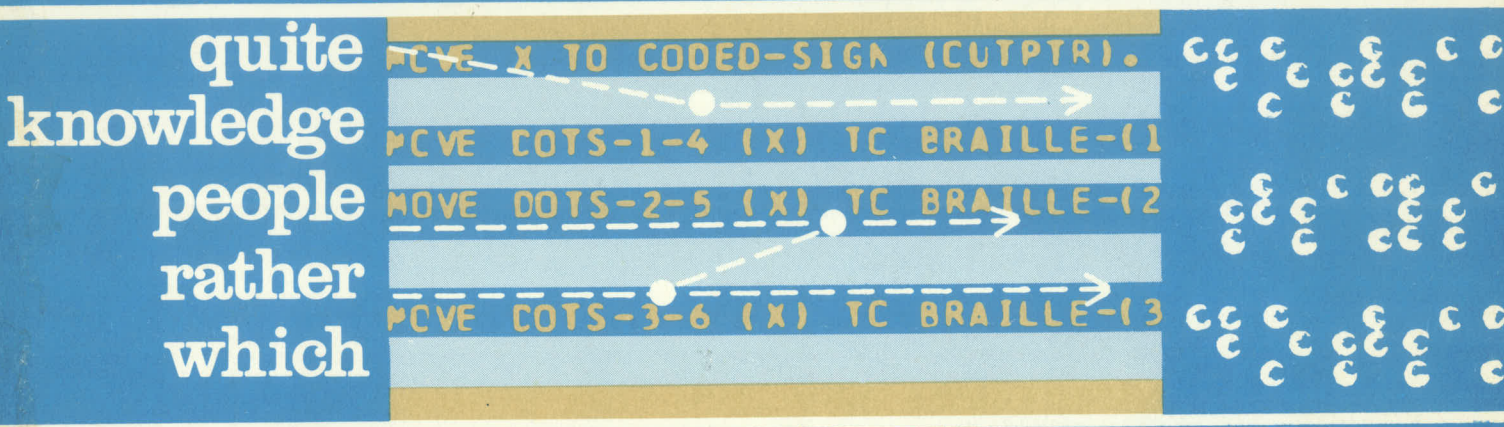
Computerized Braille



Proceedings of a Workshop on the Compliance of Computer Programs with English Braille, American Edition

Edited by R. A. J. Gildea and M. Berkowitz

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American Foundation for the Blin

COMPUTERIZED BRAILLE

Proceedings of a Workshop on
COMPLIANCE OF COMPUTER PROGRAMS WITH ENGLISH BRAILLE, AMERICAN EDITION

New York City, June 7–8, 1976

Sponsored by
Association for Computing Machinery
American Foundation for the Blind

Edited by
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Transcribed in English Braille by

ARTS Service Bureau
Protestant Guild for the Blind
Watertown, Massachusetts

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Foreword

In the past decade a vast amount of experience has been accumulated in the computerized translation and production of English braille. Some of the braille rules reflect the fact that the code is based, in part, on natural language considerations such as pronunciation, stress, pause, syllabification, and variations in type, font, and format. Experience has shown that it is not economically feasible, and in some instances impossible, to program a computer to translate English braille so that the translation will be in perfect accord with the braille rules without human intervention. It is imperative to reduce the amount of human intervention which is required so that automation will be able to achieve:

a. much greater variety of braille reading matter;

b. more timely brailled material;

c. inexpensive braille despite sharply rising costs;

d. error-free braille.

The entire braille community, including producers, consumers, and supporting organizations, is interested in these goals so long as readability of braille is not significantly impaired. Changes in the present rules could come close to attaining the above goals without significantly tampering with readability. Upon the basis of experience with computerization of braille, we are now in a better position to define the problem areas which prevent automatic translation of braille by computer. It is advisable, therefore, to determine which provisions of the official rules should be modified. It is important to stimulate communication between computer programmers (who may not be experts in the rules of braille and in the problems of braille readers) and experts in braille (who may not be cognizant of computer limitations). Such interchange of ideas can form the basis of informed recommendations for modification of the official braille rules to facilitate computer production of braille while maintaining high standards of readability. With this goal in mind this first national conference was convened to serve as a forum for the exchange of ideas among experts in braille and in computer technology.

Preface

The American Foundation for the Blind (AFB) and the Special Interest Group on Computers and the Physically Handicapped (SIGCAPH) of the Association for Computing Machinery (ACM) jointly sponsored a workshop held in New York City, June 7-8, 1976, at AFB.

Participation in the workshop was for those expert in the rules of English braille and in computer translation of braille. The goal of the workshop was to produce two types of recommendations concerned with automated production of computer braille:

TYPE A: Changes to the rules for English braille; and

TYPE B: Changes to the policy and procedures for Library of Congress certification.

This workshop was concerned only with literary braille, not textbook formats, music braille, the Nemeth code, or multiplicity of automation implementation issues. The final recommendations of the workshop will be submitted to the National Braille Authority who will act on matters concerning rule changes. There was insufficient time to consider Type B recommendations.

Invitations to participate in the workshop were extended to those who submitted position papers, recommendations, or background material. A small number of observers were also invited. Copies of these documents, in print or braille, were distributed in advance to all invited participants and observers. A roster of attendees is included at the end of these Proceedings.

The workshop began with a plenary session Monday morning and broke into six working subgroups Monday afternoon. Tuesday began with a short plenary session followed by subgroup meetings. The subgroups completed their deliberations by mid-morning. The workshop ended with a plenary session during which subgroup reports were read and discussed.

Each subgroup was assigned a section of the 1972 revision of the braille rules* for consideration as follows:

* English Braille American Edition 1959, revised 1962, 1966, 1968, 1970, 1972, compiled under the authority of the American Association of Workers for the Blind, the Association for Education of the Visually Handicapped, and the National Braille Association. Louisville: American Printing House for the Blind, 1972.

Subgroup 1. Rule VI: Abbreviations, particularly quantity and acronyms.

Subgroup 2. Rules and sections concerning and, for, of, the, with, and a and to, into, and by.

Subgroup 3. Punctuation, composition, letter sign, and number sign.

Subgroup 4. Rule XIII: Lower Signs.

Subgroup 5. Initial-letter and final-letter contractions.

Subgroup 6. Short-form words.

Subgroups consisted of a discussion leader and a secretary. At least one braille and one computer expert were in each subgroup.

At the conclusion of the workshop, expressions of appreciation were voiced to AFB and ACM for their creativity and imagination in initiating and supporting a workshop to discuss such pression issues. Special appreciation is extended to Mr. Robert Gildea of ACM and to Dr. Marvin Berkowitz of AFB for organizing and hosting the workshop. A special note of appreciation is made to Mr. Peter Duran and the ARTS Service Bureau, Protestant Guild for the Blind, Watertown, Massachusetts for preparing braille copies of the position papers and a braille version of these Proceedings on the ARTS computer system.

Sponsors' Statements

ACM Statement

With great pleasure this statement is being written, because the workshop documented herein was so successful. I think it was successful in the following three ways.

The first way in which it was successful is that there was a beneficial exchange of understandings and experiences amongst the participants. Most participants said to me or Dr. Berkowitz that they were pleased to have been present and that they learned a lot.

The second way is that the workshop was the first step in bringing together those who are knowledgeable in the design of the braille rules and those who are knowledgeable in the design of computer programs for braille translation. At the end of this document there is a list of attendees which reflects a very broad representation of the brailling community. The workshop initiated the dialogue between the braillists and information processing technologists at a time when the three sponsoring organizations of the Joint Braille Authority were considering revamping the structure and operation of the Joint Braille Authority. Hopefully, the results of the workshop will serve in some way as a contribution to the three organizations in reaching the goal of serving the readers of braille.

The third way is that the material in these Proceedings, especially in the position papers, forms a significant data base for researchers who will continue the work started at this workshop.

The Special Interest Group on Computers and the Physically Handicapped (SIGCAPH) of the Association for Computing Machinery (ACM) is very interested in the subject of introducing more automation into the production of braille. In 1973, it co-sponsored the First International Workshop on Computerized Braille with the University of Muenster, American Foundation for the Blind, and IBM Germany. That workshop, held in Muenster, Germany, and the Second International Workshop, held near Copenhagen, Denmark, were restricted to those who were information processing technologists. This workshop on English braille, held in New York City, had the added dimension of participation by braille rules experts and was better for it. The first two international workshops have possibly served their purpose in having the technologists learn about what is going on in the rest of the world.

Perhaps the next international workshop on computerized braille will start with the New York meeting as a model and extend it to invite not only the technology and braille rule experts, but also the representatives from the ministries and braille presses.

The purpose of the workshop was to study the American version of standard English braille and since this is of interest to other English-speaking countries, observers were invited from Canada and England. I made a serious mistake in forgetting about our friends in Australia and New Zealand, for which I sincerely apologize. I hope that this error can be rectified by communicating with them in the future.

This document is divided into two main sections, with the first being the minutes of the workshop and the second the set of correspondence, articles, and position papers which were for the most part generated before the workshop. The material in the first part is the product of much distillation of the discussions of the workshop because there were enough participants who did not want to be quoted or have their remarks taken out of context. The detail that is left in the minutes of the workshop and in the submitted position papers is there for the use of future researchers.

Several of the participants assisted in the preparation of these Proceedings starting at the close of the workshop on Tuesday, and working through Wednesday and Thursday. A special note of appreciation is expressed for the contribution of Dr. Phyllis Biesemeier, who worked through that nearly three-day period on the Proceedings. Also assisting in the editing were Peter Duran, Bernard Krebs, Lois Leffler, Susan Maure, and Dr. Abe Nemeth.

As Vice Chairman of SIGCAPH I was pleased to work with and receive the cooperation of the staff of the co-sponsoring American Foundation for the Blind and wish here to express my appreciation.

Robert A. J. Gildea
SIGCAPH Vice Chairman for the Blind

November, 1976

AFB Statement

In co-sponsoring the workshop on Compliance of Computer Programs with English Braille, American Edition with the Special Interest Group on Computers and the Physically Handicapped of the Association for Computing Machinery, the American Foundation for the Blind carried forward its involvement with braille, an involvement stemming from the early 1920's. (Frances A. Koestler has documented this history in her recent book The Unseen Minority--A Social History of Blindness in America, David McKay Co., Inc., New York: 1976.) We are mindful of the considerable emotional and intellectual investment that leaders in braille transcription made in resolving the "War of the Dots," during the period when several competing braille punctiform codes vied for supremacy among the braille reading public. And we tend, therefore, to weigh with care any proposal to alter the code used for the past fifty years in braille printing.

Advances in both software and hardware in the computing industry during the last ten years have made possible the automatic transcription of ink print into contracted braille. In the main, the systems developed to date involve skilled braille transcribers in feeding data into the computer, checking the output of the computer, or both. The most recent developments presage wholly automatic transcription of ink print into braille without human intervention.

Elsewhere in the world where such developments have taken place, there exists already a two-, three-, even four-tier set of "standards" often de facto but not de jure, that is, only the code authorized for human transcription and not using the computer is an official standard; the alternative standards represent variations in the published braille standard introduced because of the limitations of the computer in coping with the intricacies and difficulties of the rules for braille transcription. Even so, it ought to be pointed out, the quality of braille transcription possible by wholly automatic translation is strikingly high, as several observers at this Workshop pointed out.

It is interesting to note that of the 775 new titles of books announced as available in the U.S. in the Braille Book Review during 1970, nearly 600 were made without assistance from the computer. It is obvious to us that there is considerable room yet for the introduction of automatic transcribing capabilities in wide-scale deployment if we are to reach the goal of enhancing the availability of braille, holding down the cost of its production, and increasing significantly the present readership of braille publications.

It was AFB's hope that by bringing together skilled braillists, those responsible for establishing the rules for braille, and computer specialists who had developed the capability for computer transcription of ink print material, we could create the conditions under which braille could be more widely deployed while still satisfying the demands of readers for continuity in the braille code. As an ideal, we shared with the participants the hope that a single standard for braille transcription would eventually obtain; failing that, that some accommodation could be made with the official standard for the contraction of braille and the application of its rules, to the end that the variability among computer-generated facilities could be reduced as far as feasible.

We believe that:

- the dialog among experts initiated at this meeting was an important first step in that direction;
- greater understanding and appreciation will be generated of both the inherent logic of the present braille standard and the capabilities of the computer to undertake automatic transcription; and
- out of the efforts of this group will come a mandate for structured research and application of changes in the rules of braille toward the goals of preservation of readability and the lowering of cost of the braille product.

Marvin Berkowitz
Leslie L. Clark

Research and Technological
Development Department

November, 1976

Proceedings

I. Plenary Session, Monday, June 7, 1976

The opening session of the workshop was convened at 9:00 a.m. on Monday, June 7, 1976.

After introductions and a brief discussion of arrangements, the group considered principles on which the rules of braille should be based using as a basis of discussion Peter Duran's position paper (Annex 3).

We present here the major points of view discussed in each case without attributing authorship and without making a judgment on their merits. We shall be as brief as possible and no importance should be attached to the amount of space required for the presentation.

A. CONFORMITY BETWEEN BRAILLE AND INK PRINT

1. Complete conformity is necessary because blind people must have a common ground of communication with sighted peers.

2. Conformity should be sacrificed where necessary in favor of improved readability.

3. The amount of conformity depends on the philosophy of education and on the roles of the blind persons in society.

4. Adherence to strict conformity would facilitate computer translation of braille.

5. Complete conformity is impractical because of space considerations and the huge ratio of available print symbols compared with braille symbols.

6. Publishers' preferences for symbols and type fonts should not be permitted to impair readability where alternative standard practices are available.

B. ONE-TO-ONE CORRESPONDENCE BETWEEN PRINT AND BRAILLE SYMBOLS

This principle means that there should be one and only one unique symbol in braille for each distinct print symbol and vice versa.

1. Failure of one-to-one correspondence leads to ambiguity in transcription and to ambiguity in reading.

2. A strict one-to-one correspondence is impossible in the present braille system.

3. A better assignment can be made for the symbols that are currently used in braille.

4. The long history of usage and habit makes reassignment objectionable.

C. READABILITY

1. Serious research should be conducted into factors which contribute to or detract from readability.

2. Uniform presentation of words and format is desirable and promotes readability.

3. Changes which violate long habit may be mistaken for lack of readability.

4. Braille rules should depend on logical considerations such as syllabification and pronunciation.

5. Contraction rules should disregard syllabification and pronunciation and depend only on the spelling.

6. Grade 2 is too complicated to learn and to use. Older people and young children should not need to learn anything more complicated than Grade 1 and Grade 1-1/2 and good braille readers can read these grades just as easily as Grade 2.

D. COMPLETE REPRESENTABILITY

Some people expressed concern about handling print constructs for which no provisions exist in the current literary braille code.

1. Although a special symbol indicator exists, its use is restricted to special symbols on the typewriter keyboard.

2. No problem of representation of symbols exists. The present braille code can adequately handle all such occurrences.

3. If no principle is formulated, transcribers and computer programmers will create their own techniques, resulting in proliferation of representations.

4. One common example of the problem of representability is when letters, numbers, and punctuation are intermixed in an expression. Such an occurrence is possible in literary material and hence should be covered by the literary code.

E. ACCOMMODATION TO COMPUTERS

1. Maintaining high braille standards is important and the needs of computers should be subordinated to the needs of braille readers.

2. We must recognize the role that the computer is playing and will play in providing a wider variety of braille automatically.

3. Controlling changes to the code is more desirable than allowing proliferation of computer programs which violate the code in various ways.

4. Automation of transcription will increase but manual transcription will always be required for some types of material.

II. Final Plenary Session, Tuesday, June 8, 1976

After the individual subgroups had completed their work, the entire group met. Several main issues emerged in the discussion as being of major interest. They included:

- underlying assumptions and objectives;
- the question of whether we should vote for or against specific recommendations for rule changes;
- the double standard;
- the present quality of computer braille and the present braille production system; and
- research.

This discussion plus the presentation of group reports took up one hour Tuesday morning and three hours Tuesday afternoon. A general discussion of these points is given here. The group reports are also included following the general discussion.

A. DISCUSSION OF UNDERLYING ASSUMPTIONS AND OBJECTIVES

The members of Subgroup 4 spent several hours on Monday afternoon sharing what each member of the group had as his basic working assumptions. This seemed necessary when a discussion of the subgroup's objectives uncovered the fact that each member of the group was starting from a very different place in his thinking. This reflected the very different backgrounds of the group members. A list of seven assumptions upon which all five members agreed was finally drawn up and presented in rough draft form to the other subgroups for their consideration. A list of objectives was drawn up in a similar manner and also presented. As a result of these discussions, a final list was obtained which follows. This represents the thinking of three of the six subgroups.

1. List of Subgroup 4 Assumptions

a. The main advantage of a computer system for producing braille is that it allows people having little or no braille skills (clerk typists) to provide input to the production system. This will lower the true costs of braille production. Computer systems may not result in cheaper or faster braille or a wider variety of braille.

b. We assume that the braille rules are improvable but that a change is worthwhile only if it will help the reader, transcriber, and the computer programmer.

c. Changes will result in some trade-offs, but where there is a choice, top priority should go to benefiting people rather than the computer. Changes should be evolutionary rather than revolutionary.

d. We should try to eliminate all exceptions to a rule rather than cutting down the number of exceptions to a given rule. In cases where there is a choice between an exception table in the computer system and human intervention, we should use the exception table.

e. We feel it is desirable to reduce the dependency on the sighted transcriber in the production system. We recognize, however, that some types of material will never be computer-transcribable.

f. We are considering only the literary code as used in general literature.

g. We want both perfection and speed of translation but give top priority to perfection of translation.

2. List of Subgroup 4 Objectives (in order of priority)

a. To remove existing contradictions or ambiguities in the rules.

b. To make it easier for the majority of Grade 2 readers to use braille.

c. To preserve, as far as possible, readability, pronunciation, and spelling.

d. To make it possible to program accurately Grade 2 rules.

e. To preserve or create a place for the mini-computer in braille production.

f. To consider the effect of rule changes on computer translation.

Group 1 also presented a statement of objectives based on Group 4's ideas. This statement is included below.

3. List of Subgroup 1 Assumptions

A significant advantage of a computer system for producing braille is that it allows persons having little or no braille skills (clerk typists) to provide input to the producing system. This will lower the true costs of braille production, particulary when the text is available in machine readable, error-free form. (Note: If the text is available in machine-readable, error-free form to be input to a computer translator, the clerk typist is unnecessary. If, however, it is not, then an automated system should allow a clerk typist to prepare ordinary typed text for input to a computer translator rather than having a highly skilled braillist do the translation.)

Assumptions b. through f. of Subgroup 4's report were accepted by Subgroup 1.

4. List of Subgroup 1 Objectives (in order of priority)

a. To promote the ease of learning, reading, and writing Grade 2 braille.

b. To preserve, as far as possible, the integrity of the print text.

c. To facilitate production of Grade 2 braille by skilled transcribers and automated systems.

Subgroup 5's objectives are presented at this place in the Proceedings.

5. List of Subgroup 5 Objectives

a. Approve

b. Change to "To make it no harder, etc."

c. - "Pronunciation" should not be considered

- Pronunciation and spelling should be given some priority but balanced against consideration of efficiency

- Approved as is

d. Approve

e. Approve

f. Approve

B. VOTING

The question of voting on recommendations reported by the smaller subgroups was discussed. Voting was recommended as a method of determining overall reaction to group reports. Arguments against such a vote were as follows.

1. There was not enough time to examine in depth arguments which had taken six groups four to six hours to discuss.

2. A minority opinion might be easily undervalued and overlooked.

3. Issues such as these cannot be resolved on the basis of a vote.

A vote was taken on the statement that each recommendation should be voted on by the group as a whole. The workshop voted 16 No; 2 Yes and it was decided that no vote would be taken on recommendations.

C. THE DOUBLE STANDARD

As the question of what was computable (able to be translated correctly by means of a program) and non-computable came to be understood, it became apparent that rule changes would have to be implemented in order to produce error-free computer braille translated by a computer.

Basically, the arguments presented for a single set of braille rules to fit all production methods were:

1. simplicity for the reader; and

2. ease of learning for the new braille reader or student.

Those favoring a single standard were split into two groups. Some felt that each recommended change should be looked at solely from the point of view of whether it was advantageous to braille readability. Computability was not to be a criterion. Others felt that changes should be made that allow for direct computer translation while maintaining readability.

The arguments for adopting a double standard (a computer implementable standard as well as a manual transcriber implementable standard) were as follows:

1. It would allow production with existing equipment without delay.

2. It would allow experimentation with computer braille.

3. It requires no retraining of existing braillists or interference in existing production methods.

D. PRESENT QUALITY OF COMPUTER TRANSLATION AND THE PRESENT COMPUTERIZED BRAILLE PRODUCTION SYSTEM

At present, the American Printing House produces a significant portion of the yearly supply of braille by means of a computerized system. Their system, which produces braille meeting Grade 2 standards, is semi-automatic in the sense that extensive human intervention occurs before and after the computer translation process. On the other end of the spectrum is the output of a completely automatic system such as the one used by the Warwick Research Unit for the Blind. This system can operate without human intervention.

E. RESEARCH

The point was made that there is not enough data concerning the projected changes to make informed, intelligent decisions. It was recommended that studies be undertaken to collect data and make recommendations. The following three areas of research were suggested.

1. Many proposed rule changes involve increasing the number of cells used, thereby increasing bulk. The effect of these changes on bulk should be measured.

2. The recommended rule changes also would have an effect on readability. The effect of these changes should be measured.

3. Some of the recommended changes refer to exceptions to rules. The frequency of these exceptions should be measured.

III. The Subgroup Reports

The reports of the six subgroups are included here.

A. SUBGROUP 1 ON RULE VI: ABBREVIATIONS

Leader: Susan Maure
Secretary: Barbara Tate
Members: John M. Gill, Edward G. Brown

The members of Group 1 agreed at the outset that whether or not changes in the braille code are made now, next year, or never, braille transcription is being, and will continue to be, produced by both humans and machines. Our concern was with preventing, as far as possible, any major divergence between the two systems of braille production which would decrease either the readability or the availability of braille.

