation. The trivial clerical errors that cause another compilation, another assembly, and another two days of project delay are avoided. So I would advise you, Bud, that the next time you get that thought, dismiss it pretty quickly because it is expensive in time for the entire project.

Our next speaker is George Bartram from Canada.

Paper 6-3

DAILY PROBLEMS AND SOLUTIONS

Mr. George Bartram

Litton Systems of Canada, Rexdale, Ontario, Canada

Mr. Bartram

It is a distinct honor and pleasure to be here as a speaker; and to give some of the problems which I have encountered and the solutions which I have worked out in my daily work as a programmer.

First though, let me give you a brief history of the computer course for the blind in Canada.

The course began as a pilot project in 1964-'65, after officials from the Canadian National Institute for the Blind had observed and discussed the course here in Cincinnati, Ohio.

Mr. Bartram (Cont.)

Four students attended the pilot class and received instructions from the personnel at the University computer Centre and from the IBM office in Winnipeg. Three of the first students are presently employed in various parts of Canada; having been at their original jobs for the past four years. The fourth member of the pilot class, Mr. Donald Keeping, took over management and teaching of the course, and is enjoying very good successes in his undertaking.

At the completion of five successful years, about forty students have been enrolled and approximately thirty to thirty-five have completed the course and are employed throughout Canada, working for Government installations, both Federal and Provincial, and private industries.

During the past four years, the agenda of the course has been modified to include COBOL, Assembler and PL-1 languages for IBM/360 computers, in addition to Autocoder and Fortran-2 for the IBM 1401 and 1620 computers respectively.

The latter two computers are used mainly for introductory purposes, but students may study them in detail as extracurricular activities if they wish.

Recently -- in the last year or so, I understand they are using braille output, although three years ago when I attended, the braille package had not been perfected enough for use.

Now -- to some problems and solutions I have met and handled in day to day work.

The problem of receiving program specifications at first was a large problem, especially in communicating what was desired.

First we tried using braille, someone dictating and I copying. As you can imagine this was slow and time consuming, tying up two persons, the reader by taking him from his duties, and myself, having to stop what I was doing, or just waiting for someone to be free to read.

Shortly thereafter, I brought a portable tape recorder to the office; which I had used in earlier experiences with teachers and lectures with a good deal of success. This method proved to be the most visible one. However, this produced another problem. When the reader dictated, he could stop and ask if I understood, or I could stop him and ask for an explanation. These little explanations were stopped if I was there when the problem was being read onto tape. Consequently, we decided that I, to enable others to know I understood what was required, should give back my interpretation of the problem. We tried verbal communications first, which proved unsatisfactory. Next we tried my typing in an explanation which was quite successful at the time.

At the moment, we are experimenting with an IBM supplied program, a type three, meaning not maintained by IBM, but available through them. I have had no experience with the package personally, but our Systems people are learning how to best use it. Apparently, it is coded somewhat like COBOL, and the user writes what he thinks is to be done, and the package then will make a logic flowchart of the programmer's interpretation. I believe that once I have learned how to use the package, it could, with some modifications, or by interpreting the output from a tape, produce a braille logic chart enabling the blind programmer to follow his logic and as well as producing an ink-print copy so his colleagues may also check or advise on better methods of doing the same problem.

This package, to the blind programmer, has another advantage, it cuts down on time wasted in typing an interpretation, while coding it provides the braille notation and the computer provides the logic chart far faster and more explicitly than can be accomplished in words. Something like the old saying "A picture is worth more than a thousand words" on the topic.

This handles the processing diagrams quite well; and combined with the input and output specifications, taken from the tape, gives the required results, reception of the problem, interpretation. This now brings us to organization and preparation of the program prior to coding.

Mr. Bartram (Cont.)

As a rule, I do very little flowcharting; however, if the program appears to be quite complicated or extensive, I do use flowcharts.

The method I employ is a type of decision table, using cards, and written in braille. The main idea is, ask a question on a card, representing the decision to be made. Following the question on the same card, I put the word (YES) about the middle of the card below the question; and the word (NO) on the right side of the card below the question, as you are reading it. Again, still on the same card, next line down, are three numbers. The first, most left-hand one, is the number of the decision block. The second, below the (YES) is the number where to branch, in the flowchart; if the decision is true. The final number, below the (NO) is the number to branch to if the decision is false.

I prefer this method of charting logic to any other I have tried, although it doesn't convey much to my sighted colleagues. I learned it while attending the programming course in Manitoba, and I think it originated in England.

As I mentioned, I very seldom flowchart; finding that if I study the input specifications along with the output specifications and from this study, note on paper the worked area required and the best possible way of describing fields formats on the records. This will involve some time, as most of you know, but in doing so, the problem is solved quite readily and once you are sure what is expected, in combination with the notes I made during the study, I can code quite straightforwardly.

As you may have guessed by now, the study, notes, and if I use a flowchart, my method leads to a modularly constructed program which aids considerably in debugging during testing, and much easier modifications in the future.

Here, before I discuss keypunching, I wish to clarify which languages I use. They are mainly COBOL and some Assembler for the IBM/360.

In preparing for keypunching, I sometimes type the coding up, using a string of numbers across the top of unlined typing paper, the numbers running from one to zero, and on the line above, I type the preceding digits, such as a one above the first zero to indicate column ten etc. Also, when coding the program, usually a one for one statement basis in braille and keypunched material, I use sequencing numbers as much to my advantage as possible. For example, sequence numbers beginning with a one in the first digit are in the identification and environment divisions of a COBOL program. The digits two or three in the first position of the sequence number, respectively, are the file and working-storage sections of the COBOL program, which make up the data division. A number four in the first position of the sequence number indicates it belongs to the Procedure division of the program.

Consequently, any questions arising during the keypunching of a program can be referenced by use of the sequence number; and I can reference the braille copy of the coding and make corrections. The most frequent problem is for the keypunch operator, determining which are i's or l's, O's and zeros. As you know most installations have their own standards of crossing specific letters and numbers.

Usually I do my own keypunching, time being the main factor for this action. I can punch the program almost as fast as the keypunch operators, and without the benefit of verifying, be almost as correct in most cases. Besides, it gives an additional check to logic and coding, as does typing the coding, but, removes the time-consuming step of typing, errors when I do the punching personally.

I shall take the opportunity here to mention that we do not use braille output to any extent, and presently we haven't been using it for some time. Therefore, in removing syntactical errors, I enlist the aid of a fellow programmer and a tape recorder.

As a rule, I let the other programmer read the errors on tape, if there are many, otherwise I copy them as he dictates. I get the reader to associate the computer sequence number for the statement to corresponding sequence number I gave the statement; and also to read the error message associated.

Mr. Bartram (Cont.)

In the source deck itself, I have cards placed the opposite direction to the others at the beginning of each major section of the program, which makes for rapid location of this section. Using a card reader, modelled somewhat like the ones used in Cincinnati, and designed and produced by a private firm in Toronto for the Canadian National Institute for the Blind, I can read the statement in error in the source deck and correct it. Any statements to be repunched I do myself always.

This method of handling errors in assemblies we have found to be the fastest and most practical for our purposes. As I hope you noted, my keypunching ability is quite good and has improved greatly since my employment. This makes it possible to begin testing of the program after three assemblies on the average.

During this phase of implementing the program, testing, we are responsible for creating our own test data either by utilities or use test files backup for several programmers to use.

We have found again, the feasibility of using braille output too impractical. It is much faster to check printed output against file formats and specifications and make sure the proper data is in the right file fields.

Data exceptions and other errors causing core dumps, we handle by having some unsung hero look them up, check the data fields and then, after describing to me what output I have and what fields went wrong, I can check for possibilities of erroneous coding in my program. I guarantee, nine out of ten times, the programmer is at fault, I know.

We also have in our installation a software package, Autoflow, which will flowchart the logic of a program, assembler or COBOL, which aids some programmers in finding logic bugs during or prior to testing.

Besides the software packages available, I have also found the modular style of programming a great asset for debugging. It is much easier to explain a program to someone when they are assisting you, that your main logic decisions are located in one place, and that the program branches to sub-routines and closed routines to effect the necessary work of the decision. Also, an advantage lies in quickly narrowing the search for a bug to a specific routine, and latter for doing maintenance to the program. Some of these techniques come with experience, others were taught to us on the course, and still others such as using meaningful names for data have been suggested by fellow workers to aid them in assisting me in debugging or maintaining of a program in my absence.

Now we come to the point which all programmers, I think, would like to ignore, namely final documentation, and as a result neglect it badly, including yours truly.

Employing the flowchart packages I briefly mentioned earlier, this problem has been greatly reduced, and need only entail a concise and direct write up, by the programmer, to be placed along with the flowcharts, source listing and deck, and file specification to be filed together.

The problem was, before these little blessings came along, not in having the source listing deck or file layouts, but in leaving an intelligible understanding of the program logic.

I first used, with the most satisfying success, written documents, explaining in words, each logical step of the program, using a typewriter and much time to do so.

Shortly afterwards, we heard of a drawing kit developed by Mr. James Swail of the National Research Council, which allows him to devote his full time to developing aids for the blind. The drawing kit uses an idea similar to drawing figures in geometry used when I attended school. There is a rubber mounted mat on a board to provide a little give, a plastic-type of paper, like cellophane in texture but much stronger, and a special pen is used, the only differences I think from an ordinary ball-point, are the chemicals inside and the ball is a little larger.

Mr. Bartram (Cont.)

A significant advantage in drawing a diagram is you draw it as you would a pencil, and the lines are raised upwards rather than on the bottom side of the page, the exact opposite to drawing with a ratchet wheel.

This manner of drawing diagrams was excellent in showing me logic blocks and how to do complicated bits of logic much easier than I already was employing. The biggest drawback was, for me, that I'm a very poor draftsman, and the symbols on a template being too small to draw distinguishably, and they didn't allow enough room to mark them distinctly as to be unique. Also, to make the diagrams for my purpose to follow at a later date, we found they were too cumbersome and still required written information to explain what was being shown, both in braille for my use, and in type for those who would follow.

Therefore, we continued to use my method of explaining the logical steps for a while longer until we acquired the Autoflow flowchart package, which I think, along with a few written comments, will likely be our best means of documentation both for the blind and sighted programmer in the future, or systems of similar design.

Throughout the preceding oration, receiving a program, organization etc., I neglected something which plagued me badly at first; and sometimes still is my downfall, namely Job Control Language.

Through the aid of a friend, a fellow programmer, I obtained specific information and descriptions of control statements and their functions.

The most valuable knowledge came however in the actual handling of these statements.

In larger installations, I believe it is the practice for a job controller to design test runs and files, and add the required job control statements.

In smaller installations such as ours, as some of you know, tests are designed by the programmer, and as a rule, he is responsible for his job control statements and creation of test files. This has the advantage of a closer relationship between your program and others associated with it; in the same system, and also aids in describing how your program fits in the stream when talking to the Operations Supervisor, and is an asset in aiding him in designing production schedules to take the fullest benefit of available computer time.

Most of my knowledge is oriented towards the IBM/360 Disk operating System, and the information I use is mainly acquired from the Sort Merge utility and System service and System control program manuals.

These are a few of the problems and solutions, or partial solutions I have to offer. I hope they will be of benefit to some of us just starting, or perhaps give a new light and open new doors to solving them more readily.

Mr. Gildea

Our flow now takes us to Dr. Abraham Nemeth.

Dr. Nemeth

If you and I were to swap two neckties, you would have a necktie and I would have a necktie. If we were to swap ideas, you would have two ideas and I would have two ideas. Since this conference is all about idea swapping, I would like to give you my thinking about flow charts for blind computer programmers.

FLOW CHARTING FOR BLIND COMPUTER PROGRAMMERS

Dr. Abraham Nemeth

University of Detroit, Detroit, Michigan

Dr. Nemeth

It is an axiom that documentation is an important part of programming. One of the principal tools for achieving this documentation is the flow chart. Some of the comments I shall make are of a general nature and apply equally to all programmers, whether blind or sighted. Other comments are directed particularly to blind persons in the computing field. In any case, the blind programmer, to stay competitive, must have at his disposal the same tools as others, the flow chart being one of them.

Flow charts arise, generally, in three ways. I shall describe and discuss these in turn.

First, a flow chart may originate with the programmer himself, either before or after his program is running properly. Often, the flow chart begins and ends in one's head, in which case being blind plays no role. However, if the flow chart is to be committed to paper, and if the programmer uses braille, he must be conversant with at least one of the flow charting techniques devised for this medium of writing. Naturally, I prefer the one that I have devised. While it is not possible to present a detailed description of that technique in the time allotted to me (and even less possible in the less time allotted me), I shall attempt to highlight the principle features of the technique now.

Each box in the flow chart must be numbered. It is not necessary for the numbers to begin at one, nor for the numbers to be consecutive, although these features are a psychological help. It is only necessary for each box to have a number and no two distinct boxes may have the same number. In brailleing the flow chart, one puts these numbers at the beginning of the braille line, at the margin.

The shape of the box is then represented by the use of the Nemeth Code technique of shape indicators. To prevent any possible embarrassment, I will here and now proclaim to the informed and the uninformed alike that the Nemeth Code shape indicator consists of dots 1, 2, 4, 6, the same as the ED contraction of English braille. The characters which follow this indicator are then to be interpreted as shapes. For example, when the letter "R" follows the shape indicator, rectangle is intended; when the numeral 4 follows the shape indicator, a square -- a 4-sided regular polygon -- is intended, etc. Rectangles are commonly used for representing assignment statements. Diamonds or ovals are commonly used for representing decision statements. A box in the shape of an IBM card with a left corner cut is commonly used for input/output statements. Circles are commonly used for entry and exit points to the flow chart as well as for remote connectors in the case of large flow charts. In any event, by actually indicating the shape of the box, the kind of statement to follow is made known, even though the precise content of the statement is still to follow. I feel that such knowledge is helpful to the programmer and is the reason why the distinction is made in printed flow charts.

After indicating the shape of the box, one next indicates the contents of the box. This information is written in English braille, Nemeth Code, computer notation, or a combination of all three depending on the content of the statement. The statement may be a question, as is often the case inside a decision box. A good flow chartist tries to make his statement language independent -- not FORTRAN, not COBOL, etc. -- so that the program can be coded from the flow chart in any language. If the statement is too long to be accommodated on a single braille line, it may be run over onto the next line after indenting two cells away from the left margin. Additional runovers on to a third or succeeding line should likewise be indented two cells from the left margin. By this technique, the braille reader can quickly scan the flow chart by running his finger down the left margin where only the box numbers appear.

Having completed the statement, the arrow linked to another box is represented by the braille dash, consisting of two hyphens. (The hyphen is formed by dots 3, 6.)

If a box has just one arrow emanating from it, the braille equivalent of the arrow is followed by the box number to which the arrow leads. This number should be present even when the arrow leads to the very next box of the flow chart. Often, however, an arrow leads to a remote box in either direction -- back toward the beginning of the chart, or forward toward the end of the chart. The need for placing such numbers after the braille dash is then self-evident.

If a box has more than one arrow emanating from it, as is the case for decision statements, the braille dash which follows the statement should be followed by no number at all, but the situation should be treated as follows: on the next braille line after indenting two cells, one puts another braille dash followed by the label on one of the arrows. In the case of a decision statement, such labels might be "YES", "NO", "LESS THAN 0", "EQUAL TO 0", "GREATER THAN 0", etc. After the label, one puts another braille dash followed by the box number to which that arrow leads. This disposes of one of the arrows. Therefore, in the next braille line after indenting two cells from the left margin, one shows another arrow and treats it in the same way as was just explained. One continues this procedure, using a new braille line for each of the arrows emanating from the box. In the simplest case, there are only two arrows, each of which requires one line of braille for its representation. It is clear, however, that the representation is possible for as many arrows as necessary.

If you experiment with this technique awhile, you will be surprised at how easy it actually is, despite the elaborate explanation just completed. Furthermore, you will find how easy it is to "play computer" with your flow chart written in this way where you must actually make one of the various decisions possible deciding at each decision box. The numbering scheme makes it possible to proceed to any box of the chart, whether it is the next box, or a box which is remote in either direction. Furthermore, the number at the end of a braille dash, when compared to the number of the current box reveals instantaneously whether one is proceeding logically in the forward direction of the chart, or whether one is looping back to a previous point, or whether one is branching around the next several boxes to pick up at some future point.

There is nothing to prevent the presentation of a flow chart of this form on the typewriter, after which it can be read or followed by a sighted person as easily as the original was followed by it's blind originator. The typewritten form can be filed as is, or it can easily be converted into the geometric flow chart familiar to sighted persons. So much for flow charts which originate with the programmer himself.

