BRAILLE RESEARCH NEWSLETTER

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edited by

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Baruch Computer Research Center for the Visually Impaired

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In the discussion so far today, we have concentrated
on the capability of the Center to attend to the needs of
persons in the learning environment. We have concentrated
on the ways in which we can make information transparent
to persons with impaired or no visual input. But the
Center's tasks include an even larger purview, and I
should like to touch upon these in my remarks.

First, we are undertaking a national sample survey
of the braille and large print reading public, in
collaboration with the American Foundation for the Blind.
The results will document the areas in which the current
system of provision of braille and large print product
is ill served, in quantity, variety, and depth of material.
In fact, some of the operating goals and priorities of the
Center will be informed, in part, by our findings.
Naturally, we also intend the scholarly publication of
what we discover.

Second, there are at least three areas in which appli-
cation of computer techniques can be made which we can pur-
sue immediately - so great are the obvious needs. The first
is the provision of tactual graphics: maps and other
pictorial representations of the environment. Within a
very few months, the Center will have in place a computer-
assisted design and production system for tactual graphics
capable of providing extremely high quality at very low
cost. It will be the first facility of its kind in the
United States. I have some examples of this kind of product
generated at an experimental facility in the United Kingdom
(Warwick Research Unit for the Blind). The symbols used
on these examples are the result of over 25,000 experi-
mental observations made by Graham James of the University
of Nottingham and John Gill of the University of Warwick,
observations designed to yield a reasonably small set of

symbols that are maximally discriminable one from another. The tactual maps can be produced for pennies each; and the epoxy master has been shown capable of making over 15,000 copies at very low cost.

We intend to pursue the creation also of other pictorial representation - other than maps, that is. Although there has been some controversy over whether pictorial diagrams can be presented tactually, there has been no suitable means of producing them in high quality so that their usefulness can really be assessed. We will explore the <u>definition</u> of useful information in such a tactual form, and evaluate the product in conjunction with actual users.

But it is important to point out that we will have the capability of producing maps of school, university, travel, and work environments easily and cheaply. Furthermore, since reading maps is a learned skill, we will develop instructional modules that will enable naive map readers to use these products.

The second area of immediate application of computer technology is that of providing direct access to information that is normally considered private or privileged, but which is not normally so accessed by blind persons. I mean, of course, information contained in bank statements, charge accounts, and the like. There is now in operation in England with most of the major banks a service which gives blind persons the option of receiving bank statements in braille. We thought originally that it would be possible to import that system and install it in the American banking system. Nothing is ever quite that easy in so elaborated a society as our own: the complexities of automatic deposit and withdrawal, electronic funds transfer, and the multitude of other banking services in the American system require a rather more complicated solution. We have been intensively involved in discussions with major banks in the New York, and midwest area, and we are currently negotiating a

contractual arrangement to develop program modules for
computer processing that take account of these complexities
of American banking service practice. These modules will be
operated experimentally at the Center until thoroughly
debugged. They can then be transferred out into the
working environments of the banks themselves. This
development will preserve the advantages of privacy that
informed our effort from the start.

The third area of immediate application of computer
techniques is the provision in braille of information
which is profiled to the specific interests of pro-
fessionals. In our beginning effort we look again to our
British colleagues at Warwick University. There, a
service has been operating for some time that provides a
selection from the American Psychological Association's
Psychological Abstracts to about a dozen blind psychologists.
Each month, subscribers to this service receive a listing,
with abstracts, of up to 75 references matched to a
specific set of interest terms drawn from the Psychological
Abstracts Thesaurus. What has been faintly scandalous
about the enterprise is that American data tapes have been
sent to England, processed on an American computer, using
an American translation program from ink print analogue
to braille analogue, embossing the translated output on
a high-speed American embosser, and sending the bulk of
the output to American psychologists! Except for
experimental purposes, this arrangement is patently absurd,
and we are working to redress the situation. We intend
to do even better - namely, to extend our capability to
provision of abstract services of this kind to other
blind professional groups, such as engineers, computer
specialists, biologists, physicists, and others.

So much for some of our immediate projects. What of
future research undertakings? Here there are two classes
of activities: those for which we can see that there is
almost enough information available to us to allow the
creation of new products from the Center; and those for
which we know sufficient information will not be

immediately available to allow us to act, but which we
monitor carefully for their potential applicability.

One could give many examples of such research based
on what Robert K. Merton called "hypotheses of the middle
range", but from that set I shall mention five that span
a fair domain of diversity.

Thus, building upon what I have already mentioned
for map reading and the need for an instructional module
teaching the reading of maps, we shall be looking into the
construction of instructional modules that will ease the
entry of visually impaired persons into the professions
and occupations. It is at present very difficult for such
a person to obtain an M.B.A. or, indeed, any other profes-
sional degree. In part that is a result of a lack of
information sources, which the technologies we have al-
ready demonstrated here redress in part; but in part it
is a matter of altering the way in which instruction is
given, assisted let us say with computer techniques.
Such an approach is taken in one project at the
Center which is tailoring instruction in advanced data
processing techniques to a blind individual in a major
corporation; he will then instruct other visually impaired
persons in his own organisation. One interesting result
is that the sighted student of whatever age may well
benefit by the increased clarity and logic of instruction
and teaching - a serendipity that has bestowed benefits
on the sighted population in the past, by way of the
invention of the phonograph, typewriter, ball point pen,
and long playing record for blind persons.

In a parallel way, we shall be investigating the
design and conduct of the work-place for that mix of
system and social technologies that will open new jobs to
the visually impaired. This is more than an effort to
find new applications for computers; rather, it is a
comprehensive undertaking requiring task analysis, job
integration, microprogramming of information flow in the
workplace, and enrichment of tactual and auditory
interfaces with the workers. There is an increasing

number of jobs, particularly in the technical occupations, that because they depend on machine read-out of various kinds lend themselves conceptually very readily to adaptation to visually impaired persons. Consider the modern atuomated office: there are few machines, if any, that cannot be used by the visually impaired with appropriate adaptation, perhaps a simple aid of two, and minor alterations in the organisation of work flow. This area has received some attention - not much - in the USA, particularly by the Sensory Aids Foundation in California. We intend to carry this out further with the help of the rehabilitation counsellor community, and to design machine-assisted information inventories on our experience so that they may have the widest possible applicability. In this we are collaborators with the American Foundation for the Blind and with the Conservatoire National des Arts et Metiers in Paris. The specification of new kinds of sensory aids may well be one important product of this work.

Another activity will be the examination of the implications in the new generation of compact, if not in every case portable, devices from France, West Germany, and the United States that encode and display braille information. Such devices use digitally coded braille; they are thus transparent to computer input and output (or can be made so with interface equipment that is equally compact). Such devices may have a revolutionary impact on the local and remote input and output of information - including computation and programming tasks - in braille displays. Systems of this sort may alter radically the conduct of work and study for braille readers, and we will remain sensitive to the implications.

Finally, in this set of proximate research goals, we shall be reporting out fairly soon on the routinisation of the use of photocomposition tapes to produce braille, large print, and synthetic ink print books and journals. Although the feasibility of using photocomposition tapes to produce braille has been demonstrated on an experi-mental basis, we shall be reducing to a practice art the

complexities in the creation of software that make a wide variety of photocomposition tapes available as input to a computer programmed for the automatic transcription into braille, for creating large print output, and for creating a synthetic speech equivalent of the ink print page. The day draws closer when textbooks for blind students will arrive at the same time as textbooks for their sighted colleagues - and not up to two years later!

Parenthetically, I should mention that experimentation with alteration of the braille code - to reduce the difficulties in learning it, to increase the speed of writing it, and to increase the speed of reading it - are now under way in a few centres in the world. We intend to assist in this experimental programme by providing materials for such experiments, and by consulting in the conduct of experiments to test the usability of such material.

Beyond these immediate tasks, let me now mention rather rapidly more remote goals for the Center's research activities for which we hold considerable expectation. I shall mention but four examples drawn from a larger set.

First, we shall be examining the implications of recent advances in voice data entry systems, systems which by-pass the use of keyboards. I think it not merely a human conceit that we need to have our machines speak to us and understand our speech: small scale and very expensive data entry systems using the human voice are already showing significant gains in speed and efficiency where they have been applied to inventory and order service functions that can be clearly specified. Undoubtedly, advances in microprocessors and in speech technology will make possible large reductions in the cost of such equipments. If so - and the American Foundation for the Blind is investigating this technology intensively - we are prepared to move quite early on in applying it to the data processing needs of the visually impaired.

Second, the possibility of providing a full page of braille in a transient, transitory, or "refreshable" display, is under active prototype development in a few places in the world. At least one of these designs, and perhaps two, give evidence of the possibility of eventual serial production at a cost of $1000 or less. Here, the advantages of tabular display and simultaneous voice read-out for relevant information - in look-up of reference information such as timetables, tax tables, and the like - are quite obvious.

Third, the eventual deployment of relatively sophisticated microprocessor-based small voice-and-digital-braille data entry and output systems allows us to think in terms of a networking operation, in which some functions not supplied by the small local user unit can be supplied by a central computer processing unit over telelinks, i.e., by telephone line or radio. Not only would this supplement small digital braille equipment with capabilities for voice synthesis, greater computational ability, and larger storage of information; such a system could also be adapted relatively easily to the deaf-blind, whose communication needs are difficult to satisfy.

Finally, we remain alert to the possibilities that will ensue from a forthcoming National Science Foundation meeting focussing on the interrelations among the communicative senses. Sensory research and advanced technologies allow us to consider for the first time, in any serious way, the possibilities of creating enriched sensory environments by cross-transfer of information from one sense to another. In this way, it may be possible to match and coordinate the capabilities of the tactual sense for spatial resolution, for example, and the capabilities of the auditory sense for temporal resolution. For the blind, that would mean the creation of the "hearing-feeling" transformation or imitation of the visual environment - that is, a bi-modal display. For the hearing impaired, one might opt for the creation of a "seeing-feeling" transformation of the auditory environment. I have already referred to a crude

approximation of this approach in discussing the simultaneous
presentation of braille and auditory information; the pro-
posed scheme simply carries this approach to its logical
conclusion. The implications for rehabilitation are
enormous, and we shall try to interpret these advances for
the counsellor and the impact they will make on him and
on his client.

In summary, I would say that the Baruch Computer
Research Center for the Visually Impaired will con-
centrate ab initio on one application area all of
those technologies, both system and social, that enhance
the ability of the visually impaired to function optimally
in study, work, and leisure. As we gain experinece in
transferring this knowledge to the everyday practice
domain, we shall extend our purview in logical steps,
building upon the expertise we gain in fulfilling our
purposes. Our overall aim is no less that the creation
of, or restoration of, a life style and a competence among
the visually impaired that will allow such persons to
function indistinguishably from their sighted neighbours.
I do not regard this as a noble goal, but rather merely
our obligation in human terms to the population we intend
to help.

(This article is a transcript of remarks made at
the formal opening of the Baruch Computer Center for the
Visually Impaired, 29 March 1978, at Baruch College, City
University of New York).

Braille Readership in the United States and Distribution of Braille Materials

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It is nigh impossible to estimate the braille-reading population in the United States. Louis Goldish has made a couple of stabs[1] and so have others including the Library of Congress, Division for the Blind and Physically Handicapped. Neither Mr. Goldish nor we have done much more than scratch the surface: the sources for his figures were secondary sources, and DBPH's most recent effort in assessing braille readership arose from a loosely constructed survey with limited objectives.

If one attempts an honest estimate or projection of this readership by looking at a variety of national sources, one can see, I believe, that the braille readership appears to be at a plateau in terms of numbers. There have been many efforts, however, to provide improved reading services to braille readers, some coming from the United States and some from other countries.[2] It is these

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[1] Goldish, Louis H., Braille in the United States: Its Production, Distribution and Use. New York: American Foundation for the Blind, 1967, especially ch. 2; also cf. Goldish's two-part series in New Outlook for the Blind, i.e., "The Severely Visually Impaired Population as a Market for Sensory Aids and Services: Part 1". 66 6 June 1972, pgs. 183-190; and "The Visually Impaired Population as a Market for Sensory Aids and Services: Part 2 - Aids and Services for Partially Sighted Persons". 67 7 September 1973, pgs. 289-296.

[2] A recent statement about the Library of Congress braille readership and DBPH's production of braille, as well as some optimistic speculations about the fruitfulness of recent technological developments, mostly from countries other than the United States, were set forth in an address by Frank Kurt Cylke to the Helen Keller World Conference on Services to Deaf-Blind Youths and Adults, held in New York City, September 11-16, 1977. Copies of the address entitled "Braille Resources for the Deaf-Blind Person: What They Are and What They Could Become", are available by writing to F.K. Cylke, Division for the Blind and Physically Handicapped, Library of Congress, Washington D.C. 20542.

efforts to meet braille readers' needs that have taken up a good deal of my time in these past four years, and for that reason I am pleased to be here to give you our view of "what's up with braille".

Who are the Braille Readers?

Even with this disclaimer about numbers, though, one should attempt to establish a magnitude or level or range; for without this, none of us, either organisations or individuals, will know what services we should be providing or seeking. Let me make a stab at it, using available sources and, frankly, a conservative judgement. Working from Goldish's estimates, as shown in his written material and as a result of a recent conversation with him,[3] we can speak of a population today of about 60,000 persons who use braille fairly regularly. This is a 33 percent increase over the 45,000 estimated a decade ago. By looking at some figures collected over the past five years, we find not only a less clear picture - certainly not a straight-line increase - but even contradictory figures. The number of readers registered with the American Printing House for the Blind increases each year, from 25,800 for 1974 to 29,000 for 1976 (probably 30,000 for the most recent reporting period); but the numbers who read just braille or both braille and large print have decreased steadily in this same period, from 7,850 to 7,300.[4]

It is not too helpful for present purposes to look at figures available from the Library of Congress - for the simple reason that we count only those who register with one or another of our cooperating libraries for braille service - it is user-initiated. A user survey

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[3]Telephone communication between the writer and L.H. Goldish, October 3, 1977.

[4]Figures on visually handicapped persons eligible to receive educational materials from the American Printing House for the Blind under the so-called quota system, and in particular figures on braille readership were supplied to the writer by Ralph McCracken, Braille Editor at APH in a telephone communication on August 15, 1977.

conducted in 1968 for the Library of Congress[5] sampled
from a braille reader population of 10,000; the same
population was sampled in a 1974 survey of braille readers
only,[6] this time about 12,000 (the subscribers to the
Braille Book Review). Actually, DBPH reader statistics
show a larger population, because not everyone who uses
a braille lending library subscribes to this bimonthly
periodical. For the most recent five years for which we
have statistics, the increase has been about 17 percent,
from 18,300 in 1972 to 21,600 in 1976.[7] In this same
period the legally blind population, as reported by the
National Scoeity for Prevention of Blindness, grew only
three percent, from 475,000 to 490,000. If we accept,
however, the prevalence indicated by the 15-year-old
household survey by the National Center for Health
Statistics, the blind population is more like 865,000.
I think you will agree all this is confusing, misleading,
and perhaps useless. About the only clear conclusion is,
I beleive, that a thorough, truly scientific study must
be made.

Some inferences can be and have been made from one
or another of the above figures - and I will tread among
them and a few others. In the period of five years when
braille readership in the Library of Congress network
grew 17 percent, the total number of readers (95 percent
or more using audio materials only) grew about this

[5]Survey of Reader Characteristics, Reader Interests and
Equipment Preferences; A Study of Circulation Systems in
Selected Regional Libraries, a report by Nelson Associates,
Inc. to the Library of Congress, Division for the Blind and
Physically Handicapped, Washington, DC, April 1969 - cf.
Appendix A, Questionnaire Results, Findings and Conclusions,
in particular the Introduction, page 1.