1. In considering potential code modifications we agreed to weigh them against the following criteria.

   a. Would the change promote ease of learning, reading, and writing Grade 2 braille?

   b. Would the change preserve the integrity of the print text?

   c. Would the change facilitate Grade 2 braille production by both human transcribers and automated systems?

2. When applied to the braille code rules which affect the transcription of abbreviations (Rule VI) the criteria above led us to make the following recommendations:

   a. Abbreviations should be brailled in accordance with their presentation in the print text as to spacing, capitalization, and punctuation.

   b. Braille symbols should be assigned to represent special print signs, e.g., cents (¢), degrees (°), dollars ($), prime (′), double prime (″), paragraph (¶), percent (%), pound sterling (£), at the rate of (@), etc. The placement and spacing of these braille symbols should conform to that shown in the print text.

   c. A two-cell braille symbol should be assigned to represent the oblique stroke wherever it appears.

   d. Abbreviations written in full capitals should be treated uniformly as to use or non-use of contractions, e.g., SEATO vs. MEDICO.

   e. Data presented in print by Arabic and/or Roman numerals should be brailled as printed.

   f. The problem of whether to insert the apostrophe in the case of capitalized abbreviations was in the province of another group considering punctuation.

B. SUBGROUP 2 ON RULE XI, SECTION 37: a, and, for, of, the, with AND RULE XIII, SECTION 41: to, into, by

Leader: Peter Duran
Secretary: Betty Epstein
Members: Ralph E. McCracken, Darlene Bogart

The subgroup considered readability and the accommodation of computer translation without human intervention.

With respect to readability, three of the four felt that both sections were satisfactory and that they should stand.

With respect to computer accommodation, all agreed that if "natural break" is uncomputable, consideration should be given to deleting both sections and discarding the contractions to, into, and by.

C. SUBGROUP 3 ON RULE I: PUNCTUATION SIGNS AND RULE II: SPECIAL BRAILLE COMPOSITION SIGNS

Leader: Abraham Nemeth
Secretary: Alice M. Mann
Members: Robert L. Haynes, Maxine B. Dorf
Observers: Michael Tobin, Franz Kutchera, Menford Harres

RULE I

1. Section 1 should not be changed.

2. Section 2a, Quotation Marks: The degree of adherence to print is a matter of philosophical outlook. A well-conceived research project into the matter of readability would help to resolve many problems.

3. Section 3a, Parentheses and Brackets: In some circumstances a parenthesis, opening or closing, in the interior of a word might be taken as "gg."

4. Section 4a, Apostrophe: Consideration should be given to clearing up the ambiguity which results from writing "´d" in expressions like "OK´d" such as stated in the last two sentences of the section. We consider the method of writing "ps and qs" questionable when there is no apostrophe in print.

5. At this point we recommend the "Exception" of Section 29 be omitted and the letter sign be used.

6. Section 5a, Hyphen: Make the rule of hyphenation permissive instead of mandatory.

7. Section 6, Dash: The spacing rule for the dash should not be enforced.

8. Section 7, Ellipsis: As a general rule represent the number and spacing of the ellipsis data as they appear in print.

It might be better as the result of this meeting for us not to make a series of piecemeal recommendations for changes in the code. Rather, it would be more profitable for us to make recommendations of areas for investigation and research that could be taken up by existing organizations and institutions, so that when the data have been gathered from these investigations, a conference of this kind could be called to make specific recommendations in the light of these findings.

RULE II

Delete the decimal point from the list of composition signs. It is not a composition sign.

1. Section 8, Order of Punctuation: The whole section is in conflict with Rule I, Section 1.

   a. Remove the decimal sign from the list in the "Order with Numbers" column.

   b. The symbols of enclosure should be in the same order as in print.

   c. One member would like to see all punctuation marks blocked together and precede the block of composition signs.

2. Section 10a, Italics: The note that appears in this section places a burden on the computer as well as the transcriber.

3. Section 10a, Subsections (a), (e), (f), (g): The time involved in deciding about italics, foreign words, acronyms, series of names of three or more books and other publications, ships, pictures, hotels and the like is not a cost efficient procedure.

D. SUBGROUP 4 ON RULE XIII: LOWER SIGNS

Leader: Lois C. Leffler
Secretary: Virginia B. Katz
Members: Richard H. Evensen, Emerson Foulke, Martin Droege

We reviewed all the position papers before assembling these recommendations.

1. General Comments

The consequences of a single change which increases space requirements may be insignificant but the effect of such changes are cumulative, and so, many changes of this sort would be detrimental.

Many of these rules need further research before decisions can be made concerning changes. Many of the decisions should be guided either by existing data or by data which can be gathered. Making such decisions in the absence of data would be irresponsible.

2. Recommendations and Suggestions

a. The italic sign contains dot 4 and therefore should be considered an upper sign. This will affect Sections 39, 40, and 44 of Rule XIII. We feel it is important to preserve orientation.

b. Investigate the possibility of making punctuation signs unique one-cell characters to distinguish them from other one-cell lower signs. A contradiction seems to exist in the present rule Section 39 and we suggest that the capital sign not be allowed to precede the whole word contractions for be, enough, were, his, was and in.

c. A consistent rule (either first or second contraction) governing choices between alternative use of contractions in a string of characters would facilitate the task of the computer programmer. If this can be accomplished without increasing perceptual difficulty, it should be done.

d. We suggest that two-cell contractions may not be harder to read than one-cell lower signs but we would like this to be researched. If perceptual difficulty is not a problem we suggest that the two-cell contraction be used.

E. SUBGROUP 5 ON RULE XIV: INITIAL-LETTER CONTRACTION; RULE XV: FINAL-LETTER CONTRACTION; AND RULE V: ACCENT SIGN, DIPHTHONGS, AND FOREIGN LANGUAGES

Leader: Phyllis J. Biesemeier
Secretary: Evelyn S. Lang
Members: Donald Keeping, Elaine Behnke, Carl F. Evert

RULE XIV

1. One member felt that each of the initial-letter contractions should be regarded as a string of characters wherever they appear in a word regardless of pronunciation and meaning. This person felt that an important criterion should be the use of one standard. If one standard is not developed, computer programmers will be forced to break the rules anyway for economic reasons. This would result in multi-standards which would be undesirable. Although the current Rule XIV is superior to any changes we might recommend, it is better to change the rules to achieve uniform implementation than it is to permit proliferation which would result from each.

2. Another member proposed shorter exception lists for this rule. Initial-letter contractions should be used in all words unless sound, meaning, and syllable division are all changed concurrently. The rule could be relaxed somewhat without interfering with readability. Many blind people use these contractions in their own notes and other writings in ways presently considered unacceptable. This recommendation of concurrency may need refinement but does indicate the direction intended for modification.

3. Another member's objection to recommendation #2 was that one set of exceptions would be replaced by another equally complicated set of exceptions or two standards of braille would develop.

4. One member stated: "I'd like to see textbooks produced according to the standard. For me, however, I'd take any material any way I could get it. Furthermore, I would like it to be permissible for rules to be violated if there is a cost savings."

5. Another member stated: "I want good braille. Leave the rules as they exist. I can't see why the cost of computer braille cannot come down in spite of these rules. Computer translation requires editing anyway, so why not edit according to the rules as they exist?"

RULE XV

The following recommendations were agreed upon by all participants.

1. The rule should stand as is but the exceptions should be deleted.

2. Exception "a" should be incorporated into the basic Rule rather than be treated as an exception.

3. Exception "d" serves merely as an example of Section 35a. It could be left in to serve as a reminder rather than be considered an exception.

RULE V, SECTION 25

All of the participants of the subgroup agreed that this rule about diphthongs and diaereses should be deleted. Contractions including letter "e" of the diphthongs "ae" and "oe" should be permissible in English.

F. SUBGROUP 6 ON RULE XVI: SHORT-FORM WORDS, RULE XV: FINAL-LETTER CONTRACTION, AND RULE XIV: INITIAL-LETTER CONTRACTION

Leader: Joseph E. Sullivan
Secretary: Marjorie S. Hooper
Members: Mrs. Robert W. Loewe, George Luffel, Bernard Krebs, Kenneth R. Ingham (Tuesday only)

RULE XVI

1. It was the consensus of the group that Rule XVI should be left as is, although the computer standard might be allowed the exception of not contracting short-form words appearing as part of capitalized words.

2. The suggestion from one of the position papers that the "oo" combination in a large number of words be dropped was discussed and completely rejected.

3. Section 47e: The Subgroup agreed not to change Section 47e and 47f.

4. The Staack material was completely rejected.

5. A proposal was made that a computer standard be adopted allowing for Grade 1 or Grade 1-1/2 braille. This was not discussed at length since the advocate had to leave and the rest were against the idea.

6. It was recommended that a double standard for braille be considered, and if so, it must be determined where it is necessary to vary from the regular rules. Two members were very much against this idea.

The subgroup finished its above assignment earlier than other subgroups and was asked to consider the following areas.

RULE XV

A study should be made of the validity of using the final letters of the contractions to define the contractions and that consideration be made toward using the beginning letter of the combination for the contraction.

RULE XIV

Initial-letter contractions should be used wherever they occur, or a special list of exceptions be drawn up. It was agreed that the exceptions a-d be dropped from this rule.

Annex 1:

Summary of Workshop Submissions with Regard to Change in the Rules of Braille

In order to aid the effort of the workshop, Donna M. Lombardini went through the papers available to her and produced a cross-reference matrix. The cross-reference matrix attempts to show which papers recommend changing or deleting each of the braille rules. This cross-reference matrix was not intended to be exhaustive in its treatment, but to give a first look at which rules seem to be causing the greatest problems.

EDITOR'S NOTE: In the following section, the rule number is followed by those authors recommending change, and then by those recommending deletion. If no change or deletion was recommended, that word will appear followed by a dash. Rules which received no comments by any authors are not listed.

I		change:	Duran, Sullivan; delete: --
	2	change:	Biesemeier, Leffler, Duran, Ingham, Keeping, Loeber, Nemeth, Sullivan; delete: --
	a	change:	Biesemeier, Leffler, Dorf, Evensen, Duran, Hooper; delete: --
	b	change:	--; delete: Duran
	3	change:	Duran, Hooper, Ingham, Nemeth, Sullivan; delete: --
	4	change:	Sullivan; delete: --
	a	change:	Biesemeier, Leffler, Dorf, Evensen, Duran, Hooper, Nemeth, Sullivan; delete: --
	5	change:	Ingham, Sullivan; delete: --
	a	change:	Dorf, Evensen, Duran, Ingham; delete: --
	b	change:	Duran; delete: --
	6	change:	Biesemeier, Leffler, Duran; delete: --
	a	change:	Duran; delete: --
	7	change:	Biesemeier, Leffler, Duran; delete: --
	a	change:	Duran; delete: --
	b	change:	Duran; delete: --
II		change:	Katz; delete: --
	8	change:	Biesemeier, Leffler, Duran, Nemeth, Sullivan; delete: --
	9	change:	Loeber; delete: Loewe
	a	change:	Duran; delete: Loewe
	b	change:	Duran, Sullivan; delete: Loewe

10 change: Biesemeier, Leffler; delete: --
a change: Biesemeier, Leffler, Duran; delete: --
b change: Biesemeier, Leffler, Duran; delete: --
c change: Biesemeier, Leffler; delete: --
d change: Biesemeier, Leffler; delete: --
e change: Biesemeier, Leffler; delete: --
g change: Biesemeier, Leffler; delete: --
11 change: Sullivan; delete: --
a change: Duran, Sullivan; delete: --
12 change: Dorf, Evensen, Hooper, Nemeth, Sullivan; delete: --
a change: Duran; delete: --
(1) change: Duran; delete: --
(2) change: Biesemeier, Leffler, Duran; delete: --
(3) change: Duran; delete: --
(4) change: Duran; delete: --
b change: Duran; delete: --
(1) change: Duran; delete: --
(2) change: Duran; delete: --
(3) change: Duran; delete: --
(4) change: Duran; delete: --
(5) change: Duran; delete: --
(6) change: Duran; delete: --

III

15 a change: Biesemeier, Leffler; delete: --
19 change: Biesemeier, Leffler, Hooper, Keeping, Nemeth, Sullivan; delete: --

IV

23 change: Biesemeier, Leffler, Dorf, Evensen, Hooper, Keeping, Nemeth, Sullivan; delete: --

V

24 change: Biesemeier, Leffler; delete: --
25 change: Biesemeier, Leffler; delete: --
26 change: Biesemeier, Leffler; delete: --

VI

27 change: Biesemeier, Leffler; delete: --
d change: Dorf, Evensen; delete: --
e change: Dorf, Evensen, Keeping, Nemeth, Sullivan; delete: --
f change: Dorf, Evensen; delete: --

VII

28 change: Nemeth, Sullivan; delete: --
a change: Hooper, Keeping; delete: --
f change: Sullivan; delete: --
h change: Biesemeier, Leffler; delete: --
j change: Sullivan; delete: --
29 change: Hooper, Keeping, Nemeth, Sullivan; delete: --

VIII			
	31	change:	Biesemeier, Leffler, Dorf, Evensen, Hooper, Keeping, Loewe, Nemeth, Sullivan; delete: --
X		change:	Biesemeier, Leffler, Ingham; delete: --
	34	change:	Staack; delete: --
	b(1)	change:	Brown, Bogart; delete: Staack
	(3)	change:	--; delete: Brown, Bogart
	(7)	change:	--; delete: Brown, Bogart
	c	change:	--; delete: Brown, Bogart
	35 a	change:	--; delete: Brown, Bogart
	b	change:	Brown, Bogart; delete: --
XI		change:	Biesemeier, Leffler, Ingham, Staack; delete: --
	36 b	change:	Duran, Hooper, Keeping, Nemeth, Staack, Sullivan; delete: --
	37	change:	Dorf, Evensen, Keeping, Nemeth, Staack; delete: Duran
XII		change:	Biesemeier, Leffler, Ingham; delete: --
	38	change:	Duran; delete: --
	e	change:	--; delete: Duran
XIII		change:	Biesemeier, Leffler, Brown, Bogart, Ingham, Staack; delete: --
	41	change:	Dorf, Evensen, Duran, Keeping, Nemeth, Staack, Sullivan; delete: --
	42	change:	Brown, Bogart; delete: --
	a	change:	Brown, Bogart; delete: --
	b	change:	Brown, Bogart, Staack; delete: Duran
	d	change:	Brown, Bogart; delete: --
	43	change:	Brown, Bogart, Duran, Staack; delete: --
XIV		change:	Biesemeier, Leffler, Ingham, Staack; delete: --
	45	change:	Biesemeier, Leffler, Duran, Keeping, Nemeth, Staack; delete: --
	a	change:	--; delete: Duran, Staack
	b	change:	--; delete: Duran
	c	change:	--; delete: Duran, Staack
	d	change:	--; delete: Duran, Staack
	e	change:	--; delete: Duran
	f	change:	--; delete: Duran
XV		change:	Biesemeier, Leffler, Brown, Bogart, Ingham; delete: --
	46	change:	--; delete: Duran
	a	change:	--; delete: Biesemeier, Leffler

b	change:	Duran; delete: Biesemeier, Leffler, Staack
c	change:	--; delete: Biesemeier, Leffler, Duran, Staack
XVI	change:	Biesemeier, Leffler, Brown, Bogart, Hooper, Ingham, Keeping, Nemeth, Staack, Sullivan; delete: --
47	change:	Staack; delete: Duran
a	change:	--; delete: Duran
b	change:	Keeping, Nemeth; delete: Duran
c	change:	--; delete: Duran
d	change:	--; delete: Duran
e	change:	--; delete: Brown, Bogart, Duran
f	change:	Brown, Bogart; delete: Duran
g	change:	--; delete: Duran
h	change:	--; delete: Duran
i	change:	--; delete: Duran

EDITOR'S NOTE: In the following section, the author is followed by those rule numbers recommended for deletion, and then by those recommended for change. Authors not recommending changes to or deletions of specific rules are not listed.

BIESEMEIER, LEFFLER

Delete: XV-46-a, XV-46-b, XV-46-c

Change: I-2, I-2-a, I-4-a, I-6, I-7, II-8, II-10, II-10-a, II-10-b, II-10-c, II-10-d, II-10-e, II-10-g, II-12-a(2), III-15-a, III-19, IV-23, V-24, V-25, V-26, VI-27, VII-28-h, VIII-31, X, XI, XII, XIII, XIV, XIV-45, XV, XVI

BROWN, BOGART

Delete: X-34-b(3), X-34-b(7), X-34-c, X-35-a, XVI-47-e

Change: X-34-b(1), X-35-b, XIII, XIII-42, XIII-42-a, XIII-42-b, XIII-42-d, XIII-43, XV, XVI, XVI-47-f

DORF, EVENSEN

Delete: --

Change: I-2-a, I-4-a, I-5-a, II-12, IV-23, VI-27-d, VI-27-e, VI-27-f, VIII-31, XI-37, XIII-41

DURAN

Delete: I-2-b, XI-37, XII-38-e, XIII-42-b, XIV-45-a, XIV-45-b, XIV-45-c, XIV-45-d, XIV-45-e, XIV-45-f, XV-46, XV-46-c, XVI-47, XVI-47-a, XVI-47-b, XVI-47-c, XVI-47-d, XVI-47-e, XVI-47-f, XVI-47-g, XVI-47-h, XVI-47-i

Change: I, I-2, I-2-a, I-3, I-4-a, I-5-a, I-5-b, I-6, I-6-a, I-7, I-7-a, I-7-b, II-8, II-9-a, II-9-b, II-10-a, II-10-b, II-11-a, II-12-a, II-12-a(1), II-12-a(2), II-12-a(3), II-12-a(4), II-12-b, II-12-b(1), II-12-b(2), II-12-b(3), II-12-b(4), II-12-b(5), II-12-b(6), XI-36-b, XII-38, XIII-41, XIII-43, XIV-45, XV-46-b

HOOPER

Delete: --

Change: I-2-a, I-3, I-4-a, II-12, III-19, IV-23, VII-28-a, VII-29, VIII-31, XI-36-b, XVI

INGHAM

Delete: --

Change: I-2, I-3, I-5, I-5-a, X, XI, XII, XIII, XIV, XV, XVI

KATZ

Delete: --

Change: II

KEEPING

Delete: --

Change: I-2, III-19, IV-23, VI-27-e, VII-28-a, VII-29, VIII-31, XI-36-b, XI-37, XIII-41, XIV-45, XVI, XVI-47-b

LOEBER

Delete: --

Change: I-2, II-9

LOEWE

Delete: II-9, II-9-a, II-9-b

Change: VIII-31

NEMETH

Delete: --

Change: I-2, I-3, I-4-a, II-8, II-12, III-19, IV-23, VI-27-e, VII-28, VII-29, VIII-31, XI-36-b, XI-37, XIII-41, XIV-45, XVI, XVI-47-b

STAACK

Delete: X-34-b, XIV-45-a, XIV-45-c, XIV-45-d, XV-46-b, XV-46-c

Change: X-34, XI, XI-36-b, XI-37, XIII, XIII-41, XIII-42-b, XIII-43, XIV, XIV-45, XVI, XVI-47

SULLIVAN

Delete: --

Change: I, I-2, I-3, I-4, I-4-a, I-5, II-8, II-9-b, II-11, II-11-a, II-12, III-19, IV-23, VI-27-e, VII-28, VII-28-f, VII-28-j, VII-29, VIII-31, XI-36-b, XIII-41, XVI

Annex 2:
Call for Papers

Call for Position Papers
for Workshop on
Compliance of Computer Programs with
English Braille, American Edition
22 March 1976

During an informal meeting at the Library of Congress in December 1953, representatives of the American Printing House for the Blind (APH) were asked by the Library of Congress to see what possibilities existed for applying automation techniques to braille production. Thus, on 1 April 1954, APH, in conjunction with International Business Machines Corporation (IBM), initiated the computerization of braille production. Ten years later the system became operational and since then, a vast amount of experience has been obtained in computerized translation and production, not only at APH, but in numerous other places in the world.

Some of the braille rules reflect the fact that this code, in part, is based on the pronunciation of words and the meaning of words. Today, it is not economically feasible to program a computer to translate English braille so that the translation will be perfectly in accord with the braille rules without human intervention. However, it is still desirable to consider reducing the amount of human intervention which is required so that automation will be able to move us further along in producing: (a) a much greater variety of braille; (b) more timely brailled material; (c) braille despite the decreasing number of stereotypists; (d) braille economically despite sharply rising costs; and (e) braille which has as few errors as possible economically.

The entire braille complex, including the producers, consumers, and supporting organizations, is probably interested in these goals so long as readability of braille (as subjectively measured with today's braille rules) is not significantly diminished. Some changes in braille rules have been incorporated under the guidance of the Joint Braille Authority to improve the code and remove problems.

Minor changes to the present rules may move us towards the goals mentioned above without tampering with readability significantly. Now, we can utilize some of the experience derived from working on computerized translation, along with the experience of experts in braille rules and transcribing, to examine the rules for possible modification. The purpose of the modification is so that the translation of braille can

be more mechanical and require less human judgment.

The American Foundation for the Blind (AFB) and the Special Interest Group on Computers and the Physically Handicapped (SIGCAPH) of the Association for Computing Machinery (ACM) will jointly sponsor a workshop to be held in New York City, 7-8 June 1976, probably at AFB.

Participation in the workshop is for those expert in the rules of English braille or expert in computer programming of the translation of English braille.

The goal of the workshop is to produce two types of recommendations:

TYPE A. Changes to the rules for English braille; and

TYPE B. Changes to the policy and procedures for Library of Congress certification of transcribers.