Second, a flow chart may be submitted by another programmer. This "other programmer" might be a text book or manual. The recipient of such a flow chart may be required to debug someone else's program with or without the consultation of the originator. For a blind programmer, a braille version of the original flow chart is necessary. In these situations, sighted assistance is required. This assistance can be reduced to a minimum if the sighted person is properly instructed in how to communicate a flow chart to a blind person. Just as I have explained earlier, a sighted person is first asked to assign numbers to the various boxes. It may happen that the author of the flow chart has already assigned numbers to some of the boxes. The sighted assistant must then be careful not to use these numbers for other boxes. The flow chart may then be read in a manner similar to the following: "Start and go from box 1. Box 1 is a rectangle in which is the statement...and from which there is an arrow leading to box 2. Box 2 is a 'decision box' in which is the question...and from which there are three arrows. One arrow is labeled 'less than 0' and leads back to box 1. The second arrow is labeled 'is equal to 0' and leads to box 3. The third arrow is labeled 'greater than 0' and leads to box 7. Box 3 is a...etc." Any disposition on the part of the sighted reader to describe a complete path of control should be discouraged. Only the current box number, the shape of the box, the statement with the box, and the numbers within the box or boxes to which the arrow or arrows lead directly should be read. In this way, the blind programmer may copy the flow chart being read to him in accordance with the technique described earlier. It would probably be worth while to prepare and distribute a short set of instructions in this regard to present your would-be tape recorders to improve the communication regarding flow charts via the recorded medium.

Dr. Nemeth (Cont.)

Third, a flow chart may be computer-produced by one of the standard software packages now available, such as AUTOFLOW. In this case, the brailleout package seems to be of little help. When we consider more closely what is involved, however, we see that the geometric layout of the flow chart is not the important factor we may have conceived it to be. If there could be provided the identification of the boxes, the contents of the boxes, and the labels on the arrows, this is all that is logically necessary to produce a flow chart. With this in mind, some work is needed to write a program that will extract from an existing flow charting program the information just listed. This information could then be made available via the regular brailleout package, and the blind programmer may use the result as is, or he may wish to reconstitute the information furnished in the format described for producing one's own flow chart. I therefore bring my presentation to a close with the recommendation that such an interceptor program be written and tested. It would "intercept" the information of the types listed from a standard flow chart package and then present this information to the brailleout program for embossing. The realization of such a project would constitute another "breakthrough" for the blind programmer.

Mr. Gildea

Before I relinquish my roll as panel chairman I want to bring up one point from discussions with Paul Duke, namely, operating in a technical position as a blind person with sighted assistance.

This is the technique that I have been following. I am not much of a brailist. I only have a few braille notes I have to worry about. Most of my work is done on the telephone interfacing with people, and very little of it is on solitary technical research. I may spend only a few hours a week dictating such materials. I spend ten times as much reading the mail, and all the braille in the world won't help when it's input from the United States Air Force on the specifications of a certain project. No one is about to braille such materials. For a blind person operating in programming or in any other technical activity, there are times when it's very helpful to have sighted assistance, the handy eye ball. It's sometimes mandatory. It's sometimes a luxury. I think what we have to do is really examine this and find out which are the luxuries. We don't need them. Get rid of them because they are adding expense and detracting from the image that you could present as a professional. They may also develop further myths that are adverse.

Those that are mandatory we must accept. A man making \$8 an hour should in any economic situation have available to him occasionally a clerk making far less. As the situation demands, such a person may perform clerical activities, be they keypunching, soldering hardware together, or reading specifications. If it's mandatory, let's face it and let's not say that the blind person is completely independent. I agree with Dr. Hallenbeck in the respect that nobody is completely independent, and that includes that fellow interviewing you. He needs you and you need him. He gets his raises from somebody. He's dependent on quite a few other persons. We are not completely independent, and neither is he. There are dependencies on both sides.

I don't think we need to spend too much time on that. I think what we have to do is spend the time on determining the techniques to get the job done. Where sighted assistance is required, we should specify that it is required. We know our work. We know what we do. Let's lay it out at the proper time in the interview, where it's important.

Miss Jankowski

My name is Toni Jankowski, Defense Department, Fort Meade.

This is to Mr. Kennedy, in particular. It seems that everybody here is selling tape recorders. We are talking about saving time, and you said that when you discuss your specifications for the systems analyst, you record and take notes later. It seems to me that is a waste of time. Why not take the notes right then and there rather than to tape it?

Mr. Kennedy

If you pay completely no attention when he is talking to the tape recorder it's a waste of time. It does take you longer. If I could take notes as fast as he was talking, that would be faster, but I feel if I go back and play the tape recorder back and make my notes which I have already recorded in the discussion with the guy, I don't have to go back and write word for word what is on the tape, but I don't waste his time, and that is the important part of it. I am willing to accept the fact that I am going to spend a few minutes extra a day in order to hold my job.

Miss Jankowski

If you are talking to him for a couple of hours, do you tape the whole thing?

Mr. Kennedy

Nobody ever sits down and talks about business for a couple of hours. I have never been involved in a two-hour presentation of any project, at least consecutively.

Miss Jankowski

I didn't mean to imply that it would be a consecutive thing. It would seem to me that if you were in any way proficient in taking notes in braille, you can do it a lot faster by taking notes as you go along and save yourself a lot of time later.

Mr. Kennedy

I can write braille fairly reasonably, but it's distracting to the questioner I am talking to. Of course, this is debatable.

Mr. LaGrone

Would you use a combination of the two?

Mr. Kennedy

Yes. Again, you have to adapt to the situation. You may take the numbers down and some guy comes up and says, "How about trying to get a piece which has already been shipped out of the load for machine 4 million". I don't run around and grab the tape recorder and make him say it again. I take notes where it's applicable.

Miss Jankowski

In addition to that, isn't a stylus a lot more portable? You don't have to drag around a microphone.

Mr. Kennedy

I am not talking about the 23 pounder. There are certain advantages to it, and there are times when it would be better to be done that way.

Mr. Coleman

During the interview you will note parts that you want, and either note the tape portion on the indicator or the time from the beginning of the interview at which point it occurs, and you go straight to the point on the tape when you play it back.

Mr. Crook

If I may be so bold as to offer a comment on the tape recorder, I use one quite frequently for note taking for two reasons. You don't have to record the entire conversation. You can use just verbal notes, and it's also handy at keeping your supervisors honest.

I did have a question for Mr. Bull about his supervisory capacity. I think perhaps Mr. Gildea may have answered it.

I am interested in promotional possibilities. They are realistic, but they take with them other components of a great deal of paperwork. I wonder if Mr. Bull could elaborate on the manner in which he handles the additional paperwork in record keeping for the people he supervises?

Mr. Bull

I am trying to work out exactly what the questioner wants to know. I didn't cover minutely the contact with the system analyst, if this is what you are getting at.

Mr. Crook

Perhaps I should explain what supervision in our company includes. A coordinator has a group of six system analysts. These people don't have the responsibility of writing the programs, but of doing the system analysis necessary to support the program and integrating it into the total system. Documentation and job control language are all part of this. The coordinator is a second level management position, and these people must be conversant with all of these concepts. He must also look after the time sheets that are broken down to the different phases that the work has been divided into. He must make his reports to supervision. He must evaluate reports from supervision. In other words, he is the interface between the upper and lower managerial staff.

Mr. Bull

It's essential for the blind supervisor to parallel documentation, that is, in braille and typewritten. As far as timesheets are concerned, he keeps his own braille copy and types, in parallel, a manuscript. As far as keeping check on the programming and analysis work, what I do is translate the flow charts into similar narrative type flow charts which have been mentioned by Professor Nemeth and Bud Kennedy. I also record any other documentation that they have with the salient points thereof. I won't have the full facts. I would just have enough to let me know exactly what the situation was.

Mr. Gildea

I have one thought that I would like to add. Dr. Nemeth mentioned a typed form of the braille version of the flow charts. This has been referred to before, and it is quite extensively used. It's called a linear flow chart technique. It's in the book by Brooks and Iverson called Automatic Data Processing.

Going to another point as to the interview in getting the job specifications that requires a tape recorder, and you don't want to interrupt for special notes at the time, but you have some indicator of the key data and that is all you'll have to braille out later. There is a braille counter which is a luxury available in England and which is not available in the United States. I've got one of them that costs \$25 and it's beautiful, and I like it

Mr. Gildea

very much. There is a Sony 105-four track available at the American Printing House. You press a button on it and it puts a 60 cycle hum on the tape along with the sound. Tom Benham put one of those on one of his RK-142 tape recorders which makes this now a much less expensive unit than the Sony 105, but it does give the capability to search for a tone at high speed, and you can then stop the tape and braille out what you need. It has a fast forward and you can scan the tape very quickly, and you haven't added one bit of time to the total operation of getting the specs down, which is an important detail.

Mr. Kennedy

One thing, Bob. This is directly still at your question which certainly brought back a lot of talk. The most difficult part of being a supervisor, I think, and I think you are referring to, for example, is when I submit my reports to management.

Everybody in our department uses a Norelco tape recorder. We have a secretary who types up the memos and the reports and other cumbersome matter that is coming in. Some of these are difficult things. If they are small enough, I just have somebody read them to me. If they are voluminous like somebody explaining why he is copping out, then I take them home to my wife. I got a memo the other day that said, "Due to lack of interest, tomorrow has been cancelled".

Mr. Rogers

My name is Rob Rogers with the Kroger Company in Cincinnati, Ohio.

I was wondering if any of you panelists would care to comment on the use of the dictaphone. No one mentioned this. I guess one of you has, but where I work we have a steno pool and it seems to me like you are compounding the risk of error when you are typing and passing it out to the keypunch operator who makes many errors. It seems more streamlined to use the dictaphone of some kind. You have the tape dictaphones which are the cassette type which are superior to using a typewriter or your own keypunching. If you find out you can't get a keypunch operator to use the dictaphone at some time, you can use it yourself. To me it just seems this would be a way of streamlining your operation. Would any of the panelists care to comment on this?

Mr. Coleman

One thing that occurred to me, and I certainly can't speak for all keypunching errors, but the sheer speed of the keypunch operator stems from the fact that she is continuously just about reading the next line while she is working on the previous one. It's a very streamlined technique, and at the dictaphone she's got to keep starting and stopping. You are limiting yourself to the keypunch, which you may not get access to all the time. At my own company no one stays on the keypunch for more than 10 minutes. This just rules you out except for lunchtime or overtime.

Mr. Rogers

There is another possibility of documentation. A Programmer is a programmer. He is not a typist. We have girls earning much less than a programmer in our company, and they are being paid for the skill of being a typist. It seems to me that dictation there would be far superior. Our management personnel use dictaphones. We have three secretaries in our department, and every one of them at one time or another has used the dictaphone for their typing, and it seems to me that the programmer would be improving the operation if he would use a dictaphone there too.

I say a programmer is a programmer. He is not a secretary or a typist. He doesn't have the time to raise his proficiency on the typewriter, where the girl who is doing this day in and day out is doing a far better job.

Mr. Gildea

Proficiency in typing is a bit cloudy. I think the important thing here is accuracy. The programmer may take four times longer than a typist, but the rate of error will be significantly less. If the typist makes one error, it can cost him four hours. You have to look at the economics of the entire operation, and the error rate is, I think, the key point there. A typist can rarely type a full page with no error, and I don't think you want one error on each coding page.

Mr. Seeley

There are two ways of effecting braille, and I don't think he quite distinguished between the programmer and the type of agency.

Mr. LaGrone

Let's take the first type which is what we call the elastomer type of embossing, where you take a piece of elastic or a piece of rubber, or in whatever form it may be found on any female employee somewhere. With the latter we use a piece of polyurethane material. (Mr. Kennedy mentioned that it could be obtained from the Stockwell Rubber Company somewhere over in Philadelphia.) It sells for something like \$22 a yard, whereas elastic sells for about \$.30 a roll. I still use the garter elastic because I love to look for it, so take your choice. If you can't find it anywhere else, it is at the drugstore.

I've got some excellent braille from that, and I've also got braille that isn't very good, but all of it I have been able to read. I took braille up to Harrisburg to the conference that we had back in November, and I showed this to Bud Kennedy and Harry Bassler, and I thought it to be some of the best braille I ever got. Harry Bassler, without any direction from me or anybody else, got braille out in the INA computer for Mrs. Beck, which is far better than I did. He used elastic and polyurethane material. That is one form of braille embossing, which is written in mirror impact. When you write the program it's got to be written in mirror impact. There are a pair of brackets or clips available from IBM, and the brackets cut down the operator's setup time from maybe five minutes to two or three seconds, because the elastic is permanently mounted on the brackets, and it's simply flipped up into place when you need to use it so that you don't have to worry about having to try to mask it on with some sort of tape and have it slip off, and so forth.

Now the other type of braille is a far better quality, and it's produced by pairs of what is called pimples and dimples; the dots in front of a set of hammers. When the hammers are fired, the dots hit the paper and are driven into some indentations on the interchangeable cartridge. The setup time for that thing is about three minutes. It has an interchangeable cartridge on the N-1 printer, which is 600 lines per minute, and also, I guess, the model 2, which is 1100 lines per minute. The dots are on a little rail that goes horizontally along the printer near the front of the hammers. When a hammer fires, the dot hits the paper and is driven into the little indentation, causing a dot on the paper. We have been able to get very good braille out of that. The braille on this type of printer comes out the front. That is when you program for the braille, you program for it right side up as opposed to the mirror image with the other. There is a little programming consideration here, in that every fifth printing position is unused. You get 52 characters per line with what we call the braille features as opposed to the 44 characters per line with the elastomer method. I am able to get 25 lines per page with the braille feature as opposed to the maximum 20 with the elastomer method. The difference in speed is that with the RPQ Printer, any printable character makes a dot. However, as I discussed earlier, with the elastomer method you have to use certain dots.

In the RPQ Printer, there is not as much movement with the chain or train as with the elastomer method. I would think you could get the full 1100 lines per minute. I think I am told by the system engineers at Endicott that if you don't have a chain, you can get 1400 lines per minute. You divide 1400 by four, which is three passes of the braille printing, and the fourth with the blank line between the two braille lines, and you've got it.

Mr. Coleman

I was just going to say that with the 1400 lines, we have done research at Hursley and we got the same thing. You should only divide by three and not by four. If you program properly, you just skip a line and you don't actually print it.

Secondly, we have a program working at Hursley which produces 26 lines to the page.

Mr. Keeping

I am Don Keeping from the University of Manitoba. I would like to ask Dr. Nemeth if his excellent system of flow charting he just described is available in summary or description, or is available in ink print or in braille, and if so, how can it be acquired?

Dr. Nemeth

I am sorry to say the brief description I gave is not available either in ink print or in braille, and I guess the principal reason is that a group of people in this country are very jealous in keeping these things from being printed until they are completely and fully formulated so that you don't have three opposing presentations, each with its own idiosyncracies. They have sort of dissuaded me from writing it up in complete detail and distributing it. It's not available in either form.

Some of the textbooks which are available in braille, both on numerical analysis and computer materials, do have charts in them produced exactly the way my transcriber uses. These masters are made available upon request to the Braille Book Bank. Anybody who gets the books from the Braille Book Bank will have a copy of these charts, but not a description.

Mr. LaGrone

You have, however, as a part of the proceedings, entered a complete description of the technique with examples?

Dr. Nemeth

I am transmitting my paper just as I have given it. I can submit as many samples of flow charts as you care to see, big ones, little ones, all sizes.

Mr. Chandler

My name is Chandler and I am from Kentucky.

I would like to address a question to Dr. Nemeth. I have one client who is taking a computer science course and anticipating a degree in this. I understand, Dr. Nemeth, that you may have some information or may know something of procuring a braille copy of Art of Computer Programming Volume I.

Dr. Nemeth

The name is "The Art of Computer Programming". It's scheduled to come out in seven print volumes, one a year. Two volumes are all ready. The author is Donald E. Knuth. I will be using it as a textbook to offer a course of my own this coming January. It is not yet completely transcribed. I only have 10 braille volumes of it, but it doesn't begin from the beginning. It's excerpted here and there, and as soon as the transcription is finished, it will be available to the Braille Book Bank from whom it can be requested. They will duplicate as many copies as they get requests for.

Mr. Chandler

Would it be possible or feasible to get any portion of that? Sometimes, and particularly when we use the code in the mathematics, we find ourselves where we can't get the entire volume, but someone will transcribe it bit by bit. We ask our volunteers to do this on the basis that we get ahead, and a person can have some sort of information without having it entirely.

Dr. Nemeth

I will release the complete book to the Braille Book Bank when it is available. To dissuade your anxiety, it will be transcribed at the rate of a braille volume a week. She is already through half of the book. It is not volumized. In other words, I have 30 pages between one set of covers and the next section happens to be 55 pages between another set of covers. It would just create havoc with keeping the book together in any proper order. I've got to release it when it's completely volumized.

Mr. Falter

I am John Falter from UNIVAC. My question at this time is, I understand that the Inktronic printer is being developed, and I am wondering what kind of effect on braille users this will have if it becomes widespread? I am not too familiar with it.

Mr. LaGrone

We are not saying that we won't be impacted by it. We are saying it's quite a long distance down the road yet. They are going to be extremely high priced and it will be a long time before we will do away with the impact or the drum, or even the platen type of printers. In the meantime, it was a thought for a while that the Gestetner stencil could be used. This is something that should be looked into, and if I have anything to say about it, that is one of the things that VIDPI is going to look into.

Mr. Gildea

The Inktronic is on the market today. We have been worried about this for years. This is discouraging to some extent, but you are not going to get rid of the other for a long time. The others will be far more economical and far more feasible in certain business operations. Inktronic and the other versions will never replace them completely.

The electric typewriter has not replaced the manual completely. Far more encouraging is the time-sharing operation that allows a blind person to work moderately independently. I see problems in the future with the electrostatic printer, but they are much smaller than the tremendous gains we are getting in the other areas. I feel it far less than Ted Sterling does, and I want to stand up and be counted as not worrying about it.