[6]Evensen, Richard H. Report on Braille Reader Survey,
Washington, DC: Library of Congress, Division for the Blind
and Physically Handicapped, November 1974.

[7]Reader and circulation statistics, for braille and talking
book formats, are reported annually by the cooperating
regional libraries to the Division for the Blind and
Physically Handicapped, Reference Section; the Section's
statistician supplied the writer with the necessary reader
statistics, with comparable figures on legally blind persons
as reported annually by the National Society for Prevention
of Blindness, and with extrapolations from the 1968 report
of the National Center for Health Statistics, U.S. Public
Health Service.

percentage each year. It seems safe enough to say, then, that there are fewer new braille readers added to the population each year. This seems to be confirmed by the decrease in braille registrants at APH - and we usually look to the young for the preponderance of growth in braille readership. The best that one can say, after balancing a slight increase against a decrease, is that we are probably at a plateau with respect to the number of braille readers. Like most plateaus, this is negative, for almost everyone who looks at general statistics expects that the number of legally blind, or more broadly visually handicapped persons will grow at a relatively high rate since this handicap occurs most frequently at older ages, beyond 50 or 60.

Who are Serving the Braille Readership and with What Services?

Over about the same five-year period I have been using for other purposes, we have figures that indicate a still high production level and a high demand level. Clovernook Printing House for the Blind reports an increase in the number of plates produced annually, from 46,000 in 1972 to 50,000 in 1976, but a decrease in the number of pages - from 66 million to 50 million in the same period.[8] Similarly, APH in this period saw a drop and a rise in the number of plates but a steady drop in the number of pages produced; thus between 1972 and 1976 the first figure looks the same - 176,000 plates - but the second decreased from 57 million to 48 million pages.[9] Both Martin Droege and Ralph McCracken, in my conversations with them, see some of the same things already mentioned here - fewer new readers - but they also point out that more individual needs are being met (educational as well as recreational

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[8]Supplied to the writer by Martin Droege, Plant Manager, Clovernook Printing House for the Blind, Cincinnati, Ohio, in a telephone communication on August 9, 1977.

[9]Telephone communication between the writer and Ralph McCracken, APH, August 19, 1977.

with APH, mostly recreational with Clovernook). This
speaks well for their sense of service, their responsiveness,
and for users' demands.

Other organisations are responding just as positively:
the growth of instructional materials centres in several
states serving students with all media; and the success
in meeting educational needs in braille by the still in-
creasing number of volunteer braille transcribers; recrea-
tional and professional as well as educational needs are
being met by other braille presses such as Volunteer
Services for the Blind - and, of course, right here in
Boston the Howe Press and National Braille Press.

There are strong assists to braille production from
systems analysts, programmers, and manufacturers - and
again there is a strong centre in Boston: the DOTSYS
translation programs begun some years ago at MIT and
Mitre Corporation, the efforts by American Systems, Inc.,
ARTS Service Center, Duxbury Systems, and Kurzweil Computer
Products. Let us not forget the great boom to braille,
brailling and braillists made possible by the quiet genius
of David Abraham, the Perkins Brailler, successfully
brought into production by him and Dr. Edward Waterhouse,
and maintained at high production levels and according to
high standards by Harry Friedman and his staff at the
Howe Press.

I am not at all modest in pointing to the strong
efforts at the Library of Congress, Division for the
Blind and Physically Handicapped, where there have been
significant increases: from a $1.3 million braille budget
two years ago to a current one of close to $3 million;
from a total of 300 new press braille titles to 375 in
the same period.[10] There are other advances too: we
have embarked on a program of making available four
copies of braille titles produced for DBPH by volunteer
braille transcribers; and the braille magazine program
has grown both in the number of magazines and of

[10]Cylke, F.K. op. cit.

subscribers, despite the heavy increases in braille pro-
duction costs. DBPH has strengthened production standards
and inspection, and is receiving fine cooperation by both
paid and volunteer producers, both types considered
professional braillists, in our opinion.

These many examples show the revitalised concern in
many places to do a better job in braille - the very
holding of this workshop proves, I believe, such concern
and dedication: the leadership of the National Braille
Press chose this as a fitting, meaningful celebration of
its fifty years of service, and the response to this
stimulus was nationwide - those who are here today.

What Must Still be Done?

Of great concern to us at DBPH and to many who work
with us in braille production and distribution is the high
cost of braille. What can be done about it? We have
asked a question beyond this: what help can be had from
the fruits of technology? Technology has always been
significant in the Library of Congress reading program.
Consider all the advances in the talking book program from
that first long-playing record in 1934. For about two
decades, the question about braille has been addressed in
terms of computer assistance: the translation programs,
automatic card-driven stereograph machines, and more
recent efforts to provide flexible computer programs. A
still knotty problem in this area is the continued search
for, development of and agreement on computer-compatible
braille codes and/or braille code-compatible computer
systems.

We must follow other directions also, many of which
still depend on the computer but perhaps in different
ways. I am here speaking of developments in which DBPH
has had a very direct role. We are continuing our efforts
to assure high standards of braille production. We are
eager partners in the reorganised Braille Authority of
North America, and look to its being strengthened in terms

of financing, expertise, and especially program outlook.
And we are very active in supporting, where possible,
promising technological advances. We sat with other
organisation representatives on an advisory committee
during the planning of the preliminary testing of the
Argonne Braille Machine. We are presently devising a
draft evaluation plan for the ELINFA Digicassette Portable
Braille Recorder, which is a good example of a revolutionary
idea - storing braille magnetically on cassettes (what a
saving in space). We have a contract with Triformation
Systems, of Stuart, Florida, for modification of its
embosser which, if successful, will speed up embossing of
zinc and iron plates by as much as six times the rate for
stereotyping by an operator. We have a contract with Ray
Kurzweil's company whereby, again if successful, his al-
ready ingenious reading machine will produce braille out-
put as well as the present voice output. We are following
other ventures in the concept, design or prototype stage,
but frankly our still-limited funds force us to back truly
promising devices and systems, which means beyond the
breadboard and prototype stages.

Conclusion

It is up to all of us to keep open our eyes, our
ears, and our minds to the possibilities of technology
for braille - even such possibilities as high-speed
transmission of braille, possibly by satellite. We must
strive and strive together to do a better job, whether we
be educators, rehabilitation workers, librarians, producers
or providers, inventors or developers, publicists,
leaders - all of use interested in advancing braille,
perhaps even in saving braille, certainly improving the
production and distribution of braille by exploring
practical alternatives to achieve such improvements. But
never, never must we go far in any direction of improve-
ment without complete and total attention to the needs
and demands of the ultimate consumer, the braille reader.

Role of Talking Books and Their Influence on the
Demand of Braille Literature

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Scientific and technical progress is correctly refer-
red to as one of the most important social phenomena of
the present time. It has been instrumental in the intro-
duction of unprecedented changes in all fields of human
endeavour. Its action is increasingly being extended to
the solution of a whole series of matters which concern
blind people all over the world.

However, and this is true in any field of activity,
the scientific and technical progress becomes a powerful
creative force only if social conditions are favourable.
Its achievements depend to a large extent on the economic
power of society as well as on political and other
institutions.

The problems of the blind are deeply social and this
is why the role of scientific and technical progress
depends entirely on the social policy of a given community.

It is very well known that in the USSR, in the
countries of socialist cooperation and in the developed
countries of Europe and Asia great achievements have been
made in the field of compensation of blindness and in
the rehabilitation of the visually handicapped. The
energetic action of society, the development of culture
and the education of people with scientific progress
acting as a thriving factor have banished forever the
eternal myth of blindness as a fatal phenomenon charac-
tersitic of mankind. In the USSR, the satisfactory
solution of some very vital problems of the blind, such

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as the prevention and treatment of eye diseases, employ-
ment, the constant improvement of their cultural and
educational standard has traditionally been made with
the assistance of a close cooperation between scientific
knowledge and practical action. An organic connection
with scientific organisations for the solution of a wide
range of problems relating to the improvement of working
and living conditions of blind people and to their
vocational training is a distinct feature of the activity
of the All Russia Society of the Blind (VOS).

Thus, we can say that scientific and technical
progress is a sort of catalyser of the main processes
which occur in a given society. This will necessarily
influence the nature and methods of the solutions to
specific problems of education and integration of the
blind.

The problems of the situation of the blind in
the age of Science, a difficult and contradictory matter
in many aspects, is one of the concerns of the national
associations as well as of the World Council for the
Welfare of the Blind. And this has not happened by chance.
Under the current conditions, the question has been posed
as follows: Can the collective participation of the blind
in the process of social production be in accordance
with rapidly changing demands?

So is the dialectic of life. Although all that has
been said above has a universal character, it imposes on
the social organisations and above all on the organised
movement of the blind, the special responsibility of
safeguarding the positions already attained, of consolidating
and developing them.

The practical results of our work, especially the
model of solution of the most vital problem, i.e., the
rational employment of the blind, reply positively to
this question. Reality shows not only that there is a true
correspondence between the possibilities of the blind and
the demands of the present time but also that these

possibilities have new perspectives. To achieve this end,
a decisive factor is the constant understanding and the
increasing support of the state and scientific institu-
tions with regard to the solutions to the development
task of the material, technical and professional bases of
the All Russia Society of the Blind.

The objective analyses of the development trends of
blindness and of the demographic composition of seriously
visually impaired people, have permitted this institution
to work out new methods for the solution of the tasks
relating to the training of blind and partially sighted
people bearing in mind current demands. This results in
the increasing importance of subjective factors, such as
the mobilising role of social organisations - in our case,
the All Russia Society of the Blind - and the increasing
social activity of blind people themselves. Our associa-
tion is not only an independent organisation which gives
a certain contribution to the national economy but also
an important leading centre which has the responsibility
of studying, organising coordinating, consulting and
assimilating the work carried out in pratically every
field of the social and vocational rehabilitation as well
as of placement in employment.

Social activity, implies for every expert in any
branch of production, science and culture, a sense of
responsibility of the task he has been assigned and an
understanding of the need to improve constantly the
standard of professional knowledge and knowhow.

The availability of books is a great benefit for
contemporary mankind. Society acts in a humanitarian
way by giving blind people access to the treasures of
human genius. There is a growing need of acquiring con-
cise information. This general phenomenon deriving from
the information explosion and the increase of the cost
of the time necessary to obtain new data demands from
the national organisations, the application of better
methods in the vocational training and the improvement

of social and cultural services for the blind.

Scientific and technical progress has presented the blind with the tape recorder and talking books. The availability of talking books meant that for the first time after the creation of the marvellous system of Louis Braille, blind people had received a second means offering them the possibility of working independently with a book. This has given birth to a whole series of new and rather complex tasks. In this paper we will deal with the mutual dependence of two types of books.

All the discussions on the supposed opposition between braille and talking books should be considered as mere sophistics.

Both types of books exist and develop in a parallel way.

The book in braille or in talking book form is one of the most important means of getting information about reality, of obtaining and exchanging vocational skills as well as scientific and cultural values. Books, besides being a mass medium of information, offer to society an immense possibility considering their variety and power to influence both the individual and the community as a whole.

We are going to study some development trends of the two types of books for the blind. Each kind has its own specific features. Both are defined above all by the nature of the perception involved and by their efficiency and comfort of manipulation.

The application to vocational and study purposes becomes one of the most important trends in the development of embossed books. Today it is undeniable that not all books can be perceived by listening. In order to carry out a serious scientific study, it is necessary to know how to work independently with a book. Blind people can acquire this skill thanks to the braille book. There

has been an increasing availability of books for blind
people engaged in different fields of intellectual work.
There is a growing number of publications relating to
Sociology and Politics and scientific books designed for
the general public as well as reference books and
dictionaries. The publication of periodicals is braille
does not decrease either.

Libraries for the blind have an excellent stock of
Russian and world classics as well as of contemporary
foreign and Soviet authors. In 1977 the stock of books
in the libraries for the blind, in the Russian Federal
Socialist Soviet Republic only, amounted to 1,350,000,
including records. (All the figures mentioned in this
report refer exclusively to the above-mentioned republic.)
More than half of this stock consists, as above, of
books in braille. However, the proportion of braille
books in the total stock is decreasing considerably. The
proportion of talking books is increasing.

In the following table we show a comparison of the
distribution of book stocks according to the type of book
and the proportion of each type in relation to the total
stock of 1974-1977.

Type of book	1974		1976	
	number of copies (thousands)	% in rela- tion to the total stock	number of copies (thousands)	% in rela- tion to the total stock
Books in braille	1643.5	54.1	1759.9	50.2
Talking books	810.5	26.6	970.8	27.8
Ink print books	582.6	19.2	703.1	20.0

We can make the following remarks concerning these figures: in two years the number of books in braille has increased 6.5% and that of talking books 7.5%. The increase in the number of books in ordinary print of 21% is due not only to the presence of a certain number of sighted readers but also to the increasing demand from the blind themselves.

This same pattern can be observed in the analysis of the data concerning the loaning of books in libraries.

In spite of the increase of the absolute indexes relating to stocks and loaning of braille books, it is possible to see a clear trend towards a decrease in the demand of such books. This undoubtedly influences the number of copies printed in each edition. If we take the 1971 editions of braille books as a basis for comparison, in 1977 they represented 90% and this year they do not exceed 78%.

Our experience shows that the period of initial accumulation is rather quick. The basic stock of talking books has been completed for almost all the branches of knowledge. Its development has started a stage of regular increase of book stocks on the basis of more specific topics within the general subjects. We must point out that the subject trends will be constantly corrected as methods and quality of recording are improved and with further development of duplication techniques.

In 1977 the total stock of talking book libraries amounted to 2,200 titles, of which 80% corresponded to fiction, and approximately 20% to literature on Sociology and Politics, text books and scientific books designed for the general public.

If the recording of talking books amounted to 3,200 hours in 1970, in 1977 it equalled 3,650. These figures show that there is an increase in the production of recorded literature. In terms of edition sheets, the

figures just mentioned amount to 4,000 and 4,562.2.

Talking books according to the demand from readers are produced in two quantities of copies. The small quantity is equal to 150-170 copies of each title and the large one 250-270. All the books are distributed to libraries for the blind.

The tape-recorder, despite its degree of perfection, enslaves man and transforms him into a "dumb" worshipper. Technical whims do not disturb man but rather annoy him when there is a forced interruption of reading. All the same, the demand of talking books is rapidly increasing. Their mean circulation is eight times larger than that of braille books.

The recording of books on tape undoubtedly has some advantages. The broadcasting of talking books in special factories for the blind, and the listening of talking books at home which generally becomes a collective reading session of all members of the family, are factors which have an enormous educative value. The advantage of the talking books is that they are read by great artists, and qualified radio announcers. This produces a great moral and esthetic satisfaction, and increases the emotional and educative effects on man.

Moreover, recorded books have some advantages in comparison to braille with regard to their weight and size. Talking books can be easily carried and stored.

The facts are clear. The talking book has had for a long time a leading position. What are the prospects of these two types of books in the world of literature for the blind? Does this imply that a progressive abandonment of braille is taking place?

In the Soviet Union the talking book has had a great impulse for the last twenty years. Blind people receive tape-recorders at reduced prices or free of charge. The

talking book does not require any of the physical or intellectual efforts necessary for the assimilation of braille.