The final recommendations of the workshop will be submitted to the Joint Braille Authority (or its successor) and the Division for the Blind and Physically Handicapped of the Library of Congress for their consideration. In considering these recommendations, these two bodies will be free to accept, modify, or reject any or all of the recommendations.

Invitations to participate in the workshop will be extended to those who respond by submitting recommendations, along the lines of the instructions of Attachments 1 and 2. A position paper may contain either or both types of recommendations and should be submitted on or before 10 May 1976 to Marvin Berkowitz. Copies of position papers will be distributed to participants subsequently for review and analysis prior to the workshop.

The bulk of the workshop activity will be to review submitted recommendations. It may be expected that additional recommendations will be generated in the workshop activities. A tentative program of the workshop is given in Attachment 3. According to this program, the workshop will start and end with general sessions, and will be divided into working subgroups in the middle of the workshop. Each subgroup will have a representative of each area of experience, a discussion leader, and a recorder.

This call for papers is being sent to persons with experience and organizational affiliations as follows:

a. Computer programmers of English braille;

b. The Joint Braille Authority;

c. The Library of Congress, Division for the Blind and

Physically Handicapped;

d. The National Braille Association;

e. Professional braille editors; and

f. Selected observers, e.g., representatives from AAWB, AEVH, CNIB, and RNIB

For the convenience of some recipients of this call who may wish a little assistance on getting started on position papers, there are four attachments here, which contain (1) some problems in programming English braille (Attachment 4), (2) some suggested revisions to the English braille rules (Attachment 5), (3) some evaluations of these suggested revisions (Attachment 6), and (4) a position paper (Attachment 7) with Type A recommendations by Dr. Abraham Nemeth (nearly formatted in accordance with Attachment 1).

Note that this workshop is concerned only with literary braille, not textbook formats, music braille, the Nemeth code, or multiplicity of automation implementation issues. If this workshop is successful, then perhaps in the year following, another such workshop may be organized. A major revision to the textbook format rules is in publication presently.

Very truly yours,

R. A. J. Gildea
Vice-Chairman for the Blind, SIGCAPH

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Attachment 1

Format and Contents for Type A Recommendations for Changing English Braille Rules

In order to facilitate review and analysis by other participants, the following format to be followed for each recommendation is:

a. The number of the braille rule which is to be modified;

b. The recommended change to the braille rule, either by "add," "change," "delete" statements, or by complete restatement of the new form; and

c. Discussion of the change.

In the discussion section of the format can be included such things as the reasons why the recommendation is made, examples of conditions before and after the change, and if desired, some examples.

Attachment 2

Format and Contents for Type B Recommendations for Changing Transcriber Certification

No special format is required for these recommendations. A statement of the concept will be enough. It is hoped that in the near future, a written statement of the policy and procedures for transcriber certification followed at the Division for the Blind and Physically Handicapped of the Library of Congress will be made available to all participants, so that the proposed recommendations can be made much more specific.

The main reason for including Type B recommendations in the workshop is that computers are being introduced into the production of braille more and more and this fact should be considered for recognition in the certification procedure. Today, computers are used to translate into braille material which has been prepared by persons using keyboards to transcribe printed material into machine-readable form. Tomorrow, computers will be used to translate, without human intervention, material from compositors tapes used in the printing industry, and judged "clean" enough by that industry for printing. This semi-automatic and automatic translation of braille will probably be accomplished by computer programs which have everything in common but the input section. It would be highly desirable, for numerous reasons, for the Library of Congress to specify a qualification test for the computer programs which translate braille.

Persons preparing input material for the semi-automatic translation of braille, rely on the computer for much of the final product's compliance to the braille rules in format and translation. These persons need to know less about the braille rules to prepare and edit input material than does a transcriber at a manual brailler. The person producing manually on a brailler needs to know the braille rules, which is to some degree, less of a requirement than that which is required of a computer system braille editor who must know not only the braille rules but also the input controls of the computer system which govern the production of proper braille output. The controls and the rules for use of these controls will vary from computer program to computer program implementation and thus are more or less dependent on the particular implementation.

It may be desirable for the Library of Congress to recognize in the transcriber certification policy and procedure the differing roles of persons in braille production wherein some computerization is employed. A human transcriber will learn more and more as experience in transcribing is obtained. Hence, the specific level at which a certification threshold is set is really not critical.

Attachment 3

Tentative Program for Computerized Braille Workshop

Monday

9:00 a.m.	Welcome
9:15 a.m.	Organizational Meeting
9:30 a.m.	Discussion of Type A Recommendations
10:15 a.m.	Break
10:30 a.m.	Discussion of Type B Recommendations
12:00 noon	Lunch
1:00 p.m.	Subgroup Meetings
3:00 p.m.	Break
3:15 p.m.	Subgroup Meetings Continued
5:00 p.m.	Close of Monday Business

Tuesday

9:00 a.m.	Presentation and Review of Subgroup Results for Type A Recommendations
10:15 a.m.	Break
10:30 a.m.	Presentation and Review of Subgroup Results for Type A Recommendations Continued
12:00 noon	Lunch
1:00 p.m.	Presentation and Review of Subgroup Results for Type B Recommendations
3:00 p.m.	Break
3:15 p.m.	Presentation and Review of Subgroup Results for Type B Recommendations Continued
5:00 p.m.	Close of Workshop

Attachment 4a

Proceedings: Conference on New Processes for Braille Manufacture, 1968

by Robert L. Haynes*

PRODUCTION

Since the installation of a 709 computer system at the American Printing House for the Blind, 261 titles have been translated to braille. These titles consisted of 697 braille volumes or 98,711 braille plates. The majority of titles were literary books. Some magazines and text books have also been translated. Production in the past year included a number of titles that presented special problems. Among these were 10 volumes of Music in a New Found Land and 10 volumes of Men, Women, and Pianos. While translating these two books intermittent space was reserved for music code. Also, Canterbury Tales was translated into six volumes of poetry format. The results of computer translation in 1967 indicate that in all probability any literary book can be translated effectively by the 709 system.

SYSTEM DEVELOPMENT

In December, 1967 a new braille translation program was put into operation. This program written by John Siems reflects the experience of translating over 200 titles. Also, a braille translation benchmark was developed for the System 360, and a program to simulate the 360 on a 709 was completed.

FUTURE PLANS

During 1968 a data transmission system between the Printing House and Perkins will be tested. This system accepts inkprint data at the Printing House over telephone lines. The inkprint is translated to braille and transmitted back to Perkins, where braille will be printed on an automatic braille writer.

Experimental production from compositor tape is an important item for 1968. This procedure reduces the amount of keypunching involved in braille translation.

A math translation program is being developed by Schack Associates. This program is sponsored by the Office of Education Grant 2-6061190-1578 and should be in operation in the near future.

* American Printing House for the Blind, 1839 Frankfort Avenue, Louisville, Kentucky.

A study will be made to determine the practicality of using System 360 for braille translation at APH. If there is an indication a 360 might be installed, an assembly language program will be developed during the coming year.

MEMORANDUM ON BRAILLE TRANSLATION

Some types of data encountered when translating inkprint into braille:

1. New words.
   Vietnamese

2. Variant spellings.
   greate (for great) Conectecotte (for Connecticut)

3. Rarely used words.
   bioengineering Salmonellosis

4. Letter sequences whose translation depends upon meaning.
   do (verb) do (musical note) said (verb) Said (place)

5. Compound words divided at the end of an inkprint line. Determination of whether or not to use a hyphen is based upon how the word appears elsewhere in the text.

6. Run together words.
   "an Idon'tcareifittakesahundredyears attitude"

7. Foreign words. Foreign words are translated in Grade 1. A distinction must be made between foreign words which are names and those which are not. Names are put in Grade 2.

8. Acronyms. Translation depends upon whether or not the initials stand for separate words.
   SHARE SEATO DAR

9. Initials followed by periods. Spacing in braille may vary from inkprint depending upon whether or not the initials stand for a person's name.
   Washington D.C. D. C. Jones

10. Single letters. Sometimes a letter sign must be prefixed in braille.
   Ward C. C. Arnold A (article) big red A

11. Prepositions. Contraction in braille depends upon meaning.
    note "to" in the phrase "be friendly to all your" ... how wrong you can be about a person you have taken the trouble to be friendly to all your life, but at least ...
    It is difficult to be friendly to all your neighbors.

12. Italics.
    a. Words italicized in inkprint are not always italicized in braille.
    b. Italicizing of a series of words in braille may be indicated in different ways depending upon whether or not the words are a title.

13. Measures. Abbreviations which follow numbers in inkprint precede the numbers in braille.

14. Hyphenated but not compound words. The hyphen is used in braille but may not end a line.
    say-ing th-th-them

15. Numbers separated by colons. Braille representation of time differs from representation of a reference.
    He came at 6:30. Genesis 3:12

16. Numbers separated by a hyphen. Usually the number sign is not repeated but there are exceptions.
    1956-58 5:10--5:20

17. Dash. A long dash in inkprint becomes a braille single dash if it is punctuation. A short dash in inkprint becomes a braille double dash if it represents an omission.

18. Blank lines. The effect of a blank line upon the format of the braille page depends somewhat upon nature of the preceding and following text material.

19. Chapter titles. Occasionally the number of lines required for a title in braille varies from the estimate based upon inkprint. This in turn may affect the ending of a page to begin the next chapter.

The list above is not intended to be complete. The types of situations mentioned are not hypothetical but are based upon normal work in translation. All things considered, the application of data processing to braille translation has been successful. Correct translation of the types of data mentioned above is achieved by a procedure which includes:

a. Occasional editing of inkprint copy by a braillist.

b. Insertion of some special control symbols by the keypunch operators.

c. Pre-translation reading of the text by the computer to locate a number of types of potential difficulties.

d. Scanning by a braillist of a test prooflisting of the format.

e. Proofreading of the braille text.

Occurrence of particular items given above tends to be frequent. However, occurrence of one or another of the types of data mentioned tends to be frequent. That is, if there are ten problems each of which can be expected to occur once in every ten books, then one type of problem can be expected to occur in every book.

It would appear that braille translation involves a combination of data processing and human decision making. A goal in data processing is to make the human intervention increasingly easier and more significant.

Attachment 4b

A Frequency Count of the Symbology of English Braille Grade 2, American Usage*

by C. J. Kederis, J. R. Siems, R. L. Haynes

Braille is the medium for reading and writing used by the blind. It is a complex code that is read tactually and consists of 63 characters which are formed of from one to six dots in a two-column, three-row matrix called the braille cell. The characters are used singly and in combination with one another to stand for letters of the alphabet, letter sequence, words, numbers, punctuation, and composition signs. The standard braille literary code contains approximately 260 such assignments. Throughout the remainder of this paper these 260 items will be referred to as the elements, or constituents, of the code.

A factor important to the braille code is the frequency with which the individual elements recur in the reading material of the blind. This factor is important in terms of (1) textual reduction through the use of contractions and abbreviations, (2) the amount of information that is conveyed by the elements of the code, and (3) the ease with which the code is read. It is with this factor of the recurrence of the elements of the code that the present paper is concerned.

There have been three such previous counts to which the authors could find reference. The earliest, Irwin and Wilcox (1929), was concerned with the difference in amount of space saved by braille Grade 1-1/2 and braille Grade 2. (Braille Grade 1-1/2 was a less-contracted form of the code officially used in the United States from 1918 to 1932; the present-day standard is braille Grade 2). Their count consisted of 91,000 words taken from four literary works. Each of the four selections appeared to have been at the adult vocabulary and interest level. Concerning the validity of their results, Staack (1962, p. 89) stated, "... (the count) leaves much to be desired in the range of material sampled." This is true, but it should also be pointed out that the works were chosen because they were published in both Grade 1-1/2 and Grade 2 braille, enabling a comparison, the original purpose of the count.

* This study is part of a program of research supported by the United States Public Health Service grant, NB 03129-04, from the Institute of Neurological Diseases and Blindness. Mr. Kederis is a Research Associate in the Educational Research Department, Mr. Siems is the Assistant Data Processing Manager, and Mr. Haynes is Data Processing Manager at the American Printing House for the Blind.

Another thing that affects the validity of the Irwin and Wilcox count concerns the fact it is 35 years old. While this is not a long time in terms of changes in written language, the present code differs on some 10 elements from the code used then; also, the rules for usage are not entirely the same today as they were then. In addition, their count did not include numbers or punctuation and composition signs.

The most recent of the counts was one by Staack (1962). As a good indicator of the frequency of the braille elements, though, it is of little value because the sample size and sample material are entirely inadequate--7000 words from patent applications. However, Staack's principal purpose in this undertaking was not to obtain an especially valid count, but to show that a computer is a useful tool for such an exercise.

The third count was one by Lochhead and Lorimer (1954). At the time of this writing, though, it was still not available to these authors. This count may have been the most valid of the three, but even so, it would also be subject to some objections on the grounds that it was done in the United Kingdom, and the use of the code there differs somewhat from the American code.

Thus, it should be obvious that another count is needed, a count which is more up-to-date, which samples a broader type of literature over a number of grade levels, and which includes all of the constituents of the braille code as they are used in this country.

METHOD

Sample

From a list of 45 books, two fiction and two non-fiction works were selected randomly, when possible, at each of three grade levels (4-7, 7-9, adult).[1] From each of the 12 books thus chosen, one braille volume was used in the count. (An average-sized print book, 200-300 pages, requires four to five, 100-page volumes in braille). Information about the sample is contained in Table 1.

Procedure

The frequencies were obtained on an IBM 709 computer. This computer is used at the American Printing House for the

[1] Due to time and financial considerations, only books on cards acceptable to a computer were used. Thus, only 45 books were available, and of these only five were rated as appropriate to the 4-7 grade level. All grade level ratings came from The Book List or Children's Catalogue or Standard Catalogue for High School Libraries.

Blind as part of an automated process of producing braille from ink print. The frequency count was accomplished by modifying part of the same program which is used in the translation step of the process. This is the Schack-Mertz IBM Braille Translation Program (1961).

A section of this program consists of a table of print symbols, each entry of which has three parts. Part 1 can be a letter, a letter sequence, a word or a punctuation mark. Part 2 is a code number indicating the circumstances under which the Part 1 items are used according to the rules of the braille code. Part 3 is one or more three-digit numbers representing the 63 braille characters into which the print symbols (Part 1) are translated.

TABLE 1

SAMPLE DATA

EDITOR'S NOTE: In the following table, the "Publishing Date," "Title," "Author," "Type" and "Vocabulary Level" will be on one line, separated by semicolons.

1957; Little Laughter; Love, K.; Verses & Rhymes; III-VII
1948; Yellow Fairy Book; Lang, A.; Fairy & Folklore; IV-VI
1964; Private Eyes; Kingman, L.; Fict.; IV-VIII
1963; Stormy: Misty's Foal; Henry, M.; Fict.; IV-VIII

1949; Hearts Courageous; Herman, W.; Biog.; VII-IX
1920; Children of Odin; Colum, P.; Myth.; VI-IX
1881; Prince and Pauper; Clemens, S.; Fict.; VI-IX
1963; Girl on Witches Hill; Lawrence, M.; Fict.; VII-IX

1963; Many Faces of Civil War; Werstein, I.; Hist.; IX-Adult
1964; Eighth Moon; Sansan; Soc. Sci.; Adult
1959; Advise and Consent; Drury, A.; Fict.; Adult
1962; Inheritors; Golding, W.; Fict.; Adult

For the frequency count, only Part 3 of the entries in the table was changed. Instead of the number codes representing the 63 braille characters, a new identifying number was assigned to each of the 256 elements of braille. For example, with Part 3 of the entries unchanged, the number 066 represents the braille character with dots 2, 3, 5, 6. This character, depending on context, can be gg, were, or a parenthesis sign to the reader. However, for the frequency count, a distinct identifying number was given to gg, were, and the parenthesis sign separately. As the print input was read, instead of writing the numbers which represented the

braille characters, a total was developed for each of the 256 elements. The count was checked by comparing the total number of characters in a volume obtained by this method with a total previously obtained from the same volume by another method.

RESULTS

The results consisted of the number of times each of the 256 elements of the braille code appeared in the sample of brailled reading material. The print counterpart of the sample contained approximately 291,000 words: grades 4-7 (84,000), grades 7-9 (94,000) and adult (113,000). It is necessary to specify braille reading matter, because the frequencies of some of the elements, due to the rules of braille usage, are not the same as in print, albeit the correspondence is close. For example, if the ea and ed letter sequences were being counted in print, their appearance in the words "uneasy" and "reduce" would add to their totals. However, in braille, they would not be counted because their use would violate one of the rules of the code (English Braille, 1962, p. 33).

The number of times each of the braille elements appeared in the sample is shown in Table 2. Similar information also exists for each of the grade level divisions and each of the individual volumes of the sample. To those who are interested, this material is available through the American Documentation Institute.[2]

Also included in Table 2 is the number of ink-print letters saved by each of the contractions and abbreviations in the braille code. The total letter spaces saved, over the total number of ink-print alphabet letters used in the sample, showed a letter-space saving of 31%. Thus, the contractions and abbreviations of braille reduced by 31% the use of the ink-print alphabet letters.

Other items contained in Table 2 are the punctuation marks, composition signs, and numbers. The punctuation and special signs (decimal, dollar, etc.) constituted 6-1/2% of the total material. The special braille composition signs represented 4-1/2% of the total. Numbers accounted for less than 0.1%.

[2] Frequencies by book and grade level have been deposited with the American Documentation Institute. Order Document No. 8562 from ADI Auxiliary Publication Project, Photoduplication Service, Library of Congress 20540. Remit in advance $2.25 for microfilm or $5.00 for photocopies and make checks payable to: Chief, Photoduplication Service, Library of Congress, Washington, D.C.

TABLE 2

OCCURRENCES OF THE BRAILLE ELEMENTS
AND THE INK-PRINT LETTERS SAVED
BY THE CONTRACTED FORMS[3]

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
E	61,862	--
A	53,515	--
S	43,211	--
L	41,491	--
O	41,032	--
Capital sign	40,849	--
T	37,887	--
I	36,498	--
R	32,861	--
N	27,978	--
the	24,810	49,620
D	22,006	--
M	21,786	--
P	19,649	--
Period	18,437	--
Y	18,400	--
C	18,346	--
Comma	17,645	--
U	16,456	--
H	16,301	--
ed	15,100	15,100
and	13,060	26,120
er	12,425	12,425
B	12,155	--
W	11,807	--
G	11,417	--
in	11,321	11,321
K	11,047	--
F	10,962	--
en	9,098	9,098
ing	8,850	17,700
ar	8,490	8,490
st	7,973	7,973
V	7,708	--

[3] In order to avoid confusion on the point of textual reduction resulting from the encoding of braille, it should be noted here and elsewhere that the savings or reductions referred to do not include the letter spacings saved between words as a result of rules governing the use of some of the whole-word contractions (to, into, by, and, for, of, the, with).

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
to	7,360	7,360
of	7,117	7,117
Quote (LD)	5,963	--
Quote (RD)	5,932	--
th	5,455	5,455
ea	4,829	4,829
Apostrophe	4,804	--
sh	4,789	4,789
ow	4,233	4,233
ou	4,159	4,159
was	4,082	8,164
wh	3,582	3,582
ch	3,564	3,564
for	3,174	6,348
it	3,148	3,148
his	3,143	6,286
that	3,143	9,429
with	2,513	7,539
gh	2,337	2,337
you	2,266	4,532
one	2,178	2,178
had	2,139	2,139
as	1,834	1,834
but	1,812	3,624
be	1,758	1,758
said	1,636	3,272
him	1,613	1,613
Question Mark	1,565	--
Hyphen	1,514	--
not	1,480	2,960
J	1,440	--
were	1,338	4,014
from	1,274	3,822
Exclamation Mark	1,254	--
X	1,243	--
so	1,174	1,174
there	1,138	3,414
out	1,130	2,260
ound	1,105	2,210
com	1,074	2,148
ble	1,052	2,104
this	1,024	3,072
ever	986	1,972
would	976	2,928
ong	971	971
Z	968	--
Dash	968	--
have	964	2,892
could	947	2,841
by	908	908
Semicolon	811	--
con	803	1,606

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
some	753	1,506
into	751	1,502
their	745	2,235
day	726	726
ment	680	1,360
ful	653	653
time	641	1,282
ation	634	1,902
do	629	629
Q	610	--
more	610	1,830
Italic sign	595	--
about	595	1,785
will	585	1,755
dd	584	584
like	582	1,746
ought	572	1,716
tion	567	1,134
little	521	2,084
ally	506	1,012
know	491	982
can	490	980
right	485	1,455
where	484	1,452
which	451	1,804
your	438	876
go	419	419
just	413	1,239
gg	411	411
ity	411	411
Colon	410	--
ness	402	804
again	400	1,200
ff	397	397
ance	396	792
people	396	1,980
before	392	1,568
under	391	1,173
work	390	780
dis	389	778
great	389	778
after	385	1,155
good	361	722
here	359	718
ount	350	700
ence	343	686
through	323	1,615
very	322	966
still	300	1,200
much	294	588
himself	292	1,168
Number sign	287	--

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
word	268	536
first	266	532
sion	263	526
upon	257	514
less	252	504
father	247	988
cc	245	245
part	245	490
because	241	1,205
bb	240	240
its	240	240
many	238	476
these	236	708
must	232	464
every	228	912
us	226	226
young	211	633
against	209	627
friend	205	820
shall	197	788
name	196	392
should	190	760
l	189	--
world	187	561
always	182	546
such	181	362
0 (zero)	170	--
across	165	495
mother	159	636
quick	157	471
Ellipsis	150	--
Accent sign	148	--
between	136	680
together	136	680
behind	134	536
those	128	384
enough	118	590
beside	116	464
also	111	222
quite	109	436
children	107	642
lord	99	198
almost	98	294
8	95	--
above	94	188
herself	92	368
already	85	340
6	83	--
although	80	320
question	78	468
rather	76	380
themselves	70	420

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
child	69	276
either	67	268
2	66	--
Quote (LS)	66	--
Quote (RS)	63	--
receive	60	240
letter	59	236
cannot	58	236
whose	57	171
afternoon	55	330
neither	53	212
today	52	156
tomorrow	51	306
5	48	--
myself	48	144
3	47	--
immediate	46	276
perhaps	46	184
itself	45	180
beyond	44	176
4	42	--
9	42	--
spirit	42	168
Parenthesis (L)	39	--
Parenthesis (R)	39	--
yourself	39	195
below	37	111
tonight	34	170
declare	26	104
according	25	175
7	24	--
character	24	168
paid	24	48
beneath	22	110
o´clock	22	88
blind	21	63
Bracket (L)	16	--
Bracket (R)	16	--
knowledge	16	128
Dollar sign	15	--
Termination sign	13	--
rejoice	13	52
Letter sign	12	--
necessary	12	72
afterward	11	66
ourselves	10	50
Asterisk	9	--
perceive	9	36
thyself	9	36
deceive	6	24
Decimal point	5	--
rejoicing	5	25

ELEMENTS	NUMBER OF OCCURRENCES	LETTERS SAVED
conceive	4	20
perceiving	3	15
receiving	2	10
yourselves	2	12
altogether	1	7
oneself	1	4
Ampersand	0	--
Fraction line	0	--
Percent sign	0	--
braille	0	0
conceiving	0	0
declaring	0	0
deceiving	0	0
TOTAL	924,760	392,521

To obtain a total for all the print letters used in the sample, it was necessary to reduce the frequencies of the braille elements to those of the 26 letters of the alphabet. Thus, a frequency count of English print letters was obtained. This information is shown in Table 3.