Mr. Seeley

What about the optical scanner as input for the brailier?

Mr. Gildea

The purpose is to allow feed back from the computer to the blind person. Harry Bassler and others have, in fact, already received braille output from material read in by optical scanners.

Mr. LaGrone

We have been able to use print from the printer as input to the optical scanner. The fact that it's an impact printer doesn't make any difference as long as it's in the same type font which the optical scanner will use.

Mr. Gildea

I am talking about the final braille that gets put on the blind programmer's desk that came from some device. That braille came from the impact printer more than likely. The fact that an installation has no impact printer, but only has an electrostatic printer would create a void in the feedback -- an opening in the feedback from the computer to him. The optical character reader is an input device. Once the information gets into the machine, one still needs some device to emboss paper.

Mr. DiBlasio

My name is Nicholas DiBlasio from the state of Ohio, Department of Highways in Columbus. I would like to address a question to Mr. Kennedy. You talked about a new programmer, and I am a new programmer. It seems to me that his method of operation would slow down the program. He says he takes paper and has it cut up. Why wouldn't he take the IBM cards with the clipped corners and put instructions, one per card. You know, where the top of the deck is. You can make corrections on the IBM card and you can flip it in upside down and go right to it when you are ready to keypunch. It's simpler than using the rectangular card.

Mr. Kennedy

I band the thing together and I pull the ones in which I am interested out a half inch, but I think it's a good idea.

Mr. Coleman

Can I say this in fact is the highlight of the business that I talked of earlier. The biggest trouble at the moment isn't machine communication but man-to-man communication. Many of you have been using the IBM cards for this since we started, and this is really the problem, isn't it?

Mr. Gildea

I would like to close the meeting.

October 11, 1969

Morning Session

Session 7 - PROGRAMMING PROBLEMS AND SOME SOLUTIONS - AN
IDEA SWAPPING SESSION

Mr. Collard

I have with me here on the panel a very interesting gentleman who has an even more interesting solution to the output problem. Since he didn't send me a biographical sketch, I can only tell you that his name is Jim Willows and he is from Lawrence Radiation Laboratories in California.

Paper 7-1

A VERBALIZED COMPUTER OUTPUT SYSTEM*

James L. Willows

Lawrence Radiation Laboratory, University of California

Livermore, California

Mr. Willows

At Lawrence Radiation Laboratory I work almost entirely in a time-shared environment. Except for punched card input and my longer printouts, all my interaction with the computer is via a remote teletype. Therefore my greatest need in order to become independent of sighted help was a means of "reading" teletype output.

Several people in our Advanced Software Systems Development Group had been working on computer generated audio output for purposes other than use by a blind programmer. When they heard of my needs, they were able quickly to develop the system to be described.

I have prepared a tape recording with a few further remarks and a sample of the verbal computer output. We shall now hear this tape:

"The following is a brief description and sample of a verbal computer output system under development at Lawrence Radiation Laboratory in Livermore, California. Although the system is in a preliminary user evaluation stage, I have already found it quite useful in my work.

"The present system is installed on a single CDC 6600 time shared computer. We hope eventually to install it in our Octopus System, which time shares several large computers through a PDP-6 executive and file manipulation system.

"The present system is designed to 'read' messages to the teletype for routine interaction between programmer and computer. Brailleing must be done manually. A 'message repeat' mode facilitates this operation. We hope soon to implement a 'braille print' mode using the braille teletype head developed at LRL by Gary Anderson and David Rogers.

"The system software consists of the READ controller program, the VOICE and dictionary (DICT2) files and a PPU output subroutine. The READ controller intercepts all messages to the teletype, looks up their ASCII representation in the DICT2 file

*Work performed under the auspices of the United States Atomic Energy Commission.

and locates the proper blocks of sound representation data in the VOICE file. These blocks of sound data are sent to the output PPU, which formats them for D/A conversion and audio output. Two PPU's are used alternately to speed up sound output. A third PPU handles visual teletype output. It is at this point in the system that we hope to implement the braille print feature.

"The sound representation information in the VOICE file is created by sampling the spoken word audio waveform at a 6-kHz rate. The samples are digitized, smoothed, compressed logarithmically and stored on disk in blocks of four-bit bytes.

"You will probably experience some difficulty in understanding the output that follows. This is especially true in SPELL mode. We have found that this difficulty does not exist when following familiar formats.

"A brief note on word usage is in order. The dictionary contains the 26 letters of the alphabet, the 10 numerical digits, the phonetic military alphabet and about 200 of the words most used in FORTRAN or in our utility routines. The words in the phonetic alphabet are useful as variable names to cut down on spell mode operation.

"Representation of some of the FORTRAN operations may not be immediately obvious. These are: 'slash' for divide, 'times' for multiply, 'is' for equals, 'operen' for open parenthesis, and 'cloparen' for close parenthesis.

"The somewhat clipped speech is caused by the need for getting a complete word in a one-second sample. We are continuing to study our utility routines to include more of the often used words in our dictionary. This will cut down on spell mode usage and save computer time.

"Let us now turn to a sample of our verbal computer output in the compiling, editing and running of a short function integration routine."

Note: The sample was presented as a dialogue between programmer and computer in that the programmer's voice is heard explaining what is being typed on the teletype and then the response from the computer is heard. These will be denoted by P: and C: respectively. Words that are spelled will be written in capital letters.

P: We initiate our read controller by typing read/maximum running time and priority value. The response, zulu, indicates that the program is ready for more teletype input.

C: zulu

P: We will now get a listing of our files by typing startup files.

C: 5664 +READ line feed
3600 R BIN line feed
2323 R DICT2 line feed
...
all done line feed zulu

P: We now check the time in our bank by typing \$b.

C: Bank is 5 MIN 25 seconds line feed zulu

P: We attempt to compile under the CHIPPAWA compiler by typing startup chip program-name, compiler-length, program-length.

C: 000001 fortran ERRORS in PE line feed
all done line feed zulu

Mr. Willows (Cont.)

"P: We have a fortran error. Error indications are in a file called output. We type startup NAB output. The length of this file will be returned.

"C: L is 1240 LF OK line feed zulu

"P: The error is marked by ***. We will do a find statement on this set of symbols. The file address of these symbols will be returned.

"C: 00000072 LF OK line feed zulu."

(At this point the tape was stopped due to time limitations.)

I believe that is enough to give you an idea of our verbal output. I want to reiterate the point that the output will be easy to follow when you are working with familiar routines and formats.

There are three refinements we had hoped to include before making this tape. I am sorry we did not get them in. These are:

1. The addition of more words to the dictionary to decrease spell mode usage;
2. The suppression of leading zeros to save computer time;
3. The recording of the dictionary using a woman's voice to improve sound quality.

Many people have worked on this system. Those largely responsible for its development are Hans Bruijnes, Bernard Thornquist, Jack Oliver, and Ervin Ferriss.

Mr. Adair

Is it possible to back the response up and have him repeat a line?

Mr. Willows

You just hit a couple of keys on the teletype and it repeats the message that is in it at that time, so you can repeat as often as you want to.

Mr. Collard

Would it be possible to speed up the return of the output and record it and slow it down in order to save teletype usage?

Mr. Willows

In most casts this is true. At each point I am interacting directly with the teletype. I am talking about when you are getting output results, the long string output results.

Mr. Falter

My name is John Falter from UNIVAC. I was wondering if you could get it off in one second intervals character by character onto the tape recorder, then rewind the tape recorder and listen to it. You wouldn't be tying up a teletype line character for character. Has that ever been thought of?

Mr. Willows

The big thing is that you are tying up the output processing unit. You are being charged for this audio channel essentially at the same rate you would be charged for a tape reader or

Mr. Willows (Cont.)

something like that. It's expensive. It costs a lot in computer time. As I mentioned at the beginning, when I do have a lot of output I do get that out in the regular printer, and this braille print mode that I mentioned wouldn't help there.

Mr. Knellinger

My name is Dave Knellinger from Community College of Baltimore.

May I ask you the approximate size of the program that does this, and how much storage space on the disk for the 200 word size?

Mr. Willows

This takes a 600K disk. This could be cut down considerably. I am used to operating in a big way. We have a huge computer facility and this is the very preliminary stage of this. We just wanted to see if we could do it. I think we are working on ways of cutting out leading edges of the sound audio and then the trailing edges.

Mr. Knellinger

This is 600,000?

Mr. Willows

600,000 words on the disk in the voice file. The read controller is like 62K, but I am not sure of that number. I think it's about that. The dictionary file is smaller. There are three files on the disk.

Mr. Knellinger

May I ask you about the output device? Is it a special device or just tied into the terminal?

Mr. Willows

It just takes the data out of the read file through the simple D/A converter. This consists of four resistors and an audio amplifier. This part is very inexpensive.

Mr. Falter

Could you tell me exactly how big one character is on the disk?

Mr. Willows

We've gotten it down to about 4,000, four-bit bytes. We sample at 6,000 cycles per second, digitize this and compress it down to the four-bit bytes. You just try to keep the voice quality up and cut out as much non-informational content of the signal as possible.

Dr. Hallenbeck

I would like to call your attention to Ken Ingham's computer produced speech.

Mr. Willows

I just learned about it shortly before I came to the meeting. I had a short conversation with Ken Wednesday or Thursday morning.

Dr. Hallenbeck

I'd like to ask you whether you have considered some technique of overlapping the actual characters in order to spell a spelled word. Let's say, character N plus 1 begins before character N finished in order to improve the flow of the spelled word. Have you considered this?

Mr. Willows

We really haven't considered too many things as of now. I think there are a lot of things that could be done. In fact, there are a lot of projects going on in compressed speech.

Dr. Hallenbeck

Dr. Ingham's data indicates reading rates up to 120 words per minute can be achieved by the correct choice of overlapping.

Mr. Willows

It's unfortunate that we don't really have that much time or money. As I say, we probably won't do much more on this system we have now. I will probably use it the way it is, and I wanted to bring it to you as something that I am using. I would like to do more on it, but I frankly don't think I will be able to do much more. We will probably just use it as it is. I would like to do more, but I doubt that we will.

Mr. Collard

We have on the panel this morning another member of The MITRE Corporation. Mr. Norman B. Sutherland. As a member of the technical staff I would like him to talk to you about some of the work being done at The MITRE Corporation, particularly with a braille display device.

Paper 7-2

CONCEPT FOR A BRAILLE DISPLAY DEVICE*

Mr. Norman B. Sutherland

The MITRE Corporation, Bedford, Massachusetts

Mr. Sutherland

I am pleased to be here today, to report on a small sensory aids development effort at The MITRE Corporation which I believe may be of interest to this group.

My interest in sensory aids for the blind is quite recent, dating from the spring of this year. At that time, our department was involved in an exploratory effort with the Massachusetts Commission for the Blind, investigating the use of computer-based speech output to support their blind rehabilitation counselors. As we thought about and talked about the problems, I began to

*Note: Subsequent to the date of this presentation, The MITRE Corporation has approved a small development project to be supported from the Corporation's independent research funds.

appreciate, in some small measure, the difficulties encountered by the blind in the acquisition of information, especially in employment situations.

Now, much of the information with which we routinely deal in the business world today is at one time either machine generated or machine processed. The use of such equipment as electronic measuring devices, adding machines, electronic calculators, accounting machines and computers as standard tools is increasingly common. Unfortunately, for the blind, use of such equipment is difficult and often impossible, since the output is intended for sighted persons.

Recognition of this difficulty led to the consideration of methods for displaying machine output in tactile form. A survey of activities in this area indicated that the main thrust has been toward the development of reading machines for the blind, producing either aural or tactile output. Where tactile output is employed, the mechanisms tend to be an integral and sometimes inseparable part of the reading apparatus. My approach has been to treat the output function as a separable function, and to seek a design which could be employed in a variety of applications.

The constraints under which the selected design evolved are as follows:

First - Size. Regardless of any other considerations, the design must produce braille of standard size and spacing.

Second - Modularity. A modular approach was sought, where each module would correspond to one braille cell. This would allow one to combine modules to tailor-make a display of any desired line length and number of lines.

Third - Individual Addressability. It was considered desirable to design the modules so that they could be individually selected and set without disturbing the contents of any other cell. This allows the possibility of operating a group of cells from a keyboard so one might be able to compose and edit in braille.

A variety of design ideas was explored, and one emerged which I feel has considerable promise. The selected design is modular, where each module corresponds to one braille cell. The shape of the module may be compared to a small domino standing on end. The module is about 1 inch high, and the top or end section is 1/4 inch by 3/4 inch. Operation of the module is achieved through a combination of pneumatics and electro-mechanical action.

Each module contains six pins, that slide vertically in six cylinders which are arranged in the standard 3 x 2 braille pattern. The pins are about half as long as the cylinders. Air pressure is the drive force which moves the pins. Through the middle of the module, a thin plate slides horizontally back and forth across the cylinders. The plate contains six holes. When it is closed, the holes are misaligned with the cylinders, and the pins which are at the bottom of the cylinders are blocked or held down. When the plate slides forward the holes align with the cylinders and any pins which receive an air pulse are free to rise to the top of the cylinder. After selected pins have been raised the slide is allowed to close, and now serves as a base plate to hold up the selected pins while continuing to hold down unselected pins.

This sliding plate or pin lock mechanism is opened and closed by actuating a very small solenoid. One solenoid is required per module. The solenoid is mounted so that the push rod operates vertically along one edge of the module. The vertical motion of the push rod is translated to horizontal motion of the sliding plate through the use of a bell crank, that is, a right-angle coupler engaged at one end by the push rod, at the other end by the slide, and mounted to pivot at the vertex.

Viewing either face of the "domino", you would see six holes, passing from one face to the other. Each hole is connected internally to a different cylinder. When a number of modules are joined side by side to form a row, the holes line up to create six air lines which are common to the row. In other words, all pins corresponding to dot one in the row would be on a common line, all pins for dot two would be on a common line, and so forth. The six-bit code for a given character will open or close six valves, one at the end of each of the six common air lines of a row of modules. The code for a given character is delivered simultaneously to

Mr. Sutherland (Cont.)

all modules in a row due to the common air lines, but is only set in the module in which the slide has been actuated to unblock the pins.

The 1/4 inch thickness of the modules yields standard four-to-the-inch spacing of characters when modules are stacked together to form a row.

This particular design yields an interesting potential bonus. The fact that the pins are locked firmly in place after a cell has been set, offers the possibility of embossing directly from the surface of the display to obtain permanent paper copy. Some arrangement such as a rubber-backed lid or roller might be used to get a positive distribution of pressure, and it may be necessary to use a relatively light-weight paper.

Now a few words on applications. I would like to see the concept implemented for at least one small but valid application. The addition of a braille readout to a digital voltmeter is a suggested first choice. This has the advantage of requiring only a few modules, perhaps as few as four or five, and yet would give us some experience with pneumatics and a vehicle with which to test cell design. If successful, this application could be useful to the student taking measurements in the laboratory or perhaps to the employee performing a quality control inspection job.

Other electronic measuring devices such as a thermometer with a lighted numeral readout could be similarly modified to add a braille readout register.

There are a number of desk calculators on the market which display their results in lighted numerals or Nixie tubes. These could be modified to operate a parallel output register made up of the appropriate number of braille display modules. Where possible, modifications of this kind should be achieved by adding a braille capability without altering the original capability, so that the same equipment may serve both the sighted and the blind.

I would like to see a punched card reader equipped with an 80-cell readout so that the entire card could be tactilely displayed at one time. I would suggest mounting the cells in four rows of twenty, with every fifth column of each row identified by raised markings on the frame above the row.

Another application that I think has potential involves the commercially available DASA T3 DATACALL. The DATACALL uses a clip-in cartridge loaded with 3-inch wide magnetic tape. Each cartridge holds 1000 lines of information, with 80 characters per line. The cartridge can be scanned forward to backward rapidly or stepped a single line at a time. The magnetic tape has a paper backing which can be written on to identify the record which is magnetically recorded on the reverse side. A desired record is located by visual inspection of the back of the tape as it is stepped. Once located, information can be read out to a variety of equipment. We use the DATACALL at MITRE for locating and transferring "canned" information such as forms to the Sanders alphanumeric display. Adding a braille counter which steps once for each line advance, and an 80-cell braille display, and by supplying the user with an index by line number to the contents of the cartridge, this device could be used for accessing such information as address lists, price lists, personnel data and so forth.

The applications that I have discussed thus far involve using the tactile display only as a read-out device. However, because of the individual addressability of cell positions in a display made up of the proposed modules, a number of applications may be possible which permit a user to interact with the display through the use of a keyboard. These might take the form of training aids which require student inputs and machine-generated outputs, or even remote interaction with a computer over telephone lines.

To keep a proper perspective, however, let me re-emphasize that I am primarily interested in developing a general output capability which would be viewed as a package, adaptable for use in modifying a variety of devices to supply tactile output.

Regarding the status of the project, we have not progressed hardware-wise beyond the construction of a single test cell. The development is currently in abeyance while we look for project funding. I hope that this will prove to be only a temporary condition.

Mr. Adler

My name is Bill Adler from the Bendix Corporation in Kansas City.

Regarding the pins that are raised up, are they flat metal or are they teflon coated which would be better for a braille reading finger?

Mr. Sutherland

We have not determined what the satisfactory materials would be for the final model. The first model is made from quarter-inch clear plexiglass, and the pins happened to be turned out of brass. I am not sure what the final material will be.