The talking book has rapidly attracted a great number of visually handicapped persons to reading. The over-whelming majority of these people are invalids of the second group (partially sighted), who do not know braille.

Statistics show that the increase in the number of blind people is only due to the inclusion of adults who have lost their sight as a consequence of disease or injury, and whose sense of touch is very poor because of their age.

In the Russian Federal Soviet Socialist Republic out of the 205,000 registered blind people, 43,000 know braille, i.e., 1,900 people less than in 1974.

Blindness among children has reached in our country its lowest record. From 0 to 7 years, it represents 0.2% and from 7 to 16, 2.1%. On the other hand, the number of blind people sixty years and older represents a 46.5% of the total population of registered blind people.

Most of the schools for the blind have practically become schools for partially sighted.

All this has directly influenced the readers' demands as far as libraries for the blind are concerned. In 1977, out of the 143,000 readers (of these 21,000 were sighted), 28,300 people read books in braille, i.e., 65% of those who know the system. 80,000 people have listened to talking books. In relation to 1974 the number of listeners of talking books has increased almost by 12,000.

That is the evolution of braille and talking books with the background of the social processes that influence it.

As far as the abandonment of braille is concerned,
it is a problem that lies beyond the limits of this paper
and which needs an urgent and thorough analysis. In any
case, we are not at all convinced that the system of Louis
Braille is completing its historic mission. No, this
should not be taken as a narrow conservatism. A sense
of deep conviction compels us to say: the possibilities
of this system are far from being fully exploited. It will
only become history when blindness has disappeared.

We think that the practical solution of the tasks
of the rehabilitation and education of the blind, bearing
in mind the specific demands of present time, should be
supported by a deep knowledge of the peculiarities of each
category of blind people, peculiarities which are even more
varied than the ones one can observe among sighted people.

Considering the specific character of this work due
to differences resulting from the onset of blindness, the
nature and degree of visual impairment, the compensation
task for the various categories of blind people has to be
conducted in different ways utilising the most appropriate
means for each category.

This is why the success of the work will increasingly
depend on the improvement of all the systems and methods
used in the training of blind people for a useful and
remunerative life based on the achievements of scientific
and technical progress and of social development.

The maximum utilisation of educational guidance and
of the compensation potentials of the braille system as
well as of tape recorders and other technical means, are
some of the challenges derived from the present state of
development.

From a practical viewpoint the main feature of the
development prospects of both types of literature for
the blind is a stronger specialisation of publications
in accordance with the reader demands and with psychological

and educational recommendations made by the scientists.
The methodical, technical and typographical improvement
of each type of book production is very important. We
also are aware of the objective need to conduct further
research to find new methods which could make possible a
combination of both types of literature, offering the blind
the chance to have at their disposal a book using the
two systems, i.e., braille and recorded, taking into account
the perceptive potentials of both braille and talking books
as well as their information possibilities. The creation
of such books, for instance for handbooks and textbooks,
for those who learn a foreign language is entirely
feasible and does not require any additional expenses.

In many countries, including the Soviet Union, studies
are being conducted along these lines. The international
exchange in this field will contribute in our opinion to
the promotion of our common cause.

All that has been said so far confirms the view that
braille and talking books are natural allies, which are
destined to develop and complement each other. Since
the tape-recorder is a remarkable achievement of scientific
and technical progress, it has become a device liable to
be humanised, as they said in England. Now we are wit-
nessing the birth of new discoveries and inventions for
the blind. The optacon and other reading machines still
have a long way to go before they become media as effi-
cient, reliable and easily accessible as their brother
the tape-recorder.

For more than a century, braille has been the only
instrument available to the blind to get to know life in
an independent manner, to penetrate in the world of human
treasures and to prepare them to lead a useful life.
Nowadays scientific and technical progress is broadening
the possibilities of the blind to become independent, and
it contributes to the process of their adjustment and
integration in society. The community is becoming more
and more aware not only of its responsibility but also of

the interest in solving the current problems of the blind.

In conclusion, I wish to make the following proposal for the final resolution: to consider that the combination and development of traditional and new methods for an independent access to information are important pre-requirements for the successful integration of the blind in present society. To achieve this end, it is essential to obtain an increasing moral and material support in order to solve the present problems of the blind taking into account the demands of scientific and technical progress.

Effective Forms and Methods of Lending
Literature in Braille and on Sound Carriers

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Scientific and technical development has notably increased in the last few decades. There is talk of the penetration of the scientific-technical revolution in all countries of the world and in all spheres of human life, including the new devices and aids for the blind and visually imapired. We, the directors of printing houses and libraries for the blind, have the responsibility of taking immediate and full advantage, in our work, of the results of the rapid growth of this modernisation and technical development.

The organisation of braille libraries, of recorded literature, and of books, magazines and manuals in large print for the partially sighted need not be isolated from the general development. Also in this same aspect it is necessary to search for new ways, new work methods, inasmuch as both the blind and visually imapaired represent at the present time a significant factor, which must be integrated, as an important part of society and state in normal life.

The historical development of libraries for the blind has not been, of course, identical in all countries of the world. It has suffered the influence of a great number of factors, among which we might mention as most important the constitution and the system of distribution of state wealth, secondly, social conditions, and finally, the manner of providing financial means, whether from charity organisations or from state allotments, as is the case in the more progressive societies.

There are, in essence, three types of libraries:

1.   The library united with the printing
     house for the blind on the same premises.

2.   The library as an isolated unit, indepen-
     dent in its organisation and financial
     matters.

3.   The library included in the system of
     public libraries.

The most frequent of these three types is the first:
the functioning of the library is directly linked with that
of the printing house for the blind. This system has its
advantages and its disadvantages. The advantages have to
do with the common objectives of the two services, the
possibility of immediate collaboration between the two
and the close contact which is established with the pro-
duction system. The disadvantages arise from the insuf-
ficiency of available space, which offers few possibilities
for expansion of the services, and from the dependence of
the library's administration, whose development is
subordinate to that of the production techniques of the
printing house.

The independent library, in this sense, is in a much
more advantageous situation. It is free from the problems
of the production of literature for the blind and from
the worries arising from them. It has its own financial
base and must take care of only its own development goals.
It is a system which is in accordance with the modern con-
ception and which is likely to become in the near future
the most common system.

The lending libraries integrated within the system
of normal public libraries should be considered only as
a complement to the above-mentioned systems, and will need
to be converted preferably into branches of the libraries
in regional capitals. These branches are more easily

accessible to readers and relieve the postal services of
an enormous burden as regards the sending of braille books
and talking books. This type of library constitutes as
well a new form of development which sooner or later
will become a supplement to the services of a central
library. It is also to be expected that these branches
plant the seeds for future social centres for the visually
impaired. These centres will be able to establish small
recording studios, communication and technical assistance
services, services for aid to students from all kinds of
education centres, and when the time comes they will be
converted into centres for the use of computers in the
system of data processing.

The equipment of the libraries is, save for a few
exceptions, out-dated. In them we find various types of
simple shelves in total or almost complete absence of
mechanisation. The reference system of the braille and
talking books is carried out in the majority of cases by
way of a simple system of cataloguing, inasmuch as the
number is not too large and its ordering is rather simple.
This is another aspect towards which we should direct our
efforts in order to obtain total technification. The
type of materials available for lending is well known.
These materials are books and magazines in braille, records,
books and magazines on tape, radio plays, large print
books and magazines for the partially sighted, informative
materials of all types, including translations of sister
magazines from all over the world, brief reports on re-
search, musical scores in ink print and braille, text books
on tape for secondary schools and universities, and a
small collection of ink print books.

The volume of production increases continually.
Printing houses for the blind will be supplied with modern
systems of computerised transcription, rotary presses,
automatic presses and sophisticated techniques of book
binding. At the present time the recording studios
increase the production of books on tape, the number of

copies on open reel tape and cassettes is multitplied,
and the number of blind and visually impaired students in
upper level education centres increases. The growth of
activity in a specific area, in production for example,
implies the appearance of a greater need for improvement
in the reference and cataloguing systems and in the lending
systems. One of the aspects in which it is possible to
imagine modernisation is in the possibilities of mobility
of the book shelves. It is necessary to eliminate the
complicated search for desired books and materials as well
as the useless movement from one shelf to another. The
equipment in braille libraries differs undoubtedly from
that of talking book libraries. Braille books take up
considerably more space and are rather heavy, which causes
the lending process to be much slower. How can we resolve
these problems? The shelves will be placed one after
another in modular form without intermediate passageways.
Each one will have its own transportation system and will
be electrically movable, controlled from a central control
board. This control board will be located as close as
possible to where direct contact with the readers takes
place. The numbers on the control board for the shelves
will correspond to the catalogue reference numbers.

In the case of the talking book library, including
records and radio plays, the problem will be resolved in
a different way. In the majority of cases there will be
an area exclusively set aside for this purpose. Here
also there will be a control board, but the shelves will
adopt the form of a continuous ellipsoidal moving band.
In the first place the desired title will be sought, and
then by way of a button the movement of the band will be
ordered to carry the shelves until the corresponding
point is found, in which position the movable wall will
stop. At this point it will be extremely simple to find
the book. It is possible also to incorporate the
reference system of the books in a computer, which will
also be used for the automatic printing of braille and
ink print.

The storing of information of all kinds, the translations made from specialised journals for the blind in braille or in ink print, as well as other translations that the research service may have been able to obtain, are carried out much better with the help of the computer and its very extensive memory. Musical scores in braille should also be supplemented by the corresponding version in ink print and on tape and the three variants will be filed in one single container.

The existing systems strongly depend on the development which has taken place up to now in the lending services for visually impaired readers and their range of application is of a limited scope. Most of their activity takes place in the central library and consists of two fundamental procedures. First, the readers who live in the town where the library is located go to the library personally or send some family member to pick up the material for them. Those who live in different cities use the postal service and order by mail the literature that they wish to receive. The library makes sure that they receive the requested volumes. This system, which is the one most frequently used, is advantageous for both parties and will continue in effect for many years to come, although in some of the very advanced countries new alternatives have begun to appear. These alternatives are, in the case of large cities, the transportation in vehicles belonging to the institution, of the books to the home of the reader and especially to elderly blind people.

For this purpose in large cities district branches of the libraries are opened. They are very adequate for this type of collaboration with the readers, inasmuch as in addition to developing other activities and practical services, they create the possibility of more efficiently meeting the needs of the readers, because of a better understanding of their desires. The moving of these branches to industrial centres where a great number of blind and visually impaired people are employed is possible only if the workers reside in the surrounding area of the production site. In this case, the corresponding

library actually becomes a branch of the central library while the central library becomes the consultant and provides its branch with the books and materials.

All libraries have, in addition to their primary task of supplying literature in braille and on tape to the inhabitants of the area who are not able to go to the general information centres, another even more appealing mission. They must educate their readers, advise them, widen their horizons through the spoken word, which is as well we know the most effective contact possible. We have in mind conversations which could take place in clubs, lectures, concerts, short plays, literary gatherings and other similar activities, in short, educational and cultural activities. Visually impaired readers show a special interest in this type of social life which also provides them with the possibility of getting to know each other better and of making new friends.

In this way, the meeting hall, club, gymnasium or sports field is not only a place for social life but can also be a place for informal gatherings. In this way the library workers would be able to see the results of their work in a more efficient manner than that which is provided by analyses carried out by way of questionnaires, no matter how detailed they may be. The services which are provided for the reader in the library itself should be supplemented by reading and study rooms, recording studios and listening booths. The available tables in the rooms should be equipped with modern technical devices in order to facilitate maximum concentration for the student. In these rooms there will be tape players with earphones, optacons, digicassettes, reading aids for the partially sighted and other similar equipment.

In our work with the readers, we should not forget the need to provide information and reporting in an efficient and regular manner. The most adequate informative medium is the publication of regular supplements to the catalogue, in which the publication of new works should be announced. In reporting it will be most important

to make known the situation of the blind welfare movement
on an international level, as well as information about
new work methods, aids, new machines, devices, etc. And
we should not overlook the efforts which are carried out
in order to find creative solutions to our internal
problems and difficulties.

Computer technology and its integration in the library
system represents a new and very specific field in the
coping with our problems. The minicomputer is already
opening the way towards the utilisation of automatic pro-
duction of materials in braille and on tape and can claim
to have produced some very positive and economic results.
Taking into account that the computer has a very extensive
memory it is also possible to use it in the activity of
the circulation of books. Computerised files for books
and readers do not constitute the only possibility of
application. Computers must also take the responsibility
for a much more important task in the creation of an
"information memory" and it will be possible to make use
of that system, after work hours, by way of a direct tele-
phone or a radio network. Once the corresponding number
is dialed the equipment will switch on and will fulfill,
according to the order which has been transmitted to it,
the required services, for example, a mathematical calcu-
lation, or the search for specific data in its memory.
Automatic computer printing is already operational, and
the use of computer services without the necessity of
directly handling them is at this time in a stage of
development and will not be long in becoming a reality.

A new service, which is acquiring increasing success
among the other aids for the visually impaired, is radio
broadcasting.

Although it may seem that telephonic connection with
the users of this service through a central installation
is a matter which corresponds to the telecommunication
authorities, we think that a separate organisation for
this activity would be more efficient and practical. So,

I recommend that libraries have available their own system
for control of the central installation, which could
in addition activate a device with a telephone connection
in order to rapidly transmit information concerning new
additions to library stock as well as the progress of the
blind welfare movement.

Dear friends, these brief thoughts which I have
dedicated to the ways and methods of the functioning of
libraries for the blind are by no means an attempt to
give a complete view of our problems. My intention has
been to give a short look at the present situation and at
the new possibilities which are arising, and to provide
some suggestions concerning new work methods with and for
the readers. We should take advantage of this conference
to express in the forthcoming discussion our opinions
concerning these matters. If, from this conference, con-
crete results must be produced, it would be appropriate
to examine the following suggestions:

1. That the European Regional Committee examine the
    possibility of creating the necessary conditions
    for the establishment of a centre in charge of
    the systematic reading of all of the journals
    for the blind, as well as specialised literature
    from all over the world for the purpose of
    sending the most important articles and news
    items to all countries.

2. That a specialised international journal be
    published concerning the production of written
    material for the blind, book binding, computer
    technology, library sciences, etc.

3. That regular meetings be organised for the
    directors of libraries and printing houses.

Finally, I would like to express my desire that we
dedicate all of our energy to the strengthening and
improvement of our humanitarian mission for the welfare
of the blind and visually impaired throughout the world.

From the Ink Print Book to the Braille Book
Difficulties of the Process

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One of the most important problems braille printing houses and libraries have to face today is, beyond any doubt, the accurate transfer from the ink print to the braille book, especially with regard to the transcription of textbooks for the different subjects of the various educational levels: primary, secondary, vocational and university education without neglecting, of course, the difficulties which one encounters in other books, which while not belonging to any planned instruction, on account of their specific contents, also present certain difficulties.

The book editing service, or if this does not exist, the transcribers in printing houses and libraries are the ones who first have to cope with the transcription problems the ink print book present, so that the braille book provides the blind student or reader with the same scientific or cultural information which is contained in the normal one. The following two principles have to be borne in mind:

(a) That the blind have to use the sense of touch as the reading and information means and that this sense has a psycho-physiological behaviour different from that of sight, and

(b) That the possibilities of the braille system and of graphic representation with embossed dots are very limited.