TABLE 3

NUMBER OF OCCURRENCES OF THE ALPHABET LETTERS IN ENGLISH PRINT

LETTER	NUMBER OF OCCURRENCES
E	158,080
T	114,903
A	101,990
O	94,832
N	85,359
H	83,907
I	80,010
S	76,412
R	70,741
D	62,364
L	52,565
U	35,011
W	31,877
M	30,201
C	28,462
G	28,186
F	26,061
Y	25,127
P	21,113
B	19,997
K	12,705
V	10,468
J	1,871
X	1,243
Z	968
Q	954
TOTAL	1,255,407

Comparing the order of the print letters in Table 3 with those for braille in Table 2 showed one of the effects of the contractions in braille. The position of t changed from second place in Table 3 to sixth place in Table 2. L changed from 11th to 14th place, and h from 6th to 16th, etc.

In order to determine the frequency of recurrence of the 63 braille characters, the frequencies for the constituents were combined wherever one of the characters was used. The results of this reduction are contained in Table 4.

TABLE 4

NUMBER OF OCCURRENCES OF THE
63 SINGLE-CELL BRAILLE CHARACTERS

CHARACTER DOT NUMBERS	NUMBER OF OCCURRENCES
1-5	63,995
1	56,200
2-3-4	48,089
1-2-3	44,567
2-3-4-5	43,500
1-3-5	43,233
6	42,084
2-4	36,706
1-2-3-5	35,030
1-3-4-5	31,401
1-4-5	28,726
2-3-4-6	26,999
1-3-4	25,583
2	22,474
1-3-4-5-6	22,374
1-2-5	22,035
1-4	20,481
1-2-3-4	20,372
2-5-6	19,425
1-3-6	17,330
1-2-4-6	15,100
1-2	14,743
1-2-4	14,406
2-4-5-6	14,406
1-2-4-5	14,336
1-2-3-4-6	13,060
1-2-4-5-6	12,575
3-5	12,090
1-3	11,711
5	11,177
3-5-6	10,985
2-3-6	10,737
2-3-5	9,762
2-6	9,216
3-4	8,980
3-4-6	8,850
3-4-5	8,490
1-2-3-6	8,290
1-2-3-5-6	7,117
1-4-5-6	7,019
1-2-5-6	5,871
3	5,368
1-4-6	5,176
1-3-4-6	4,676

CHARACTER DOT NUMBERS	NUMBER OF OCCURRENCES
1-5-6	4,574
3-6	4,524
1-6	4,239
2-4-6	4,233
5-6	4,039
2-3	3,931
4-5-6	3,409
1-2-3-4-5-6	3,174
4-6	2,966
1-3-5-6	2,802
2-3-4-5-6	2,513
1-2-6	2,337
2-4-5	2,041
2-3-5-6	1,859
2-5	1,462
3-4-5-6	1,339
1-2-3-4-5	954
4-5	946
4	148
TOTAL	966,235

The grand total for all the characters is also contained in Table 4. Comparing the total number of braille characters with those of ink-print, including numbers, punctuation, and special signs, it was found that braille used 26.5% fewer characters. Here characters refer to all the symbols in written English for which there are braille counterparts. Thus, braille diminished the use of the ink-print letters and symbols by approximately 26.5%.

One further reduction of the data was made to determine the frequencies of the individual dots within the braille cell. This information is contained in Table 5.

This reduction showed that the dots in the various positions within the braille cell did not recur with equal frequency, but that the dots on the left occurred 7% more often than those on the right, and the top dots were 8% more prevalent than the bottom dots. Moreover, dot 1 occurred almost twice as often as dot 6. The total number of dots covered over the total for the characters give 2.88 as the average number of dots for the characters.

TABLE 5

NUMBER OF OCCURRENCES OF DOTS BY POSITION WITHIN THE BRAILLE CELL

DOT POSITION	NUMBER OF OCCURRENCES
1	583,487
2	491,320
3	499,690
4	453,028
5	452,659
6	303,298

DISCUSSION

Even though the present count was suitable for the purposes of the authors, as a count reflecting the frequencies of braille symbology in the reading matter of the blind, it was somewhat limited. According to Josephson (1961) only a small percentage of blind persons continue to read books by means of braille after leaving school. By inference, then, a large, perhaps the largest, amount of the material read in braille is of the textbook or periodical type, and none of this material was included in the sample for the count. Hence, although the present count was more extensive and covered a wider range of material than either of the two mentioned earlier, it was still not as adequate as it should have been.

One of the reasons for the count was to determine whether relationships existed between the frequency of recurrence of the characters, dots, etc., and these factors as they influenced perception of the braille characters. Nolan and Kederis, in Nolan (1964), established orders of legibility of most of the single-cell braille characters. Significant correlations, coefficients up to 46, were obtained between these orders and the order of frequency of recurrence of the characters. They also found that the braille characters with fewer dots were more easily recognized than those with many, and that the dots on the right and at the bottom were missed more often than those on the left and at the top. These findings, also, corresponded well to the results of the frequency count. Approximately 70% of the characters that appeared in the sample for the frequency count were of three and fewer dots, and the occurrence of dots in each of the six cell positions was in a direct inverse relationship with the frequency of missed dots by cell position. Thus, some of the factors that are important to the perception of the characters

appeared to be partially related to their frequency of appearance in reading material.

Another interesting aspect of the results of the count was the change the contracted forms of braille produced in the order of frequency of recurrence of the letters of the alphabet. Thus, in studies such as the one by Mayzner, Tresselt, and Adler (1964), wherein they found high correlations between subject-generated letter frequencies and the frequency of recurrence of the letters in English, different relationships might have obtained had the subjects been braille readers. Conceivably, such differences could even reflect on the way in which braille is perceived.

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Attachment 5

A Study of Braille Code Revisions

by Gerald F. Staack

Submitted to the Department of Mechanical Engineering on August 31, 1962 in partial fulfillment of the requirement for the degree of Master of Science in Mechanical Engineering.*

This thesis is an analytical study of Grade II braille for the purpose of determining what revisions are necessary to make it possible to translate from regular printed material to braille. At the present time this problem is complicated by both the 189 contractions which are used in braille and the requirements that many of these contractions not be allowed to overlap syllables. A complete description of the braille system is given, as well as the history of its development and the arguments concerning its adoption in this country.

Three criteria are developed for the evaluation of braille contractions. These are:

1. their ability to reduce the bulk of material saved as determined by their frequency of occurrence and the number of characters saved each time they are used;

2. their effect on the readability of braille as evaluated by previous studies;

3. their ability to be translated mechanically without consideration of pronunciation or syllabification.

The contractions are divided into groups on the basis of their braille form and the rules governing their use. The contractions within each category are then evaluated with respect to the above three points. Specific recommendations are made concerning the omission of infrequent current contractions, the adoption of new contractions, and changing the rules restricting the use of some contractions. The overall efficiency of the braille contraction systems as a means of saving characters is evaluated in terms of the mathematical theory of communication.

* Thesis Supervisor: Dwight M. B. Baumann, Assistant Professor of Mechanical Engineering

Some of the recommended changes were tested on a sample of blind people. Both the results of the reading test and the comments of the subjects strongly indicate that the recommended changes could be adopted with little problem for the average blind person and with desirable long-range effects.

A computer program has been written to count the frequency of contractions in various texts and to record the words in which they occur. This program should serve as a useful tool in future evaluation of present contractions, and also proposed changes of contractions and existing braille rules.

EDITOR'S NOTE: A selected Table of Contents from Mr. Staak's thesis is included for those who would be interested in further reading.

TABLE OF CONTENTS

SUMMARY OF RECOMMENDATIONS

It was suggested that consideration be given to the following changes of contractions:

1. "g" to represent "great" instead of "go."

2. "r" to represent "right" instead of "rather."

3. Discontinue the use of a single-cell contraction for "enough."

4. Stop using the double-letter contractions "bb," "cc," "dd," "ff," and "gg."

5. Eliminate use of the initial-letter contractions "mother," "father," "lord," "spirit," "name," "world," "character," and "whose."

6. Discontinue use of the short-form words "oneself," "declaring," "deceiving," "conceiving," "receiving," "perceiving," "rejoicing," "below," "yourselves," "thyself," "conceive," "beneath," "blind," "rejoice," "deceive," "perceive," "declare," "afterwards."

7. Add contractions "al" for "all," "hz" or "hs" for "has," and "(wh)t" for "what."

8. Change the contraction for "also" from "al" to "als."

Furthermore, each contraction, particularly short-form words, initial and final-letter contractions, and lower contractions, should be thoroughly studied with reference to ease of reading and space saving. New contractions should be devised for those words among the one or two hundred most common words which are currently spelled out in full, and which have obvious contractions which would not impair reading.

It is also suggested that the following rules concerning the use of contractions be changed so that the rules are consistent with themselves and with the capabilities of mechanical translators.

Rule 34. Amend so that contractions are used when the sequence of letters they represent appears in a word, regardless of pronunciation or syllables.

Rule 36b. Revise so that the alphabetic and similar whole word contractions are permitted before the apostrophe in all words, even colloquial ones.

Rule 37. Revise so that space is omitted between "a," "and," "for," "of," "the," and "with" at all times, except when they are separated by punctuation.

Rule 41. Revise so that the contractions are always used for, and the space omitted after, "to," "into," and "by," except when they are followed by punctuation.

Rule 42b. Omit this section, thereby allowing double-letter contractions and "ea" to be used whenever they occur in the middle of a word.

Rule 43. Revise so that "be," "con," and "dis" can be used whenever they appear at the beginning of a word and not just as the first syllable.

Rule 45. Revise so that punctuation is not considered in using the initial-letter contractions as part words.

Rule 45a. c. d. Eliminate these three sections so that "one," "some," and "part" may be used as part words at all times without regard to syllabification.

Rule 46b. c. Omit these sections so that "ness," "ity," and "ally" can be used at all times.

Rule 47. Amend so that short-form words are used as part words wherever they appear, or so that some are used as part words all the time and others are not used at all.

Attachment 6

Evaluation of Staack's Recommended Revisions to the Braille Code*

Letter from Dr. Abraham Nemeth

To Bob Gildea
From Abe Nemeth
15 December 1975

Bob, I'm talking to you on tape because what I have to say is lengthy and because I don't have secretarial help. I'm responding to your inquiry about Gerald Staack's recommendations, and you want to know whatever became of them.

Of course I was familiar with them when they were first published, and you wanted to know why they were never considered. Well, they were never considered because they were never presented to the Braille Authority. The publication was only issued and the braille-reading community, or those of us who were interested in it, read the report, but no official presentation of his recommendation was ever made to the Braille Authority, so the Braille Authority never undertook to consider it. But if the Braille Authority had considered them, the chances are they probably would have been rejected. If I were on the Braille Authority, I would reject them.

Let me tell you a little in detail what's involved. First of all, he maintains that the present rules make translation impossible. Now, you know that the impossible, as far as translation is concerned, is a relative term. It all depends on how much programming effort you want to put into it. In other words, it may make it more difficult if you have to do syntax analysis or if you have to implement more rules, but impossible, of course, no. More complicated languages than braille have been translated with much more involved, and a pretty good job has been done on them.

He claimed that the problem of syllabification is the principal problem. It is a problem, but I don't think it's the principal problem that's involved in translating braille.

Now, he has three criteria for evaluating contractions. First of all, the ability to reduce bulk. Now, many studies have been made and they have found that English braille Grade II as it now exists is effective in reducing the bulk of material by about 17-19%. I don't know what 17-19% means.

*Transcribed from magnetic tape cassette

Does it mean 17-19% less weight?; does it mean 17-19% less shelf space?; does it mean 17-19% fewer cells? I really don't know, but I have to claim 17-19% less--and that's about right--17-19% less than what? Well, less than straight Grade I braille, of course. So, now let us assume that a book takes 10 volumes. Well, if you did it in Grade II instead of in Grade I, then you would reduce it to 8 volumes. Well, that's hardly reducing bulk. Someone has said that it doesn't take too many of those braille books to make a dozen. Usually, anything worth while takes a lot of braille volumes, and so it might take one volume less in Grade II than in Grade I. So Grade II is not that effective in reducing bulk.

Effect on readability is what he says. Now, I think one of the pluses that the present Grade II system has is that it is readable, and I don't think any change or any system will improve readability. Some changes will not greatly deter it, but improve it--I doubt whether any changes would improve readability. I will come to that later. (You see, I'm talking to you off of braille notes that I made when I read your abstract.)

The third criterion that he uses for evaluating contractions is its ability to translate mechanically. Now again, if he just wants to do a one-to-one scanning and look at a very small field of letters, then I understand what he means, and he is going to get himself into trouble if he wants to do that, as I will presently point out. Clearly, when he wrote his summary of recommendations, it was quite apparent, from whoever reads this, the person who wrote this had very little experience with braille and doesn't know braille very well--that he is a johnny-come-lately to the system. His first recommendation is to use the letter "g" to represent the word "great" instead of the word "go." Now, anyone who is familiar with braille knows that the word signs like "g" for "go," "h" for "have" and "b" for "but" are not subject to any modification. For example, the word "like" is represented by the letter "l." But as soon as you want to write the word "likes," you have to write l-i-k-e-s, and if you want to write the word "likely," you have to write l-i-k-e-l-y. You cannot add to the "l" to form longer or modified words from "like." Now if "g" were "great," then it would be impossible to contract words like "greatly," "greater," "greatest," "greatness," and many other derivatives of the word "great." Currently, "grt" is a short-form word that is permissible to add prefixes, suffixes, and any other modifications you need.

Now his next recommendation is that "r" should represent "right." Well, this is subject to the same criticism, because if "r" represented "right," then words like "rightmost," "bright," "fright," and all words of which there are many which contain r-i-g-h-t would not be contractable. Only the bare word "right" would be contractable.

Now, he wants to delete the contraction for "enough." Well, okay, that's harmless if he doesn't want the contraction for "enough," it doesn't occur that often, and no great harm would accrue from deleting that.

Now he also wants to discontinue the double-letter contractions for "bb," "cc," "dd," "ff," and "gg." I don't know whether that would be good or not. It wouldn't detract from readability much if they were deleted. Grade III has other double-letter contractions in addition to these. Grade III has "ll," "ss," "tt," which are also commonly occurring combinations in English. Of course, Grade II doesn't have those. Now, he wants to delete the following contractions: "mother," "father," "Lord," "Spirit," "name," "world," "character," and "whose." Now, again as I say, I don't know what good would come from deleting those words. It would add to the bulk, rather than decreasing the bulk for whatever small amount that might mean, but nothing earthshaking would happen if the decision went one way or another. He also wants to delete "oneself," "declaring," "conceiving," "perceiving," "deceiving," "rejoicing," "below," "yourselves," "thyself," "conceive," "be," "blind," "rejoice," "receive," "perceive," "deceive," "declare," and "afterward," etc. He deleted those on the basis of a frequency study, I imagine. Anyone who knows the history of the development of Grade II braille will realize that the earliest works in braille were of a religious character, the Bible predominantly, and words like "rejoice," "perceive," "deceive," "mother," "father," and "Lord" are common occurrences in the Bible; when the step was taken to extend braille literature from the Bible to other works, those contractions were never deleted. In fact, there are still other contractions considered part of Grade II which are still retained only for liturgical or biblical use, such as "grace," "glory," and "holy," etc. They are not contracted in secular literature. So these words hang over from the time most transcription was biblical or religious.

Now, he wants to add some contractions like "al" for the word "all" or "hz" or "hs" for "has," and "wht" for "what." I don't know why he singled those out; there are many others which he could have had. When he says "hz" for "has," he is again revealing his naivetè in braille and lack of experience. One thing that an experienced braille reader knows is that braille is not phonetic, but it is entirely conformal with proper spelling. If h-a-s spells "has," then the letter "z" has no place in there. I know there is an exception--the letter "z" all by itself stands for the word "as," because the letter "a" cannot serve that function. The letter "a" is a word all by itself. But otherwise, braille is not phonetic. For example, declare is a short-form word represented in braille by the letters "dcl." One cannot write "declaration" by adding the contraction for "ation," for that because "declaration" is spelled without an "e," and declare does have an "e," and by affixing the "ation" contraction to "declare,"

the implication would be that "declaration" does have an "e," which it does not. Thus, "declaration" cannot be contracted like that. And the same thing is true throughout the whole braille system; it's completely preservative of spelling.

He wants to change "al" to "als" for "also." I guess his motivation is it should not be confused with the name "Al." But there is a special rule, if you want to write the name "Al" in braille, you must put a letter sign in front of the capital sign in order to indicate to the reader that it is the name "Al," not the word "also."

He wants to study short-form words, initial-letter contractions, final-letter contractions, and lower contractions for readability and space-saving. Well, then he wants to add contractions for 100 or 200 common words which are evident and do not impair reading. I'll tell you something. Grade III has never achieved very wide popularity, and the reason is that it impairs readability. It has about 450 contractions instead of 189 of braille Grade II. Because it has that many contractions and because it is a short cut, it requires a continuous decipherment on the part of the braille reader. He is undertaking a continuous recognition process; every contraction has to be recognized, as they are so frequently occurring that there is no time lapse between the occurrence of one contraction and the next one. He is engaging in a long, continuous, recognition process. This seems to act as a psychological impairment to braille reading. I'm a very rapid Grade II braille reader, but when I have to read braille Grade III, and I know braille Grade III very well, I am slowed down by Grade III. Grade III also uses a process of outlining, where obvious vowels are omitted, and this shortens the words, or the space which the words occupy, so it is not quite as conservative of spelling as Grade II, but it does slow down the reading when you have to do that much filling in. There seems to be a psychological limit somewhere between Grade II and Grade III (Grade II is below it and Grade III is above it), and if he wants to add 100 or 200 more contractions I am afraid that he would again surpass the limit of easy reading.

He wants to allow certain contractions regardless of pronunciation syllables. This is all right to a point. In fact, there are differences between what we allow in this country and what we allow in England, simply because of the way we pronounce words. For example, in this country the word "reduce" does not permit the contraction for "ed." In England, it is permitted. Similarly, we do not permit "er" in "derive," but in Britain "er" is permitted in "derive," because they make their "e" considerably shorter--they say "d'rive" and we say "de-rive"--we clearly pronounce the "e." In cases like that, there's no danger, but there are many cases where using a contraction regardless of syllabification or pronunciation would be devastating to the readability of

a word. Consider the following examples and you will see. Suppose I were to permit the contraction for "name" in the word "ornament." Suppose I were to permit the contraction for "time" in the word "sentiment." There are many examples of this kind. When I was a kid we used to have a little riddle: how do you pronounce the word spelled as follows: SO-MET-I-MES? Well, obviously the word is "sometimes." Grouping the spelling properly, one has no difficulty, but when you disturb the grouping of the letters, this greatly impedes the readability of braille. To allow contractions regardless of pronunciation or readability is a rash recommendation.

He also wants to use the contractions for "to," "into," and "by," regardless of context. Well, maybe you can get used to that and maybe you can't. Certainly there would be times when it would cause you to stumble in the reading process.

He also wants to use the double-letter contractions regardless of prefix stem; in other words, as in "sub-basement," in the current rules of English braille, the "b" of "sub," and the "b" of "basement" are not allowed to be contracted because one belongs to a prefix and the other to a stem. He would allow the "bb" to be contracted. Well, that's not so terrible, I suppose.

He also wants to allow the "be," "con," and "dis" contractions at the beginning of a word. Well, first of all, how would one write "con" (the word itself) as in "pro and con"? Would one use the c-o-n contraction or not? Also, you have this problem: if you were to use the "be" all the way, without restriction, you would find the "be" contraction used in words like "bell." What about if we used it in the word "bet"--how would we distinguish the proposed form from the short-form word "between"? The short-form word "between" uses the "be" contraction followed by the letter "t," but if he wants to implement his rule, that would become the word "bet." Similarly, the name "Ben"--currently we use the "b" followed by the "en" contraction; his suggestion is to use the word "be" followed by an "n." If we did that, however, that would cause the short-form word "beneath." Thus, you would find yourself in the situation of rescinding certain rules only to find that you have to make up corrective rules.

He also wants to contract "ness," "ity," and "ally," wherever they occur, no matter what they mean. Well, consider, the "ity" contraction in a word like "fruity." Or the "ally" contraction in a word like "misally." Other examples don't come too readily to mind.