Dr. Nemeth

This is Abe Nemeth. With all of these devices, the first question that comes to mind is when will it be available and how much will it cost?

Mr. Sutherland

The availability I suppose depends a great deal on the available funds to continue the project. As to the cost, we have an estimate from a local plastics firm on costs of machining dies and the cost of turning out cells for mass production. They made an estimate of a rather large number of cells, and it turned out to be about \$4,000 to machine the dies, and about 18½ cents apiece for the plastic parts once the dies were made. You have to add the cost of the pins, that is, six pins per cell, plus a bell crank, a latch plate, and a solenoid which in single lots would cost about \$3 apiece. I think if you buy them in quantity they run about two dollars apiece, perhaps a little less. We are looking for perhaps something like \$3 per module.

Mr. Collard

In July of this year the American Council for the Blind had a conference in Charlotte, North Carolina. We mentioned it to you earlier. At this time I'd like to present Dr. S. Bradley Burson of the Argonne National Laboratories.

Paper 7-3

RECOMMENDATIONS FROM 1969 ACB MEETING IN CHARLOTTE, N.C.

Dr. S. Bradley Burson, Argonne National Laboratories
Argonne, Illinois

Dr. Burson

Thank you, Al, for this opportunity. Let me not read the entire proceedings of the North Carolina meeting, but only one section which I believe is most pertinent.

VII. RECOMMENDATIONS FROM THE CHAIRMAN

Data processing may be termed a "white-collar" occupation. In the past few years, it has come to represent what is probably the most significant vocational opportunity ever presented to the visually-handicapped segment of the population. It is expedient, therefore, to exploit this beach head to the utmost and to establish a firm base. Both tactical and strategic factors must be considered. The maximum number of blind persons should be trained and installed in the profession while the opportunity exists. On the other hand, the long-range impact will depend upon the establishment of a reputation of excellence in performance in the field. These two

objectives are in some measure contradictory and the policies invoked must strike a compromise. The relatively high abundance of job opportunities will enable a number of inferior persons to enter the field, and this will inevitably downgrade the standard of expectation prevailing among employers of blind programmers. Conversely, high standards of acceptability and ultimate job performance may frustrate the ambitions of a few but, in the long run, will establish a field in which long-range security for many persons will be found. Further, in the broader social picture, high-level performance in this profession will inevitably open new vistas of opportunity for all handicapped groups.

Without some specific practical recommendations, such philosophical observations are empty platitudes. I believe the following recommendations can be implemented and may contribute to the objectives at hand.

1. Descriptive Brochure

A brief brochure entitled "Data Processing - What Is It and Who Can Do It?" should be prepared under the direction of some neutral agency or organization (such as the American Council of the Blind). The thinking of all factions involved should be crystallized into a brief descriptive pamphlet which covers two subjects: (1) the nature of responsibilities expected of a professional data processor, and (2) a clear statement of the academic and personal characteristics that best suit a person for the occupation. This brochure should be disseminated to all rehabilitation counselors working in the job-placement field and made available in braille to interested blind persons. It should be distributed to schools engaged in training blind programmers. The composition and format of the brochure should present an acceptable image against which employers might measure a prospective employee.

2. Rehabilitation Services Administration Policy Bulletin on Standards for Admission to Training for Blind Computer Programmers

There are only two portals through which prospective candidates can be screened: (1) the training institutions, (2) the rehabilitation agencies that provide the counselling and funds. There are literally hundreds of schools in this profit-making business, and I know of no organization or agency capable of imposing uniform standards on these institutions. While most of them can be expected to adhere to high academic standards, there is no guarantee; no curbs or remedies are available in the event of default. It is, therefore, not realistic to look to the schools to impose constraints upon themselves which might divest them of their present autonomous power of decision as to which blind candidates they admit to training.

On the other hand, through its control of Federal funds, the RSA Department of Health, Education, and Welfare regularly dictates guidelines, limitations, and policies to state and local agencies. The RSA should prepare a policy bulletin on this subject which should encompass the considerations outlined in this report. In preparing this directive, the RSA should bring together representatives from the newly formed International Association for Visually-Impaired Data Processors, representatives from various training institutions (especially those involved in the training of blind programmers), and in particular, representatives from among the various agencies and industries in which blind programmers are employed. The enforcement of such a policy directive should be subject to the routine avenues of appeal.

3. Standards of Acceptance for Candidates for Training

Both the brochure and the policy bulletin outlined in the previous paragraphs should include the following.

(a) A Bachelor's degree from an accredited college or university should be considered adequate to satisfy the academic requirement for admission to training. (This is not intended to exclude other requirements.)

(b) Persons who are not graduated from an accredited high school should automatically be excluded. Persons who have no academic training beyond high school should be further screened before being accepted. It is suggested that for such persons some testing might be advisable. Numerous proficiency tests exist, such as those used in college achievement ranking. For instance, if the high school graduate does in fact know his high school algebra, he may

actually be better qualified than the college graduate, and testing can aid in determining this. Such tests are less subject to uncertainties than are psychological and aptitude tests.

4. Recommendations in the Area of Training

The following considerations might be invoked by both schools and rehabilitation agencies simultaneously.

The rehabilitation agency should provide the counselor, the student, and the school with a written schedule of requirements. The schedule of requirements should enumerate the physical facilities to be expected, the minimum curriculum standards to be fulfilled by the school, and the list of periodic supervisory responsibilities to be performed by the counselor. This schedule should be made a part of the training contract to which the trainee is a party. The rehabilitation agency should be expected to enforce the agreement on behalf of the trainee. Such a schedule of training can readily be worked out between experienced counselors and administrators from the schools with experience. This schedule would relieve counselors from unjust accusations of dereliction of their responsibility (except perhaps when they are guilty of it.)

5. Standards of Training Institutions

The Department should include in its directives on this subject a statement of minimum standards for schools desiring to train blind computer programmers. Such minimum standards should include specifications of the physical facilities, number and qualifications of staff members, and criteria for curriculum.

6. Braille Resource File

A central library facility should be selected and maintained for the purpose of transcribing into braille appropriate technical material and making it available to students and practicing programmers. This resource should be funded through some appropriate government agency so that quality and availability will be uniform. If the rehabilitation agencies or the Library of Congress do not have sufficient fiscal channels available, this deficiency should be remedied by appropriate Congressional action. The American Council of the Blind can be instrumental in this area.

7. Why an Organization of Blind Computer Programmers?

If one takes the trouble to examine the areas in which this report indicates deficiencies, he will discover that with few exceptions they are the consequences of failure to include the blind programmers themselves at the administrative and policy-making levels. While the idea may sound revolutionary and come as a shock to some, the people most qualified to judge the significance and magnitude of a common problem, such as blindness, are those who are encumbered with it. At a conference on programming a few years ago, the question was raised as to how many blind programmers were among the conferees. There were none! Such situations demonstrate the point; they offend the intelligence and self-respect of the group in whose behalf the efforts are being made.

There is but one way to reverse this established practice: the group itself must pool its resources to provide the leadership needed to reshape social attitudes and customs.

The interests and problems common to blind data processors fall into three categories: (1) problems arising out of their mutual physical handicap; (2) problems relating solely to their professional activities; and (3) problems that combine aspects of the first two, and are unique to the group. It is the third category that creates the motivation and justification for the formation of a separate association. This is the common denominator of the group. Thousands of questions arise which must be solved by the blind data processor simply because that is what he is. For example: Can program specifications be best prepared from braille notes or from tape recorded conversations with the customer? Should card decks be punched by presenting typed sheets to the key-punch operators or should they be made by the programmer with a portable punch at his desk?

Dr. Burson (Cont.)

An organization sets up routine channels of communication, calls meetings, disseminates new ideas of common value, and provides an on-going body of knowledgeable, involved people from which leadership can be drawn. It provides guidance to the training institutions and rehabilitation counselors. And, finally, it serves as "big brother" to "watchdog" the policy makers and administrators to ensure that high standards are established and maintained.

To function effectively, the organization should be autonomous - operating under its own charter, by-laws, and board of directors. The association should enlist the support (both in manpower and in funds) from the collateral groups involved, such as the manufacturers of computing equipment, the training institutions, and the rehabilitation organizations. The structure of the organization should ensure control by visually-handicapped data processors, but must not exclude the participation of interested sighted colleagues. The association should establish an on-going relationship with the American Council of the Blind so that the broader resources of that organization are available. Similarly, a close liaison should exist between the organization and the specialized professional groups, such as the Association for Computing Machinery.

Just as we could not expect our seminar discussions to exhaust the various aspects of the subject under consideration, neither can I hope to exhaust the field of possible solutions to the problems. I have attempted to strike at but a few of what seem to be the most urgent and significant areas and to submit a few suggestions which I believe are subject to implementation. The most urgent recommendation of all is henceforth to involve the practicing and experienced blind data processors in all deliberations and decisions that affect them.

Mr. Jones

As the first official act of the organization, I would like to thank Al Collard and Bob Gildea, and I suppose I will miss somebody, but I would like to thank all of the people who have been responsible for this excellent conference. It's so full that I am sure that I will go back home and be four weeks digesting all this, and I think that is probably true for most of you who are here today.

We did feel and still do feel the need for the blind programmer, the guy that is working every day, to have a voice, a vehicle by which he can communicate and receive information, so we organized. I was elected president. We elected a board of directors of seven people who come from seven different geographic areas; Washington, D.C., Colorado, Oklahoma, Pennsylvania and some others. If this organization is to succeed, it's going to be your organization. Hopefully, you will support the organization.

We enter the field not to take over anything else, but to supplement whatever the interests of the blind computer programmer or the blind person in the field of data processing lies, wherever his interest can be improved.

At this point I would like to tell you about a couple of things that we did last night. We did make anyone who joins prior to January 1, 1970, a charter member of this organization. We did agree to have our next meeting in Oklahoma City, the approximate dates being the first Monday and Tuesday of the middle week of July. We plan not only to have a meeting at that time, but we do plan to have a seminar similar to this one here, perhaps not as fully packed, since this has been an excellent one, and we would certainly welcome the help of the people at ACM, the people at ACB, and the people at the NFB.

We do not like to think that this is going to be just another organization for the blind. We feel this is an organization of professional people who happen to be blind and who are also in the field of data processing. Mike Mady, who was elected to be our treasurer, will be available to accept membership dues. Membership dues are \$10 for individual members, \$10 for organizational members, and \$5 for people who wish to join as associate members.

I won't take up too much more time, but I will say this. I was elected President. I did accept, not because I felt I was particularly qualified, but because I felt sincerely that someone should try to promote this type of organization.

Dr. Burson

We adopted one resolution, and that resolution was that the Board of Directors be empowered to implement forthwith all of the recommendations that arise both from this conference and from the seminar in Charlotte. The idea being that this organization isn't going to be one unless it does things. There are enough things spelled out for us to do. The time to start is right away. There are 21 people officially registered. We know of at least 20 more who are not at this meeting, so there is a quorum of at least 40-45 people who are going to belong to this organization.

If there are any questions, I will try to answer them, and we hope you will join up and get this thing going.

Mr. Collard

There are many things that this conference hoped to produce. I think one of the most significant things is the organization of this professional association, and I would like to congratulate Ray Jones on being elected President.

Copies of the proceedings of the ACB seminar can be obtained from Dr. S. Bradley Burson at Argonne National Laboratories, Argonne, Illinois.

Dr. Lois Leffler of the Argonne National Laboratories has offered to act as Chairman of the subcommittee for the development of a placement package. Others who volunteered were Norris B. Gordon, Berl Colley who is a programmer from the State of Washington, and Paul Cherry from Nationwide Insurance also indicated his willingness to assist.

Mr. Bull

I would like to ask Ray Jones if the VIDPI organization is going to be in collaboration with Bob Gildea who has done a lot of work on the Newsletter. We can't split at this stage. We want one organization, if possible.

Mr. Jones

I agree with that 100 percent. We don't want to come in and take over anybody else's doing. We realize that the blind computer programmer and the blind individual in data processing should have a say in the future - future problems, future solutions to these problems, and this type of thing. We certainly hope that we can work with all existing groups who have done a tremendous amount of ground work in this area. I can't speak for his personal feelings toward the organization, but I faintly recall yesterday that he endorsed, at least from the platform, the principles of the organization of blind computer programmers. We don't want to run anybody else out of the field, because these people have done a tremendous amount of ground work and probably, were it not for them, many of us would not be employed, including myself.

We don't want to be disrespectful of any of the work that has preceded ours, or any work that is going on. We do hope to help the persons in data processing to have a voice in these matters.

Mr. Collard

I would remind you in Dr. Sterling's opening remarks, he said that if such a professional organization did result from this conference or subsequent conferences, there is no problem with affiliation with ACM.

Dr. Hallenbeck

I would like to comment on this. I would like to support the group that has just been organized. I indicated my own personal endorsement of it yesterday from the platform, and Bob may not be here this morning, but I am sure I can reflect his own support of the group, and I am sure he will do so as the opportunity arises.

We have had communication between Bob and myself as representative of the Newsletter, and the group who have been organizing the VIDPI organization. We haven't had as close contact as we would like to have, but we are here, and if there is any way in which the Newsletter can be used as a part of the VIDPI organization, we are ready and willing to do everything we can to support it. Neither Bob or I can speak on behalf of ACM other than individuals who happen to belong to those groups, but we can speak for the Newsletter and its policies, and we would like to do that at least.

Mr. Jones

I would like to thank Dr. Hallenbeck because without people like himself, Bob Gildea, the gentlemen from England and people like Dr. Sterling and Mr. Collard, without these people we couldn't possibly have any success, and we realize this. So the effort as far as I am concerned should try to bring out the forces working together, not one of them subordinate to the other, but as promoting the interests of the blind person in data processing.

Mr. Collard

Let me say that I totally agree with what Dr. Hallenbeck said. In other words, you have the unqualified support of Bob Gildea, Chuck Hallenbeck, and myself.

Dr. Burson

The point is there is nothing which is not part of this group. All that has been done is to establish the machinery. There are 21 listed members right now. As I told some of the people the other night, if they can't get there, I don't care. If there are five people there, that is all you need. All you have to do is take it over, and here it is.

Mr. LaGrone

Mr. Chairman, as Chairman of the Steering Committee of the Organization of Visually Impaired Data Processors International, one of my first acts, and Bob Gildea and Chuck Hallenbeck will be witnesses to this, was to call their attention to the fact that we had organized and what our aims, goals and purposes were. One of them, I don't know who it was, whether it was Bob Gildea or Chuck Hallenbeck, said he would convey to Al Collard what we had done. I got back the statement that everyone seemed to be sympathetic to our cause, and as long as we could cooperate together and work together we could do a lot of things. So I think the gentlemen from England need not have any concern, and I would like to say to Mr. Bull that he become a member of our organization. He can either represent the British Society - I think Mr. Bull is blind - he may be a member, or if he is sighted, he may be an associate member. Everyone, regardless of where they are, is certainly invited to be with us and work with us. We solicit the help of anyone interested in electronic data processing.

Mr. Collard

Thank you very much.

Our next speaker this morning is one of the most dynamic young men I have ever met. He scarcely needs an introduction, because I think he has talked to each and everyone of you already. Mr. David Mick from the Air Force Special Weapons Laboratory in Albuquerque, New Mexico.

HARDWARE DEVICES

David Mick

Air Force Special Weapons Laboratory, Albuquerque, New Mexico

Mr. Mick

I would like to discuss some hardware devices that I or other individuals at Albuquerque have designed.

One of these devices is a modification to the CDC 1612 high-speed printer. This is a drum printer similar to the Honeywell. I am sure you are all familiar with it. Our particular machine has 120 print hammers. Opposite the print hammers are 64 characters that are represented by punched card codes. As you know, in order to emboss braille on the IBM high-speed line printer, you place a piece of garterbelt across the hammers and emboss by using the period. I tried stretching a piece of rubber across the print hammers on the CDC 1612. It impinged the paper against the revolving drum and it ripped the paper. So we had to get around this. Also, the line spacing on the 1612 is six vertical lines per inch, but ten lines per inch is needed in order to obtain approximately standard dot-to-dot spacing of one-tenth inches on center. A very clever electronics design engineer by the name of Gerry Hittinger, who has since transferred to Wright Patterson Air Force Base, promised me that he'd be here this morning, but so far I haven't seen him. He is an electronics genius, and he came up with a modification to change the printing from six to 10 lines per inch. A perforated tape determines the format of the paper. It has a little axle wheel. We modified this by attaching a little disk, with 40 slots in it. We used the slots to chop the light from a light bulb shining through the slots. On the other side we had a TILS 600 photocell, and in conjunction with the circuit, Gerry used a resistor switch and a mercury cell, and that was it. He unsoldered two wires which were the output from the magnetic pickup, resoldered the photocell, and when this switch is in one position it gives six lines per inch on the CDC. When you flick it to the other position, you get 10 lines per inch.

For the embossed braille, I put 120 ball bearings on a piece of six-inch wide aluminum channel, which is held around the drum. A piece of rubber is placed opposite the hammers. You don't have to change the carbon on it.