It seems obvious that with such premises the transcription problems cannot be completely solved. However, one should always try to find the best possible

solution in each case. Clearly aware of the responsibility
that we, directors of braille printing houses and libraries,
have with regard to the numerous transcription problems,
I have chosen this topic for my paper. I do not intend
to offer miraculous solutions but to make a detailed
analysis of the various problems involved in the transfer
into braille of the contents of the ink print book and
to propose some basic criteria suggested by my own
experience in this field, which could serve as a basis
for a recommendation. In my paper I shall adopt the
following plan:

(a) Premise - Comparative study of the psycho-
physiological behaviour of the sensory organ for reading
and gathering book information in blind and sighted people.

(b) Problems posed in transcribing by the current
abundance of visual resources in ink print books: photo-
graphs, drawings, graphs, diagrams, synoptic tables, tree-
type structures, etc.

(c) Problems derived from the great variety of print
resources used in ink print books: different type sizes
and forms, use of various colours, marginal or inter-
polated paragraphs, footnotes, etc.

(d) Problems arising from the use of special signs:
mathematical and scientific, linguistic, phonetic and
musical.

(e) Conclusion: Critical analysis of the positions
adopted by those concerned with the problems presented:
sightism, blindism and eclectic position.

And after this necessary introduction, let us go on
to the problems indicated, in accordance with the outlined
plan:

(a) Premise - Comparative study of the sensory
organs for reading:

It is not my purpose here to carry out a thorough
study of sensory sight and touch organs which are used
for reading respectively by the sighted and the blind,
since it would not be appropriate now, but only to make
a comparative analysis of the psycho-physiological
behaviour of both senses in respect of reading and book
information.

We must emphasise that whereas sight is synthetic
and global, touch is analytical and sequential, and,
therefore, these senses are opposite in behaviour. These
circumstances imply the existence of various features
which differ in both senses: sight totalises and integrates.
Touch, on the other hand, individualises and disintegrates.
Sight has a second analytical stage, in which it con-
centrates its attention on the different parts, and touch,
on the contrary, is not able to synthesise by itself but
only with the help of imagination and memory. Sight per-
ceives the whole, and appreciates in it forms, sizes and
colours, whereas touch only distinguishes those forms and
sizes which are sequentially perceived by the fingertips
in movement. Sight has an extensive and varied series of
sensibles which produce a very complete sensation, rich
in nuances and remote, and touch is more limited, much
poorer in nuances and needs direct contact, and lastly,
sight has a very wide sensory horizon, apprehends space
and perspective, whereas touch has a sensory horizon and
spatial perception limited to the environment the hands
can reach, is sequential and does not apprehend perspective.

The features we have just mentioned clearly show that,
in connection with reading, graphic information and book
resources in general, sight gives a quantity and quality
of information far superior to that furnished by touch
and that there are means and procedures in ink print
books which are essentially visual, and which, if they
are transcribed into braille with the same form in which
they appear there, their purpose is betrayed and, if we
adapt them to tactile characteristics, their aim is not

fulfilled either. <u>Synoptic</u> and <u>other types of tables</u> are
a clear example of this.

In order to illustrate what we have just said it will
be sufficient to have a look at a <u>synoptic table</u> as
elementary as the one appearing on page 37 of the IV
volume of the work "Consultor, Ciencias Sociales" for the
VIII Grade of the General Basic Education in Spain, pub-
lished by Editorial Santillana. The purpose of the <u>table</u>
is to make a comparative study of three factors in
Iberoamerican countries: absolute population, relative
population and per capita income in each one. And in
spite of its obvious simplicity, whereas the sighted
visualise the <u>table</u> in a global manner, establishing the
comparisons immediately between each of the factors in
each country, the blind have to read it sequentially,
either horizontally - the country and its three factors -
or vertically, analysing each factor in each country,
and they will therefore need to resort to the help of
memory to make the comparison.

The more complex the <u>synoptic table</u> is, the greater
the difficulties will be for the blind reader to under-
stand it, regardless of the technical problems involved
in its transcription. So, for instance, the <u>table</u>
appearing on page 181 of the first volume of "Los Partidos,
Arma de la Democracia", is far more complicated. There
a comparative study of the main European political parties
is made, covering the following data: electoral system,
countries, parties in each of them, date of the last
elections held, net percentage of votes and seats obtained
in the Lower House. It is easy to imagine the technical
difficulties its transcription presents, as it has six
columns and fourteen rows. In braille one is compelled
to transcribe it with a structure in accordance with the
possibilities of the system whereby is shown the inability
of touch to <u>understand globally</u>, which is precisely what
the ink print table tries to do, i.e. to give the sighted
reader synthetic and comparative information much clearer
than what the blind get by sequential reading.

The differences between sight and touch as reading and information organs are shown more clearly when dealing with graphic information in ink print books. This information will generally have to be left out, as we will see in the next section when talking about visual means. Touch as a reading sensory organ is an imperfect substitute for sight and therefore has obvious disadvantages.

(b) <u>Problems arising from visual means with regard to braille transcription</u>. The enormous abundance of visual elements which ink print books have today is a great hindrance to their transcription, because it is not an adequate solution just to eliminate all the graphic information, as this undoubtedly implies a serious impairment to the book in its informative function.

On the other hand, it is not possible either to carry out an entirely exact transcription, reproducing with embossed dots all that graphic information, because in some cases this is not technically possible and in others, due to the fact that such a reproduction is unintelligible to the blind.

It is therefore, necessary to establish some basic criteria which might serve as general guidelines so as to determine what should be done when each of the visual means is presented, with regard to their transcription into braille, so as to guarantee the appropriateness of the conveyed information. These basic criteria are as follows:

1. All pictures, photographs or drawings of a figurative nature should be eliminated because, even if they are capable of reproduction with dots, they are inaccessible to touch and, however simple they might seem, they are difficult to identify. Touch, on account of its inability to appreciate perspective, cannot discriminate forms in a bi-dimensional representation.

2.   When pictures are eliminated one should consider whether their omission significantly affects the contents of the book. If so, they should be substituted by their corresponding caption when it is explicit enough, or by a textual explanation.

3.   Geometric drawings, diagrams and graphs, which are usually the basis of a mathematical or scientific demonstration should be made with dots and they should comply with the following conditions:

(a)   That braille embossed reproduction should be technically possible.

(b)   That such reproduction should be perfectly understandable by touch, and

(c)   If the figure is very complex, before its transcription someone with sufficient experience should simplify it to the limit by eliminating unrelevant auxiliary lines or he should adapt it without detriment to the demonstration.

4.   Figures should be placed in the braille book as near as possible to the theorem or problem they illustrate or for the demonstration of which they are the basis.

5.   With regard to diagrams, organigrams, tables with keys or the like, developed formulae for Organic Chemistry, tree structures, synoptic tables, etc., a similar criterion as indicated for geometric figures or graphs should be followed. Their possibilities for embossed reproduction and their ability to be understood

by touch should be carefully studied and if
necessary, they should be adapted by an expert.
When tables and diagrams, etc., are too complex
and difficult to be transcribed or understood,
it is better to reproduce them horizontally and
sequentially, as this is more in accordance with
tactile possibilities.

In order to apply these criteria we have just specified
adequately, it is first necessary to carry out a thorough
study of the ink print book so as to eliminate, adapt or
transcribe the visual means it contains. This study
should be made by suitably qualified people with a good
knowledge of the subject of the book, with a mastery of
the possibilities of braille transcription and with good
teaching experience. This team should consist of both
sighted and blind people. The book-editing team has to
work in close cooperation with the printing house or
better still, it should consist of members of the braille
works staff in order to ensure perfect functioning.

(c) Problems posed by print resources. At present
ink print books, especially textbooks, contain a great
variety of print resources: use of different colours and
various type sizes and forms, marginal or interpolated
paragraphs, formulae layouts and definitions, footnotes,
etc. All this, together with the enormous abundance of
visual elements render the books extremely pleasant and
are a recreation for sight.

But this luxury in the print book, relevant in many
occasions since it emphasises what is important and acts
as an aid to memory, and which is a true visual rest,
poses great difficulties for its transcription into braille,
if we intend to show everything.

It is well known that the braille system has a single
character type and that its possibilities are limited to
the combination of the six dots, with which the sixty
three simple signs can be made. It is necessary to use

<u>key signs</u> which, placed before the <u>simple ones</u>, transform them in numbers, capital letters or italics. However, bearing in mind that braille reading is analytical and sequential, these <u>key signs</u> should be reduced to a minimum so that they do not become a serious obstacle for the blind reader.

Although we are not going to give a detailed account of the rules concerning the use of <u>key signs</u>, it is, however, absolutely necessary to suggest some basic criteria so that transcribers know what action to take and how to interpret the ink print resources suitable when having to make the braille version. These criteria are as follows:

1. In braille transcription it is impossible to reproduce the enormous variety of print resources of the ink print book, i.e., use of different colours and different type sizes and forms. Consequently, <u>key signs</u> should only be used in really relevant cases:

(a) The number sign should precede any numerical expression.

(b) The capital letter sign will be used in the following instances: before the initial word of any writing, all proper names, the initial word of a paragraph, after full stop and optionally after the colon and in any other cases where the text requires it, such as a literal mathematical expression, some items with literal enumeration, etc. When in the ink print book a word is written entirely with capital letters or when the initial letter of every word in a paragraph is capital or the whole paragraph is written with capital letters,

there are some conventional solutions
in braille, but they are not very con-
vincing, and therefore, it is advisable
not to apply them.

(c) The italic letter sign will precede
     those words which, because of their
     importance, it is necessary to emphasise
     as well as brief paragraphs applying
     the existing braille solution for that
     `purpose, which is not very convincing
     and which should be eliminated in long
     paragraphs. The italic braille sign
     stands for the following ink print
     variants: italic, bold type, letters
     with a different colour, underlined
     words, or in general, all forms of em-
     phasising a word. It is also used to
     emphasise a letter or group of letters
     - desinential prefixes and suffixes -
     but this solution is hardly in accordance
     with braille, and therefore, its appro-
     priateness should be studied in each
     case.

2.   When paragraphs written in small characters,
marginal or interpolated paragraphs are indica-
tive of complementary information or a more
advanced knowledge corresponding to a higher
educational level, they should be transcribed
into braille in a distinct manner, isolating
them by means of blank lines and using a con-
ventional sign. In Spain for this purpose, we
usually write a double asterisk sign preceding
the capital letter which initiates the para-
graph and a single one after the full stop sign
that ends it.

3.   If those marginal or interpolated paragraphs
are only placed in this way for situational

reasons, as parallel information, an adequate place within the text will be sought to insert them.

4. Formulae, definitions or paragraphs in a box can be transcribed, surrounded by dotted lines, in order to enable their easy location and make them stand out.

5. Notes, both those from the ink print book and the ones belonging to the braille edition, should be placed at the foot of the page and should be separated from the text by a dotted line. However, when books have a great profusion of notes and, therefore, their insertion at the foot of the page would imply a serious nuisance for reading because of the limitation of the written braille space, they can be placed immediately after the end of a chapter or lesson, this being indicated when the first one appears. Bearing in mind that print resources, besides having an informative goal, also aim, as we said, to be an entertainment for sight it would be worthwhile to investigate whether in braille books, within the lack of resources, means could be found to serve as entertainment for touch. I wonder whether some blank spaces and lines, provided that they do not hinder the continuity of reading, could fulfill this end. This is my suggestion, in case it should be of interest it should be further investigated.

(d) Special notations. Braille with its limited resources has to cope with the presentation of signs and symbols for mathematics and science, phonetics, linguistics and music and which often appear in ink print books with a great variety of meanings.

In order to solve this problem, as blind people progressed in the field of culture, in the different countries special codes gradually appeared, based on the elementary ones created by Louis Braille, and thus emerged the special notations, unfortunately differing from one country to another because cultural evolution has not been parallel.

Today there are different notations, for science and mathematics, music and phonetics, and in spite of the efforts made by the World Council for the Welfare of the Blind through its specialised commissions to achieve the desired unification, it has not become a reality yet, although we are all convinced of the considerable advantages that unity would bring.

With regard to mathematical and scientific notation, Spain has adopted the "U" notation, created by Francisco Rodrigo Dominguez, an official of the Spanish National Organisation of the Blind, who has recently been appointed as Chairman of the Subcommittee on Mathematics of the Committee on Cultural Affairs of the W.C.W.B. This notation is now in the experimental stage and is being studied by experts from different countries, and it adequately satisfies the demands for transcription of mathematical and scientific books.

(c) As far as phonetic notation is concerned, in Spain we are using the code published in Marburg in 1938, translated and revised by Byron Eguiguren, and produced by the Editora Nacional Braille de Buenos Aires. This notation, where only consonant signs, semi-consonant and semi-vowel sounds, are included, was supplemented later with the signs for vowel sounds by Mr. Eguiguren and Mr. Pajon, in accordance with the table published by the Imprenta Nacional Braille in Madrid.

For linguistic codes, Spain has followed the work "World Braille Usage" by Sir Klutha Mackenzie, published by UNESCO with some later modifications approved in international meetings of the Iberoamerican countries.

Finally, with regard to music notation, Spain for many years used the eight dot music code of the Spaniard Abreu, but in the early fifties the 1929 Braille Music Notation was adopted in order to contribute to the international use of a unified system. Today we still use it with some modifications introduced by experts.

These notations, which have emerged separately and without communication among the experts who created them, have already posed some problems for lack of coherence among themselves especially if we consider that culture nowadays is mainly interdisciplinary, and mathematical symbols, for example, can be found very frequently not only in physics, chemistry or biology, etc., but also in grammar, sociology, philosophy and in some specific subjects, such as logics. On the other hand, in mathematics use is made of Greek and Hebrew letters together with the Latin ones, and this makes it necessary to render them distinct from the corresponding linguistic signs.

I do not wish to make an elogy here of the advantages of unified braille notations, but I think that we, directors of printing houses and libraries who are directly concerned with this problem, on account of our responsibility in braille production, should undertake to pressure the experts so that unification soon becomes a reality.

(e) <u>Conclusion</u>. So far we have made an objective study of the problems arising from the transcription of the ink print book into braille from the point of view of the production centres: printing houses and libraries; but now we shall try to analyse critically the opinions of the interested parties: blind students, professionals and readers, those who receive our book.

Three positions have been adopted by those concerned, and they usually coincide with their conception of blindness in general:

1. <u>Sightism</u>. Those who maintain this position believe that braille should be an exact copy, a very accurate transcription from the ink print book, containing the graphic information, reflecting the typographic resources and omitting exclusively those prints, tables or typographic resources, which are clearly impossible to be transcribed on technical grounds.

The defenders of this position think the apprehension possibilities of touch are in a way equal to those of sight because the visual sensibles that touch does not perceive can be replaced, so they believe, by imagination and intelligence. They hold the view that touch can even apprehend perspective with a period of training.

2. <u>Blindism</u>. The defenders of this position believe that textbooks should be made specially for the blind, taking into consideration the resources of the braille system and the information. The fight against <u>verbalism</u> has led to the opposite extreme, that is, <u>intuitionism</u>, and the enormous abundance of visual means makes textbooks almost intranscribable, above all, those prepared for the first grades of elementary education where there is a minimal amount of written text and graphic information occupies almost the entire book.

3. <u>Eclectic position</u>. This is a midway position, belonging to those who consider that many texts cannot be transcribed exactly in the same way as they have been conceived, not only for reasons of technical impossibility

but for the fact that they would prove inadequate
and of very little use. However, if we make
special textbooks for the blind this would
imply a greater isolation from the surrounding
world, acting against the necessary socialising
nature of culture. Thus, for example, a blind
person will never be able to verify that snow
is white and blood is red, but he has to know it.