He also wants to use short-form words as parts of words regardlessly; he just wants to use short-form words even if they are parts of longer words. So, for example, "blind" is "bl." Well, how would you write "blinded"? You would add an

"ed" contraction, and according to his rule, this would become the word "bled." There are many other examples of this kind which he did not address.

Well, those are a few off-hand comments that I had to make about Mr. Staack's proposal. My overall concept is that he is a very energetic young man, that he did a very thorough study, but that his lack of experience in braille shows through very clearly in what he did. All the rules are tradeoffs of one kind or another, and we'd just be getting different kinds of tradeoffs. When he got through, his set of rules would not be perceptibly mechanically easier for braille translation. That's just my opinion. I know you're collecting other opinions from other people and I don't know what they will tell you, but I have to tell you that's my opinion.

Another thing, there are certain rules that he points out for "to," "into," and "by" which should ignore sentence structure. I think you do have to pay attention to syllabification and pronunciation. Otherwise, you're going to impede readability, without a question, in my opinion. When I did my braille translation process mechanically, I came across many anomalies which I laugh at today. The "-ing" contraction appears in "Leningrad," and the words "ornament" and "sentiment" I gave you as examples were directly the result of my first efforts at braille translation before I realized what the problem was. Another anomaly that came up--try this one for readability--was "coupon." By his rules, one would write a "c," an "o," and the contraction for "upon." If that wouldn't rip you flat on your face, I don't know what would. The contractions force you to group the letters in a certain way for good readability. If by implementing the rules blindly, one groups letters the way they fall into contractions, regardless of how they are pronounced, one falls upon the "Sometimes Syndrome" that I told you about before--the grouping of letters makes the thing wrong and unreadable.

Very truly yours,

Dr. Abraham Nemeth

Attachment 7

Position Paper*

Letter from Dr. Abraham Nemeth

To Bob Gildea
From Abe Nemeth
9 March 1976

Hi Bob. This is Abe, beginning the assignment which you made to me via telephone.

The book I am working from is called Standard English Braille, American Edition, 1959. I also have an addendum dated October 1960. I know there have been later addenda to this work, but I do not have them and, in any case, they do not significantly change the rules of braille. They only polish some details, and I believe that later addenda also do not significantly change the section numbers of the code book, and, therefore, I am using this work that I have as the basis on which to make my comments.

The first objection that I have is not to any rule of the code at all, but it falls more in the area of textbook format. I am working from a braille edition, and in my braille edition there is no indication of the print page from which the braille edition was transcribed. This bothers me, because, for example, of the work which we are doing. There will be blind people reading braille copies, there will be sighted people reading print copies, and the sighted person should not have the added chore of finding the corresponding print page of a blind person's reference--I should be able to give it to them. The textbook format rule is something like the following: When you are transcribing a textbook, then you should indicate both the braille page numbers and the print page numbers. Print page numbers should occur in the upper right hand corner and braille page numbers should be placed in the lower right hand corner--that's for textbooks. But when you are transcribing just ordinary literary material, then you should ignore the inkprint page number and you should use braille page numbers only. They should be placed in the upper right hand corner of the page. This is what has been done in the braille copy of the book from which I have been working, so I'm sorry that I cannot give you any print pages.

*Transcribed from magnetic tape cassette

RULE 1, SECTION 2.

The first reference is Rule 1, entitled "Punctuation Signs," and my reaction is to Section 2, "Quotation Marks." The rule reads "In inkprint, even though the normal sequence of quotation marks is occasionally reversed, in braille, the one-cell signs are always used to represent the outer quotation marks and the two-cell signs to represent the inner quotation marks." I object, because this is a spurious deviation from print practice. We don't know why there was this deviation. Nevertheless, since it was done in print, the braille reader should have the opportunity to see this in braille. If he sees in some books that the roles of the quotation marks have been reversed, he will know that this is common, acceptable print practice; whereas, if he never sees it, he will be stranger to the world of print practice and we don't want to do this to our blind people.

RULE 1, SECTION 3.

My next comment is Rule 1, Section 3: "Parentheses and Brackets." This is a sort of a negative comment, I guess. I don't object to anything in the rule, but when formulating the symbol for the parentheses, the opening and closing parentheses are the same in braille and could lead to confusion. I don't have a suggestion at this point in time as to what different braille symbol should be used to distinguish between an opening parenthesis and a closing parenthesis.

RULE 1, SECTION 4, SUBSECTION A.

I am now on Rule 1, Section 4, called "Apostrophe," and this is Subsection A: "The apostrophe is to be inserted before `s' in plural abbreviations, numerals or letters, even though it has been omitted in inkprint." I think that this is again a braillism and a device to shield the braille reader from what goes on in the sighted world. You will find me objecting whenever this occurs. My solution to the problem is the following: if no confusion results, just add the letter "s." For example, to form the plural of "1930," put an "s" immediately after the zero. But if confusion is likely, just precede the "s" by the letter sign. So in "ABC's" the inkprint shows capitals ABC and a lower case "s" to form the plural; the code book shows double capital sign "ABC," the apostrophe is inserted in braille, followed by "s." My solution is just insert the letter sign before the "s," in which case we know that the letter "s" is not capitalized, and furthermore, forms the plural. It tells us that there is no apostrophe in print.

RULE 2, SECTION 8.

My next reference is to Rule 2, its title is "Special Braille Composition Signs," and this is Section 8, titled, "Order of Punctuation and Composition Signs." I think that the order which the code book suggests is spurious, and the following simpler rule should be adopted: I suggest that whenever you have punctuation signs and composition signs, you should first write the punctuation signs and then the composition signs. Among themselves, then, the punctuation signs should appear in the order in which they occur in print, and the composition signs among themselves should appear in the order suggested for composition signs in the code book. So, for example, if I have the phrase that the code book has, "'Tis true," the phrase is both italicized and enclosed in quotation marks. The code now requires the quotation marks first, which is a punctuation, followed by the italics sign, which is a sign of composition, followed by the apostrophe, which is a punctuation sign again, followed by the capital sign, which is a sign of composition again, followed by the letters "T-i-s," etc. My transcription would be first a quotation mark, then the apostrophe, because that's the order in which they appear in print, then the italics sign, the capital sign, those signs of composition are in the order in which they are suggested in the code book. I think this makes for a cleaner, simpler transcription and reading.

RULE 2, SECTION 12.

Next comment, Section 12, "The Letter Sign." If you read the rule, you will find that the use or non-use of the letter sign depends in part on the following two distinctions: first, is the letter lower case or capitalized? If it is lower case, the letter sign is required; if it is capitalized, it is not required. The example is "5A." If the "A" is lower case, then the reasoning is that you have to stick the letter sign before the "A" because the "A" otherwise would be interpreted as a "1," and you would then read "51," which is a correct reasoning. But then the reasoning goes on to say if you have "5" followed by a capital "A," since the capital sign intervenes, and you already know that it is an "A," then you do not need the letter sign. I believe that you should have the letter sign whether the letter is lower case or capitalized; it makes a symmetric transcription. Also, part of the rule for the use of the letter sign depends on whether the letter being transcribed happens to be one of the first 10 letters of the alphabet, or whether it happens to be one of the remaining 16 letters of the alphabet. For example, suppose I have "5J" and since "J" is one of the first 10 letters of the alphabet, I must put a letter sign before the "J." But, if I have "5Q," and since "Q" is not one of the first 10 letters of the alphabet, it cannot be mistaken as a numeral. The rule is that you should not put a letter sign

before it. But I believe that if you put a letter sign in front of the "J," you should also have it in front of the "Q" to make for a symmetric transcription.

RULE 3, SECTION 19.

My next comment is Rule 3, entitled, "Format," Section 19. It says "Omissions of Copy," and the rule reads as follows: "When illustrations, diagrams, etc., cannot be reproduced in braille, reference to them in the text should generally be avoided." I have a violent objection to this; I think that even though a diagram cannot be included in braille, the braille reader still should have the courtesy of knowing that something has been omitted, so that if he needs or desires to pursue it further, he can have someone look up the corresponding print or text and describe it to him or take whatever other steps might be required. But, I think, when no mention of it is made, the poor blind person is being duped.

RULE 4, SECTION 23.

My next comment is on Section 23, and the title of it is "References." The quotation is the following: "When the meaning is obvious, the references may be condensed." And later on we have another quote which says, "Where Roman numerals occur in references, Arabic numerals should be substituted for them." Now I object to both of those rules violently. First of all, it turns a blind person who at one time was literate into one who is now illiterate. In the old days, when such a rule was not in effect, I used to be able to rely on the form of reference in the braille text, and if I had to write a report, a term paper, or what have you, I could copy that reference and be sure that it was right. Today, in self-defense, I have to keep on file a card showing what the proper form is for making print references, lest the person who reads my typescript should cluck his tongue and say, "Well, this poor blind fellow, he doesn't see how it's normally done, I'll have to forgive him." We don't ever want that kind of attitude, and we must have references exactly.

RULE 6, SECTION 27, SUBSECTION E.

Rule 6 is my next comment. It is entitled "Abbreviations" and it is Section 27, Subsection E. The quotation to the part to which I object is the following: "When a date is indicated by the number of the month, day, and year, separated in inkprint by the oblique stroke, hyphen or period, the corresponding numbers are used in braille separated by the hyphen with only one number sign preceding the entire group." What I object to is the switching from the

oblique sign to the hyphen. An oblique sign, first of all, is common print practice. There is no trouble at all putting it in braille when it occurs in print. Furthermore, a hyphen is often a connective, to join the initial and the terminal point of a time interval, and by using a hyphen in this way I can foresee where confusion would result. Instead of reading a point of time, on some occasions the blind person might attempt to read a time interval, with the number before the hyphen as the beginning point and the number after the hyphen as the terminating point of that time interval. There is another rule to which I object, and I quote it: "The month should always be written first." As you can by now tell, this is alien to my thinking and is a distortion of print. If days are sometimes put before months and months sometimes put before days, the blind person has the right to be just as confused as the sighted person. Worse, the blind person might misread a date and show up too early or too late for an appointment--in a foreign country.

RULE 7, SECTION 28.

The next comment is Rule 7, and it is called "Numbers and Roman Numerals." The section to which I have reference is Section 28, which is titled, "Cardinal Numerals." That section has a note in it, and I quote the note: "Note: In writing sports scores, results of votes, etc., a dash should be used instead of a hyphen, to separate the numbers." Now, I object to that, and for the same old reason. If it is a hyphen in print, there should be a hyphen in braille. Now, I mean, you and I can tell, the formulators (I was going to say the perpetrators) of the code thought to shield the braille reader from the interpretation that the numbers on either side of the hyphen were delimiters for time interval again. By using the dash instead of the hyphen, they are warning him that these are not the beginning and end points of a time interval but something different. My rebuttal to that is, if the sighted person has the same problem, he often sees the hyphen used in the beginning and ending sense, but he also sees hyphens used in other senses, and there is no reason why the blind person should not make the same deduction from context which the sighted person has to make.

RULE 7, SECTION 29.

This is still Rule 7, "Numbers and Roman Numerals," but this is Section 29, "Ordinal Numerals": "When the second and third ordinal numbers are represented in inkprint by the number followed by the letter `d´ only, the letters `n´ and `r´ should be inserted in braille." What they are suggesting is that if you have "2d" in print, which means "second," you must write "2nd" in braille to represent "second," and when you have "3d" in print to mean "third," then in braille you

must insert the letter "r" and write "3rd." I object for the same old reason. There is no reason to tamper with print usage, and the blind person must be cognizant of what goes on in print.

RULE 8, SECTION 31.

Rule 8, "Coinage, Weight, and Other Special Symbols," and the section that I'm dealing with now is Section 31. I quote: "When in inkprint, a number or letter is preceded by or followed by a symbol or abbreviation of coinage, weight, or other special sign, the corresponding braille symbol or abbreviation without the period or plural `s' should always be placed immediately before the number or letter to which it refers." Now, this is a braillism par excellence, one to which a blind person ought not to be subjected. I believe that the position of an abbreviation or special symbol should follow inkprint. I've come across the following problem: some abbreviation is written in front of the number sign, the number sign is then followed not by a short number but by a long number, in the millions or billions, and you have to read all of that number before you can say what unit measures, because that unit is already in front of the number sign. Also, the rule cannot be uniformly applied. For example, when you talk about so many board feet, they do not put board feet in front of the number sign, or someone talks about so many cubic centimeters or so many square miles--those are not put in front of the number sign. Anyway, it's a mess. It should occupy the same position which it does in print. Another thing that you will observe if you examine the code book is that the code book changes some standard abbreviations for purposes of braille usage. Some of the abbreviations which it changes, if you will consult the table which they give, are the following: "gr" is used for the standard grams instead of the "g," "mt" is used for meters instead of the standard "m," and "m" is used for miles instead of the standard "mi." And, well, without me saying more, you know why I object to all of that. Also, the same section talks about, in representing sterling coinage, the successively smaller denominations ought to be written one after another with separating number signs, and the same technique is used when writing successively small denominations in length. For example, yards, feet and inches, or liquid measures, like gallons, quarts, and pints. This again is a braillism, and it was done to avoid writing the standard abbreviations. Sometimes, of course, print uses the prime and double prime for feet and inches and also uses the prime and double prime for minutes and seconds, and, in order to avoid coping with that situation, the rule which is now on the books was made, but that rule is not a good rule.

RULE 11, SECTION 36, SUBSECTION B.

We are now in Rule 11, entitled "One-Cell Whole-Word Contractions." I am now in Section 36, in part B. I will now quote the part to which I object: "One-cell whole-word contractions may be used when followed by the apostrophe in familiar combinations; however, they should not be used after the apostrophe, nor in rare or colloquial forms." Instead of making a rule like that, I think the way to deal with the situation is to give a list of where the apostrophe may follow a whole word sign and in all other cases it may not. I suggest the following list:

c´t meaning can´t (abbreviation for cannot)
p´s meaning people´s--like People´s Republic of China
s´s meaning so´s, abbreviation for so is
t´d meaning that´d, abbreviation for that would
t´ll meaning that´ll, abbreviation for that will
t´s meaning that´s, abbreviation for that is
w´s meaning will´s, possessive, belonging to Will, that is
x´d meaning it´d, abbreviation for it would
x´ll, meaning it´ll, abbreviation for it will
x´s meaning it´s, abbreviation for it is
y´d meaning you´d, abbreviation for you would
y´ll meaning you´ll, abbreviation for you will
y´re meaning you´re, abbreviation for you are
y´ve meaning you´ve, abbreviation for you have
ch´s meaning child´s, possessive, meaning belonging to the child
wh´ll meaning which´ll, abbreviation for which will

and that´s all. Any other whole word sign followed by an apostrophe should not be permitted to be contracted.

RULE 11, SECTION 37.

This is now Section 37, which talks about the signs for "and," "for," "of," "the," "with," together with the word "a" which may be joined together. The rule as worded allows any combination of these. I think they can be specified which ones can follow one another, and I would say the following should be the list: and a, and for, and of, and the, and with; for a, for the; of a, of the; with a, with the. Also, any of these permitted in twos can be permitted in threes. For example, and for a, and with the. Because the first pair is permitted and the second pair is permitted, the triple should be permitted. In other words, whenever a pair is permitted, a triple should also be permitted. This is not a panacea, however, because, by permitting "with" followed by "the," you will get the following situation: "Who was that lady he left with the other night?"

RULE 13, SECTION 41.

This is now Rule 13, "Lower Signs," and I'm now talking about Section 41, which reads: "There should be no space between the lower sign contractions `to,' `into,' and `by' and the word which follows, if there is no natural pause between them. If in doubt about the pause they should be joined." Now, for computer implementation (this is only a tentative suggestion, I haven't given this a great deal of thought), you might do this: make a list of words in front of which these words can be joined. For example, the articles "a" and "the" and then all the pronouns, so you have: by me, by my, by his, by her, by our, by their, by them. Also, the word "to" could precede these words: to a, to the, to me, to my, to mine, to your and so on, and the same thing for "by." This then would mean that these lower-cell words could not be joined in front of nouns or verbs, since they would not be on the list: to let, to go, to have etc. You could do this by storing a long list of verbs or nouns, but that would be too long a list. For computer implementation, you might want to make a rule: that when braille is done by computer, the non-joining of a contraction should not be regarded as an error. In fact, that's one of the braille rules. What does a proofreader do when he observes a place where a contraction might have been used but was not used? The proofreading rule is only to warn the transcriber, but not to make the correction by inserting the contraction.

RULE 14, SECTION 45.

We now come to Rule 14, called "Initial-Letter Contractions" and I am now in Section 45, which talks about the use and non-use of initial-letter contractions. Now, there's a whole grey area which is involved here. The book gives no rule, but has two columns, and starts with various words like "day," and it can be used in "daytime," "dogdays," "yesterday," but not in "whaddaya"--in dialect, like "whaddaya say." The list then continues with the initial-letter contraction "ever," and it can be used in "everywhere," "several" and "lever" but not in "evert," "severity," "fever." It goes on in this manner for the various other contractions. It is my thought that all of these contractions should be used only in words that you could look up in a table. In general, they should only be used when they retain their original meanings. For the human being, it's easy to know that "day" maintains its original meaning in "daybreak," "daytime," "Holiday," but it does not maintain its initial meaning in the exceptional case which the code book mentions, like whaddaya. It just happens to be that the letters "d" + "a" + "y" follow in succession. On a computer, one could implement this by storing a table, and one would store all the words in which "day" might be used--"daybreak," "daytime," "Holiday," and "days," together perhaps with some endings which could follow,

like "s" to form plurals. Otherwise, the contraction should not be used. Now, you have to realize the implication it would not be used in "Dayton, Ohio," and so on. It would not be used in a man's name, like "Dayes"; whether you'd want it used in a place like that is another question. A way to solve the problem is by storing the word where it may be used, and proscribing the use of it elsewhere. The same thing is true with the word "ever." You can store the words where you want it used and make a rule that it should not be used except in those words. This will prevent the use of the word "ever" in "evert," "severity," or "fever" or other places where you would not want to use it. And similarly, you would do the same thing for the words "father," here is a classical case of where it will work. The "here" contraction was only intended to be used in words which had "h-e-r-e" in the meaning of "here," like "hereafter," "herewith" and "heretofore," but was never intended to be used in "heresy" or "Hereford," etc., and by storing the words where it might be used, you will decisively control where it may and where it might not be used. This is true of all the initial-letter contractions.

RULE 15, SECTION 47 SUBSECTION B.

This is now Rule 15, Section 47B, "Final-Letter Contractions." Here, you might want to store a list of exceptions, rather than a list of uses. For example, in the "ity" case, you might want to store "fruity" as an exception or "hoity toity" as an exception. In the case of "ally," you might want to store "squally," as an exception, and having stored all the exceptions, thereafter permit the use of the final-letter contractions everywhere else.

RULE 16.

We now come to Rule 16, called "Short-Form Words." I believe that short-form words should not be allowed to be used in proper names. One of the examples the code book has is "Doolittle," and they write it "Dooll." Now, it is not all clear whether that means "Doolittle" or whether that's somebody's name called "Dooll." Indeed, if someone's name were spelled "Dooll," I don't think the code has a provision for writing that. In the case of some of the short-form words at least, you could again store tables of where a short-form word might be used and might not. For example, in "after" you can store all the words like "afterbirth," "aftercare," "aftermath," and "afterthought." By not storing some words, like "rafter," then the "after" contraction would not be used, simply because it was not on the list.

Now, I realize that when you get through storing all the tables required for the initial-letter contractions, for all

the exceptions for the final-letter contractions, and for all the places you would use the short-form words, you may thereby have consumed a considerable amount of memory. I'm used to handling large computers where a memory is large and there is no problem. This might be a problem if you are dealing with a mini-computer, where you don't have very much immediate memory and where you might have to go to peripheral devices. These are only my first thoughts, and I don't mean for them to become hard and fast. They need a lot of going over and a lot of refinement. Now, that finishes all the rules of braille.

As you can probably tell, my comments are classified into two kinds; first, a desire to keep a more faithful representation of the print, and second, a desire to make a rule implementable on a computer. Now, I believe that most of the comments that I made when we came to contractions do indeed permit computer implementation. They do create certain configurations which are not usual in braille as it is currently used. However, I do think that this is a good compromise. It makes possible a quick short computer program and at the same time produces braille that is very readable.

That's all, Bob. I hope that this will give you grist for first starting up your mill and I will send this on to you. I will be back from Europe before I hear from you I presume, so, good luck to you and so on.

Very truly yours,

Dr. Abraham Nemeth

Annex 3:

Submissions, Position Papers, Correspondence, and Other Materials

A Guideline for the Improvement of Braille Production by Computer

by Philip R. Bagley
Information Engineering
March 15, 1976

Here is my strong opinion on what must be done to make computer-produced braille cost-effective. This is born of more than three years of struggling with producing material for the Internal Revenue Service using a modification of the DOTSYS III translator.

The principal cost is in editorial work, to prepare the material for translation, and to proofread and correct the translated result. Compared to the cost of the editorial work, the actual computer charges are unimportant. Therefore, any approach which is intended only to reduce computer time will not be of much help.

The greatest saving will be made possible by eliminating the need to proofread the translated result for content (correctness of translation). You must be able to assume that, if the input is correct (for content), then the translated result will be also. There is no compromise possible--either you must be able to trust the translator 100 percent or you must proofread and correct the result. To be able to trust the translator means that you cannot have exception tables to take care of the translator's deficiencies. Otherwise, there will always be exceptions that were overlooked and which can be found only by proofreading the translation. Thus, the braille translation rules must be 100 percent programmable. The principal rules which stand in the way are those rules dependent on syllabication, on breathing, and on meaning. The contraction rules and the rules for letter signs are thus in for radical revision.

The second major area of editorial work is in formatting--which includes handling and positioning of headings, page numbers, footnotes, illustrations, etc. I do not believe it is humanly possible to avoid proofreading the translator output for format. It has not, in my experience, been possible to find all format errors by proofreading the input to the translator. Hence, reducing the editorial effort involved with formatting can only be done by simplifying what

has to be done. Main candidates for simplification are:

1. Simplify the rules for headings, so that the editor's work is limited to indicating what text constitutes a heading.

2. Move page numbers out of the text lines, so that when lines must be rearranged to accommodate corrections or changes, they do not have to be reset.