I am going to summarize all my work in one minute. I have been working on a device called a UNIBRL Reader which will bear fruit shortly. I hoped to have it here but I didn't quite make it. Basically, it is an input-output device which I think will solve some of the problems. I have papers written on this. I will just say that everyone of you who wants copies will get a copy of it. I sent out to twenty-nine selected people papers in draft form of the UNIBRL Reader. To get these published in open literature we have to get clearance in Washington, D.C., and then we will have it published in the Air Force Weapons Laboratory, and it will be printed as a TRNR Lab. Report. It will be sent to the government printing office and micro-filmed. You can also get Xerox copies of the detailed drawings of my device, and you can make this device for yourselves. The parts cost \$150. The machining, I don't know what that cost will be.

I would like to mention the MIKBRL cell concept. It's a four-by-two matrix. The first column has numbered dots as follows: One, two, three and "X". The second column is four, five, six and seven. The dot "X" is always embossed in every MIKBRL cell. The interdot space is one-tenth of an inch. The horizontal spacing between dots one of adjacent cells is one-quarter of an inch, and the vertical dot spacing can be four-tenths of an inch, or five-tenths of an inch.

You can read the braille cell with your finger. Even a child can do it, and this is based really on Professor Foulke's research. The advantage is that it's one braille cell which represents 128 unique combinations which are not ambiguous. The dot "X" is always embossed. If you have one dot on a piece of paper that is the dot "X". You have a reference system, and in examining computers in existence today, I have seen none that use more than 128 combined print characters and functions codes of eight-level, odd-or-even parity perforated tape codes.

Mr. Mick (Cont.)

I am talking about now the Model 37 teletype machine which is not on the market to be purchased by the public, that uses 94 inkprint characters and the rest are function codes.

I realize that the IBM 360 computer system is capable of punching and printing 256 unique combinations, and people, as a result, feel that they need this many boxes on the card reader. If you want them, I can give them to you, but the UNIBRL Reader is designed to handle 128, and it can be designed to give the braille cell output as well as the column count number.

Session 8 - THE SUPPORT PROBLEM - WHAT ARE THE SUPPORT PEOPLE DOING
TO IMPROVE THE SERVICE PROVIDED TO THE BLIND PROGRAMMER?

Mr. Collard

The chairman of the next panel, Mr. Don Staley, spent 25 years in the broadcasting media in sales and administration prior to joining Recording for the Blind in 1964.

He was born in Denver, Colorado. He was educated in California and has a B.A. from the University of California at Berkely. He was a Lieutenant j.g. in the Navy in World War II. He is a member of the National Accreditation Council on standards for production of reading materials for the blind and visually impaired, and Chairman of the Reading Materials Committee which has been developing standards sorely needed, and which are being submitted for approval for next year's national conference.

Mr. Staley

Thank you very much. I think the primary function of the Chairman of a panel is to assemble qualified expertise in the form of knowledgeable panelists, and this morning I am happy to tell you that we have this here. Each one of the panelists is limited to 10 minutes so that we can get through the whole session if possible, and have some questions from the floor, if there are any.

As you know, we are concerned with producing support in the way of reading materials and other aids in any way we can to blind computer programmers, and of course, in recordings for the blind to all blind students and professionals in whatever field.

Briefly, so that I can turn this over to the other members, I think probably most of you know about Recordings for the Blind. It's a national organization where 4,000 volunteers around the country read and record any kind of educational material requested by high school or college students, graduate students, and professional and business people. Among the 4,000 we have a number of highly specialized technical readers who have in the last couple of years turned out some 116 titles of computer programming material.

Everything we record, and not only in this field, but everything we record, is kept on a master-type tape so that we can provide it quickly to anyone else who needs the same tape. We have supplied 36,000 free books to over 5,000 students in the United States. The titles we recorded in your field, incidentally, have an average circulation of seven times, ranging anywhere from one to twenty-nine times, depending on the title. We have specialized in manuals from IBM and RCA which companies record these for us.

Each book is also monitored by a second volunteer to make sure that the reading is properly done. So much for Recording for the Blind.

I would like to introduce the panel. To my left we have Paul Duke, who is a technical consultant and member of the Board of Directors for the Volunteer Services for the Blind in Philadelphia. He is a veteran of the Korean conflict. He received injuries which resulted in bi-lateral blindness. He received the Navy Unit Citation, the Korean Government Citation, the United Nations Citation, the Presidential Unit Citation, and two Purple Hearts. He graduated from Syracuse University in 1952, magna cum laude, attended Harvard Graduate School of Business Administration, and received a Master's Degree from the Wharton School of Finance and Commerce, University of Pennsylvania in 1959. He has been affiliated with the Radio Corporation of America, Camden, New Jersey since October of 1966. He is responsible for the design, programming, and implementation of an engineering shop-order information service.

Tom Benham has a B.S. and a M.S. from Haverford College. He joined the Haverford faculty in 1942 in the Department of Physics and is currently Associate Professor of Engineering. He is the principal investigator for the Bionics Instruments laser cane funded by the Veterans Administration. He founded Science for the Blind in 1955.

Mr. Staley (Cont.)

He has been blind since the age of two, and was one of the first, if not the first of the blind persons to graduate from college with a physics major. He is a Fellow of the Institute of Electrical and Electronics Engineers and is a recent recipient of the "Handicapped Pennsylvanian of the Year" award given by the Governor's Committee on Employment of the Handicapped.

The gentleman to my right is Vito A. Proscia. He is a systems engineer with a background in physics and electrical engineering, and is the director of the Center for Sensory Aids Evaluation and Development at the Massachusetts Institute of Technology.

Mr. Proscia lost his sight while in elementary school in New York City and completed his preparatory education at the New York Institute for the Blind in the Bronx, and then went on to earn his Bachelor's Degree in Physics from the City College of New York and a Master's Degree in electrical engineering from Columbia University. The MIT Center was established to evaluate, field test, and bring to engineering readiness devices that might aid persons deprived of one or more of their senses, particularly sight, in moving about, in employment, and in other life activities.

Since I am going to ask the gentleman on my right to speak first, I will pass by him and present the gentleman to my far right, Harry J. Friedman.

Mr. Friedman is employed by the Perkins School for the Blind since October, 1961 as Manager of the Howe Press. Quite modestly, he says he is somewhat responsible for the manufacture of more than 52,000 Perkins Brailers during the last eight years, and a few other new products and services.

His prior industrial background includes responsibility for electronic and mechanical assembly of radar systems for B-58 and B-52 military aircraft, miniature potentiometers and machinshop products.

He defines his responsibilities at Howe Press, "To provide hardware and services to handicapped people, that they may be better prepared for employment and financial independence".

In looking over the position papers of the panel, I thought, from a voluntary organization standpoint, the paper which Mr. Krebs is going to give you summed up our problems probably the best way possible, and so I thought I would ask him to make the opening statement, and then we will proceed to the other panelists.

Bernard M. Krebs is the Librarian for the Jewish Guild for the Blind which transcribes and circulates textbooks and general literature for borrowers throughout the United States and foreign countries. He is the Chairman of the AAWB-AEVH Braille Authority. He is a member of the Committee on Tactual Representations of the National Accrediation Council, and author of Transcribers Guide to English Braille, Lessons in Braille Transcribing, an instruction manual, and Braille in Brief, an instruction manual for the learning of braille reading.

Paper 8-1

A SIX-POINT PROGRAM

Mr. Bernard M. Krebs

The Jewish Guild for the Blind, New York, New York

Mr. Krebs

The advent of the computer into the business community has provided the launching pad for enhanced employment opportunity for blind people. Within the past decade fully competitive and well-paying positions have become available to well trained, capable individuals whose abilities range from keypunch operators to program analysts. The shortage of qualified

Mr. Krebs (Cont.)

personnel has in great part opened the computer field to blind people and it is essential that this fact be taken advantage of through accelerated training courses and alert placement services.

The continuous flow of improved or new hardware into the computer field creates a real problem in providing updated or new manuals in braille or in recordings for each specialized type of equipment. It is basic that computer personnel be supplied with the appropriate reference manuals to assure their continuing capacity to cope with employment demands. Up to the present time volunteer recorders and braillists have been supplying a limited variety of instruction and reference manuals in a more or less haphazard manner at the behest of individuals or training centers. If employment opportunities are to continue to exist or to expand, steps must be taken to establish an organized productive program of supply of essential materials. To accomplish this, the following modes of procedure should be taken under consideration for implementation.

1. The Braille Computer Code must be fully developed and standardized so that volunteer transcribers will be provided with the tools to service requests.
2. A reference center for existing recorded or brailled computer materials should be maintained to furnish immediate information on available publications.
3. A registry of knowledgeable braillists and recorders should be established to allow for speedy assignment of new required text materials.
4. A planning council is required to keep abreast of developments in new hardware and to determine the order in which new materials should be processed.
5. An editorial committee can be helpful by reviewing updated manuals in order to determine whether part or all of the text requires replacement.
6. Although volunteers have and can continue to serve effectively, if the employment of an individual may be jeopardized due to the lack of required materials, serious consideration should be given to the possibility of engaging a qualified staff of recorders and transcribers who can meet required deadlines.

A fair supply of basic and supplementary computer materials are now at hand and thermoform copies are being provided at material costs. The Braille Authority has been endeavoring to seek the cooperation of blind programmers in working through a standardized Braille Computer Code. When this code becomes available, many more volunteers will be enabled to expend their services in providing a more adequate library of computer information.

Mr. Staley

Our next panelist is Paul Duke.

VOLUNTEER SERVICES FOR THE BLIND

Mr. Paul Duke

Radio Corporation of America, Camden, New Jersey

Mr. Duke

As Mr. Staley indicated, I have been familiar with Recording for the Blind since 1952. I think they read me through freshman or sophomore political science.

The first thing I presume will be of permanent interest is the production of manuals. Volunteer Services to the Blind has on file many IBM manuals, as well as RCA manuals and Honeywell and Burroughs information, most of which has been transcribed by hand and is available at material cost. Many of the IBM manuals are available in the new computer-generated braille. The process for securing computer-generated braille is for the user or the client requesting the braille to secure a copy of the format in inkprint image on magnetic tape from IBM and send us the tape. We take the tape to INA where it is translated into braille and embossed on the IBM 1401 printer.

I would like to discuss some developments which might be of interest here, some of which are very recent, like just the other day, and a few tests that myself and my associate, Nancy Andrews have run.

We find that for a small agency, it is very difficult to justify the cost of a high-speed embossing device. The technical advantage of the braille chain on the 1403 printer is, of course, outstanding. There is nothing I can say that would in any way detract from it from the agencies' point of view.

Generating braille with the on-line printer may not be financially feasible. We can get donated computer time from any one of the users, and from any number of people on the Board of Directors, but at the same time we find that this again makes us beholden, and does tie us to one site.

I took a tape on one test, I can't recall the name of the text, and I ran it into the computer at INA. Rather than going directly to the on-line embossing situation, we went to a braille output tape. This again was the braille image on the magnetic tape. To emboss manually took two and one-half hours. To translate it took 12 minutes. If we had the ability to go to the free-standing printer, we would then be able to fill the previous translated tape and emboss to our heart's content. If we would get a request by phone or mail in the morning, and if the printer were available, we could then mount the tape and have it out in the mail that afternoon.

With the cooperation of Bell Telephone, we took this tape, with counsel and guidance from Mr. LaGrone of IBM, to Bell Telephone, and after almost wrecking a \$65,000 piece of equipment, we did succeed in generating braille on the free-standing Analox 716. We have also taken steps to members of the Board to secure an Analox printer, and we understand there are several possibilities that they have available. There are a couple of engineers who are going to supply free engineering time in an attempt to design a free-standing high speed printer which takes magnetic tape already translated in a braille image on a computer. The device will be oriented to a small agency right now. Brand new, it will cost from \$15,000 on up. The obvious thing here is to reduce the embossing time so that embossing can be done right at the agency. No training will be required. It will be a simple matter of mounting the tape similar to the tape recorder.

There are a few other things that have come to my attention which are a little more interesting. There is a data processing technique called "text processing" which was originally developed by IBM. It has many brand names. Some manufacturers call it Text 360. Some of them call it Data Text. Some call it Autoform. There are a few others available in the Philadelphia area. The Text 360 is available at Burr and Wurtaugh, and it's available at Pennsylvania Research Associates at the University of Pennsylvania.

Mr. Duke (Cont.)

The Autoform is not yet fully implemented by RCA.

The important thing to understand here for those of you who are concerned with the development and production of braille, is that a text processing system amounts to a computer technique which will accept input from a keyboard. I'd rather stay totally away from brand names. There are a dozen different kinds, and to each his own as to which ones are better. Essentially it's a typewriter keyboard which can be operated by any clerk-typist. They use certain codes. For instance, in developing input, they use maybe 15 instruction codes. This reduces the inkprint data to a processable medium, which in computer terminology, is massaged by a computer. By instructing a machine through various techniques the program creates on magnetic tape an inkprint format with the proper page being numbered, paragraphing, titling, and so forth, just about any material which you can reduce down to a typewriter input.

The typewriter vertical spacing is variable, such as on the IBM. You can half space and quarter space, both vertically and horizontally. Once this inkprint input, I say that to differentiate it between print and braille, is reduced to a processable medium, it goes through this particular program which creates a tape. This is something which is surpassing, or let's say replacing, the old compositor tape, the old type-setting technique. This tape can then be passed through several other devices. There is a photon tube. There are video display units and oscilloscopes. There are brand names. We call ours Videocom. This is not yet available. There is one organization which has this available, and it is working and functional today. I tried to set up a demonstration, but the gentlemen couldn't get the device here. The end result is this. It is totally and absolutely technically possible and feasible today to sit in a given location and transmit over a device similar to a typewriter operated by a clerk-typist, who can be trained in four to eight hours, to transmit inkprint information to a computer location, and that location literally can be anywhere. This data is placed on a magnetic tape and processed into an inkprint image on magnetic tape in a page format such as a textbook. It is then possible to take this tape into a program such as the one developed by Bob LaGrone and translate it into Grade 1 braille, and simultaneously using microfilm and photo reproduction techniques, generate large type up to 24 point type. This can be done with the speed that it takes a typist to type the information. At the same time using various techniques, processing techniques, it is possible to update or change that material. Last year we spent about \$18,000 on Kodak equipment. You can take that, using other photo reproduction techniques like Kodak equipment, and reproduce other images into a format which could be used by those people who have some vision. While these services are available, most, in fact, none, I believe have today incorporated the automatic ability to translate braille. At the VSB I hope to run tests within the next month transmitting to Washington, D.C. Perhaps that will be translated on the IBM 360. The large type will come onto the photon - I forget the model number. I was hoping to have it today. Next week I hope to have it in Riverton, New Jersey. I hope also to try a Grade 2 translation with a program which was developed under the supervision of Bob LaGrone. If the Grade 2 translator can be made available, and without a lot of funding, if there is enough of my time, Bob's time, and any associate's time, and if a proper organization would fund it, and I know of one, and its initials are MIT-SAL, this can be done. I say this with emphasis today without any further discussion. Bob LaGrone's Grade 2 translator sits and waits to be implemented. It will need a shake-down. Mr. Proscia has spent considerable time and money on the embosser that is now functional and working in the other room. Text processors are available to every agency represented here, both in a time-sharing environment or in a batch environment. They can be had in many cases, and I am sure vendors will release them for free. You can avail yourselves of computer time on the service bureau basis for free.

The telephone company in Philadelphia has agreed to cooperate with Wats lines. Most of the consulting firms - they are in it for money, but one in particular is only charging \$3.50 an hour to hook up the training terminal. All we need to do is act.

Mr. Staley

Next we would like to hear from Tom Benham.

THE SUPPORT PROBLEM: WHAT ARE THE SUPPORT PEOPLE DOING
TO IMPROVE THE SERVICE PROVIDED TO THE BLIND PROGRAMMERS?

Mr. Thomas A. Benham

Science for the Blind, Bala-Cynwyd, Pennsylvania

Mr. Benham

SCIENCE FOR THE BLIND is a supportive agency. We are seldom directly concerned with the education, employment, or rehabilitation of blind persons. However, we assist in all three. Where computer programming is concerned, we are prepared to help - provided those in the direct service fields will let us know what is needed. Since we are not working directly with blind "clients", we are not fully cognizant of the day-to-day problems which the blind programmer meets. However, we do have facilities to put material on tape and circulate it; we have facilities for production of small instruments and aids; we have the capability to embark on full-scale research and development projects if the goal of the project and its need can be clearly stated to us.

Individuals working on company time can develop items without a formal presentation of the need. For example, Jim Swail has developed a simple card reader at The Canadian National Research Council, and David Mick has developed a sophisticated one at Air Force Weapons Research in New Mexico. As long as people and companies are available to do this kind of work on a no-cost basis when it needs to be done, this is a highly satisfactory way of handling the problem.

For a non-profit organization like Science for the Blind to undertake such development work, funding must be secured from government or private sources. In order to obtain funds, we must have some formal statement from those who are patently knowledgeable in the field.

We have felt in the past, because we have been asked to help, that our help was needed. Where we have had sufficient information, we have proceeded: e.g., in producing COMMUNICATIONS OF THE ACM on tape (we currently send out 50 copies a month) and in making available a light sensor by which a programmer can tell which lights on a computer panel are on and which off. However, in spite of our repeated assertions of a willingness to do anything we can, we have failed to receive the input necessary for us to produce anything of significance. If our help as a supportive agency is not needed beyond what we are currently doing, then this is no great loss. If it is needed, though, we recommend that a committee or association be formed, composed of people who can interpret from individual problems the kind of help needed and set down the requirements for this help in a form which has "credibility" so that Science for the Blind can use the information as the basis for securing funds from external sources for large projects or for allocating SFB funds on smaller projects.