The defenders of this eclectic position believe that
ink print books should be previously or simultaneously
adapted for transcription into braille, eliminating those
drawings unsuitable or impossible for touch, simplifying
those which can be simplified for better interpretation,
replacing where necessary visual means by adequate
written information, giving the synoptic tables, diagrams,
tables, etc., the most accessible form for touch and in
a word, showing only those typographic resources which are
really meaningful.

The three alternatives given serve to some extent as
a corollary to the problems presented above, problems
which offer us a wide range of subjects for meditation,
which we feel if critically contrasted in an open and
constructive debate, will no doubt lead us to adopt the
appropriate agreements and make the necessary recommendations
for reaching valid solutions.

Report on Experiences About Modern Printing
Techniques Under Consideration of
Traditional Methods

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Introduction

The framework of this report has been defined with
precision.

Modern techniques are obviously the utilisation of
data processing and electronics, and traditional methods
are the embossing of sheets of paper or plastic.

However, we will recall some characteristics of the
traditional techniques and, at the end, we will mention
briefly the non-traditional methods, such as the elimina-
tion of braille paper and the utilisation of the normal
method of printing embossed characters for the production
of braille.

According to traditional techniques, the cooperation
of a non-blind person is used. This person should have,
according to his abilities, the knowledge of grade 1
braille, contracted braille, braille music or mathematical
notations.

The instruments used are the LOUIS BRAILLE writing
frame or slate, the 6 key braille writer and the stereo-
typing machines. These latter permit the embossing of
aluminium plates, indispensable for the press printing of
a large number of copies on paper, or occasionally on
plastic.

This demands a specialisation on the part of the
transcriber whose actual production is very small. It
is estimated in fact, that a transcriber will not produce
more than 600 words per hour and, since this work is tiring
and demands great attention, the daily production should
approximate 4,000 words.

Consequently, it is necessary to point out that this
procedure is not valuable or economic unless the trans-
criber is a non-paid volunteer.

It becomes very expensive if it is necessary to pay
the transcriber, even more so when the transcriber pro-
duces only one copy at a time, which explains the enormous
amount of time required for a given transcription and the
interest of trial experiments in various countries, notably
in Denmark, the Federal Republic of Germany and in France,
in the utilisation of data processing. The computer program
replaces the individual knowledge of the braille transcriber.

The Production Process of Braille using Modern Techniques

In order to fully understand the interest of modern
techniques, the development of experiments, and the pro-
gress which can still be made, we will study the produc-
tion process of braille which includes 4 steps: data col-
lection, data processing, stocking and distribution of
processed data, and finally the presentation of this data
on braille paper.

With the exception of the first step, all of the
others can be automatic, the reliability of the equipment
used eliminating possible errors.

(a) Data collection or the feeding into the computer
of the text to be transcribed into braille.

In general, starting from the document to be fed into
the computer, punched cards are made.

The control of the cards should be carried out with care in order to eliminate practically all error.

In the different countries where experiments of this kind have been performed, it is undeniable that the problem of the accuracy of the cards is the most important one so as it is for normal printers.

Will it be necessary to use the method which consists of typing the document on a typewriter, equipped with a given type of characters, verifying and correcting as required the typed text, and then having it read by an electronic eye producing a punched or magnetic tape, which will then be inputted into the computer?

In certain cases, apparently very limited, the collection of the data can be carried out using punched tapes, magnetic tapes of the discs used by normal printers in their composition process.

This solution would be advantageous since a document already transcribed on a data carrier is available and permits its direct input into the computer; however, this last solution poses certain juridical problems because of the use of punched or magnetic tapes, where that which is recorded on the tape belongs to the publisher, while the tape itself belongs to the printer.

(b) Data processing, that is, processing in the computer.

It is necessary to draft a program which processes the data to output, be it grade 1 braille, which is simple since there is a one-to-one relation between the ink print character and the braille character, or braille according to the system of contractions of the language of the country concerned.

It is, in fact, deceptive to think that it is possible to have one day an identical contraction code for all

languages.

In the three countries mentioned above, the programs have been completed.

In France in particular, a team of data processing experts from the SABATIER University in Toulouse has completed a program with total reliability for the contracted code of the French language, despite its complexity.

This program has been checked with the very greatest care and should be considered reliable.

As regards musical transcriptions, the problem is much more complex and experiments are in progress, particularly in France.

With regard to the transcription of mathematics, of detailed mathematical notations, there do not yet exist to our knowledge any complete programs.

If the setting up of a program is expensive, it is done once and for all and the cost of its setting up can be made up for over a very long period of utilisation.

Keeping in mind that this type of program requires a very large computer, it seems desirable to centralise the data processing instead of dispersing it which would be expensive.

(c) The stocking of the processed data and its distribution.

It is no doubt possible to adapt at the output of the computer a braille printer, such as IBM has done and in this way to have directly available a copy on paper, but it seems preferable, at the output of the computer, to stock the data on punched tapes, magnetic tapes or discs.

The copy obtained at the output of the computer can then be reproduced, as many copies as desired, on simple automated machines, and at a relatively low cost.

This would allow in particular the supplying of materials to libraries, schools and associations which would be able to produce the actual braille volumes as needed.

As has been mentioned above there are no doubt advantages to the centralisation of data processing. It seems, on the other hand more interesting to decentralise the embossing on braille paper itself, stocking locally the punched or magnetic tapes which take up much less space than the braille books. The production of the actual braille volumes would be performed on request.

This is the solution that seems to have been adopted in Denmark.

(d)   The embossing on paper of the braille text.

In this area, the experiments vary according to whether it is a case of the printing of one copy at a time or of a large number of copies.

We have mentioned above the braille printer developed by IBM.

In France, the SAGEM Company has modified a traditional teletype machine to permit the printing of braille paper instead of typing the text in "black and white".

This machine prints the paper at the speed of 15 characters per second. It can be connected to a computer to form an actual computer terminal or be controlled by a punched tape.

As regards emission, it can be controlled either by the normal teletype keyboard or by 6 specialised keys corresponding to the 6 points of the braille character.

This machine, which is now operational, installed
in libraries and schools, would permit either the pro-
duction of braille copies upon request or the production
of a punched tape for the internal needs of a given school
or library.

It is also possible to modify the traditional stereo-
typing machines so that they are controlled by punched
tapes and produce in this way the metallic plates, which
permit the press printing of large quantities.

The question, which can be raised, is if it is
better to modify the controls of the traditional stereo-
typing machine or to develop a machine similar to the
SAGEM teltetype machine, but permitting the printing of
aluminium plates.

This quick review of the 4 steps in the braille pro-
duction process shows that if the second and third steps
of the process are, already, completed and operational,
research should be pursued in order to reduce the cost
of the first step, data collection, and to find the most
adequate system for the fourth step: be it greatly
decentralised with the use of machines like the SAGEM
machine in the various production centres, or centralised
in a few important printing houses equipped with stereo-
typing machines, controlled by punched tapes, magnetic
tapes or discs.

Conclusion

We would not like to conclude without saying a few
words about the non-traditional methods and, in particular,
about the Digicassette machines, which use a braille
display by electronic means.

Studied in particular in France by the VALENTIN HAÜY
Association with the collaboration of the ELINFA Company,
this type of machine permits magnetic stocking of more
than 150,000 braille characters on one single side of a
C.90 cassette tape.

An interface linking the Digicassettes with the computers has already been developed. And thus it is possible to obtain texts recorded on cassette tapes starting from the elements of the second or third step of the above mentioned production process.

We would like to point out that the same display system has permitted the adaptation of calculators, making it possible in this way for the blind to perform complex calculations, which, up to now, have been barred.

Finally, one last word about a technique concerning which research is in progress in order to obtain a method by which the printing of braille might be produced using the traditional method of normal printers, who wish to obtain a slight embossing.

This technique of embossing until now as regards braille, poses difficult problems, because the relief to be obtained is significantly greater than that used in normal printing.

This report has been purposefully limited to the general principles, without mentioning all of the experiments which have been performed in a number of European countires and, I will be pleased to make any further clarifications for the participants of the Conference. I thank you Mr. Chairman, ladies and gentlemen for your attention.

Possibilities for Stimulating Learning
and Reading Braille

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Introduction

In common with sighted people, the blind during the last fifty years have enjoyed a continuously increasing range of benefits which have come from the rapid and often bewildering advances in scientific knowledge that have been made in less than a normal life-time. Not the least of these benefits is the increasing volume and variety of braille literature which is becoming available through the development and increasing use of automated methods of production. But while it is highly desirable that this search for yet more efficient ways or producing books should continue, it is surely no less desirable that thought should be given to devising ways of making braille a more satisfying and a more easily accessible reading medium. Studies already completed or now under way emphasise the need for a critical review of current methods of teaching braille reading and of the rationale for them. The purpose of this short paper is to describe briefly the research that has been done and to outline the implications of the findings. These implications are relevant, not only to the English-speaking countries in which the researches have been conducted, but wherever braille is used.

The Need for Braille Code Revision

Investigators in the United States of America (Ashcroft, 1961; Nolan and Kederis, 1969) have shown

that much of English-speaking children's difficulty in
learning and reading braille stems directly from the com-
plexity of the contracted code and from certain of its
features. The assignment of up to eight meanings to a
symbol, the opportunities for reversal and inversion and
for confusing upper with lower signs, and the use of
short-form word signs infrequently occurring are among the
structural features which are troublesome to many beginners,
children and adults alike. Furthermore, frequency surveys
carried out in Britain and the U.S.A. have revealed that
many of the contractions contribute very little to space-
saving. Their removal from the code would ease learning
difficulty and the resulting increase of space would be
almost imperceptible. These weaknesses are probably
characteristic in varying degrees of contracted codes
used by other linguistic groups.

There are those, usually the highly competent braille
readers, who call for the addition of yet more contrac-
tions. However, research findings appear to indicate
that any further revision of the code should be in the
direction of reducing rather than increasing the number
of contracted forms. There will be a point beyond which
the addition of contractions will have no noticeable
effect on saving space but will only increase learning
difficulty and reading time.

In Britain and elsewhere there is evidence of a
growing belief that a simplification of the contracted
codes now in use would be of advantage to readers and
producers of braille. The desire for change, however,
appears to spring from two rather different and possibly
conflicting aims. Teachers regard simplification
primarily as a means of reducing learning and reading
difficulty whereas the printing houses will understandably
tend to seek changes which will facilitate computer-
controlled production. It is hoped that any change
sought by computer programmers will be adopted only if
it also has the approval of braille readers.

Objective evidence which will support or refute the case for a simplified code is now being gathered in England. This is part of a research project on the braille code, extending the use of braille, and the improvement of reading skill which was very recently set up under the joint direction of Dr. M. Tobin, (University of Birmingham) and Professor J.L. Douce, (University of Warwick). I am a Research Fellow at Birmingham closely associated with this investigation. Two experiments have been conducted to obtain some indication of the effect on reading time of using fewer contractions.

Experiment 1. The 16 volunteer readers involved had all begun using braille while in a junior school for the blind. Their ages ranged from 20 to 65 years and they represented a wide range of occupations. They read silently two different 900-word passages, one in standard contracted code and the other in a modified code which contained only 57 out of the 190 contractions normally used. The modified version of a passage occupied 8% more space than the standard version. Comprehension was not tested. A balanced design was used in allocating passages and braille versions to readers. In order to maximise negative effects, readers had no knowledge beforehand of the modified code being used.

Despite the adverse conditions the difference between mean speeds (94 w.p.m. on the standard version and 77 w.p.m. on the modified version) was found on statistical analysis to be non-significant.

Experiment 2. A similar experiment was later conducted with the same group of volunteers but under conditions more favourable to the readers. The code used on this occasion comprised 73 contractions and increased standard braille space by 6%. As before, two versions of two different passages (each about 1,250 words in length) were assigned in a balanced design. But this time readers were able to practice with the modified code during the two weeks immediately before the timed test.

Contrary to the forecasts of some of the readers, mean speed rose from 89 w.p.m. on the standard code passages to 95 w.p.m. on the modified versions. Statistical analysis showed that the difference between the two versions was non-significant. This result was considered to be most satisfactory, indicating that the group read the standard and modified code presentations at approximately the same speed.

Further experiments are being designed in which subjects will read orally as well as silently and be tested for comprehension. The data so far obtained does seem to support the view that the removal of the many weak contractions in the English code would only slightly increase braille space and make no difference to reading speed. At Warwick University, Dr. J.M. Gill is undertaking a large-scale survey of the frequency of occurrence of contractions in English literature. On the basis of this survey it is confidently expected that it will be possible to devise a simplified code that will be less of a burden on the memory and that will be easier perceptually and cognitively to learn and use. Such a code could bring braille reading within the reach of many who have been unable to cope adequately with the complexities of the present code, especially less able children and adults who have lost their sight in later life.

Teaching Methods

In addition to code simplification there is clearly a need for improved teaching programmes, greater teaching expertise and better designed training materials. Indeed, it is in this direction that most surely lies the possibility of raising reading standards and of more widely extending the use of braille. There is a growing realisation among educators that the teaching of reading in schools should continue for a longer time and to a higher level than is generally the case at present, and that the reading courses available to adults are often inadequate. The effectiveness of new teaching approaches

has been demonstrated by experiments recently carried
out in the United States and in Britain.

Experiments and Techniques for Increasing Braille Reading Speed

In the United States, Vearl McBride (1972) trained
a group of highly-motivated adults to use techniques for
rapid reading which had been found to be very effective
with print readers. By the end of the two weeks'
training, the mean speed for the braille readers had risen
from 138 to 710 w.p.m. or twice the rate at which print
is generally read. Despite the difficulty of assessing
the validity of this dramatic result, there seems no
doubt that the kind of training given did produce sub-
stantial improvement in reading speed, as was later con-
firmed by other American investigators who used McBride's
methods but under scientifically controlled conditions.

In 1977, I tried out some of the techniques used by
McBride and others in a controlled experiment at Lickey
Grange School for the Blind, near Birmingham. Unlike the
American projects, the children receiving the training
were not volunteers and were not even aware that they
were taking part in an experiment, for it was a particular
aim to conduct it under the conditions in which the
teacher would work if the training programme were an
established part of the curriculum.

Although not explicitly stated in their published
reports, the American training programmes appear to have
rested on three assumptions about braille reading:

(a) that scanning techniques used by the
     sighted are equally effective for the
     blind;

(b) that braille readers read at a pace which
     is well within the limits of their
     perceptual capacity; and

(c)   that the sensitivity of fingers can be
      increased by training and practice.

Although doubtful about their soundness, these assump-
tions were tentatively accepted. The experimental group
received training weekly for twenty weeks.

While the control group made only minimal gains,
the experimental group's mean speeds in oral and silent
reading increased by 36% and 82% respectively without
significant loss of comprehension. The teachers partici-
pating in the experiment were agreed that the experimental
group would not have made such substantial progress with-
out the stimulation, the challenge and the systematic
training provided by the course. Children who had been
apathetic and casual about reading became markedly more
interested and purposeful. Indeed, the largest individual
gain was made by a girl who chanced to meet me just
before one of the earlier training sessions and asked,
"Do we <u>have</u> to come to do that reading again?"