An additional minor improvement in cost reduction can be achieved if occasional typographical and format errors will be tolerated--at about the level committed by newspapers. It takes a tremendous effort to achieve a small improvement after the first proofreading and correction cycle.

With regard to my suggesting changes to the braille translation rules, it is not appropriate for me to do so. The criteria are very simple--the rules must be 100 percent programmable--but what the actual rules are does not matter to the programmer. On the other hand, they matter very much to the reader (which I am not). The ultimate determination of a set of programmable rules can best be done by those who are braille readers who understand what "consistency" means--for the choice of rules is guided almost wholly by what is acceptable to the majority of braille readers.

With regard to changes to the format rules, however, I have suggestions based on what we have found to be tedious for editors--which braille readers are not in a position to judge.

The area of system design certainly has a major impact on production cost, but has nothing to do with braille rules. Naturally, I have very strong opinions on how computer-based braille systems should be designed. I believe the system must make the editor's work as simple as possible: this implies on-line input, editing, and processing. Some of the system design details depend heavily on the translation and formatting rules, which have to be resolved first.

Position Paper

by Elaine Behnke
Volunteer Services for the Blind

Volunteer Services For The Blind, in Philadelphia, believe that the Division For The Blind and Physically Handicapped, Library of Congress, should continue to maintain the same strict standards which it now demands for certification of individual braille transcribers. Furthermore, we feel that these same exacting standards should be required for certification of computer braille operating systems.

A lowering of certification standards might be equated with the substitution of inferior quality materials for the construction of a building. The end result is inevitably marred by defects in workmanship and is at best a mediocre product. Once such a downgrading of standards is begun, it is but a small step to an ever increasing disregard for the rules and regulations of English braille.

Computer technology has been widely heralded as a major advancement in the field of automation. This is undeniable. But if we must accept a relaxation of certification requirements in order to obtain computerized braille--with the concomitant modification or disregard of braille rules--then such technology cannot be viewed as a step forward. Rather it must represent a regression in our service to the braille readers.

Our past experience has been that programmers initially harbor the belief that the computerization of braille will be a simple matter. They quickly discover the error of their thinking as the complexity of the task before them becomes apparent. However, rather than proceeding to expend the time and effort necessary to perfect a satisfactory program, they have thus far preferred to settle for a product which is seriously flawed. Materials far more complex than braille have been successfully programmed into computers. Thus we find it unlikely that the trouble lies with the material itself.

Many of the problems we have encountered arose directly from the programmers' lack of familiarity with the rules of English braille. This situation is analogous to having someone attempt to program the French language without a knowledge of liaison or French syntax. Both cases are equally absurd. The ideal remedy would be to have the programmer himself expert in the rules of braille. However, equally

satisfactory results could be achieved simply by having him work in conjunction with a certified braillist. This would not only save both time and money, but would also eliminate many unnecessary and avoidable mistakes.

It has been argued that the daily newspapers are full of errors made by computers. This is not a valid comparison, since a daily newspaper has hourly deadlines with last minute changes for late-breaking news. The sighted community demands--and receives--standards of high quality in all of their other printed materials. Are not the visually handicapped equally entitled to excellent quality braille, whether it is produced by individual transcriber, stereotypist or computer?

We at the Volunteer Services for the Blind in Philadelphia can see no valid reason for any major changes in the braille rules as presently adopted and authorized. We can see no reason for depriving the blind of the highest quality braille we are capable of producing.

Finally, with your permission, we would like to add a few comments to those of Dr. Nemeth concerning Gerald Staack's thesis. When we read Mr. Staack's paper sometime ago our reaction was that his knowledge of braille was rather superficial and that his research had not been sufficiently extensive to comprehend the reasoning behind many of the current braille rules. We feel that his recommendations would not reduce the bulk of material or improve the readability of braille. The changes he proposes simply discard certain current regulations while substituting new ones to be learned in their places. Usage of these new rules would make portions of braille almost incomprehensible, or at least confusing and time consuming to read. While Mr. Staack's suggestions might initially make programming easier, it is rather doubtful that the final result would be worthwhile.

Respectfully submitted,

Volunteer Services For The Blind
Elaine Behnke

Recommendations for Changing English Braille Rules

by Phyllis J. Biesemeir, Ph.D.
Lois C. Leffler, Ph.D.

Argonne National Laboratory
June 7-8, 1976

INTRODUCTION

This paper is based on experience gained as a reader of braille (PJB) and as a writer of a computer program to translate inkprint to braille (LCL).

Furthermore, the experience relates to production of braille for the Argonne Braille Machine. This device presents braille as a continuous stream of characters on an endless plastic belt which moves under the reader's stationary fingers. Therefore, some braille rules which present problems to most translators, such as rules pertaining to hyphenation of incomplete words at the end of a line of braille or to page structure, do not apply and are not considered in this paper. Other rules, such as those for formatting and footnoting must, of necessity, be modified for the braille machine. Some of the decisions about an appropriate way to handle these rules for the braille machine have not yet been made.

If we omit discussion of a rule, we either feel it is acceptable as it stands or we have no suggestions for changing it.

The authors of this position paper agree that, where at all practical, braille should follow inkprint usage in completeness, punctuation, formatting and writing of abbreviations. This insures that the blind person is familiar with the usual print conventions. It also simplifies machine translation. This one principle, more than anything else, guided our consideration of the rules. We also took into consideration "usual" compositor tape practices and the difficulty of instructing a sighted MC/ST or MT/ST operator about modifications (pre-processing) which must be made to text being prepared for submission to a translator.

In some cases the authors agreed to disagree. This will be indicated clearly in the text.

We are using English Braille, American Edition, 1959 as revised in 1972, as our authority.

RULE I. PUNCTUATION SIGNS

We recommend that the order of single and double quotation marks be as given in the inkprint text being translated. If italics are used in the print to indicate quoted material, the italics should be kept in the braille rather than substituting quotation marks for the italics. If change of type or change of margin is employed to indicate quoted material, then we suggest the present rule of inserting quotation marks be followed.

LCL feels that the rule of inserting the apostrophe where omitted in inkprint (OKd) should be kept as a flag indicating the discontinuation of the effect of the capital sign; PJB is uncertain. It is never incorrect to write OK'd in inkprint.

An apparent contradiction exists in the braille rules. In "OKd" the use of the apostrophe terminates the double capital sign while in "O'CONNOR" it does not. (Rule I, 4a vs Rule II, 9b)

PJB feels that the apostrophe should not be added when an "s" follows a number such as in "1930s." LCL favors the insertion of the apostrophe into the braille to terminate the effect of the number sign.

The dash can cause some problems for the translator. A dash ending an incomplete sentence is not always easily differentiated from a dash used as punctuation (Rule II, 6). We suggest the inkprint practice be followed for both the single and double dash; that is, the presence or absence of spaces surrounding dashes should follow the inkprint text.

The translation of the ellipse and the use of dots to indicate omitted letters should follow the inkprint text. If a space is omitted before the ellipse in inkprint, it should be omitted in braille and visa versa. If asterisks are used in print, instead of dots, to indicate an ellipse, then the asterisk sign should be used instead of the 3 dot even though it takes more space (Rule I, 7).

We feel the principle that inkprint practice be followed is very important in Rule I.

RULE II. SPECIAL BRAILLE COMPOSITION SIGNS

We suggest that the number sign appear after the apostrophe when they occur together as in "'53" (Rule II, 8). This change in the order of braille punctuation and composition signs would simplify machine processing. (LCL: The apostrophe then is also consistent in terminating the effect of the number sign.) We also suggest that the italics rule (Rule II, 10) be changed in the following way: When an

italicized word or group of words is encountered, a single italics sign should appear first before any other punctuation or composition signs. Another italics sign is then placed after all terminating punctuation marks to terminate the effects of the italics. This procedure eliminates the need to count italicized words and also follows the conventions some compositor tape systems use to indicate a type change. We realize this adds a cell to the braille translation for a single italicized word, but saves a cell for three or more words.

We further suggest that italics be used whether or not it has "value" in braille, thereby following inkprint practice (Rule II, 10a [note]).

Since the computer does not know (and it may not even be apparent to the sighted reader) why italics are used, we feel that words should be italicized together even if the italics are used for different reasons in a sentence or to refer to different items (Rule II, 10b, e).

We see no reason for omitting the italicizing of dashes, ellipses, quotes or punctuation marks in general since they appear to be italicized in inkprint (Rule II, 10d).

There seems to be no particular reason to remind the braille reader that successive paragraphs are italicized (Rule II, 10c).

Italics and quotation marks should both be used for quoted material if both are used in the inkprint text (Rule II, 10g).

We feel the letter sign is a necessary evil (Rule II, 12). Italics, parentheses or quotation marks surrounding letters in print should not be omitted in braille (Rule II, 12a[2]).

An apparent contradiction to the rules for the letter sign appears in the use of the letter sign in dg98 F (Rule VIII, 31). In the example, a letter sign is inserted even though there is no space before the capital "F."

RULE III. FORMAT

All information given on the title page should be written in braille (Rule III, 15a). Bibliographic information, such as the place of publication, is sometimes unfortunately omitted.

We also feel references to charts, illustrations, etc. are important and should not be omitted from the text even if these visual aids cannot be brailled or described. Knowledge

that they are there is enlightening (Rule III, 19).

It would be very useful to have both braille and inkprint page numbers indicated in all books.

RULE IV. ASTERISK, FOOTNOTES, REFERENCES

We feel that the asterisk should be used to indicate an ellipse if used in this way in the inkprint (Rule IV, 21a).

References should not be condensed nor Arabic numbers substituted for Roman numerals (Rule IV, 23).

RULE V. ACCENT SIGN, DIPHTHONGS, FOREIGN LANGUAGES

The translator, or a typist, may not be able to tell if a word is a foreign word or if a particular foreign word is anglicized. Therefore, the contraction in foreign words appearing in English text should be contracted in the way they are used in English unless an accent sign would fall in the middle of the contraction (Rule V, 24). We suggest that the contraction be used if the accent sign applies to the first letter of a contraction, such as in "general."

In the case of the diphthong or diaereses "ae" and "oe" we feel the contractions which divide these letters should be used "A-erial) (Rule V, 25).

We see no advantage in writing a foreign passage in uncontracted braille if it occurs in English text (Rule V, 26).

RULE VI. ABBREVIATIONS

Inkprint conventions should be used, period.

In the case of acronyms, we feel contractions should be used although we recognize that acronyms become such with time and the exact point in time when "S" "E" "A" "T" "O" (no contractions) became "SEATO" (contracted?) is subject to doubt. LCL feels that "DAR" should be contracted; PJB disagrees. Using contractions wherever they occur in unpunctuated capitalized abbreviations would assist machine translation (Rule VI, 27).

Roman numerals used in dates should be indicated as such in braille if so used in the inkprint (Rule VI, 27c).

RULE VII. NUMBERS AND ROMAN NUMERALS

Inkprint practice should be followed when expressing time (Rule VII, 28h).

RULE VIII. COINAGE, WEIGHTS, AND OTHER SPECIAL SYMBOLS

We again feel that inkprint usage should be followed in braille and, in particular, the braille should use the same letters for these abbreviations as does the inkprint (Rule VIII, 31).

Considering the question of whether abbreviations and symbols should precede or follow numbers, we see a pro and a con. The pro is that the braille reader is seeing the same thing as the sighted reader and becomes accustomed to normal inkprint usage. The con is that the letter sign and an extra space are often required. Nemeth code is now familiar to many braille readers, especially since it is widely used in the education of children. Furthermore, the use of Nemeth code would sometimes eliminate the need for the letter sign or an extra space if print sequence is followed. Could the use of Nemeth code conventions in coinage, weights, and other symbols solve some of these problems?

RULES X--XVI. CONTRACTIONS

A question exists in our minds whether braille is perfectly translateable by mechanical means. It is based on a natural language (English, which is not a perfect means of communication). LCL's experience seems to indicate that a perfect translation may only be approached asymptotically with the later improvements coming at horrendous cost in programmer and machine time and computer resources. As the rules now stand, unless one makes extensive use of tables and logic, it is seemingly impossible to have a perfect Grade II braille translation even if one does not consider context. Considering context makes perfect braille impossible without context checking. Tables and logic cost time and money and, further, make the use of smaller computers impractical. This suggests that degrees of certification for machine braille translators (e.g., Grade 1.9) would be appropriate for use in situations where it seems more important that some kind of braille be available, especially on a timely basis, rather than none. If perfect machine braille is needed, a very expensive hybrid human-machine system is probably required.

We do agree, however, with Nemeth's comment that "To allow contractions regardless of pronunciation or readability is a rash suggestion." It appears very important that pronunciation, spelling, readability and context be preserved. The use of a braille contraction implies a psychological

"togetherness" which is not present when two or more inkprint letters are printed side by side. Changing the rules could have considerable effect on a child learning to read and spell. Changing the rules, upon close examination, also seems to lead to trade-offs; one exchanges one set of problems for another.

It appears to us that before one changes the rules to make machine-translated braille, by definition, perfect braille, testing for readability, comprehension and user acceptability should be made. Field tests being planned for the Argonne Braille Machine, using machine-generated tapes, may give preliminary information about these factors. In considering changes to the rules of authorized braille, one should consider the fact that what is perfectly acceptable for one person may be a stumbling block for another.

Although we did not have time to study the problem thoroughly enough to make many useful suggestions, we think a revision of contractions on the basis of frequency counts from a wide variety of reading materials would improve braille considerably. Since only a limited number of dot combinations are available for contractions, it would be wise to follow the principle of using the available symbols to represent the most frequently used letter sequences.

If some rules about the usage of contractions were relaxed in computerized brailles, any small loss in readability would be offset by the advantages of having much more braille available. PJB believes that becoming accustomed to a certain form of a word greatly influences its readability in many cases. Changes in the use of contractions in certain words might at first be difficult for established braille readers, but familiarity with the new forms would eventually make them perfectly acceptable. Below are some of PJB's suggestions for changing particular rules about contractions.

RULE XVI, 45. INITIAL-LETTER CONTRACTIONS

In general, these contractions could be permissible in all braille except when the following three conditions occur together: (1) change in sound, (2) change in meaning, (3) division of a syllable within a contraction at a point not occurring in the original definition of the contraction. Under these conditions such hard-to-read words as "whaddaya," "enamel," and "parthenon" would not use the "initial-letter" contractions. Contractions in "sphere," "sword," "chromosome" and "centime" would be permissible. Exceptions would need to be made for some words. For example, PJB personally would not like to see "theses" using the "these" sign, or the "had" sign used as part of the diphthong "sh" in words such as "shade." These suggested changes are not destroying a present rule that is totally consistent. For example, contractions are

permitted in "acknowledge," "partial," and "Germany" although the sound of these contractions is changed. PJB finds it perfectly acceptable to use the "ever" sign when the first "e" is long, as in the word "fever." She would also eliminate Section 45c since the "part" sign is as acceptable in "partake" as in "partial."

RULE XV, 46. FINAL-LETTER CONTRACTIONS

PJB believes that most exceptions to the rule about final contractions could be deleted in all braille with little or no loss of readability. Presently, the "ence" contraction must be used before "d" or "r." Using the "en" sign followed by "c" and "ed" or "er" would use the same number of cells. Decisions about whether or not to use the "ence" sign in these cases could be made on the basis of programming ease. The final contraction for "ness" could be used in all words, whether or not the root word ends in "en" or "in." (Presently, the "ness" sign is acceptable in "baroness" but not in "chieftainess," a seemingly minor distinction.) Further, the signs for "ally" and "ity" could be used wherever the current rule seems inconsistent. Why is the "ally" sign permissible in "usually" (in which the basic form of the word is changed) but not in "squally"? In sum, Rule XV, Section 46a, b, and c could be deleted.

RULE XVI. SHORT-FORM WORDS

LCL feels that short-form words should be permissible in proper names for machine translation. Differentiating proper nouns from other words is a contextual problem for the computer which is not easily solved.

This concludes our formal comments at this time.

Some Suggestions Concerning Braille Usage

by E. G. Brown, Chairman

The Canadian National Institute
For the Blind, Standards Committee

This paper suggests amendments to rules X, XIII, XV and XVI, as set forth in English Braille, American Edition--1962 compiled under the authority of the American Association of Instructors of the Blind and the American Association of Workers for the Blind.

The amendments are designed to relax the rules governing the usage of certain contractions, delete others and add one contractual form and a number of short-form words to the existing literary braille code.

The committee's earnest desire is that braille should represent inkprint accurately and completely. Further, it is our view that other considerations should be subordinated to readability.

AMENDMENTS TO RULES:

RULE X.

Section 34-b-(1). Exception: The "EA" should be used even where a word ending or a suffix is added to the base word. EX: s(ea)man

Section 34-b-(3). Deleted.

Section 34-b-(7). Deleted.

Section 34-c. Deleted.

Section 35-a. Examples: "Bubble" deleted.

Section 35-b. Examples: Omit "Haddock."

RULE XIII--LOWER SIGNS

Sign Contraction	Punctuation
(Dot 2) EA	Comma
(Dots 2-3) BE	Semicolon
(Dots 2-5) CON	Colon
(Dots 2-5-6) DIS	Period

Sign Contraction	Punctuation
(Dots 2-6) EN Enough	
(Dots 2-3-5) TO	Exclamation
(Dots 2-3-5-6) Were	Parentheses
(Dots 2-3-6) HIS	Opening quotation marks; question marks
(Dots 3-6) COM	Hyphen

Section 42. The lower sign contraction for "EA" must be used only when these letters are between letters and/or contractions within a word. They must never begin or end a word.
EX: m(ea)n, r(ea)lize, eat, sea, s(ea)s

Section 42-a. "EA" should not be used when in contact with a hyphen or an apostrophe.
EX: Sea-island, sou'east.

Section 42-b. The contraction for "EA" must not be used where the letters are separated by a primary syllable division. (See Section 34-b-(2)).
EX: preamble, agreeable, readjustment

Section 42-d. Omit reference to "DD," to "HAD."

Section 43. The lower part-word contractions "BE," "CON," and "DIS," may be used as syllables at the beginning and middle of a word. They may be used in a syllabized word. As part-word contractions, they must not stand alone as syllables at the beginning of a line in a divided word. These contractions may not stand alone with a hyphen.
EX: (be)lieve, di(sh), un(con)sid(er)(ed), un(dis)turb(ed), (dis)(con)t(in)u(ed), un-(be)com(ing), dis-pl(ea)sure

RULE XV--FINAL-LETTER CONTRACTIONS.

In the following the signs in column 1 are preceded by dots 4-6; in column 2 by dots 5-6; in column 3 by dot 6.

Column 1	Column 2	Column 3
d ound	e ence	n ation
e ance	g ong	s ities
n sion	l ful	y ally
s less	n tion	
t ount	t ment	
	y ity	

RULE XVI--SHORT-FORM WORDS.

It is suggested that the single-syllable, four-letter words having "oo" between two letters be abbreviated by omitting the double "o," excepting in "door," "moor," and "wood." For a suggested list of words, see appendix 2.

Section 47-e. Deleted.

Section 47-f. An addition may be made to a short-form word, provided the combination could not be mistaken for, or have the appearance of, another word. The short-form words for "after," "blind," "cool," or "friend" should not be used when followed by a vowel. However, they may be used when followed by a consonant or a hyphen in a divided word.

EX: Used: blfold, bl(ness), purbl; cl, clly; frly, fr(sh)ip; (be)fr- (ing); etc.

Not Used: bl(in)d(ed), bl(in)dage, bl(in)de(st); cool(ed), cool(er), coole(st), cool(ing); (be)fri(en)d(ed); etc.

DISCUSSION:

We suggest the deletion of section 34-b-(3) and (7) in order to reduce exceptions that contraction usage is subjected to on grounds of mispronunciation. There seems little difference in the syllable division in "sofa" and "reduce," and yet the contraction is allowed in the former and not the latter. If 34-b-(3) and (7) are deleted, 34-c becomes redundant and should also be deleted.

We suggest the amendment of section 34-b-(1)--exception, 35-a--examples, 35-b--examples, rule XIII--list, 42--list, 42, -a, -b, -c, -d, 43 and 47-e to permit the discarding of the double-letter signs for "BB," "CC," "DD," "FF," "GG." The usage of these signs gives rise to a substantial number of exceptions.

The elimination of the double-letter signs would permit the use of contraction of "BE," "CON" and "DIS" wherever these occur as syllables and do not stand alone at the beginning of a line or in contact with a hyphen or preceding an apostrophe or as a final syllable of a word.

The suggested change to rule XV--list is to introduce a new contraction "ITIES." This letter grouping frequently appears in long words which often are not otherwise contracted. The use of Dot Six S (.S) would, in this Committee's opinion, substantially improve readability. As far as we have been able to ascertain, there would be no exceptions in the usage of this contraction. Sample words are given in Appendix 1.

The suggested change to rule XVI that single syllable four-letter words having "oo" between two consonants be abbreviated by omitting the double "o" except in door, moor and wood, is made in the interests of saving space.

Mr. A. Nemeth's point concerning readability of braille is well taken. It is considered that the introduction of this "family" of abbreviated words would contribute to readability, in spite of the fact that there needs to be exceptions: DOOR and MOOR could conflict with Dr. and Mr. if presented in the text without periods. We suggest that WOOD be exempted as the abbreviation. "WD" has become established as "WOULD." A listing of suggested words appears in Appendix 2.

Appendix 1. Sample words employing the contraction "ITIES."
abilities, activities, ambiguities, calamities, capabilities, cavities, cities, deities, festivities, gratuities, incongruities, inequalities, inequities, oddities, opportunities, partialities, principalities, pities, possibilities, probabilities, responsibilities.