We are in a position to start from scratch on projects, or to take projects such as Mr. Swail's or Mr. Mick's and work out final manufacturing procedures and produce the instruments. In the case of very expensive instruments, we can likely find funds to subsidize the cost.

We are not experts in the computer field. We do not even own a computer. We can help significantly only if we are given an expert sense of direction. Given this, we are anxious to help in any way we can.

Mr. Staley

I will now ask Mr. Proscia to speak.

M.I.T. HIGH SPEED EMBOSSEER AS SUPPORT TO THE BLIND PROGRAMMER

Mr. Vito A. Proscia

Sensory Aids Evaluation and Development Center
Massachusetts Institute of Technology, Cambridge, Massachusetts

Mr. Proscia

This communication problem which does exist as far as who is doing what and where, and how do I get there, and how do I get the information, is also the problem which I will be talking about, in terms of getting information from you.

I have a paper here in braille which I will read. It's called the "M.I.T. High Speed Embosser as Support to the Blind Programmer." The M.I.T. Center for Sensory Aids Evaluation and Development has, from its inception, under the direction of the late John Dupress, been concerned with the problem of allowing braille to become more accessible to the blind. In fact, M.I.T.'s general philosophy is that we would like braille to become available and accessible as print. Our goals have not been realized; however, we have experienced and demonstrated some significant breakthroughs.

As early as a year ago the Center was responsible for a successful production of a braille novel concurrently with the inkprint edition by utilizing the compositor's tape as input medium to the braille program. The publication was the East India Man by Ellis K. Meech, and marks a new departure from braille materials for the computer braille programmer. There have been over 300 books and magazines published at the American Printing House for the Blind for the past five years by computer processes for which the original typesetting had been done on keypunching machines. The same punched tape used for composing the type for the original inkprint text was employed as input to a series of computer programs. The output of these programs was the usual deck of punched cards to be used as input to the stereograph. Many agencies and people cooperated with the Center and its project, including the Library of Congress, the American Printing House for the Blind, IBM, and consultants from the Center. It is hoped that this process will make more braille material more quickly available to the blind.

In the braille programs conducted at M.I.T. as well as many other programs, many of the devices developed and evaluated at the Center have originated in the students' theses program of the Department of Mechanical Engineering. Examples of these in the area of braille are the Blackman continuous belt reader, which is similar in some respects to the Argonne National Laboratories reader, the monotype tape reader, and the M.I.T. High-Speed Braille Embosser. The student and faculty participation in initiating these projects play an important role in determining the feasibility of the devices under study. These aids are then transferred to the Center for future engineering production, development, and extensive evaluation under field test conditions.

This collaborative process of the research, development, and evaluation constitutes a unique approach to solving problems in sensory aids for the blind. Not only does the student involvement demonstrate the feasibility of these devices, but it also creates an environment where the young and talented individual is exposed to the problems of sensory deprivation. In addition, the concepts, ideas, and devices generated by the student and faculty activity are not neatly tucked away on shelves to gather dust. In collaboration with, and including the interacting period of joint participation, the Center takes on the responsibility of many of the programs.

The use of the time-shared computer as the means of providing instantaneous braille from keyboard input and remote braille consoles has been and is being demonstrated at the Center. The braille presented to the console can be of two forms; the Grade 2 braille via dots stored in the IBM 7094 CTSS system at the Computation Center of M.I.T., or the single character braille which is a one-to-one correspondence of the ASCII code utilizing 63 characters of braille.

Last year, a two-month demonstration was held at the Perkins School for the Blind providing them with remote instantaneous interacting braille. A teletypewriter and the M.I.T. High-Speed Braille Embosser were connected by telephone lines to the M.I.T. time-shared computer. This system was able to provide Grade 2 braille to the user, although not without difficulties.

At present, a full time system is in operation at the Center. Plans for this installation were laid in January to test a prototype Brailier which was to be ready in February of this year. The Embosser used in this system has produced over ten million characters of braille. The failure of a \$40 part did occur after embossing nine million characters of braille. We expect the machine to last many more years. Several installations are planned for the time-share mode.

The present design of the Embosser has been made possible through a grant from the Hartford Foundation. This grant allows for the production of twenty machines. The redesign was conducted by the Instrumentation Laboratories of M.I.T. with the support of certain staff and consultants. A braille character chart has been prepared, has been distributed, and is available. However, I would like to give you a few characteristics of the Brailier.

It uses a fan-fold track drive. The paper is the heavy-sized paper which is 11 by 11½ inches. It uses 25 lines of braille per page, 38 cells per line. That is in the standard machine. The chart also discusses and describes a machine function of various inputs and also codes.

The main purpose in my being here today is to describe the Embosser as a braille output device which can be utilized by blind programmers. One of the models displayed here today has been specifically designed for immediate accessibility to braille by the user. The display machine will have one additional modification. Instead of 38 cells per line, the embosser will be expanded to a 42 cell line. The machine on display has a lift-up platen allowing the braille to become immediately accessible to the touch.

Since June of this year, a blind programmer has been able to come to the Center according to plans which suited his schedule, switch on the system which was made available for his needs, and communicate with the time-sharing computer in order to carry out his very important work on systems analysis in the Department of Economics in M.I.T.

Michael Lichstein has written an unsolicited paper which we are going to share with you, and perhaps you may have a copy already, on his experiences with the time-sharing computer utilization of the M.I.T. High-Speed Braille Embosser.

Mike feels that the Embosser provides the blind programmer with the same advantages as other programmers in the time-sharing mode. That is, whatever the computer can provide the sighted, it can provide the blind programmer with a braille duplicate of this material. This is for both input and output.

Mike says in his paper, and I quote; "This means that in a large number of cases, it's possible for the blind investigator to carry on his research independently, or as a fully functional member of a group. The tedious problems of data collection which are literally impossible for a blind individual, are to a large extent solved. Further, complete compatibility is available with a sighted co-worker since both braille and print outputs are obtained. It is thus possible for two investigators, one blind and the other sighted, to work side by side, receiving the same information with no time lag. It is this type of interaction which makes a blind individual a fully functioning member of a research team."

Mike Lichstein is a second year graduate student in the Department of Economics of M.I.T. He is studying under a NSF Fellowship, and is working toward his Ph.D. in Economics. His interests are primarily along the lines of economic theory and mathematical economics. Mike's contribution to the Center has been very much appreciated. His innovative ability as a researcher and experimenter has paved the way for the installation of similar systems.

As I indicated earlier, a limited number of machines will be constructed by June, 1970. Some of the Embossers will be used in evaluation and demonstration programs which have been

Mr. Proscia

planned for the future. However, if any of you are interested in procuring an Embosser, it is essential that you make your requests in writing to the Center in order that we may pursue the appropriate course of action for manufacturing purposes.

May I emphasize that your letters will be indicative as to the level of action the Center will take.

We have brought several documents with us, and we would appreciate it if you would make an attempt to pick them up and read them. One includes the Mike Lichstein paper on making braille as accessible as print, and we also brought a picture of the present Embosser installed.

Mr. Staley

Thank you very much, Mr. Proscia. We will conclude the panel presentation by calling on Harry J. Friedman.

Paper 8-5

ACTIVITIES AT THE HOWE PRESS

Mr. Harry J. Friedman

Howe Press of Perkins School for the Blind, Watertown, Massachusetts

Mr. Friedman

What are the support people doing. Is this a question or an exclamation? I sum it up in two words, "Not enough", and with only two suppliers in the United States of writing devices and hardware, I admit to the inadequate contributions of Howe Press. I can only tell you about the 52,000 Perkins Brailers that are in use throughout the world. You should also know that eight years ago we owed approximately 1800 units on backorder, and on October 1st we have a backorder totalling 1975 units.

Why isn't the Howe Press doing more for you? Let me try to provide some background. First, what is the Howe Press? We are part of Perkins School for the Blind and operate under a non-profit charter granted in the early 1900's, permitting us to manufacture aids and appliances and emboss braille books to be sold to and for the visually handicapped. Our non-profit charter means that we do not pay State or Federal taxes on our sales dollar. While the scope of our services has widened over the years, to include the volunteer transcribers, our basic assignment has not changed. The Howe Press makes products and sells same. We have no subsidies, private or Federal. What money Perkins School has is theirs, and Howe Press must generate their own sales dollars to meet the operating expenses. Our total sales for the fiscal year ended August 31, 1969 approximated \$62,000, of which I spent just about every dollar for labor and material, and plowed the remaining monies into new equipment, new products, research and development. Since I have been with Howe Press it is truly a no-profit, non-profit operation.

Who buys from Howe Press? What is our market and where is it? The following are the categories we serve, and each has special requirements:

School children, both residential and public schools, grades 1 through 12.

College students and professionally employed blind adults.

Volunteer transcribers.

Adults with unexpected loss of sight due to accident, war and so forth.

The international market. Last year 46 percent of the Perkins Braille production was shipped overseas. 2200 units, and for you marketing men, 67 percent of that shipment was done by air freight.

The last category is the senior citizen. Each of the above groups has special considerations and requires same, and we must coordinate our products and services accordingly.

At present six different design concepts for the Perkins Electric Braille are being tested, and it will be another year before field reports and repair shop data are gathered and we can announce an availability date and purchase price. We approximate the selling price will be less than \$150. Any mechanical Perkins Braille can be converted to the electric model. Once converted to electric, it will not function without 110 volt input. The actual operating system will be on 24 volts DC.

What's new in slates? Our six line, 27 cell slate in our price list is the ACM slate, and at the suggestion of one Robert Gildea, on Wednesday we released a new design that we call the Jiffy Slate made strictly for Hollerith cards. It has no hinges and no paper retaining pins. Just slip the card in and out. As a result of the continued persistence of the suggester, we started to look for the ultimate, an eight line, 27 cell slate, the jiffy or EZ read model. Incidentally, the English have always produced slates with many more lines and cells than in the United States, and we are just starting to catch up to them.

Another feature we are incorporating in all of our slates is the Dymo Tape "George Slot" named for George Gores of New Jersey. This is a pair of 9/16 slots punched in the top leaf of the slate, on the second line, before the first cell, and after the last cell. You can make Dymo Tape labels with any of our new standard slates, rather than the special single line slate. We are not phasing out the single line slate, but we believe that the Dymo Tape slots in the standard slates will be useful. Will you be charged for this extra feature? Of course. You wouldn't want something for nothing. Incidentally, slate prices haven't changed since February, 1964, so guess what's coming. The greatest disservice Howe Press can do for you is to price our products so low that we price ourselves out of business.

The Perkins Braille will soon have an attachment that will permit you to emboss Dymo Tape 38 cells at a time. The entire 12 foot roll of tape can be continuously embossed in this manner.

Extension keys are the idea of Gerard Mayer of the Canadian National Institute for the Blind. He introduced the concept of extension keys. The attachment of the seven extension keys reduces the finger span on the keyboard by 2 and one-quarter inches thereby enabling the user to operate the entire keyboard with one hand, and simultaneously read a braille page with the other hand.

Straight extension keys are a new concept of the regular extension keys and were intended solely for the brailist who lacks sufficient strength to activate the standard keyboard. All seven attachments extend out straight, and this increased leverage enables many arthritic persons to continue using their Perkins Braille. Both models of extension keys fold to permit the use of the carrying case.

In July the Veterans Administration Hospital in Hines, Illinois asked for a Braillewriter that produced large dots and cell spacing, the same as on our "Jumbo Dot Slate". The Veterans Administration had a veteran who could not learn to read conventional braille as he had lost both hands at the wrists. Three weeks later, the prototype model was delivered, two days later I sold them a production model, and the Veterans Administration was charged half of the engineering and development costs. The jumbo braille cell has dots 1/8 inch on centers as compared to the standard 3/32 dot spacing. The jumbo cell requires twice as much paper due to more space around the cell and increased line spacing.

I am reminded of a man who visited Howe Press and complained that he could not learn to emboss braille because the stylus would not remain securely positioned in his artificial hand. He was a graduate geologist who, while making soundings in the Arctic Ocean, had a pound of TNT go off in his hand. We modified our reversible metal handle stylus to fit his special

Mr. Friedman (Cont.)

needs, thereby eliminating his problem, and we gave him one of our earliest Easy Read Slates, so that he could read braille with his other two fingers. I never heard any more from the man except via a newspaper clipping that he had joined the million dollar club of Equitable Insurance Company indicating sales excellence.

Eighteen months ago we modified a Braillewriter to produce the Place Matrix. The patent issued to Ruth Place does not recognize the braille code display in dots, but rather as a combination of shapes in varying positions with different elevations and contours. Mrs. Place claims the concept worked with brain damaged children who couldn't read conventional braille and were termed "uneducable". After she had established intelligence in cutaneous reading skills, she weaned the kids over to standard braille. All we did at the Howe Press was to provide a means for producing the display she required. A minor problem, nobody believes her concept works, and as a sighted school teacher of blind children she is quietly continuing in her endeavor. After all, she is only working with kids that nobody cared about anyway.

The Place Matrix and the Jumbo Braille Dot are being viewed as possible teaching aids for blind diabetics and the blind senior citizens who want to learn braille.

The study of ambiguities in the braille code is being conducted by Haig Kafafian of Cybernetics Research of Washington, and independently by Dave Mick of Air Force Weapons Laboratories. Both will require braille samples of their new codes, and Howe Press is endeavoring to assist them. If their theories are correct, they too may be upsetting a few traditional apple carts. Be patient and willing to test these far-out concepts. Sometimes handicapped people are so unwilling to bend in their concepts and ideas that they drive away willing and qualified assistance.

I am going to skip briefly to what I think is most important. I have listed many items that Howe Press is endeavoring to pursue. I would like to quickly review some new items that will influence all of us.

The first is the Phylab Braille typewriter. The idea originated in Israel, and was brought to the United States recently for market analysis. It has a half-inch paper tape output. As one is operating the typewriter in a conventional manner, it is producing typed material simultaneously and generating braille on the half-inch paper tape. The user will readily identify what he has typed. People in Israel are interested in the market potential.

We have heard much about the Grunwald Braille Tape Reader. I saw it Thursday at the Argonne National Laboratories and I think it's pretty good. A three inch roll of magnetic tape is the equivalent of 1,000 pages of braille. The three inch roll of magnetic tape has the same capacity as eight rolls of seven-inch audio tape. It's too early to predict the impact and real contribution, and there are only demonstration models, and there is much testing to be done. I was very critical to Mr. Grunwald about his news release. Since I was critical of the news release, I thought the best place to vent my opinion was right on the man himself. He listened very politely as I explained my point of view.

As Dave Mick mentioned last evening, often-times when people in the advertising field or in the newspaper or communication media get hold of a hot item, one that has universal appeal, they will play it up. It's imperative that we in this work, because of the universal appeal to the public as to what we are doing for the blind people, we make darn sure that we make conservative claims, or don't say anything. Don't let the public know what you are doing until you really have good, dependable, reliable, operating models, and you can back up the results with test data. I think we can save ourselves a lot of embarrassment and a lot of hard feelings because after that a lot of the public interest goes down the drain, and ultimately nothing happens.

I don't know if you saw the television program recently, but the young lady on TV said she could see. She was blind, and there was an illustration of the new work done on the west coast. By means of sitting in a chair, there was a tactile display impressed on her back. The display was the identical image of what the television camera was picking up. She readily identified a square and a triangle, but when the television camera picked up a telephone sitting on the table she said, "Oh, I know what that is. That is a telephone."

Mr. Friedman (Cont.)

Well, of course, there were very few people who knew the fallacy or the weakness of the experiment. All they knew, all the audience knew was that the woman claimed she could see.

Why isn't Howe Press doing more for you? Our lack of knowledge is in the complexities of the special hardware needs of the blind programmers. My excuse is that not enough pressure has been brought to bear on the hardware producers. I hope this conference will force the hardware and braille producers to seek aid, be it financial or organizational, to enable you to maintain the momentum of this conference until the next one.

Agree on what you need. Present a unified view to suppliers, and they will produce for you. If each programmer wants only his own personal needs filled because he wants to have it his way, and the same for another, and another, we have a problem. Remember that industry looks on you as a legitimate market. There are now enough of you, if you consolidate your individual purposes to the single goal of continued job skills for yourselves. Be the perfectionist, but don't be the nit-picker that holds up progress.

In the Circus Room yesterday you demonstrated the rare combination of native intelligence and ingenuity. Three different machines were generating braille on paper tape. For the record, you should know that I know nothing about computers, computer programming, and the rest, but I do know some people who do. As for braille, I can't read braille, but I have people working with me who do know braille. My question and observation about the three tape output devices is, can you in the audience agree on one general system of tape display for most of your needs? I merely offer my observation because in industry, unnecessary duplication dilutes product quality, and actually pollutes the market. Agree on what you need and then seek money from all sources.

May I recommend two books that I believe are timely, Robert Scott's The Making of Blind Men. This new book tells of some of our weaknesses and those of our friends; and to remedy our problems, the other book, How to Win Friends and Influence People.

Mr. Staley

Thank you very much, Harry.

Session 9 - WHERE DO WE GO FROM HERE?