Braille Courses for Adults who Lose Their Sight After Leaving School

It is probably the experience of most countries that
it is recently blinded adults who are particularly in
need of much improved facilities for learning braille.
In Britain a number of carefully prepared braille courses
are available, but I consider most of them to be un-
suitable for many adult beginners. None of the courses
provides the pre-braille tactile training that is so
essential at whatever age braille reading is begun. The
learning steps are too short and too many symbols are
introduced at each step. The vocabularies used are often
too advanced and the material is generally dull and con-
trived, it being the aim of the authors to use as many as
possible of the new signs just learnt rather than to arouse
interest in the content of the passage being read. A strug-
ling beginner is hardly likely to be impelled to go on when
at the end of the first lesson, he meets a sentence such

as, "A babe can do every bad deed". The perceptual and
cognitive burdens imposed by this kind of teaching approach
are too great for many beginners, and so it is not sur-
prising that they soon give up the attempt to become
readers.

An entirely new approach in Britain which is proving
to be very effective has been developed by Dr. Tobin.
After several years of research, a programmed course of
instruction was designed which enables the learner to
progress steadily and confidently without the assistance
of a visiting teacher. Simple instructions, guidance and
encouragement are given on a pre-recorded tape, and the
course is self-pacing and self-correcting. The further
development and extended use of audio programmed instruc-
tion would seem to be very worthwhile. There is already
evidence of the success of adults who otherwise would
probably never have learnt to read braille either because
no competent teacher was available or because they had
found the traditional methods and materials too difficult.

Conclusion

The extent to which teaching methods and reading
standards can be improved is dependent on continued
research effort in the areas discussed in this paper and
also on the investigation of other and highly relevant
areas. Important among the latter are the study and
evaluation of different teaching approaches, considera-
tion of the use of colour and embossed illustration to en-
hance the appeal of braille books, and research which would
yield more precise information about the braille reading
process. Because of the limitations of touch perception,
it would seem unrealistic to hope that braille can ever
be as efficient a reading medium as print. Nevertheless,
the results of work done so far indicate not just the
possibility, but the strong probability that braille
reading will become easier to master and more widely
accessible.

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Use of Modern Equipment for Storing and Reading Braille Script as well as Establishment of National Data Carrier Centres

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The development of devices which would make it possible to store braille print digitally on compact cassettes in order to be recalled for reading, was already one of the topics on the technical conference in London in April, 1977. The advantage of this procedure lies mainly in the possibility to have a large quantity of text on a single cassette. Some of those devices are already in the stage of practical test, so, for instance, the "Digi-Cassette" in France and the "Braillocord (BRS.76)" which was designed by the Heinrich-Hertz-Institut in Berlin and developed by the AID. There is, further on, the "Braillex", designed by Professor Boldt (Dortmund) which is said to come out in a series for testing in the course of this year. Supplied with a fast automatic station-scanner it is specially suited for the storage of dictionaries and files.

I had the opportunity to test the BRS.76 thoroughly. Though its stage of development is remarkable there will be, no doubt, still possibilities of improvement. Two ways of storage are applied with the BRS.76:

1. using the writing-modul which belongs to the Braillocord and

2. using the data-storage media usually used by publishers.

These data-storage media are changed into a special
computer programme by the "Rechenzentrum" in Munster.
This procedure has been very successful but has not yet
reached the most possible degree of perfection, a fact,
which must be considered also under the aspect of the
financial problems arising from the application of more
complicated computers.

As for the efficiency of these modern electronic
devices on a larger scale no decisive predictions can be
made at present. The main difficulty is the price
(DM10.000 for the BRS.76) being far too high for the
majority. Another problem lies in the complicated handling
of these devices. The experiences in other fields of
technical development show, however, that prices can be
reduced and that devices can be simplified, if there is
a genuine request. The most essential point in respect
to the present stage of development is, according to my
opinion, the demonstration of technical possibilities.

Essential for the practical use of the mentioned
devices is, of course, the existence of Braille-cassettes
accessible for each aspirant. This problem should be
thought over thoroughly already at this moment in order
to be able to take the necessary steps in time. The
opinions concerning this subject differ more or less from
one another because of various interests, for instance,
commercial ones, and, last not least, a certain wish for
prestige being understandable in a way. It is obvious
that especially the associations of the blind pay atten-
tion to these quite new perspectives because of their
mission concerning the professional and social integration
as well as promoting the cultural efforts of their members.
It is, therefore, plausible, if the corresponding discus-
sions are not always free from animosity. An intensive
engagement of the interested persons can, however, so it
seems to me, be very useful in any case. For we stand
ladies and gentlemen, at the beginning of a new period in
the application of that script having been given by the
well known Frenchman Louis Braille to the Blind of the
whole world.

Considering the problems connected with the establish-
ment of data-storage media centres it is necessary to
remember that, according to the information of experts,
copies of Braille-cassettes should be only made from
master-cassettes the exact function of the reading-devices
being disturbed otherwise. So one has to establish data-
storage media centres where Braille master-cassettes are
produced and collected. I wish to point out here, that
the production of Braille-cassettes with the writing-modul
belonging to the reading-device can only be exceptional
because this procedure takes a lot of time and needs
qualified transcribers knowing Braille and its special
scripts. This would mean considerable expenses again.
Naturally it is the same case, if one chooses data-storage
media usually used by the publishers because of the
necessary technical efforts (computers). On the other
side one must admit that only thus the advantages of this
new technique can be fully used opening a chance for the
blind to get hold of the most up-to-date literature in
the shortest of time.

We have to ask now, which kind of possibilities show
themselves at present concerning the establishment of
data-storage media centres.

1. The existing Braille publishers take charge of the
   production of Braille-cassettes.

At this point the protest of the associations of the
blind comes in. They think, that those publishers have
already reached the limit of their capacity. So the
printing of important and up-to-date books being needed
very urgently is often delayed in a very irksome way for
those waiting for them. Of course, I do not know the
situation in other countries which may be more favourable.
Besides, one should not forget the experiences and the
qualified staff of the Braille publishers that count very
much.

2. The producers of the reading-devices undertake
   the production of Braille-cassettes too.

Of course, many of the technical presuppositions that are necessary would be available in that case, and a vital interest is likely to be found here, because financial advantages might come out of it. A too intense dependence on the producer would be possible in this case bringing perhaps disadvantages for the user as well in respect to the programme as to the price.

Here I also want to lay stress upon the possible difficulties in case of licences given by the publishers, because those work on economic principles. The privileges which the talking-book libraries have obtained after much effort concerning the licence of the publishers, might be in danger of getting lost.

3. The associations of the blind become responsible for the data-storage media centres, being financed mainly by public authorities and producing, independent of financial interests, a stock of Braille-cassettes exclusively orientated on the many-sided requirements of the users.

In this case the arising problems are the personnel and financial ones. For these data-storage media centres can only be efficient if one disposes of sufficient financial means which cannot be raised by the associations of the blind. Especially with regard to the necessary qualified staff the financial factor is decisive.

Already these short hints make it obvious, that no general solution can be found here, because the starting situation is varying in the different countries.

At best one can lay down a few fundamental demands that ought to be considered in all future discussions of these problems.

(a) There must be a guarantee, that the data-storage media centres being independent of economical ambitions and wishes for prestige will develop to efficient establishments, thus creating the pre-suppositions to utilise the new technical possibilities to the utmost.

(b) Braille-cassettes must be offered as well for an adequate price or as a loan.

(c) The offer must be many-sided taking into consideration the need for knowledge and learning as well as for entertainment.

(d) A possible lending of Braille-cassettes belongs absolutely into the competence of the Braille-lending libraries, if the data-storage media centres do not pursue it themselves.

(e) It is very important to choose the right way already at the present moment to make sure, that the new technical development enabling Braille-text to be stored on a minimum of space brings all possible advantages for the users. To take care of that, is not only our task, but even our duty.

You will understand, that in the course of this meeting I could only treat my subject very insufficiently being just able to hint at some very important aspects or to give a few impulses which might lead you to think matters over. But this was, after all, my intention. Perhaps I have succeeded in contributing something to the following discussion.

Conclusions and Recommendations from the European
Conference of Directors of Braille Printing Houses and
Braille Libraries

Recommendation No. 1

With regard to the difficulties arising from the
transcription of ink print books into braille, the
Conference recommends that the braille version should
reproduce as accurately as possible the corresponding
ink print original, taking maximum advantage of the
possibilities of the braille system to identify para-
graphs, chapters, etc., through the use of blank or dotted
lines and other means.

Although the exchange of views has revealed that
there is not unanimity with regard to criteria for repre-
senting pictures, graphs and diagrams, the Conference
has emphasised the need to carry out an exchange of
experiences and practical results among the different
institutions concerned, in order to exploit fully the
potentialities of embossed reproduction and tactile
ability.

The desirability of undertaking the necessary research
and experiments so as to make braille books more attrac-
tive to touch through imaginative resources was also
pointed out.

Differing views were also expressed in connection
with the desirability and possibility of the representa-
tion of tridimensional figures, and it is consequently
recommended that comprehensive studies should be made
so as to determine the possibilities of apprehending
perspective through adequate training.

Finally, the importance of braille printing houses
and other centres interested in the production of embossed
literature having a book editing service was made clear.

This service would have the task of analysing the difficulties that braille transcription could pose, as well as of proposing effective solutions to the problem.

Recommendation No. 2

The Conference made it clear that as in the past braille will continue to be in the future an imperative aid to overcome the lack of information of blind people. In increasing measure the braille book will be supplemented by digital data carriers. Of special importance will be the compact cassette because of its possibility to considerably reduce the volume of braille books.

The Conference asks the braille printing houses and libraries as well as organisations of and for the blind to sponsor the development of this technology as far as possible, and urges the developers to achieve unification of standards and compatibility of comparable media.

The massive application of writing and reading devices using compact cassettes will only be possible if blind people can have easy access to the corresponding data carrier centres. The need to establish efficient centres for this purpose, which should function beyond commercial interests and should have sufficient capacity to cope with the wide range of demands of their potential users is therefore emphasised.

Although it is admitted that the existence of similar devices can bring about positive competition, it is recommended that adequate cooperation and exchange of information be established among the different parties concerned.

Recommendation No. 3

This Conference recommends that there should be greater dissemination of information concerning new developments in braille production including those systems suitable for developing countries.

Recommendation No. 4

The Conference recommends:

1. That a systematic compilation of specialised literature should be carried out and that appropriate measures be taken so as to provide printing houses and libraries for the blind with information of interest to them.

2. That a permanent section should be established in the Review of the European Blind on matters relating to the printing and distribution of literature for the blind and that the possibility of publishing that magazine in braille and/or recorded form should be explored.

3. That a free exchange of catalogues among printing houses and libraries for the blind should be made.

4. That home delivery and collection of talking and braille books for the blind should be guaranteed.

5. That a regular exchange of experience among directors of printing houses and libraries for the blind should be made possible by the organising of conferences and seminars.

Recommendation No. 5

Aware of the fact that the combination and development of new and traditional methods for providing direct and independent access to information is an important prerequisite for the integration of the blind in society, the Conference recommends that increasing moral and material support be given to the solution of current

problems that blind people experience in this regard,
bearing in mind the demands of scientific and technical
progress.

Recommendation No. 6

It is recognised that acquisition of skill in braille
reading and writing is indispensable to the blind in
their work and in their leisure activities, and that
without it their lives would be much impoverished. It
is therefore recommended that research effort, nationally
and internationally, should be directed towards stimula-
ting interest in braille and finding ways of making it
easier to learn, more widely accessible and more
satisfying to use.

Towards this end it is recommended that:

1.   The systematic teaching of braille reading to school
children should continue for a longer time and to a
higher level than is generally the case at present.

2.   The possibility of designing more effective methods
and materials for teaching reading to children and to
adults is in urgent need of investigation. The provision
of adequate expertise in the teaching of braille to adults
is also essential.

3.   Any change in braille codes to facilitate computer
assisted book production should be adopted only if it
also has the approval of the braille authority concerned.

Bearing in mind that unanimous criterion with regard
to the appropriateness of contracted codes for the
majority of blind people does not exist, reliable research
should be effected in order to demonstrate their pros
and cons.

Computer Aided Processing for Natural
Language - PIAF System

Application to Data Acquisition, Translation and
Editing in Contracted Braille

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Introduction

A set of programs oriented to natural language processing have been designed and implemented. These programs were first applied to French language analysis and led to creation of the PIAF system (Programmes Interactifs d'Analyse du Français).

Some applications are operational mainly in automatic information retrieval where the PIAF system performs two tasks in parallel:

1. Data acquisition and control,
2. Production of simple or compound key words.

Following a request from the Centre National des Arts et Métiers, we have developed the contracted braille translation and editing of French texts with respect to typographic codes from programs and basic algorithms of the PIAF system.

General Principles of the PIAF System

We propose to the average user a set of tools to define and handle textual datas, under the control of an editor:

(i) The <u>definition tools</u> are facilities to create and perform interactive updating of the dictionaries and models of the selected language, in a simple command language.

(ii) The <u>processing tools</u> allow the analysis and the generation of textual datas with respect to the previous linguistic definitions (which are parameters of the running programs).

(iii) The <u>morphological analyser</u> which includes a dictionary and a finite states automaton for the processing sequential data (strings).

(iv) The <u>syntactical analyser</u> built upon a set of dependancy relations and context free rules, to build and control tree structures.

Some research works are going on to implement modules for the transformation and the evaluation of tree structures.

The possibility of changing the linguistic informations allow us:

(i) the choice of source language (French, Spanish, English...)

(ii) the choice of the transduction (grammatical analysis, key words, phonetics, contracted braille, programs translation...).

<u>Application to Data Acquisition Control of Texts in Natural Language</u>

The purpose of this program is the detection of encoding errors (editing, syntactic, morphological error) with respect to a language model, during the input process (real time).

At this moment, the user is automatically advised and he can converse interactively with the computer in order to correct the text, to index the new word in the dictionary or to complete the model of the language.

(a) Morphological analyser

The dictionary contains non-varing forms and expressions, prefixes, radices, suffixes and terminal items. These elements are related to the morphological models (400 models for French) and a finite states automaton controls the application of the concatenation rules (180 rules for French) of the various elements composing a form (radice+suffix(es)+end term) and provide the required transduction, in the form of categories and grammatical variables (verb 1st person, plural, future...).

When no rule leads to a final state, a back-tracking technique is used to look for other solution (e.g. different splitting). Otherwise, an orthographical error is pin pointed.

(b) Syntactical analyser

The dependency relations between the categories induce the construction of one (or several) sentence structure.

On each vertice, a context-free rule can be applied to check the grammatical variable concordances (gender and number concordance between a definite article and a substantive). Therefore, it is possible to exhibit and detail a concordance error.

Application to the Contracted Braille Translation

The purpose of this program is to provide for each basic string its contracted braille representation, according to the rules defined by the braille library edition 64, Association Valentin Haüy. To perform this translation, we only need the morphological analyser

system described as above together with an appropriate
dictionary and automaton.

The dictionary contains the invariable forms and
expressions, prefixes, radices, suffices and terminal
itmes, as well as basic strings starting by a consonant
or a vowel. To each of these elements, the braille trans-
lation and a reference to a model (30 models for the French
braille) must be associated. The automaton verifies the
application of rule (about 30 rules). Generally these
rules have two functions:

    (i) Concatenation of the different components
of a form,

    (ii) Some production constraints (identical
codes, lower codes).

The specific techniques involved in the interactive
language processing previously written for the data
acquisition control made easier the contracted braille
translation to a large extent. In particular, the following
points:

    (i) the priority of the identification of the
longest string is possible because of the
organisation of the dictionary.