Appendix 2. Book, boom, boon, boot, cook, coop, coot, food, fool, foot, good, goof, goon, hood, hoof, hook, hoop, hoot, look, loom, loon, loop, loot, mood, moot, noon, pool, poop, poor, roof, rook, room, soon, soot, took, toot, woof, wool, zoom.

Discussion Paper for AFB/SIGCAPH Braille Workshop

by Maxine B. Dorf, Head, Volunteer Training Section
and Richard H. Evensen, Program Analyst
Division for the Blind and Physically Handicapped
Library of Congress
May 3, 1976

INTRODUCTION

The term, "position paper," is not quite apt for the thoughts, comments, questions, and concerns put forward by us in the following paragraphs. We are keenly aware of our special if not unique position (or positions): both professional staff members of the Library of Congress Division for the Blind and Physically Handicapped, whose braille budget for FY 1976 of about $1,300,000 is almost certainly the nation's largest single braille budget; and both close to and vitally interested in the activities of the Braille Authority--Maxine as its chairman and Dick as a member of an ad hoc committee that studied the organization and structure of the Braille Authority.

The play on words is purposeful: We wish to make it clear to the participants of the SIGCAPH Braille Workshop that we are not here representing positions, but, as previously stated, to express our thoughts, comments, questions, and concerns about braille rule changes as these could affect and be affected by the computer in translation from print and in production of braille materials. This is a fluid and flexible attitude; such is our full intent, and such we believe, must be the attitude of all workshop participants and of those who give subsequent consideration to the results of the workshop's discussions. But let us proceed to the subject at hand.

BRAILLE CODE STUDIES PROPOSED

It is indeed a healthy sign that so many persons have been asked to participate in the workshop; we hope that many will respond. As often happens, this workshop appears to be one of many expressions of interest in taking a new look at the English braille code. The first packet of materials sent to us did contain useful papers prepared a decade or more ago--those by Staack and by Kederis, Siems and Haynes. In that decade, however, this code has undergone some revision and clarification, but, even more important, it has had wide use and application. In that same period, there has been considerable development and ever-wider application of the fruits of computer science to the translation of print to

braille and the automated production of braille--a well-developed computer translation and plate-making system at the American Printing House for the Blind, the design of a specific computer program (DOTSYS III) for translating print to braille, and many others.

But there are some very recent efforts that are still seedlings and may bear much fruit--a broad-based study proposed to the international community by J. L. Douce and M. J. Tobin of Great Britain, another study proposed by P. Bagley of Philadelphia, and there must be others. The point is that the fruits of this workshop should be available to those seedling study proposals so that the harvest of braille codes, for computer production, and for the braille reader will be a rich one indeed.

This is a long way round to say that we do not intend to enter into a long discussion of particular rule changes. We have read and digested the suggestions of Staack; the findings of Kederis, Siems and Haynes; and the comments and suggestions of Nemeth, Bagley, and Douce and Tobin, and we do have some comments and reactions of our own to these suggestions. We prefer, however, to come to the workshop in June ready to comment on and discuss others' suggested rule changes, as presented in position papers. In particular, we believe it is most appropriate to read, digest, and react to changes proposed by persons well versed in the capabilities of the computer.

For this reason we shall not be following the format suggested by Bob Gildea in the workshop call; we shall suggest some areas of interest and concern, and a few possible rule changes. With respect to such changes, however, we still look to the computer experts to react to our suggestions. Do they contribute significantly to bringing about a more efficient use of the computer, and is readability or acceptability to the braille reader maximized?

LC CERTIFICATION POLICY AND PROCEDURES

We were a little surprised by the inclusion of this as a major topic of discussion at the workshop. The evaluation of certification transcriptions is clearly spelled out in Lesson Nineteen of the Instruction Manual for Braille Transcribing. LC's particular practice in certification is built on the Braille Authority-approved code, so any changes in evaluation would follow on substantive changes in that code. There is not, then, much we can or should say on this topic; rather, we would ask other participants to be specific on the changes they believe are necessary.

We will contribute a thought or two on the topic, however. It is clear that a computer-produced test transcription will not have erasures, a problem faced by those doing a hand transcription. Most of us accept the lack of hyphenation in computer-produced braille. When a manuscript is being produced by computer, it will be necessary to indicate this on the title page; hence, the lack of hyphenation can be duly noted--and, as it were, forgotten.

Perhaps what is really needed is a specifically prepared test that must be the basis for any and every computer-produced transcription. In this way all potential problems can be included and hyphenation, for example, can be excluded. The positive value is that computer transcriptions made by various methods will all be treated alike. With hand transcription the method has, in effect, been alike, but variation in content has been necessary.

EFFICIENCY AND READABILITY

We are not implying efficiency versus readability, nor that in a given change for the sake of the computer the choice must be between efficiency and readability. Several of those invited to the workshop are very much aware of the efficiencies (or lack of them) of the braille code; several are very much aware of the efficiencies (or lack of them) of computer processing of braille; but few of us can feel confident about the qualities and standards that constitute readability of braille. We say this because those of us at the workshop who are braille readers are most likely good readers, fast readers, long-time readers--but certainly not average readers. Moreover, readability includes subjective elements: Who among us has not heard long, even heated, discussions about the "feel" of Brailon, or the length of APH magazine pages or RNIB book pages? Readability, then, must play an important part in consideration of braille rule changes, but we so-called experts in certain aspects of braille cannot arrogate to ourselves the title of experts in readability; the experts are in the braille community--no, they are the braille community.

We have already touched on the elimination of the hyphen for dividing words at the ends of lines in computer transcriptions; there appears to be little loss of readability here. It is true of course that the braille reader will not have continuing examples of word division, but that is the most obvious loss. One area that has aroused a great deal of discussion centers around the use of the letter sign. Some argue for its virtual elimination, while others call for a marked simplification of the rules governing use of the letter sign. We favor the route of simplification; one must still be able to distinguish a letter from an immediately preceding

number, or between letters that stand for letters and those that stand for whole-word contractions.

We have also previously touched on the computer's positive effect on readability because there is no erasing of characters as happens with other transcriptions. We have seen, however, examples of computer braille where the space between lines is less, or more, than usual; we believe this could cause some confusion to some braille readers. This spacing problem does not appear to be serious; we understand it requires a rather simple mechanical adjustment at the point of embossing.

Back to the matter of efficiency: Will simplifying letter sign rules or those governing spacing or nonspacing between "to," "into" or "by" and following words, for example, bring about real efficiency? To restrict the use of "to" without space to pronouns, as suggested, virtually eliminates its usefulness, and at the same time takes up more braille page space. This is hardly advancing the cause of efficiency through computers. Incidentally, a word frequency count that includes a word like "to" and shows space saved must consider not only that this word occupies one cell instead of two, but that it also saves a blank cell when it is legitimate to join it to the following word.

Another question of efficiency arises when it is proposed that a rule be simplified by making a list of those instances where the contraction can or cannot be used. Admittedly, we are not computer experts, but from our general reading we learn that it is more efficient to reduce the number and size of look-up tables and increase the number of programming rules, thereby generalizing as many like situations and conditions as possible. Further, although large computers are increasingly available and can handle many look-up tables, is there not a significant advantage in refining a computer program for braille that is relatively small, efficient, and portable--that is, easily adapted to different computer systems?

BEST APPLICATIONS FOR COMPUTERS

If computer processing is shown to be fast and efficient, where can it be used best? Magazines, certainly, for most of this material is very timely and the reader wants it now. Best-sellers provide another obvious example. Then there are the more specialized items such as manuals for IRS, Civil Service Commission, and Social Security employees. But well over half, perhaps 80 percent, of the material brailled today is identified as textbooks, and textbook publishers are notorious for producing complex formats, and changing formats. If a literal transcription is called for, are there computer programs that can handle these complexities? If not, we must

continue our heavy reliance on hand transcription--and then we are back to a basic question: For which type of transcriber--human or mechanized--must the rules be formulated?

Some very direct questions must be answered by computer processors. Can the computer produce inter-point braille? What are the real savings in cost, considering computer processing time, one-sided versus two-sided braille, etc? What is the difference in bulk between one-sided and two-sided braille? Our measurements indicate that a two-inch stack of hand-transcribed pages accommodates 87 pages while a comparable stack of press-brailled pages contains 140 pages (70 sheets). The number of pages would vary, of course, depending on thickness of paper and height of dots. Perhaps this comes down to identifying those kinds of materials where the computer can do the best job and those that should be done by present manual and mechanized means.

We would like to hear from workshop participants, experienced in computers, what they think can be done by present-day computer programs and systems that will mean more of an accommodation to the braille code than a braille code accommodation to computers. For example, there is the recent work done to provide the necessary pronunciation symbols in Spanish (uncontracted) braille.

RULES FOR POSSIBLE REVISION

What are some real possibilities for rule changes in the present code? We have already mentioned accommodating the hyphen rule as it relates to dividing words at the ends of lines and a simplification of the letter sign rules. We feel that some fruitful results could be achieved through discussion of the following rules:

Rule I--Section 2A, quotation marks and quoted matter; Section 4A, the apostrophe with plural numbers; Section 5A, the hyphen in dividing words at the ends of the lines
Rule II--Section 12, letter sign
Rule IV--Section 23, references
Rule VI--Section 27D-F, postal zones, dates, telephone numbers
Rule VIII--Section 31, weights, measures, etc.
Rule XI--Section 37, a, and, for, of, the, with
Rule XIII--Section 41, to, into, by

From our limited experience with computer-produced braille, it would appear that some of the major problems in programming can be addressed through these rules; however, there may be other, more pertinent rules that affect good computer translation into braille.

In conclusion, our chief concerns must be efficiency, speed, cost, saving of space, and, above all, ease for the braille reader.

Letter

from Martin F. Droege, Director

Clovernook Home and School for the Blind

May 26, 1976

Dear Marvin:

I received the position papers and after studying these in the very short time available, I would like to state my comments as follows.

First of all, I would like to state that I personally don't read braille. I am more interested in the fastest and most economical way to produce braille for as many people as possible.

Since the typing and the preparation of the master plates have been done on hand or half automatic machines by blind workers who know all the braille rules, we didn't see any reason involving ourself in the changing of braille.

To keep up with production requirements, Clovernook will install a minicomputer with the capability to handle the translation program, hopefully to the satisfaction of the Braille Authorities and the Library of Congress. If there are any changes of the braille rules as set forth by the Braille Authority, the quality and the readability, of course, should not suffer. As I understand, the list of exceptions quoted is not very big and I feel if it is too difficult to contract a word, it should be spelled out. The extra space needed is very small and I understand it takes an average reader no longer to read a spelled out word than to figure out an unusual contraction. Therefore, no disadvantage in space or readability.

I can understand the position taken by the American Printing House. A big computer like IBM-706 is able to store the complete dictionary with all the exceptions, therefore, no change of rules are wanted. No other printing house, however, is able to install a similar computer. A minicomputer has to do the work. Here it could be necessary to change a few rules.

Since we rely on the program already prepared, we hope that the people responsible for the set up keep up with the requirements and will ask for the necessary changes.

I think the point is very well taken by Dr. Ingham and we support his recommendations.

Sincerely,

Martin F. Droege

English Braille: Isolation of Principles

by Peter Duran, Director
ARTS Service Bureau

INTRODUCTION

ENGLISH BRAILLE

Braille is a tactile system used by the blind for reading. The braille system can be discussed either as a formal system or as an informal system. As a formal system, it has certain structural aspects which give it the ability to represent printed material. As an informal system, it has certain purposes which give it utility. In this position paper, I wish to present some formal principles which, if consistently followed, would extend the purposes of the braille system and increase its scope of application.

BRAILLE SIGNS

One of the most frequent complaints about the braille system is that it is very limited in the kind of printed matter that it can adequately represent. This complaint is well-founded (as blind persons having to learn more than one braille code will attest). This limitation seems to have two general sources.

(1) The first task of the braille system is to represent inkprint signs. First, the inkprint signs to be represented must be selected. However, not enough common inkprint signs have braille representations. For example, there are no braille signs for "ampersand" and "at sign" incorporated into the braille system. Some inkprint signs which have braille representations have very odd ones. For example, the braille representation for the "dollar sign" is a single braille sign, and the braille representation for the "percent sign" is a double braille sign. Also, standard abbreviations used in inkprint are altered in braille. For example, the abbreviation for "meter" (a unit of measure) is "m" in inkprint and "mt" in braille.

Second, a braille sign must be assigned to each inkprint sign to be represented. This correspondence between braille signs and inkprint signs must have two basic properties.

The first requirement is that different inkprint signs must be represented by different braille signs. If this requirement is violated by having different inkprint signs represented by the same braille sign, the blind person would not know which inkprint sign is present in the inkprint text. For example, in inkprint, different signs are used for opening parenthesis and closing parenthesis. Presently, the braille system uses the same braille sign for both. Thus, by reading braille, a blind person can't learn the inkprint usage of parentheses.

The second requirement is that different braille signs must represent different inkprint signs. If this requirement is violated by having different braille signs represent the same inkprint sign, the blind person would not know under which circumstances the inkprint sign is used in inkprint. For example, in typewritten material, the same inkprint sign is used for apostrophe, opening single quote, and closing single quote. Presently, the braille system uses three distinct braille signs when transcribing typewritten copy. Thus, by reading braille, a blind person can't learn the typewriter usage of the apostrophe.

By not faithfully representing inkprint signs, the blind person is forced to learn two conventions, one for inkprint and one for braille. Since most persons could read inkprint prior to the onset of blindness, they must break old habits unnecessarily. This dichotomy of learning puts an extra burden on the blind person. To reduce this unnecessary learning, the following principle should be enforced whenever possible.

PRINCIPLE OF FAITHFUL REPRESENTATION. An inkprint sign which has a braille representation should have just one braille representation, and distinct inkprint signs which have braille representations should have distinct braille representations.

This one-to-one correspondence between braille signs and inkprint signs can only encompass sixty-four inkprint signs. Thus, if more than sixty-four inkprint signs are to be represented, strings of braille signs must be assigned to them in a one-to-one manner.

(2) The second task of the braille system is to represent strings of inkprint signs; that is, to represent words, letter groupings (such as abbreviations), and other expressions. The braille system is intended for representing literary material. For typical prose, the braille system is adequate. However, blind persons are presently using braille for reading all sorts of material: novels, trade publications, catalogs, etc. The braille system is not sufficient for representing these types of material, even though this literature does not contain any special signs.

Since most of this material does not contain any special signs, the braille system should be used for its transcription. The braille system can represent the words and abbreviations occurring in this literature, but it is difficult or impossible to represent expressions simultaneously containing letters, numbers, and punctuation. These mixed expressions occur as: part-numbers, serial-numbers, programming labels, etc. For example, there is no way to represent a period followed by a letter grouping, or a period inside a letter grouping. In order to represent mixed expressions, the braille system must be augmented. The following principle should be enforced whenever possible.

PRINCIPLE OF EXPRESSIVE COMPLETENESS. Each string of signs in inkprint, each sign of which has a braille representation, should have just one braille representation.

LEARNING BRAILLE

One of the most freguent complaints about the braille system is that it is too difficult to learn and to use. This complaint is well-founded (as aspirants for braille certification will attest). This complexity seems to have five general sources:

(1) Many rules of the braille system are unnecessarily tedious. For example, the contraction for "part" is permitted everywhere except in variations of "partake." It is more difficult to remember this exception when transcribing or reading braille than it is to accustom oneself to it. To eliminate some of the complexity in the braille system, rules with unnecessary exceptions or complicated conditionals should be minimized. The following principle should be enforced whenever possible.

PRINCIPLE OF SIMPLICITY. If more than one rule can adequately cover a situation in the representation process, the simpler rule should be adopted.

(2) Many rules of the braille system are vague or contradictory. For example, the first rule concerning punctuation marks decrees that the use and order of punctuation employed in the inkprint should be followed in braille. The next rule exempts quotation marks from this rule for no apparent reason. To eliminate some of the complexity in the braille system, vague or contradictory rules should be minimized. The following principle should be enforced whenever possible.

PRINCIPLE OF WELL-FORMED RULES. Each rule of the braille system should be precisely stated, and its application should be independent of extraneous circumstances.

(3) The braille system is not adequate for representing all inkprint. A blind person who wishes to read specialized material must learn additional braille codes. Unfortunately, these various braille systems are not mutually consistent, even when they could be. For example, the braille signs for parentheses are different in English braille and Nemeth code. To eliminate some of the complexity in the braille system, unnecessary alteration of braille signs should be avoided. The following principle should be enforced whenever possible.

PRINCIPLE OF EXTENSION. When the braille system is extended so that it can represent a greater variety of inkprint material, this extension should be consistent with English braille.

(4) Many rules of the braille system require an unnecessary alteration of inkprint format or style. For example, rules (2.a.) and (2.b.) pertaining to quotation marks require the violation of inkprint practice. Rule (2.a.) demands that when in inkprint the use of single and double quotes are reversed, this reversal should be ignored. Rule (2.b.) demands that quotation marks be substituted for inkprint style changes indicating quotations. In the first case, the text, in effect, is being edited for the blind person. In the second case, the blind person is prevented from knowing the inkprint style of the quotation. Such non-conformity with inkprint causes the transcriber to perform editing in addition to transcription and causes the blind person to miss the intended format and style of the work being transcribed. The following principle should be enforced whenever possible.

PRINCIPLE OF CONFORMITY. The inkprint copy should be followed as closely as possible with respect to format and style.

(5) Many rules of the braille system are designed to reduce the amount of space required for transcription. In addition to saving space, these rules attempt to preserve spelling and pronunciation. Space is usually reduced, and spelling is always preserved. However, pronunciation is violated arbitrarily. For example, the contraction for the letters "er" is never used at the beginning of a word when the two letters occur in different syllables. However, the contraction for the letters "ar" is permitted in such circumstances in a list of exceptions. If "ar" can be justified in "around," then "er" can be justified in "erase," and vice versa. To eliminate some of the complexity in the braille system, contractions should be employed more uniformly. The following principle should be enforced whenever possible.

PRINCIPLE OF WELL-FORMED CONTRACTIONS. The use of a contraction should depend on, and only on, the inkprint signs in the string to be contracted.

RULES OF ENGLISH BRAILLE

Although the principles discussed above are applicable throughout English braille, for the sake of brevity they will be discussed here only with respect to the rules governing punctuation, composition signs, and contractions. Each rule will be quoted and prefixed with a parenthetical one-word comment on its acceptance, deletion, modification, etc. Following the rule, the principle it violates, if any, will be given and/or a suggested alternative. These rules are quoted from English Braille, American Edition--1959, American Printing House for the Blind, Inc., Louisville, Kentucky, revised 1972.

RULE I--PUNCTUATION SIGNS

The braille signs for comma, semicolon, colon, period, exclamation point, and question mark violate the principle of expressive completeness. These punctuation marks can only be used correctly in the final position within a string of braille signs. If the braille system were augmented with the punctuation indicator from the Nemeth code, these punctuation marks could be permitted in the initial and medial positions within a string; in these positions, prefix the punctuation mark with the punctuation indicator. This additional composition sign would extend the braille system.

The braille signs for parentheses violate the principles of faithful representation and extension. The same braille sign is used both for the opening parenthesis and the closing parenthesis, and the braille system and the Nemeth code employ different braille signs for parentheses.

The braille signs for opening double quote and question mark violate the principle of faithful representation. The same braille sign represents both inkprint signs. Augmenting the braille system with the punctuation indicator would partially eliminate this problem.

The braille signs for opening and closing single quote and the braille signs for opening and closing double quote violate the principle of faithful representation. Two braille signs represent the same inkprint sign. A more careful selection of braille signs would eliminate this problem.

The braille sign for the ellipsis violates the principles of faithful representation and conformity. The braille sign for the ellipsis is three apostrophes, but the inkprint sign for the ellipsis is three periods. This problem can be eliminated by defining the braille ellipsis as three braille periods.

The braille signs of punctuation violate the principle of expressive completeness. Since all punctuation marks, except for apostrophe, have a positional significance, most strings of inkprint signs can't be correctly represented. This positional restriction on the use of braille signs limits the type of literature that can be transcribed.

The braille signs of punctuation and grouping violate the principle of extension. When the braille system is extended to the Nemeth code, different braille signs are used for these punctuation marks. For the most part, this switching of braille signs is unnecessary. For example, parentheses, braces, and brackets could be represented by the same braille signs in both systems.

1. (Accept) "The use and order of all punctuation signs follow inkprint practice." As indicated in the introduction, this rule is often impossible to follow.

2.a. (Delete) "In inkprint, even though the normal sequence of quotation marks is occasionally reversed, in braille the one-cell signs are always used to represent the outer quotation marks and the two-cell signs to represent the inner quotation marks." This rule violates the principle of conformity and rule (1.) above.

2.b. (Delete) "Quotation marks should be substituted where the inkprint copy employs change of type, italics, or change of margin to indicate quoted passages when they are not separated from the text by blank lines. ..." This rule violates the principle of conformity.

3.a. (Accept) "When a portion of a word is enclosed in parentheses or brackets, inkprint practice should be followed."

4.a. (Delete) "The apostrophe is to be inserted before the `s' in plural abbreviations, numbers, or letters, even though it has been omitted in inkprint." This rule violates the principle of conformity.

4.b. (Modify) "Similarly, the apostrophe should be inserted in the expression `OKd.' In such cases, the apostrophe terminates the effect of the double capital sign." This rule violates the principle of well-formed rules. How should both "OK'd" and "OK'D" be represented? This rule also contradicts rule (9.b.) below. It should be modified to conform to the reformulation of (9.b.) below.

5.a. (Modify) "As a general principle, the maximum number of spaces in a braille line should be utilized; also, words may be divided between pages, and compound words may be divided at any syllable. ..." This rule violates the

principle of conformity. Words should be divided according to current standards as specified by a reliable dictionary.

5.b. (Modify) "When hyphens are used to indicate omitted letters in a word, an equal number of hyphens, unspaced, should be used." This rule violates the principle of conformity. Whatever number of hyphens are used in the inkprint should be used in the transcription.