Mr. Collard

The important part of this conference is about to start, because I think that the presence here of 160 people, blind and sighted, to talk about failures and successes in the field of computer programming is an exhibition of the fact that we have arrived at a certain point in time. This has been said several times in the conference and it is true. You now have a professional organization. That professional organization has the ball.

Now, where do we go from here? This involves a great many problems for which we don't have workable solutions yet, but in order to explore some of those unworkable solutions, perhaps to work them into useable ones if not perfect ones, I would like to turn the final panel over to the Dean of the Graduate School of Western Michigan University, Dr. George G. Mallinson.

Dr. Mallinson

We have heard an awful lot of words the last few days. There have been many discussions that have gone on and the thing is, so what? Where does all this go? There have been conferences before this that have certainly produced some benefit, but in the last couple of years or so we have some shake-downs. The question is, what happens now?

I think there are several postulates that might precede the presentation by the panelists and I would like to give them briefly.

The first, there has been no disagreement that the role of the blind programmer is established. We have 355 of them who are functioning more or less effectively, we are not exactly sure, but 355 at least, are functioning at the present time in gainful positions. We are not exactly sure how effective they are because we haven't had the measurements.

We have certainly learned a great deal about recruiting, training and placement, although we did notice a number of conflicting viewpoints that were presented by the various panelists.

I suppose we might postulate also there are a great number of things we still need to know. Among some of the more mundane, I haven't heard anyone come up with figures as to how many blind persons were admitted to training programs and how many completed them. We still haven't heard how many completed them and were actually placed. We haven't heard yet how many placed really made it.

There are some of the rather mundane things, but some of the more significant ones involve how are we going to improve recruitment and placement and training, and avoid some of the mistakes of the past, assuming we know what some of these mistakes are.

The next is, what about the future for programmers?

This afternoon we have four gentlemen here who are going to tell us how to get there from here. The first of these will be Ted Glaser of Case Western Reserve University, who is Chairman in Computing Information Sciences; the second, Benjamin F. Smith, who is Assistant Director of Perkins School for the Blind; third, will be George T. Willson, Deputy Head of the Royal National Institute for the Blind, London, England; and the fourth, Ray Jones, President of the Visually Impaired Data Processor International.

THE POTENTIAL TECHNOLOGICAL IMPACT OF BLIND PROGRAMMERS

Mr. Edward L. Glaser

Case Western Reserve University, Cleveland, Ohio

Mr. Glaser

With the emergence of the field of computer programming as a fine profession for blind employees we have also the emergence of a new force, namely, a coherent, technically competent, professional group of visually impaired adults. These blind professionals have the potential to do more in benefiting themselves and their fellow blind than any other single group in history. The reason for this statement is twofold: 1. we have an example of a professional group who is economically competent to buy needed appliances and therefore encourage the production of new appliances by a number of manufacturers, since the market to which they can sell at this point is becoming considerable and the money that can be spent by individuals in this market is no longer small; 2. this group of professionals is both technically competent in the field of information processing and handling, as well as having a personal understanding of the problem of visual impairment, which after all is one of the most difficult of all sensory modalities to replace by any form of orthotic or prosthetic.

As a member of this group I find that there are many immediate problems that I have in common with other blind programmers. The most obvious of these is getting braille output from a computer. There are some immediate steps that can be taken including revamping the "standard braille code" so as to make it compatible with ASCII. However, additionally, it would be desirable to define a standard electrical interface with all terminals such that a braille terminal can be "piggy-backed" on a standard terminal. We should not in any way be constrained to conceiving of braille as only a static printout. It should be pointed out that there are many potentials for dynamic displays in the tactile mode which would give blind persons not only the advantages of a cathode ray tube, but ultimately could lead to a new form of tactile communication which could eventually replace braille as the computer or other electronic "playback" devices became more readily available.

Although our current major problem seems to be braille for computers, because of what was cited above it is the responsibility of the blind programmer to also consider computers for braille and other appliances that are of use not only to himself, but to all blind persons. In short, this paper is a plea for the blind programmer to be a programmer and a professional first who incidentally cannot see. We have then the hoped for situation taking place, namely, a blind person able to economically take care of himself, talking to other professionals who happen to be blind, and as an economic entity having sufficient monetary and technological leverage to bring about those changes which have been so needed in this field for years.

Paper 9-2

PIONEERING WITH TIME-SHARING COMPUTER SERVICE
AT PERKINS SCHOOL FOR THE BLIND

Mr. Benjamin F. Smith

Assistant Director, Perkins School for the Blind
Watertown, Massachusetts

Mr. Smith

Back in 1966, Dr. Edward J. Waterhouse, Director of Perkins School for the Blind, in speaking to our students in morning assembly, predicted that probably within ten years, Perkins would have a direct connection with a large computer and would be making extensive use of its service. He went on to suggest that very likely our business office would be applying this

computer to some of its practices, that the principal's office would be finding it useful in matters of scheduling, and that, above all, our students would be using it freely in connection with some of their studies in the classroom.

Little did Dr. Waterhouse realize in 1966 what an accurate prophet he was. Early in 1969, a bare three years after the prediction, Perkins had a time-sharing connection with General Electric's Mark I Computer 265 through two teletype terminals stationed beneath our new Research Library. Here, two of our mathematics teachers and twelve of our senior high school students are learning not only how to program for the computer, but also how to present their programs directly to the computer and to interpret responses from it.

To understand the significance of these two computer terminals at Perkins, we must return for a moment to the prediction of 1966. When Dr. Waterhouse made his prediction, he was reflecting a growing awareness on the part of himself and other key members of the Perkins staff of the rapidly increasing importance of the computer in all phases of our economic and social life including education. We were reading in newspapers and journals of the rapid invasion of business and industry by the computer. We were attending conferences and workshops where the application of the computer to scheduling in large school systems was being demonstrated and where the use of the computer in the classroom was even being promoted. Above all, we were learning that large numbers of blind people were finding highly remunerative employment as computer programmers.

When early in 1968, therefore, Mr. John Watt of General Electric Company approached us with a view to tying Perkins into General Electric's 265 Computer on a Mark I time-sharing basis on their new educational and rehabilitation program, he found us in a receptive mood. Although we had been learning a good deal about the use and spread of the computer in a general way, we found ourselves to be complete novices when it came to applying a computer time-sharing program to our own particular needs here at Perkins. Before we could commit ourselves to the rather heavy financial investment involved in this computer service, we had to establish some rather clearcut justifications either in terms of educational values to our students or in terms of time and money-saving practices in other operations of the school, or both.

Establishing these justifications stimulated a good deal of careful thought, some inquiries into the workings of established programs, and not a little debate among a number of us. In the end, we arrived at certain conclusions which led us to accept the time-sharing service being offered by General Electric.

In the first place and, perhaps on the negative side, we could not find any immediate application of this computer service to expedite the processes in our business office; nor could we find any way immediately to use the computer to assist our principal in the many involved and complicated scheduling patterns in his office. We do recognize, however, that this present failure may be due more to our own unfamiliarity with the use of the computer and its versatility than to inappropriateness for our school operation. Indeed, we did anticipate an application of this time-sharing service to statistical processes in research in our Psychology and Guidance Department. Subsequently, our students carried out a rather useful set of exercises on the computer helping with the validation of the new Perkins-Benet Intelligence Test. As time and experience advance, we may well discover many fruitful applications of computer time-sharing service to a variety of operations concerned with running our school.

Secondly, we concluded that this computer plan offered considerable promise as a tool in the classroom of some of the subject areas in our senior high school department. We felt that the application of the computer to classes in mathematics and science would be particularly effective both as a means of greater efficiency in the learning process and also as a means of motivating our students to greater interest and effort.

Finally, since it had already been well demonstrated that blind people can be highly successful vocationally as computer programmers, we concluded that we should give our students

Mr. Smith (Cont.)

experience on the computer with a view to exploring both vocational interests and vocational aptitude.

In November of 1968, bearing in mind the conclusions enumerated above, Perkins signed a contract with General Electric Company for computer time-sharing service and a contract with the Telephone Company for service of two teletype consoles and we were in business.

Almost at once, of course, as might be expected, problems began to arise. Just about every student in our Upper School wanted to get their hands on the computer. Class schedules for the school year 1968-1969 had been set long ago and were not easily altered to allow for a time schedule for the effective use of the new tool. Compromise in several areas were necessary to glean the greatest value from the computer during the remainder of the school year. Two groups of six students each from the mathematics department were selected. Two of our mathematics teachers offered each group an evening of their time for computer work, and our principal found an additional period of time for each group during the classroom week. This gave us a nucleus of twelve students who could share active experience on the computer during two periods each week and who could do additional preparation work for the computer during other mathematics classes and during study hall periods.

A second problem area became identified in the fact that our mathematics teachers, although well equipped with the general mathematical background necessary for successful computer operation, had not been trained in the use of the computer itself much less in the techniques of teaching the use of the computer. Mr. Robert Streight of the General Electric Educational Staff took this problem in hand and offered our teachers guidance and instructional time at the General Electric Educational Installation in Wellesley, Massachusetts. He also provided our teachers with the necessary manuals and supplementary exercise material which our teachers could use with our students. With these aids, together with a considerable amount of imaginative planning on their part, the teachers have been able to present our students with a program of instruction using the computer which appears to be of merit. At least our students have been able to unravel involved mathematical problems using the computer. They have been able to construct programs, they have been able to operate the machinery, and they have displayed a great deal of enthusiasm.

Perhaps a more serious problem in using the computer at Perkins arises from our present failure to have a braille printout for our blind students to use. This means our blind students must depend upon the eyes of their teachers to read back to them the information that comes from the computer. Only in one or two cases do the students have enough vision to read the print characters. This in our minds, of course, is a serious flaw as far as our computer program is concerned. The lack of braille printout, in fact, almost caused us to postpone our venture into computer programming in the very beginning. Mr. Watt indicated to us, however, that General Electric was working hard to devise a system of providing braille printout and hoped to have a satisfactory system shortly. In fact, he showed us a metal thimble-like attachment to be placed on the teletype machine which would produce a tape of Grade I braille. Subsequent tests for this thimble, however, produced braille of such a poor quality that it was not usable.

For a time, it appeared as if our computer training program would be doomed to complete inadequacy before it was hardly begun for the lack of a braille means to make our students completely independent in the use of the machinery.

At this point, it seemed clear to us that we had a choice of alternate courses of action. Either we must drop this experiment in the use of the computer with our blind students or we must take the initiative ourselves in a true pioneering spirit and organize the resources necessary to provide us with a braille printout for our blind students. Rarely has Perkins side-stepped the issue when a pioneering effort was found necessary. This case was no exception.

First of all, we decided we needed working with us a highly trained technical expert in this field of computer operation. Mr. Robert Gildea, Systems Analyst for The MITRE Corporation, a blind man himself and highly successful in his field, seemed a logical choice, offered himself, and has become our consultant.

Mr. Gildea was able very skillfully to review with us possible solutions to the securing of a braille printout on our time-sharing plan with General Electric. Under his guidance and with the help of a number of other technical experts in this field, we decided to support two separate systems proposed to provide us with a braille printout. The first of these is the system being developed by the Sensory Aids Evaluation and Development Center, Massachusetts Institute of Technology under Mr. Vito Proscia. The second is that of Mr. Ray Morrison, recently retired from the Telephone Company, who has ingeniously adapted several pieces of equipment to produce a braille printout on the time-sharing type of equipment we have at Perkins. The M.I.T. System, although rather expensive to duplicate, has the advantage of being funded from Federal sources which promises us at Perkins rather inexpensive operation at least during an experimental period of time. Mr. Morrison's system, on the other hand, must be funded privately, and Perkins has made a sizable financial contribution to this end. At the present writing, the M.I.T. System would provide the blind operator with a printout in the form of a sheet of braille which would be rather easy for him to control. Mr. Morrison's printout, at the present time, however, would be in the form of a tape which has some disadvantages in terms of handling and storage.

We at Perkins have been promised our copy of Mr. Morrison's system very shortly. We understand, furthermore, that Mr. Morrison is already working on further modification that will make it possible to provide a braille printout in sheet form this month. We are also promised an experimental model of the M.I.T. System as soon as it is ready for use. This will give us at Perkins an opportunity to test, side by side, in our computer time-sharing installation the relative merits of the two systems.

Where Do We Go From Here?

Our early pioneer experimentation with this computer time-sharing program seems to have been a fruitful experience. We know that it can motivate students in our mathematics and science classes, and that it can render more effective some of the learning processes there. We know also that our blind students can acquire some skill in operating the computer through a teletype terminal and that they can successfully perform exercises in simple computer programming. There are a number of problems facing us, however, that we are not certain we have yet solved adequately.

The first, of course, is the question of the effective braille printout. Although we are promised with considerable optimism two systems of braille printout for our equipment, neither of these has yet been tested with our students. The M.I.T. System appears to be still a bit in the future before it is ready for trial. The Morrison System, although just about ready for use, has the slight disadvantage of being a narrow tape and will require considerable testing. We are encouraged to believe that both of these printouts will be very useful to our blind students. We will certainly be seeking every way we can find to improve this printout and will gladly welcome suggestions from others in the fields.

Another question in our minds has to do with the course outlines and manuals to guide both our teachers and our students as they learn to program and to operate our computer. At the present, we are following course instructional outlines furnished by General Electric Company. One of these course outlines that seems to be most effective with our students is called INTRODUCTION TO THE BASIC LANGUAGE.

As yet, however, our teachers have not had enough experience to know conclusively whether or not they are providing our students with all of the step-by-step instructional material necessary to make them competent computer programmers. We are interested in hearing from other instructors in this field who may have suggestions as to how we may improve our course offerings in this important field since we would like to give our students as complete a training course as possible.

A further problem is the securing of adequate manuals and course materials in braille. As yet, we have not been able to examine either manuals or course materials that may already exist in braille. On the other hand, we do not wish to undertake the great expense of putting materials of this kind into braille unless we are certain we are considering the most effective materials for our course. Here again, we welcome suggestions from more experienced workers in the field.

Mr. Smith (Cont.)

A further question in our computer future, we believe, has to do with possible evaluation materials that would help us to measure reasonably accurately the potential of our students for vocational success in the computer field. If, through a battery of tests, either in the very beginning or at least after a short introductory training course in the computer, we can predict which of our students are likely to succeed as computer programmers and which are likely to fail, we can counsel our students accordingly and prevent a good deal of wasted effort on the part of a number of them. We know, of course, of a few of the important requirements for success in computer programming, but we are led to believe that there are other factors not as easily identified. This area of early evaluation is of considerable interest to us and again we welcome any suggestions.

Finally, application of the computer to classroom situations, both in mathematics and science has produced such enthusiasm among our students and has so promoted the learning process in these subjects that we are encouraged to seek application of our computer to other subject areas in our curriculum. This might include applications to history, geography, English, and perhaps even to cooking. We realize, of course, that the invasion of these other subject areas by the computer has just begun as far as the general education of normal children is concerned. We are, however, trying to be sensitive to this invasion and perhaps will find a way for ourselves to be part of it.

Dr. Mallinson

Now for Mr. Willson. Perhaps you can tell us how we looked here from your vantage point across the ocean.

Paper 9-3

RECOMMENDATIONS

Mr. George T. Willson

Royal National Institute for the Blind, London, England

Mr. Willson

Where do we go from here? This is a subject which I don't frankly feel qualified to talk to you about, but I feel I might share some thoughts aloud, particularly with a minority group here, the employment counselors.

I would like to share my thoughts with this group because I myself have been directly concerned with the employment of the blind for 19 years. It is quite likely that some of you here will have had longer experience than I have in this particular field.

However, one of the impressions I have gotten from this conference is the vast employment opportunities for programmers which exist in the United States. We have had figures quoted to us which seem quite astronomical, and I think the employment officer (we call them employment officers in the U.K.), the employment officers, the employment counselors, have important roles in the future. They have important roles which they can't play unless they get themselves sufficiently geared up to approach employers and really talk turkey.

I think you know, from remarks which one of my British associates made yesterday, that I have been concerned with the development of programming in the U.K. as a viable career right from its start. I am, in fact, responsible for employment services for the development of training facilities in the U.K. We don't provide training. We get manufacturers to provide this training for us.

I couldn't have done this without first of all realizing that it was essential for me to become reasonably knowledgeable in this particular sphere. I didn't consider it was necessary

Mr. Willson (Cont.)

for me to learn the techniques of programming. I don't think this is necessary now, but I think one has to have a very firm appreciation of what programming is all about.

So my advice would be before you go to industry, get into an appreciation course so that you can feel at home talking to an employer, you can feel comfortable, you can put him at ease, and you can put yourself at ease by explaining to him that you are not a qualified programmer, but you have a reasonable knowledge to form a basis for discussing the employment of blind programmers. I say the employment of blind programmers rather than talking about the problems of employing blind programmers. We know there are problems, but we have already seen in the past few days how many of these problems have been successfully overcome.

It is important that an employment counselor gets to know his employer. This is really vitally important. I have always had the philosophy in my association with employment work - it's been apparent to me - that I have a primary obligation to help a blind man get resettled satisfactorily into employment.

If I am going to provide him with this service, I have perhaps a more important obligation to honor, and that is an obligation to the employers who are going to provide me with the facilities to bring about the resettlement of blind people.

As I said earlier, you have in this country installations employing vast numbers of personnel and you have machines with fantastic configurations compared with what we have in the U.K.