    (ii) these strings may contain blank characters,
this makes possible the identification of specific
expressions in the input text without special mark.

(iii) each element (string) leading to a solution
(a final state of the automaton) cannot be split.
But whenever a final state is not reached, a back-
tracking technique allows a look up for shorter
elements and a solution.

Interactive Editor

A user can run the various modules of the PIAF system in an interactive mode.

(i) <u>At the definitional level</u> - the finite states grammar and the dictionary (or a partition of it) can be created while the coherence of the information is checked automatically.

(ii) <u>At the translation level</u> - the interrogation mode provides the facility of dialog with the computer (IBM 360 CP/CMS) via a terminal (SAGEM type TEM 8BR) (keyboard with stressed vowels) direct login or through the CYCLADES network.

This procedure is particularly well suited to debugging.

Considering an incorrect result (or no result at all), it is possible eventually:

(a) to activate directly the definition programs to update the models and the dictionary.

(b) to correct an error typing,

(c) to restart the current sentence.

The working mode is intended to activate the same functions as the interrogative mode but the user must specify the physical files for input/output and the length of an output lines (up to 31 or 40 characters).

(iii) <u>At the editing level</u>

Two main typographic functions are included:

(a) "COMMENT" prevents contractions

(b) "JUSTIFY" to write at the beginning of a line
or a paragraph.

It is possible to invent new typographic functions.

Conclusion

The design of the PIAF system was intended to be
interactive, parameterised and modular. In the computer-
aided design area for natural language, it requires to
work out some software problems before any application.

The translation in contracted braille is a good
example of software tool tailorable by non-expert users.
For a user, easy debugging is due to the interactive mode
designed to reach "transparency" of a set of programs.

An application to other natural languages is made
possible without any deep modification.

When there are no contracted braille definite rules
for a language, the PIAF system turns out to be a simulator;
this leads to formalisation of the processing, hence, of
the rules. Besides this effect, the PIAF system can have
frequency counters of words to estimate the gain of
contracted braille.

Translation speed is about 230 words per second on
an IBM 360 under CP/CMS.

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Zoltan Braille Embosser

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The ZBE is a computer controlled rotary press, which produces interpoint braille; the press can also print on only one side of the paper.

General principles

With the ZBE the different activities for producing braille print, which previously have been performed as separate subroutines, are now combined in one continuous system. The subroutines are:

1. The processing of text, i.e., translation of text stored on any data carrying medium (paper tape, magnetic tape or floppy disc) into a braille format including automatic generation of braille abbreviations etc.

2. The setting of braille text on the printing drums.

3. The rotary printing, cutting and sorting of interpoint braille.

The core of the system is the press with two printing drums fitted with nearly 13,000 printing pins, each of them can be locked in two positions. The setting of the pins is determined by 144 setting magnets. The setting and the supervision is done by a computer program through a hardware interface. The computer transmits orders about setting of magnets, starting and stopping of motors etc. There are also signals going from the press back to the computer program carrying information of states and positions in the press.

The press is fitted with an extensive protection
system to prevent mechanical damage arising from erroneous
orders sent from the computer or from any other source.

The press is provided with a panel for manual
operation, which permits manoeuvering and positioning of
the ZBE when the computer is disconnected from the press.
The computer is equipped with facilities for reading the
text. There is also a typewriter, which forms the control
console for the operator in determining the work of the
press.

Mechanical construction

The main parts of the press are two printing drums
and two textloading devices. Each drum is fitted with
6480 pins corresponding to every point position on one
page in the book format of 36 characters in 30 rows.

The details of the printing drums can be divided
into two groups - one group belonging to an axle and
following the rotation of that axle - and the other
group, which can be revolved relative to the former group.
This later group of parts forms the outer cylinder and
consists of 72 holding rings. The task of these rings is
to form a housing for the pointforming pins, dimension
being 11.7 mm long, cylindrical with diam. 1.2 mm. The
pins are radially movable from a pulled in position, when
the pins are completely beneath the surface of the outer
cylinder, to a pushed out position .6 mm outside the
surface of the outer cylinder.

The holding rings are exposed to an axial pressure
coming from press sockets, forming the bearing between
the outer cylinder and the axle.

In the lower drum there is a free-wheel clutch
inserted between the press socket and the axle. By this
arrangement the relative rotation between the outer
cylinder and the axle can only occur in one direction
thus giving the extra advantage of protection against

wrong direction of motor revolution.

The axles and the details attached to them are connected via gear wheels. The torque is supplied to the lower drum by the aid of a gear belt wheel and a gear belt from the printing motor. The other movable system (outer cylinder with pins and pin-locking arrangements) are also linked together by the aid of gear wheels, attached to the ends of the outer cylinders. An auxiliary driving axle with gear wheels and an incremental decoder also are part of this system. The torque for moving the outer cylinder contra the axles comes from the loading motor by the aid of a ratchet-and-pawl mechanism.

Sequence of operation

The production of braille is performed in two phases. During the first phase (loading phase) the text, which has been read into the computer, will be transferred to the printing drums by the aid of the loading mechanisms. The axles, with inner parts attached, are standing still while the loading motor steps the outer cylinders at low speed. The pins are forced out to printing position erasing the old text. The new text is then loaded into the drums by the loading mechanisms so that only those pins, which are not forming parts of the characters are pushed in. By further revolution of the outer cylinder the pins will be locked in their new positions.

The manoeuvering of the pins can be looked upon as divided between actions inside the drums by the so-called inner mechanism and activities by an outer apparatus - the loading mechanism. Forcing the pins out to the printing position and locking them is performed by the inner mechanisms while the loading mechanisms determine the pushing in of the pins.

The loading phase is completed after one revolution of the outer cylinder which takes about 30 seconds. There is no printing occuring during this phase because the upper drum is lifted thus disengaging the hold of the

paper.

Following this phase the printing phase begins.
After the upper drum has been lowered on the lower one the
printing motor is started and its torque is transferred
to the axle of the lower drum and further to the outer
cylinder via the free-wheel clutches, which now are
exposed to a rotation in their holding direction. The
upper drum follows the rotation of the lower by the aid
of the gear wheels on the axles and on the outer cylinders.
The number of pages printed is determined by the operator.
The printing speed is 4-5 interpoint pages per second.
It should be noted that the only parts, which are actually
moving during the printing procedure are the drums and
the driving motor.

The printing phase is automatically followed by a
new loading phase for the next sheets of the printed
matter etc.

Devices for manoeuvering and electronic control

Besides the above mentioned motors there are three
other motors and a set of pushing or pulling magnets for
the operation of catches, clutches and brakes.

A large group of magnets are to be found in the loading
mechanisms. There are 72 of them in each unit corre-
sponding to 72 pin positions along the horizontal
direction of the drum. Every one of these devices are
connected with registers in the electronic control unit
(the hardware interface), the registers in turn receiving
information from the computer.

Besides these active devices there are some passive
transmitters delivering signals through the interface
about the actual status of the press.

The press is fitted with a manual panel, which
enables activation of motors and magnets. The panel is

used when to locate faults, running in of the press and
inserting paper in the machine.

Internal protection aids

Computer control as well as manual operations from
the above mentioned panel could result in erroneous orders
to the press, eventually causing damage. In order to
protect the press against such situations it has been
equipped with internal logic circuits based on fast relays.
The main task of this logic is to separate the operations
of the loading phase from those of the printing phase.
Operations belonging to one of these phases can not appear
during the other.

Main data

Dimensions: length x width x height
                                     180 x 90 x 170 centimetres

Weight: about 300 kilograms

Environment temperature: $20^{\circ} \pm 5^{\circ}C$

Power consumption: 3 x 389 V Ac., 3 kVA

Capacity of production

Number of sheets	time for text loading secs.	intermediate time between phases secs.	time for printing secs.
1	30	10	.5
10	30	10	3
100	30	10	20-25
1000	30	10	200-250

Current status of the press

The press has been built as an experimental model
with 36 x 29 characters/drum. The machine is completed

and test printing has been accomplished. The whole system
has been tested when all parts for manoeuvering were
under the control of the computer program. Test prints
of book-format or of format A4 will be available within
a short time and will then be distributed for feedback
on the acceptability of the end product.

Manufacturing

The ZBE has been developed at Trask Datasystem AB
and has been economically sponsored by the Swedish Board
for Technical Development (STU). Provided that interest
will accumulate for this printing apparatus and that the
result of test-runnings are positive, a series of 10
copies of the ZBE is planned. The price for a complete
press including interface, computer and software is
estimated to 600,000 Sw kronor (circa $125,000).
Further details are available from Trask Datasystem Ab,
Stockholmsvagen 34, S-182 74 Stocksund, Sweden.

Computer Assisted Book-Lending System for the Blind

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The Netherlands

1. Introduction

The Nederlandsche Blindenbibliotheek (Dutch Library for the Blind) has been lending books to the blind since 1895. We started off with braille books only. In 1958 talking books on open-reel tapes were introduced and the number of readers increased rapidly. Nowadays we mainly lend talking books on compact cassettes. The talking book on compact cassette is by far the easiest to use and especially many elderly people benefitted from it. Since we introduced the compact cassette in 1972 the lending figures raised from 0.6 million to 2.2 million in 1978. Evidently this rapid growth imposed great changes on our library. In the early days a team of a few people registered the books in the catalogue, lent them to the blind and put them back on the shelves when they were returned. At the moment three departments are in charge of all this:

The catalogue department registers books in the catalogue and selects books to be added to our collection.

The lending department selects the books to be lent to a given reader on a given day; this department is also responsible for all the lending administration.

The expedition department sends the books selected by the lending department to the readers, registers the books returned, checks these books for damage and put them back in the store.

These departments of course closely work together.
Large piles of cards and long lists with numbers are
passed from one department to the other. However cards
may get in disorder and sometimes lists are lost. In
view of this and in view of the shortage of personnel we
decided to extend computer services to the process of ·
book registration and book lending.

Since 1970 our library has been active in the field
of computerised braille. In 1975 a lending administration
system was designed that made use of our mini computer
(PDP-8 of Digital Equipment Corporation). It was installed
in 1976 and hitherto operates rather successfully.
Encouraged by the experience with the small lending
administration system and urged by the rapid growth of
lending figures (over 30% a year), the decision was taken
to set up a much larger computer-assisted book lending and
book registration system.

The computer will get involved in many relevant
domains:

It will hold the complete catalogue, it will do all
lending administration and it will log the books sent out
or returned.

This new system is developed on a somewhat larger
mini computer (PDP11/34 of Digital Equipment Corporation).
We will start using parts of it in summer 1978. The system
is planned to be completed before summer 1979.

This paper discussed the above mentioned book lending
and book registration system. It will not contain many
technical details. Its aim is to point out the over-all
system design and the interaction between different parts
of the system. Moreover attention will be paid to
questions like: How will users communicate to the system,
how can they force it to do what they want, and what kind
of information is available for the users.

Section 2 discusses the current course of affairs. In section 3 the basic structure of the system is pointed out. The next 3 sections deal with the use of the system on the separate departments. In the last section some general conclusions are discussed and some words are spent on the future.

2. Current book lending activities

As soon as new readers subscribe to the library they receive a couple of books. They also can buy a catalogue of books, so that readers can make up their minds about the books they wish to read. A complete catalogue is brought out once every five years, supplement lists are submitted to all readers every 3 months.

New readers have to answer a questionnaire, which asks them a number of personal data and the genera of books they are interested in.

Libraries for the blind differ from ordinary public libraries in that the readers do not normally visit the library to exchange their books. On the contrary, our readers live all over the country and as they are visually impaired travelling is difficult for most of them. They receive and return their books by post. This fact heavily bears upon the work in our library. As a rule readers want to receive new books when they return the books they finished. As they are unable to come to the library and make their choice from the books currently in stack, the selection of books for readers must be performed by personnel of the library. This is the main task of the lending department.

How do we select books for our readers? As pointed out above, catalogue and supplement lists are at the disposal of our readers. The catalogue is available in ink print only, supplement lists are edited in braille, in ink print and recorded on compact cassette. From this material the reader may decide which books he wishes to

read. Readers may write down the number of these books and send them - either in braille or in ink print - to our lending department. From these lists the so-called preferent wishroll is computed for each reader. Some readers have several hundreds of numbers on their preferent wishrolls; most readers (about 70%) never ask for any special book and hence have an empty preferent wishroll.

When selecting books for a reader, we first look if books on his preferent wishroll are currently in stock. If they are, such books are sent. If the readers' preferent wishroll is empty, or if none of the books on it is in stock, the lender has to make a choice for the reader. This is quite a job. First a book must be found that hopefully suits the taste of the reader and could be of his desire. Here the genera of interest indicated on the subscription form can be used as a guide-line. Also criteria such as age, sex and education are taken into account, as is any other knowledge the lender might have on the reading behaviour of this particular reader. Once such a book is found, it must be checked whether the reader has received this book before. To achieve this we keep track of the so-called reader history. The history of a reader is a list of all books the reader ever lent from our library. Any book lent to the reader is added to this list. Before selecting a book for a reader the lender checks if it does not occur in the readers' history yet. Such a check is of course superfluous when lending books from a preferent wishroll. Finally it must be checked if the book chosen is actually in stock at this moment. If not, everything must be repeated.

The number of the book selected is put on the mailing list together with the name and address of the reader to whom it must be sent.

Before discussing the work of the expedition department in some detail we have to spend some words on the package of our books. We have developed a special box for our books on compact cassettes. This so-called Hulshof box

measures 26 x 24 x 2 centimetres and can hold up to six
cassettes. If a book consists of more than six cassettes
two or more boxes are required. Bottom and lid of a
Hulshof box are tied together with elastic bands. The
title and author of the book are written on the lid. The
box number is denoted at the side, where it can be seen
when the box is stored in the warehouse. The box number
is composed of a 5-digit book number, a copy letter (of
some books we use over twenty copies), and a 1-digit
sequence number (1, 2,.... if this box is the first, second,
... box of the book). At the lid of the box there is a
window in which an address card can be shifted. One side
of the card contains the readers' address, on the other
side the address of the library is denoted. The reader
may take the address card out and put it back in, the
other side upward, in order to return the box.

Books are mailed and stored in these boxes; the box
belongs to the book.

Each day the books returned arrive at the expedition
department. First all books are registered on the return
list. This is the list of readers (name and address)
together with all the books they returned on a given day.
After registration the address cards are removed and
stored in the address stack. The books are checked for
damage and completeness. If cassettes are missing, the
books are set aside in the case for incomplete books, where
they may easily be found should a missing cassette be
returned later on. If cassettes are to be mended, these
are passed to our department for repair. The remainder
of such a book is held apart. Books that are in order are
stored in the warehouse again.

Mailing is straightforward. The books indicated on
the mailing list are fetched from the shelves, the address
cards are inserted, whereafter the books are ready to be
sent by post.

There are of course many exceptions to this general
order. Such as: readers who do visit the library and

want to take books with them, or readers who temporarily
do not want to receive books. For clarity we left out
such details.

3. Files

Before going into the operation of the lending and
registration system, we shall introduce some of the files
stored in the computer memory. Though we feel that the
discussion of these files, before telling what they are
used for, is a bit tough, we think that an early presenta-
tion of this chapter will facilitate referring to its
contents later on.