I think my personal approach to this particular problem for the future would be that I want to go and talk to an employer about the long term employment of blind persons with him, not just start a conversation with a view to placing one particular person, but actually discuss a placement program, and discover through conversation with him whether it is possible to think in terms of a team of say three or four programmers, two teams of two programmers, or perhaps four programmers, working individually, becoming fully integrated into existing programming teams.

Make it quite clear to him that what you are doing, in fact, is planning an employment program; that you are not going to constantly badger him. You have to make it abundantly clear. I try to make it clear always that the employment of a blind person in what initially is an unknown environment may be a success, it may not be a success. It must be regarded initially as an experiment.

What one needs is not sympathy but a sympathetic understanding of the problems of blindness. One has to establish this good rapport between employment counselor and employer.

I think that my friends who came over with me from London will bear me out when I say that their employment situations have arisen as a result of me, in the first instance, coming to know the employers with whom they are working pretty well. They didn't have to go alone for formal interviews wondering what the end result was going to be. The interviews were, in fact, fairly reasonable discussions. Obviously the employer wanted to be satisfied that he was buying a good proposition.

So I would recommend this to you employment counselors: get to know your employers, build up confidence, don't try to make haphazard placements, try to plan employment programs, and at the same time it is, of course, important that one get and maintain the confidence of the blind person to whom one is providing the service.

I think it is wrong to predetermine what the outcome of rehabilitation might be. I think one has to send a newly blinded person on to a rehabilitation course encouraging him to keep an open mind. Show him, by all means, of the opportunity there might be in this new career but without committing oneself, because, if in fact, one is satisfied that a person is in need of rehabilitation, one is automatically saying at this point in time, one is not in a position to determine what type of employment he can enter.

He may not find it easy to acquire the skills of blindness, the basic skills like mobility. There may be physical factors which makes this skill difficult for him to acquire. It may be that if he is a severe diabetic, for example, he will find it difficult to develop braille to

Mr. Willson (Cont.)

an adequate standard. To my mind, for the person who has not sufficient sight to function successfully from print, he must have a very highly developed skill as a brailist.

One must be sure that the person is skillful in the use of a typewriter. We have heard during this conference comments that bad typing can lead to tremendous error rate in a programming environment.

One has to be sure that we have a thorough understanding of what industry requires of a sighted programmer. I think we have basically to be very certain in our minds before we take a person into a training situation, that he has the skills required for programming.

Finally I would say that we must, if we are going to be successful, if we are going to maintain the confidence of employers, if we are going to maintain the confidence of the blind person to whom we are giving the service, we must be sure that we train for training's sake.

Dr. Mallinson

Ray Jones.

Paper 9-4

AN INVITATION FROM VIDPI

Mr. Raythel Jones

Federal Aviation Administration, Oklahoma City, Oklahoma

Mr. Jones

In considering the question of where do we go from here, it has come to my attention in the last two and a half days and couple of nights that we have witnessed, seen, or been a part of the unfolding of the efforts of many people that have preceded us in the work of data processing for blind people. I won't attempt to name any of these people in particular for fear there would be someone I would overlook and I would not intentionally want to do that.

The thing that has come out of this particular meeting would be the perpetuation or the continuing charge to carry on the work of this type of conference. This means, first of all, the publishing of proceedings.

I think we should encourage employers, rehabilitation counselors, people contemplating the area of employment as blind programmers to read all these proceedings and digest as much of them as they can.

The vehicle that I suggest to continue the work done by the many people in advance of this conference and by the many people at this conference is the new organization of Visually Impaired Data Processors International. This is a new organization. You may want to pick at us because you don't like the name or you don't like the dues. You may think they are too high. The important thing and the question I would like to ask at this time for your contemplation is, do you share our philosophy that the blind programmer who is working day to day on the job should have an influence and a voice in the decisions that are made concerning his problems and the solution to these problems.

We did meet last night, and seven geographic areas were represented. Al Schlank is Vice-President. He is from the Brentwood, Maryland area. Helen Moore was elected Secretary and she is from Denver, Colorado; the Treasurer was Mike Mady from Amarillo, Texas; Brad Burson was elected Project Officer, he is with Argonne Laboratories in Illinois; and there are two

Mr. Jones (Cont.)

more members at large who are Richard Knauss from Pennsylvania; and Bill Adler, who is with Bendix in Kansas City; and myself, Ray Jones, President, with FAA in Oklahoma City.

Some of the things that this organization hopes to do, or influence the doing thereof in the near future, is the selection, the training, and the placement of blind people in the area of data processing.

Since this is a professional organization of computer programmers who happen to be blind, we feel that it is incumbent upon us to insist that the schools hold a high standard of selection, training and placement.

We feel this is not only fair to the potential employers or to us who are already fortunate enough to be employed in the field, but we feel it is only fair to the blind person who may think, or may be lead to think by a counselor or a school, that he is qualified, but who later finds out he is not qualified.

We should also hope to influence the rehabilitation counselors by disseminating information concerning what it takes to become a programmer.

Also we hope to perpetuate the employment of qualified blind people in the area of data processing by getting information out to employers, and if you would, testimonials from satisfied employers who have had a successful experience in the employment of blind people in the field of data processing.

The organization has convened a meeting at Oklahoma City next year. We do hope to have some help on the developing of a seminar at that time. We welcome any suggestions or help that will be forth-coming in this area, but it will be there are we will have one.

Immediately after we break up here, out in the hall, there will be someone to take your dues if you care to join at this time. Also realizing that many of us come to these conventions a little short of money, or at least leave them a little short of money, we will be in touch with you through the Newsletter, and the other means of communication, as to how you can join this organization.

I want to give some of my time back because I think maybe you need it more than I do.

I urge you to think seriously about the potential of this organization. If we are not what you want, come in and join us and make us what you want.

Mr. White

John White, CAV, England.

Last night I attended the session on braille and it has become a remarkable concern, a rather serious concern, to a number of us that the problems of resolving it to a standard braille code in the English community has been absolutely phenomenal.

I would like to see a code which, whether it is printed up by computer or whether it is transcribed into braille, would be the same code with no differences.

I don't know how long ago it was that English and the American Braille split up. It seems to me it is too long ago for the basic differences to be repaired, unless we actually get down and really devise a code which is a combination of the two.

I would like to put it forward as one of the things that our Projects Organizer place on the agenda. One of the first projects he can work on is to organize a committee to look into this.

Maybe the answer, first of all, is for us in England to resolve our difficulties and for you to resolve your difficulties so that, at least, we have only two codes. At present we seem

Mr. White(Cont.)

to have six different codes. We have codes for English, maps, and computers in each country. The problems are phenomenal. That is my contribution.

Dr. Mallinson

Very good. May I point out that Ted Glaser wants to speak. Go ahead.

Mr. Glaser

One of the problems, and I think he pointed it out, is that before we try and join hands across the Atlantic, we should settle our own difficulties.

One of the places where this group can have a remarkable effect is particularly in this area of braille codes and rules for braille. Let's get something clear. I don't mean by this just a representation in format for a particular consideration of the braille cell.

Right now if we wish to be literal, it is impossible for a computer to generate proper Grade 2 braille. There are going to be a lot of people that say I have a computer program that does.

By a little exercise about two years ago, we were able to demonstrate rigorously that the rules currently published for Grade 2 braille are recursively undecidable, which means "lots of luck".

Until concepts of mathematical linguists are applied to this area, we have brushed some of the cobwebs out, but the problem isn't going to get any better, believe me.

Dr. Burson

Mr. White, I think your suggestion is very commendable and I would like to announce that as Chairman of the Committee, Mr. White has now assumed the responsibility for getting this thing together.

Mr. Kafafian

I am Haig Kafafian of Cybernetics Research Institute, Washington, D.C.

In answer to a question that problems are going to get worse, we are immediately concerned with the basic differences in these codes, and essentially, our outlook is that in perhaps the next 5 or 10 years we will hopefully have introduced a new puntaform communication system not only for use by people with visual impairments, but for people who are looking for more modes of input to increase quality and reliability of programming. I refer to one program at the Institute, namely, HIBRAILLE.

Incidentally, I want to thank Mr. Harry Friedman who has offered this section of the report in braille to those wishing to acquire it.

Essentially the work towards a code that is unambiguous is, in our opinion, one of the solutions toward which we should all be searching and trying to evaluate at this time.

The contents of these reports which are presently being substantiated with data being collected in the field, hopefully will lay the groundwork for providing computer programs and organizations concerned with the utility of an efficient system of programming, a means of having rich language, no ambiguities, and hopefully to answer Professor Glaser's question and concern, hopefully to provide a more universal and easier system of tactile communications.

Mr. Mick

I would like to make a few comments. My name is David Mick.

I am not an advocate of standardizing on 64 characters with a three-by-two matrix at this time, because the computer industry itself is not standardized. I have seen all codes on every computer produced in the United States. Each one has some different character or characters, plus they use different punches to represent the same character.

What I would suggest is to wait until they standardize, then you standardize. In the interim you want to communicate with one another and you are standardized at the present time on your alphabetic characters, plus your digits, using a single cell, and some of the special characters. What I would suggest for common grounds of communication is to make up a little list of the exceptions to send to your friends when you communicate. I am an engineer and there is no standardization on simple symbols.

I would like to add one other comment. I have a concept which I call MIKBRL, which is a simple four-by-two braille cell, where the first column is numbered 123 X, the second column 4567. Dot X is always embossed, and the reason for that is to make it unambiguous, and the standard three-by-two braille cell is a sub-set of the MIKBRL cell. Dot 7 is a multiplier of a capital sign; as a concept, I don't know if it has merit, but I think somebody might look into it. It will handle all of the existing codes in use today. I have found none that requires more than 128 characters in print and/or function codes.

Mr. Gildea

Ted Glaser, may I ask you, is there any documentation on that research you did a couple of years ago and possibly where you quoted recommendations?

Mr. Glaser

There is not the documentation demonstrating the recursive undecideability, no. There are some recommendations.

The only other comment I would make is, before we get very excited about producing a new braille cell such as the one that was just described, there has been a three-by-three scheme. I will point out that the tactile sense, like all others, is differential. The entire set of information on understanding psycho-tactile characteristics consists of two monographs that are worth reading.

The one thing that has been learned recently is that if we change our concept of braille from something that is embossed on an inanimate page to perhaps the equivalent of the cathode ray tube for the blind, in other words, a dynamic tactile modality, several things happen, not the least of which is that there is some indication that a major increase of informational transfer, like a full decimal order of magnitude may be practical and that is worth it, to me.

Recommendations are first contained in a meeting that was held when the first braille code for computers was established. I cannot give you the exact name but the meeting was held in 1962 and it was from this that the Sensory Aids Center at M.I.T. was born. It was held at M.I.T. One of the monographs is by Jim Bliss and his group at SRI.

Mr. Adair

Chet Adair from Dayton. With reference to Mr. Mick's comments about the diversification of the industry in codes and so forth, granted the various characters will sometimes have different punch combinations for internal storage or card storage, and there may be times when two companies will use the same graphic for a different thing.

As somebody mentioned last night, in assisting the people that are trying to help us do a better job and making it easier for them to transcribe materials for us, I think that alone would be reason enough to try to standardize it.

Mr. Falter

John Falter from UNIVAC. I think since we are a small and potentially tightly knit organization we can do a lot in giving, as Mr. Adair said, some sort of example to industry. We can't afford not to standardize where they have a lot of money and we haven't.

APPENDIX I

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APPENDIX II
CONSTITUTION AND BYLAWS OF THE
VISUALLY IMPAIRED DATA PROCESSORS INTERNATIONAL

ARTICLE I. Name -- the name of this organization shall be the Visually Impaired Data Processors International -- Henceforward to be known as VIDPI.

ARTICLE II. Purpose -- VIDPI shall be a nonprofit organization whose purpose is to promote the field of electronic data processing as a profession for visually impaired persons throughout the world:

- A. By establishing and maintaining the highest possible standards for the training of qualified blind persons.
- B. By creating a more healthy environment for employment through the education of government and industry personnel.
- C. By cooperating with organizations of the blind in matters of common interests.
- D. By providing a forum for the exchange of professional information through:
 - 1. Sponsoring workshops, seminars, and conferences.
 - 2. Publishing bulletins and/or journals.
 - 3. Providing a central clearing house for the exchange of technical information.
 - 4. Working with public and private agencies to increase the flow of appropriate documentation in braille, on tape, and in large print.
- E. By establishing and maintaining continuous lines of communication between the blind engaged in electronic data processing and their sighted counterparts within the industry.

ARTICLE III. Membership -- membership in VIDPI shall be of three types: individual, organizational, and associate.

- A. Individual membership in VIDPI shall be opened to those blind persons who meet the following requirements:
 - 1. They are persons actively employed in electronic data processing.
 - 2. They are actively seeking employment in the field of electronic data processing.
 - 3. They are currently being trained for a career in the above mentioned profession.
 - 4. They are employed in professions other than electronic processing but who utilize the computer as a tool to solve problems relating to their own profession.

- B. Organizational membership in VIDPI shall be opened to any institution, agency, company, firm, or organization meeting the following requirements:
 - 1. They are engaged in the training of visually impaired persons for the field of electronic data processing.
 - 2. They are actually an employer, or interested in employing visually impaired persons in the field of electronic data processing.
 - 3. They are engaged in the business of designing data processing hardware and/or software.
 - 4. They are professional organizations whose purpose is to promote and expand the field of electronic data processing.
- C. Associate membership in VIDPI shall be open to all persons who share the philosophy of perpetuating the field of electronic data processing as a profession for visually impaired persons.

ARTICLE IV. Voting -- individual and organizational members shall be voting members of VIDPI provided they meet the following requirements and any additional requirements that may be prescribed in the Bylaws.

- A. Individual members shall have one vote provided they have paid their dues and registration fees.
- B. Organization members shall be entitled to one vote provided the organization they represent has paid its dues and registration fees, and the secretary has been notified in writing the name of the person authorized to cast the organization's vote prior to the annual business meeting.

ARTICLE V. Dues and registration fees.

- A. The dues of VIDPI shall be as prescribed in the Bylaws.
- B. Registration fees shall be determined by the Board of Directors of VIDPI.

ARTICLE VI. Officers and directors -- the officers and directors of VIDPI shall consist of the following: President, Vice President, Secretary, Treasurer, Projects Officer, and two board members at large.

- A. The officers and the board members at large shall constitute the Board of Directors of VIDPI.
- B. A quorum to transact business shall consist of four members of the Board of Directors.
- C. No member may be elected for more than two consecutive terms for the same office, or more than five consecutive terms on the Board of Directors.
- D. The terms of office for all members of the Board of Directors shall be for one year, or from annual business meeting until the next annual business meeting. Said terms shall run concurrent.
- E. Any vacancy occurring on the Board of Directors between annual business meetings shall be filled by the Board of Directors.

ARTICLE VII. Powers and duties of the officers, the Board of Directors, and the membership:

- A. The officers and directors shall perform the duties of their offices as prescribed in the Bylaws. In the absence of any provisions contained in the Bylaws, the officers and directors shall be governed by "Roberts Rules of Order Revised."
- B. The Board of Directors shall be the governing board of VIDPI between annual business meetings provided they shall take no official action that may be in conflict with existing policies or decisions of a majority of the members.
- C. Voting members, individual and organizational, may:
 - 1. Be elected to office.
 - 2. Serve on committees.
 - 3. Participate fully in the proceedings of all meetings.
- D. Associate members are eligible to serve on committees and participate fully in any conferences sponsored by this organization. However, associate members are not eligible to vote at annual business meetings or hold offices in VIDPI.
- E. A majority of the eligible voting members shall determine the time and the place of the annual business meeting.
- F. A quorum for transacting business shall consist of a majority of those registered at any annual business meeting.

ARTICLE VII. Amendments -- this Constitution may be amended by a two-thirds majority vote of eligible voting members at any annual business meeting. The Bylaws may be amended by a simple majority vote of eligible voting members at any annual business meeting.

ARTICLE IX. The provisions of this Constitution and Bylaws shall be effective immediately upon the adoption of this Consitution and Bylaws.

BYLAWS

I. Membership dues:

- A. Membership dues in VIDPI shall be ten dollars per year for all types of memberships.
- B. The membership dues shall be due and payable on or before January first of each calendar year.
- C. In order for a member to be eligible to participate in the election proceedings at any annual business meeting, the member's dues must be paid fifteen days prior to the time of the annual business meeting.

II. Duties of the officers:

- A. The President shall:
 - 1. Be the chief administrative officer of the organization.

2. Preside over all meetings of the membership and the Board of Directors.
 3. Make committee appointments.
 4. Represent the interests of VIDPI and its members whenever necessary and/or proper.
- B. The Vice President shall act as President in absence or the disability of the President. The Vice President shall also perform such other functions as may be assigned to him by the Board of Directors or the membership.
- C. The Secretary of this organization in addition to the usual functions of said office shall:
1. Read the roll of members in good standing at the beginning of all annual business meetings.
 2. Keep the Board of Directors advised as to the membership status of the members of the organization.
- D. The Treasurer in addition to the usual duties of such office shall:
1. Supply the secretary with a list of members in good standing prior to the annual business meeting.
 2. Report on the financial status of the organization at all meetings of the Board of Directors and at the annual business meetings.
- E. The projects officer shall serve as coordinator for projects undertaken by the organization.

Jacobus tenBroek Library



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