One may think of the files we talk about as large
piles of cards. The contents of these cards are stored
in the computer memory and there they may be retrieved in
some tenths of a second. Data written on the cards in a
file are available to programs wishing to use them. Of
course the contents of individual cards can be shown on
a computer terminal. Like ordinary cards, the cards in
these files can be deleted, replaced, modified or extended.
The only different is, that modifying is possible as much
as required. The previous text does not leave any dirt
on the card.

These are the relevant files in our system: reader-
description file, book-description file, reader/book
relation file, book-copy file.

Reader-description file

This file contains a card for each reader subscribed
to the library. On the cards in this file information
specific to each reader is written. For instance: name,
address, sex, education, general of interest, accounting
information. Furthermore on these cards some room is pre-
served for special information for the lending soft-ware.
Last but not least, there is room for a message. This
room will be used by the lenders to denote remarks of the
reader. In the good old days they used to write such

remarks on small notes clipped on the carton cards.

Book-description file

This file contains a card for each title available in the library. The cards hold information specific to each title. This is first of all the kind of information librarians want to see in a catalogue. One thing we added is room for accounting information. This may for instance be used to perform popularity measurements.

Reader/book relation file

This is the crucial file in the lending system. It contains a card for each reader subscribed to the library. On these cards the numbers of all books the reader is somehow in relation with are denoted. Four types of relation are distinguished.

(a) The books the reader has ever borrowed from the library; they constitute the readers' history.

(b) The books currently lent to the reader.

(c) The books the reader himself has selected and indicated on his preferent wishroll.

(d) Books the lender has selected for the reader in advance. They constitute the nonpreferent wishroll. It seems efficient that a lender selects books for a reader in advance (see chapter 4). If on a given day no books of the preferent wishroll can be lent to the reader, nonpreferent wishes may be used instead.

Book-copy file

In this file a card for each copy (not for each title!) is present. This card tells where a copy is, and sometimes

where it was before. A copy is either available in the
stack, or in repair, or incomplete, or lent to a reader,
or lost. In either case the reader that last had (still
has) the copy in loan is denoted.

4. Book lending

On the new system several lenders may be active
simultaneously. Each lender is equipped with a computer
terminal, preferably a visual display (a television screen
and keyboard). The computer holds in its memory a list
of readers to be treated (refer to the next chapter to
see how it got there).

Three types of readers are distinguished:

> those who require hand-service;
> those who can do with semi-automatic
>   service;
> those who can automatically be served.

At each instant of time the lender may switch a reader
from either of these three states into another. So if
automatic service no longer seems appropriate for a given
reader, the lender resets its state to hand- or semi-
automatic service. But if hand-service amounts to nodding
"yes" to the computers' proposals, the lender may desire
to switch the state to (semi-)automatic. But don't go
too fast, let us explain.

Hand-service

When the lender types the "who next" signal to the
computer, the computer presents the next reader from the
list. It types the readers' number, name and address, his
genera of interest, the number of books the reader still
has in loan. Moreover, the computer indicates whether
wishes are selectable. If no wishes are selectable this
does not necessarily imply that no wishes are present on
the readers' wishroll; it merely indicates that none of

them is in stock at this moment. Finally, if a message
is "clipped" to the reader card it is printed.

The lender may now ask for book descriptions in order
to choose books for the reader. He may either ask for
books from the readers' wishroll (presumed lendable wishes
are available), or he may ask for books belonging to the
readers' genera of interest, or he may himself indicate
the numbers of the books he wants to see the description
of. The computer will now start proposing books. It
types title and author on the terminal. If the lender
wants to see more, the annotation and if required any other
catalogue information is added. Once a book description
has been presented, the lender must type "yes" or "no" to
indicate whether or not the book will be sent to the reader.

This continues until the lender decides that enough
books have been selected for this reader. At that time
he types the "who next" signal and the subsequent reader
will be treated.

It is the systems' responsibility to update the im-
plied changes in the reader/book relation file and the
book-copy file. Moreover, all books selected are together
with the readers' address etc., added to the mailing queue
in the computer memory. They will eventually be found
there by someone of the expedition department, who then
is in charge of actually sending the book to the reader.

Semi-automatic service

If a reader has so many wishes (preferent or non-
preferent) on his wishroll, that, as a rule selectable
wishes are available for him, the lender may desire to
switch his state to semi-automatic. Semi-automatic
service is much the same as hand-service. It only requires
less lender intervention.

On the "who next" signal from the lender the system responds by listing general information on the reader, just as it does in the case of hand-service. This time the computer does not wait after listing the general information. It immediately continues by presenting book descriptions of lendable wishes. Preferent wishes are presented first. The only activity required from the lender is typing "yes" or "no" to the proposed books. If on a given day the number of selectable wishes would be insufficient the computer will automatically turn over to the hand-lending procedure.

Automatic service

Once we are accustomed to semi-automatic lending, we might go even a step further and introduce automatic lending. If enough selectable wishes are available, there seems to be no reason why the computer could not itself select the books to be sent to the reader. This will certainly turn out to be the fastest and most efficient lending technique.

It is important to stress that automatic book lending is restricted to the selection of wishes from the wishroll. We do not expect a machine to be able to select books on the basis of such general criteria like "genera of interest". If on a given day not enough wishes are in stock, the computer will turn over to the hand-lending procedure and request the lender to do the job.

Preferent/nonpreferent books

In the reader/book relation we distinguish between preferent and nonpreferent books. Preferent books are those that once were ordered for by the reader himself. Preferent books are opposed to nonpreferent books, i.e., books selected by the lender.

This distinction plays an important role in the selection of wishes to be sent to the reader. When the

computer checks the in-stack availability of wishes in
order to propose them for lending, it will check and pro-
pose preferent wishes first. Of course, if ever possible,
we like to lend preferent wishes to our readers.

The lender may list the preferent books of a reader
(even those from his history) to catch an idea of the
readers' interests and taste.

An overview of all preferent books bares information
on the popularity of certain (genera of) books. This is
important library information.

Gains

There are a number of obvious small advantages in the
new system. The lender no longer needs to write or type
lists, he no longer uses lists and cards and is rid of
shuffling sheets of paper and piles of cards all over his
table. Alas, these advantages will probably be compensated
for by small inconveniences, e.g., the inaccessibility of
information in computer-down time.

A large gain in hand- and semiautomatic lending is
the computer check for the in-stack availability of books.
Currently the lender spoils much time by studying cards
of books that afterwards turn out not to be in stack at
this moment. Checking the in-stack availability of books
(especially wishes) will be done by the computer before
the lender has spent any time studying the book card, and
does no longer require any of the lenders' time.

We feel that the largest gains lie in the application
of automatic lending techniques. Moreover, not only the
efficiency but also the quality of the service to our
readers will be improved, especially for those who do not
choose the book themselves (no preferent wishes). To
arrive at these gains the lender must lend books to the
reader in advance. These books will be stored in the

reader/book relation file as nonpreferent wishes. A
special program will be developed to aid the lender with
this in-advance lending. It will highly resemble the
hand-lending program.

First the lender specifies the reader to whom he wants
to lend books in advance. The program responds by
presenting the general information on the reader. Next
the lender may ask for book descriptions. He may either
ask for books of a genus the reader is interested in, or
he may himself indicate the numbers of books to be
described. The computer checks if the selected books are
present in the readers' history. If so; the book is re-
jected, if not, the lender may type "yes" or "no" to it.
If the lender types "yes" the book is added to the reader/
book relation file as a nonpreferent wish for this reader.

The advantage of this lending technique is, that
books are selected at an instant of time that nobody is
waiting for them. It need not be done in a hurry.
Moreover, the lender may select quite an amount of books
at a time, for instance forty or more. This makes it
more worthwhile carefully studying the information on the
reader, thereby not only increasing efficiency but also
the quality of the service.

At the end of this chapter we again must emphasise
that we have only pointed out the general course of affairs.
A host of small tools in the system remained untouched,
such as, programs for counting all kinds of things, pro-
grams for adding reader-indicated wishes to the reader/
book relation file, programs for adding and removing books
and readers to and from the files, book reservation
software.

The system must be able to handle a number of
peculiarities:

    readers who suddenly call for books without
        returning books,

readers who want to stop reading for a while,
readers who want to receive their books on a
temporary address (holidays).

5. The expedition department - electronic book registration

E ch day the expedition department registers all books
returned on a long list. This list is keyed into the
computer in order that the system marks the book copies
returned as "in-stack" again. Before writing their numbers
onto the list, the books (we should say boxes) are sorted.
In this way incomplete books are easily found. An incom-
plete book is a book, the reader did not return all boxes
from. Incompletely returned copies are of course not
lendable. They are put on special shelves, waiting there
until the reader returns the remaining boxes.

All these registration tasks will be minimised by the
introduction of an electronic registration device. This
so-called scan-a-bar consists of a lamp, some loops and
magic electronics. It is able to "read" specially encoded
"bar-code" labels. A bar-code label holds a stretch of
vertical bars. By making the bars thinner and thicker
information can be encoded.

All our book boxes will be provided with a bar-code
label containing their box number, i.e., the book number,
the copy letter and the sequence number of the box.
Moreover we add a check digit at the bar-code label, so
that reading errors may be detected.

The scan-a-bar is mounted in a specially designed
table. It is connected to the computer. When the boxes
slide over the table, the device registers the box number
and sends it to the computer. When the bar-code is not
understood, or another reading error is detected, the
device notifies the operator by raising a threshold at
the end of the table. The operator may then key in the
box number on the terminal and take appropriate measures.

Once the computer knows all the boxes returned on a given day, it sorts them in order to find out which copies were returned incompletely and which others possibly became complete again. There is no need any longer to treat incomplete copies separately; the system will prevent lending of incomplete copies.

Before marking the books returned as "in-stack" again, the system waits for the check results of the expedition department. As we told, all books returned are checked for damaged or missing cassettes. If there are, the box is repaired, i.e., new cassettes are played and added to the box. The expedition department announces all boxes in repair to the computer. Books of which boxes are in repair cannot of course be lent.

From the set of boxes returned the system computes a list of readers who need books. This list is fed to the book lending software (see chapter 4).

Output of the lending software is a mailing list for the expedition department. It indicates book copies (book number and copy letter) together with the address of the reader to whom a copy must be sent. The mailing list is, if desired in small parts, printed on a computer terminal located at the expedition department. Printing is started on request, so that people can ask for a list at the moment they are ready to treat it. This reduces the chance of papers getting lost.

6. The catalogue file

In the future the complete catalogue will be brought into the computer memory. It will contain all information normally found in a catalogue system.

The catalogue file will be composed of catalogue cards, one for each book in the library. A number of so-called pointer cards will be added to cope with special desires. The information on the catalogue cards is

subdivided in fields so as to increase retrievability of
specific data. Each field is identified by its field
identifier and as a rule has a rather rigid structure.

Important fields are:

author fields (up to three fields holding the
   names of the authors of the book)
title field (holding the title of the book and
   its keyword for sorting);
contents description;
genus indication.

The catalogue file may be investigated by the person-
nel of the library using any of the computer terminals.
It may be used to render information about the collection
as a whole (possibly important for the selection of new
books to be added to the collection), but it may also be
used to find certain books, books of certain authors, or
books of a certain genus (e.g. all books of certain
authors, or books of a certain genus (e.g. all detective
stories). The latter may improve the service to the
reader, as it may facilitate answering some of his
questions.

The pointer cards are added to solve some very
peculiar retrieval problems. Let us give an example.
Think of a trilogy having some title, of which each of
the three component novels has its own other title. For
each of these novels a catalogue card exists, whereas a
pointer card is added to achieve the possibility of finding
the books under the trilogy title. Similar situations
occur with omnibus editions.

The most advantageous application of the catalogue
system will probably be in the book lending process. There
the catalogue information, especially the genus of the
book, is combined with the in-stack list of that moment
and with the history of the reader under concern. The
computer may be used to preselect books, belonging to
the genera of interest of the reader, currently in stack

and not yet read by this reader. This optimises the work
of the lender. Moreover, author, title and all other
catalogue information is immediately available to the
lender.

Finally we must mention the possibility of printing
out (parts of) the catalogue. A sophisticated system
could provide complete catalogues (sorted to title, to
author, or to book number), supplement lists, or selections
from the catalogue. Last but not least it is worthwhile
noting that the print-out can be given in ink print as
well as in braille. Multiplication will be no problem.

7.   Conclusions

Why did we write this paper? First of all for our
own benefit. The best ideas come up when talking about
things. On the other hand, we believe that a number of
libraries for the blind is about to utilise a computer in
their book lending system, or will be forced to do so
before long. They might benefit from our design, or at
least this paper might stimulate a fruitful discussion.

We have not discussed a system in operation. We
started developing it in April 1978. The administration
system must be in the air in August 1978. The system is
planned to be in full operation, except for the catalogue
pring out facilities, in January 1979. Catalogue printing
must be added before July 1979. We work on the project
with two programmers. Programs are developed on the hard-
ware on which the system is to run: a PDP 11/34, a large 63
megabyte disk, a lineprinter, a magnetic tape unit and a
number of terminals. The investments were $75,000 for the
computer and its peripherals, and $20,000 for the UNIX
timesharing system. UNIX is the software package (operating
system) on which we based our lending system.

Although this is a paper on future developments we
mainly stuck to ideas for which the software was already

designed. Sometimes we mentioned possibilities that, we feel, are just behind the horizon. When writing a paper like this, one is tempted to think about the future. What will be the task of our library over some ten years and what will it look like? Let us make some guesses.

The technical developments most relevant for us probably are the braille display and the public data terminal. A cheap data terminal connected to a braille display will make quite an amount of public information available to those of our readers capable of reading braille. This will help for stuff like newspapers etc., and it will certainly affect the demand for material in braille, albeit on paper or recorded on braille-coded tape cassette. The demand for talking books will probably go upward until it has settled as the alternative reading means, not only for the blind, but for all those who have troubles in reading ink print texts.

Once house to house data traffic has become in common use, great progress in our lending system can be made. At that time we could make our catalogue system and our in-stack list accessible via a datanet. The reader could use his terminal at home to search our catalogue and in-stack list. He could select the book of his choice and order the system to place book such and such on the mailing list for him. This would almost make our library as accessible for our readers as public libraries are for sighted. (Note one tricky point: blind, unable to read braille, would probably need someone to assist with the operation of the data terminal).

Back to our feet again. We are aware of the fact that the system we described will look different once it is in operation. Nevertheless we hope to have pointed out the possibilities that are at hand in the immediate future.

Spelled-Speech Terminals

D.B. Blazie

Maryland Computer Services Inc, 101 Thomas
Street, Bel Air, Maryland 21014, USA

A Hewlett-Packard desktop computer has been pro-
grammed to output speech with a 64 word vocabulary.
The vocabulary consists of the numerals, the alphabet and
special symbols for punctuation and upper and lower case
letters.

This speech output system has been incorporated
into three devices:

(i) a word processing system which permits inputting,
editing, printing and formatting. The speech, normally
operating only during proofing and correcting, is acti-
vated whenever the cursor is positioned over a character.
The system prices start at $14,000.

(ii) an automatic data entry system which vocally
prompts the blind operator to enter data on a typewriter
keyboard. Data entered can be proofed and corrected by
speech output which is activated by cursor keys on the
keyboard. The system can be programmed to prompt the
operator for data to fill out almost any form. The system
starts at $14,000.

(iii) a talking computer terminal can communicate
with virtually any computer in several modes. The speech
portion of the terminal can be selected to monitor
either incoming data or outgoing data or both. In
addition, data can be stored in the terminal or on the
internal tape cartridge and scanned with speech output.
The price of the system is $12,000.