6. (Modify) "When used as a mark of punctuation, no space should be left before or after a dash, even though the spacing or the length of the sign may vary in inkprint. However, a space is necessary after a dash if it ends an incomplete sentence. A dash may begin or end a line, but the sign must not be divided." This rule violates the principle of conformity. The spacing and length of the dash should be reproduced in the transcription, since they may have significance for the presentation.

6.a. (Modify) "When a dash represents an omitted word or name, a double dash should be used and should be spaced and punctuated as a word." This rule violates the principle of conformity. Whatever size dash and spacing are used in the inkprint should be reproduced in the transcription, since they may have significance for the presentation.

7. (Modify) "Ellipsis: (usually three dots or asterisks in inkprint indicating the omission of words). The ellipsis should be spaced and punctuated as a word." This rule violates the principle of conformity. Asterisks should be used when they occur in inkprint. The spacing and punctuation of the ellipsis or asterisk should be reproduced in the transcription, since they may have significance for the presentation.

7.a. (Modify) "When dots are used to indicate the omission of letters in words, an equivalent number of dots (dot 3), unspaced, should be used." Whatever number of dots are used in the inkprint should be reproduced in the transcription, since they may have significance for the presentation.

7.b. (Modify) "If the omission of a complete paragraph is indicated by the ellipsis, the ellipsis should be treated as a paragraph." This rule violates the principle of conformity. The ellipsis should be treated as it is in the inkprint.

RULE II--SPECIAL BRAILLE COMPOSITION SIGNS

8. (Modify) "Order of Punctuation and Composition Signs: When two or more braille punctuation marks or composition signs occur together before a word or number, they are placed

in the following order:" This rule may violate rule (1.) above and may violate the principle of conformity. Require that all composition signs precede all punctuation marks.

9. (Accept) "In the United States, the use of the capital sign is generally preferred."

Others have suggested several potential reasons for eliminating the capital sign:

(a) Other countries have eliminated it. (To base the structure of a system of encoding on popular opinion is not necessarily a wise decision.)

(b) The capital sign takes up space. (If more space is required, then it should be used! The goal is to communicate the print copy as effectively as possible and not necessarily to save an extra line of paper.)

(c) The use of the capital sign is difficult to learn. (The rules governing the capital sign are too difficult, but they can be simplified.)

(d) The rules for the capital sign are difficult to program. (The adoption of simple and well-formed rules would make programming quite easy.)

9.a. (Reformulate) "The capital sign, when placed at the beginning of a word, indicates that only the first letter of the word or contraction which follows is capitalized. ..." This rule violates the principles of expressive completeness and faithful representation. No provisions are made for single capital letters within a word. For example, "rN" and "ration" are distinct expressions in print and are the same expression in braille. This problem occurs because the same sign is used for indicating capitalization and for introducing two contractions. (The contractions for "ally" and "ation" are the capital sign preceding the signs for "y" and "n," respectively.) To solve this problem, these contractions must be changed, or rules for distinguishing between these situations must be given.

Reformulation: The capital sign placed before a letter or a contraction indicates that the letter or the first letter of the contraction is capitalized.

9.b. (Reformulate) "The double capital sign placed at the beginning of a word indicates that all of the letters of the word, compound word, or letter-grouping are capitalized. It should not be repeated after the hyphen or apostrophe, nor at the beginning of the next line in a hyphenated word." This rule violates several principles. The principle of well-formed rules is violated. It is not precisely stated which signs terminate the effect of the double capital sign

and under which circumstances it is terminated. It is stipulated that the apostrophe does not terminate the effect of the double capital sign, but previously (in rule (4.a.)) "OK'd" is given as an example where the apostrophe does terminate the effect of the double capital sign. This rule violates the principle of simplicity. There is no way to indicate that only the first word of a hyphenated compound word is all in capitals without invoking another braille sign (the termination sign).

Reformulation: The double capital sign preceding a group of two or more letters indicates that all the letters are capitalized. Any non-letter symbol terminates the effect of the double capital sign. If a group of capital letters is followed by a lower-case letter, the termination sign will precede that letter.

10.a. (Reformulate) "The italic sign is placed before an abbreviation, word, apostrophized word, compound word, or number, to indicate that it is italicized. The italic sign is not to be repeated after the hyphen or the apostrophe. In a divided word, the italic sign should not be repeated at the beginning of the next line." This rule violates the principle of well-formed rules. It is not precisely stated which signs terminate the effect of the italic sign and under which circumstances it is terminated. For example, does the italic sign also apply to a word after a dash?

Reformulation: The italic sign preceding one or more letters and numbers indicates that all the letters and numbers are italicized. Any non-letter or non-number terminates the effect of the italic sign. If a group of italicized letters is followed by a non-italicized symbol, the termination sign will precede that symbol. If the first italicized symbol is not at the beginning of the expression, it will be preceded by a hyphen.

10.b. (Reformulate) "If more than three consecutive words are italicized, the first word is preceded by the double italic sign and the last word by the single italic sign. Where the last word of an italicized passage is a compound word, the closing single italic sign should precede the first part of the compound word. Do not italicize together two or more items which are italicized for different reasons." This rule violates the principle of simplicity. The rule should not depend on the number of items to be italicized.

Reformulation: If more than one word is italicized, prefix a double italic sign before the first word and follow the last word, or part of a word, by the termination sign.

11.a. (Modify) "When embossing technical works, the termination sign is required for clarity. When an italicized or capitalized letter or group of letters occur within a word,

the italic, capital, or double capital sign must be preceded by the hyphen, whether or not it appears in inkprint, and the termination sign should be inserted to terminate the effect of the italic or capital sign. When in inkprint a hyphen follows an italicized or capitalized group, the hyphen must follow the termination sign." This rule violates the principles of simplicity and conformity. The hyphen is not really necessary, since the termination sign is a sufficient cue that italics or capitals are present. It is usually as difficult to interpret the word with the hyphen as without it.

12. "Letter Sign: The letter sign is placed before a letter or letters when it is necessary to distinguish between the letter meaning and a number, a word, a whole-word contraction, or a short-form word."

This section of rules is necessary because the same signs are used for the first ten letters of the alphabet and the digits. This identification of signs necessitates the introduction of the letter sign and the number sign, together with rules for their use. Unfortunately, the current rules governing the letter and the number sign violate all the principles given in the introduction of this paper. The rules governing the letter and the number sign are self-contradictory; that is, obeying one of them may necessitate violating another. All of the rules in sections (12.a.) and (12.b.) should be replaced by one or two simple and more encompassing rules. After discussing the rules in these sections, a reformulation of them will be given.

12.a. "The letter sign is required when:"

12.a.1. "Any uncapitalized letter from a through j follows a number or is separated by a hyphen following a number." This rule violates the principles of simplicity, well-formed rules, and expressive completeness. For, the expressions "3-ad" and "3-dot" are not covered by this rule.

12.a.2. "A letter which means a letter stands alone and is not followed by a period indicating an abbreviation. Letters which mean letters should be preceded only by a letter sign, and all italics, parentheses or quotation marks should be omitted, even though they are used in inkprint." This rule violates the principles of well-formed rules and conformity. The two expressions "Mr. But. Can. Jones" and "Mr. B. C. Jones" appear the same in braille, although they are quite different in print.

12.a.3. "A combination of letters standing alone could be confused with a short-form word, or, when a word composed of a single letter in an anglicized phrase could be confused with a whole-word contraction."

12.a.4. "A single letter which means a letter is followed by an apostrophe `s,´ or is joined by a hyphen to a word or number which follows it. Each letter should be preceded by a letter sign when letters of the alphabet are joined by a hyphen or a dash."

12.b. "The letter sign is not required before a single capitalized or uncapitalized letter when:"

12.b.1. "The letter is an initial or an abbreviation followed by a period." This rule violates the principles of expressive completeness and well-formed rules. The two expressions "a.s" and "a.1" are not represented correctly in braille.

12.b.2. "The letter is followed by the number sign." This rule violates the principle of well-formed rules. In the expression "1-b#3," rule (12.a.1.) requires a letter sign before the letter "b," and rule (12.b.1.) does not require the letter sign before the letter "b."

12.b.3. "A number is followed by a capital letter, the letters `k´ through `z,´ or a contraction." This rule violates the principle of well-formed rules. It is not specified which contractions are permitted, certainly not all of them.

12.b.4. "A number is separated by a hyphen from a following capitalized letter, or the uncapitalized letters `k´ through `z.´"

12.b.5. "The letter is preceded or followed by the apostrophe, indicating omission of letters."

12.b.6. "The letter in an outline or listing is followed by a period, or is enclosed in parentheses or brackets."

Reformulation: A single letter (lower- or upper-case) standing alone, preceded by a punctuation mark, or followed by a punctuation mark (or both), requires a letter sign. Any letter grouping (one or more lower- or upper-case letters), preceded or followed (or both) by either a number or number-punctuation combination, requires the letter sign.

RULE VII--NUMBERS AND ROMAN NUMERALS

28. "Cardinal Numbers: Numbers are expressed by the letters `a´ through `j´ preceded by the number sign."

28.a. (Modify) "The effect of the number sign is not terminated by commas, colons, hyphens, fraction-lines, and decimals. However, after a space or a dash, the number sign must be repeated. (Note: In writing sports scores, results

of votes, etc., a dash should be used instead of a hyphen to separate the numbers.) ..." This rule violates the principles of well-formed rules and conformity. It is not precisely stated which symbols terminate the number sign. The substitution of a dash for a hyphen is unnecessary and should be eliminated.

28.b. (Modify) "Although numbers joined by the hyphen do not require the second number sign, if the number is divided at the end of the line after the hyphen, the number sign should be repeated at the beginning of the following line. Where necessary, an integral number may be divided after a comma, but the number sign should not be repeated at the beginning of the following line. ..." This rule violates the principle of simplicity. Repeat the number sign at the beginning of the next line.

28.c. (Modify) "Fractions: The sign dots 3-4 represents the fraction-line, and is used to separate the numerator from the denominator. ..." This rule violates the principles of conformity and expressive completeness. This rule only deals with the common case of a fraction. More general cases should be covered. For example, "two dollars per day" should have a representation as a fraction in braille just as it does in inkprint.

28.d. (Modify) "In a mixed number, the fraction is joined to the whole number by a hyphen, and the number sign is omitted before the fraction. The fraction may not be carried over to the beginning of a new line. A whole number separated from a fraction by a space, as in stock quotations, should be treated as a mixed number. ..." This rule violates the principle of conformity. If, in inkprint, a fraction is separated from a number, the number sign should be repeated.

28.e. (Modify) "Oblique stroke: The sign dots 3-4 represents the oblique stroke, bar, or slash, and is used whenever the symbol it represents appears in inkprint, except when it is used to denote shillings (see sec. 31-b) or in the writing of dates (see sec. 27-e). When an oblique stroke occurs between numbers other than fractions, the number sign should be repeated before the second number. Similarly, when an oblique stroke occurs between capitalized abbreviations, the capital sign should be repeated. ..." This rule violates the principles of conformity and simplicity. The hyphen should not be substituted for the slash, and the number sign should not be repeated.

28.f. (Modify) "The sign dots 4-6 represents the decimal point and is placed between the number sign and the numbers of a decimal fraction. When a decimal fraction is joined to a whole number, the number sign is placed only before the whole number. ..." This rule violates the principles of

conformity and simplicity. In braille, as in inkprint, the decimal point should be the period.

28.g. (Modify) "Decimal Coinage: The sign dots 2-5-6 represents the dollar sign and is placed before the number sign to indicate dollars. When writing dollars and cents, the decimal point dots 4-6 is used to separate the cents from the dollars, and it is not necessary to repeat either the dollar sign or the number sign. ..." This rule violates the principle of simplicity. If the letter "c" is used to indicate cents, then the letter "d" should be used to indicate dollars. However, neither is the best choice.

28.h. "In expressing a definite point of time, regardless of how it is expressed in inkprint, the colon should always be used in braille to separate the hours, minutes, and seconds, and the number sign should not be repeated. ..." This rule violates the principle of conformity. Inkprint practice should be followed. If the inkprint employs an awkward method of representing time intervals, the braille reader will not be any more confused than the inkprint reader.

RULE XI--ONE-CELL WHOLE-WORD CONTRACTIONS

36. (Accept) "When any of the above one-cell whole-word contractions is separated by a space from other letters or contractions, it is read as a word, regardless of meaning, except when `do´ and `so´ refer to musical notes. However, these contractions may be preceded by the contractions for `to,´ `into,´ and `by.´"

36.a. (Accept) "One-cell whole-word contractions may be joined to other words by the hyphen to form genuine compound words, but, with the exception of `and,´ `for,´ `of,´ `the,´ and `with,´ they may not be used to form parts of words when divided at the end of the line."

36.b. (Modify) "One-cell whole-word contractions may be used when followed by the apostrophe only in the familiar word combinations listed below. However, they should not be used after the apostrophe, nor in rare or colloquial forms, such as `d´you,´ `you´s,´ `more´n,´ `which´ll´ etc." This rule violates the principle of well-formed contractions. Whether or not a given word is familiar depends on prior experience only. They should be permitted in these cases; they won´t be any more confusing to the braille reader than to the inkprint reader.

36.c. (Accept) "One-cell whole-word contractions may be used to represent proper names, and, as such, they may be followed by the apostrophe `s.´"

37. (Delete) "The word signs `a,' `and,' `for,' `of,' `the,' and `with' should follow one another without a space between if there is no natural pause between them. If in doubt about the pause, they should be joined. They should not be written together when punctuation or composition signs occur between them." This rule violates the principle of well-formed contractions. Whether or not there is a pause present often is quite controversial. Composition signs should be permitted between them. The italic and capital signs can't be confused with anything else.

RULE XII--ONE-CELL PART-WORD SIGNS

38. (Modify) "The one-cell signs above must be used as parts of words wherever the letters they represent occur, except when specific rules limit their use." This rule violates the principle of simplicity. Perhaps some of the limiting rules can be eliminated.

38.a. (Accept) "The contractions for `ble' and `ing' must never begin a word. However, they may be used in the middle or at the end of a word, and at the beginning of a line in a divided word."

38.b. (Accept) "The part-word contractions `and,' `for,' `of,' `the,' and `with' should be used in preference to other contractions, provided their use does not waste space."

38.c. (Accept) "The contraction for `st' may be used for the abbreviations for St. (Saint) or St. (Street)."

38.d. (Accept) "Part-word signs which have no whole-word meanings may be contracted when they stand alone, e.g., Ed (name), er (vocal sound), Ow! (exclamation). However, the contractions for `en' and `sh' must not be used alone, since these contractions represent the whole-words for `enough' and `shall.'"

38.e. (Delete) "In proper names, when the letters `gh,' `sh,' and `th' are pronounced as one sound, these contractions should be used. However, where a syllable division occurs between these letters, the contractions should not be used." This rule violates the principle of well-formed rules. It is just as easy to recognize the names in either case. The recognition of a name should not be a guide to its pronunciation.

RULE XIII--LOWER SIGNS

39. (Accept) "The lower signs which represent the words `be,' `enough,' `were,' `his,' `in,' and `was' may be preceded by the capital and/or italic sign, but must not be in contact

with any other letter, contraction, word, or punctuation sign."

40. (Accept) "Any number of lower signs should follow one another without a space if one of them is in contact with a sign containing dot 1 or dot 4. Although the italic sign contains a dot 4, it is not to be considered an upper sign."

40.a. (Accept) "Two or more lower signs must not follow one another when they are not in contact with an upper sign containing a dot 1 or a dot 4."

40.b. (Accept) "When two or more lower-sign contractions follow one another without being in contact with an upper sign, the final lower-sign contraction must not be used."

41. (Modify) "There should be no space between the lower-sign contractions `to,' `into,' and `by' and the word which follows if there is no natural pause between them. If in doubt about the pause, they should be joined. Wherever `into' must be written out, the `in' sign should be used." This rule violates the principle of well-formed contractions. Whether or not there is a pause present often is quite controversial. They should be used whether or not there is a natural pause.

41.a. (Accept) "The lower-signs `to,' `into,' and `by' may not be contracted before any punctuation sign, but may be used before composition signs and abbreviations for special inkprint symbols. They should not be used as parts of words or in compound words."

41.b. (Accept) "The contractions for `to,' `into,' and `by' may be preceded or followed by a capital sign or an italic sign, but they should not be used when they are both preceded and followed by a capital sign, nor when they are both preceded and followed by an italic sign."

42. (Accept) "The lower-sign contractions for `ea' and the double-letter signs `bb,' `cc,' `dd,' `ff,' and `gg' must be used only when these letters occur between letters and/or contractions within a word. They must never begin or end a word."

42.a. (Accept) "They should not be used when in contact with a hyphen or an apostrophe."

42.b. (Delete) "These contractions must not be used where the letters are separated by a primary syllable division. ... Exception: The signs for `bb,' `cc,' `dd,' `ff,' and `gg' may overlap syllable divisions which occur between a prefix and the root of a word, since to use them would not obscure recognition." This rule violates the principle of well-formed contractions. If such a rule is

enforced, no final braille system can be expected, since language is continuously changing.

42.c. (Accept) "Always use any alternative one-cell contraction in preference to `ea´ and the double letter signs. Preferences:

`ar´ to `ea´ as in near heart bear
`ble´ to `bb´ as in bubble dabble
`ch´ to `cc´ as in saccharine bacchanal
`ed´ to `dd´ as in peddle meddle
`of´ to `ff´ as in office proffer
`for´ to `ff´ as in effort afford"

42.d. (Accept) "However, where the same space is saved, use any lower one-cell contraction in preference to a two-cell contraction. Preferences:

`dd´ to `had´ as in Haddon Hall haddock
`en´ to `one´ as in opponent
`er´ to `here´ as in adherent"

43. (Modify) "The lower part-word contractions `be,´ `con,´ and `dis´ may be used only as syllables at the beginning of a word or at the beginning of a line in a divided word, except that they may be used after a hyphen in a compound word. As part-word contractions, they must not stand alone as syllables at the beginning of a line in a divided word. They may not be used when in contact with a hyphen in a divided or a syllabized word." This rule violates the principle of well-formed contractions. Also, this rule and rule (44.) are contrary in spirit. These contractions, as well as "com," should be permitted at the beginning of all words.

43.a. (Accept) "The contractions for `be,´ `con,´ and `dis,´ when used in a complete word, should be used in the abbreviation of the word. They must not be used if they comprise the entire abbreviation, nor may `con´ be used as a whole word."

43.b. (Accept) "The contractions `be,´ `con,´ and `dis´ must never be used before the apostrophe, but they may follow it."

44. (Accept) "The lower part-word contraction `com´ may be used at the beginning of a word or of a line in a divided word, but it need not be a syllable. It must never be used in contact with a hyphen, a dash, or the apostrophe. It may be used after the capital or italic sign, unless it immediately follows a hyphen or a dash on the same line of writing."

RULE XIV--INITIAL-LETTER CONTRACTIONS

45. (Modify) "Initial-letter contractions may be used either as words or as parts of words when they retain their original sound." This rule violates the principles of well-formed contractions and well-formed rules. This restriction should be eliminated, or a list of cases when the contractions can be used should be provided.

Exceptions

45.a. (Delete) "The contraction for `one´ may be used whenever `o´ and `n´ are both in the same syllable, but it should not be used when the `n´ begins a new syllable." This rule violates the principle of well-formed contractions.

45.b. (Delete) "Whenever `d,´ `r,´ or `n´ follows `one´ or `here,´ the contractions for `ed,´ `er,´ or `en´ should be used in preference to the contractions for `one´ and `here.´"

45.c. (Delete) "The contraction for `part´ must always be used unless the prefix `par´ is followed by any variation of the word `take.´"

45.d. (Delete) "The contraction for `some´ should be used only where the letters it represents retain their original sound, and where they form a complete syllable in the base word."

45.e. (Delete) "Any alternative one-cell contraction should be used in preference to the contraction for `had.´"

45.f. (Delete) "Where a choice must be made between two consecutive contractions to avoid misspelling, preference should be given to the contraction which more nearly indicates correct pronunciation."

RULE XV--FINAL-LETTER CONTRACTIONS

46. (Delete) "Final-letter contractions should be used in the middle or at the end of a word, or at the beginning of a line in a divided word. They may never begin a word nor be used alone as a whole word, nor should they be used when preceded by the hyphen or the apostrophe." This rule violates the principle of well-formed contractions.

Exceptions

46.a. (Accept) "The contraction `ence´ should be used when followed by `d´ or `r.´"

46.b. (Modify) "The contraction `ness´ should be used in such easily read words as:

baroness governess lioness

but not where the root word ends in `en´ or `in.´" This rule violates the principle of well-formed contractions. Whether or not a given word is familiar depends on prior experience only.

46.c. (Delete) "The contractions `ity´ and `ally´ should not be used where `y´ has been added to a base word." This rule violates the principle of well-formed contractions. This rule is unnecessary. For the braille reader, recognizing "ity" in "fruity" is no more difficult than dropping a silent "e" in a word is for the inkprint reader.

46.d. (Accept) "The contraction for `ation´ should be used in preference to the letter `a´ and the contraction `tion.´"

RULE XVI--SHORT-FORM WORDS

A short-form word potentially can be used in the initial, medial, or final position within a word. For each short-form word, if it were specified which positions are correct, the following rules could be eliminated. Or, a special sign could be selected as a prefix to a short-form word indicating its presence.

If short-form words, or contractions in general, are to preserve spelling and pronunciation, a much better frequency analysis of English syllables and words should be undertaken. It is astounding how much care is taken to insure that a word with negligible frequency of occurrence should be contracted in a given manner. Whatever way it is contracted, it still appears odd. For example, "aardwolf," "aardvark," and "Aare" should, presumably, have the "ar" contracted.

47. "Short-form words should be used alone or as part of a word."

47.a. "Short-form words must not be divided at the end of a line, but they may be separated from any syllable addition."

47.b. "A short-form word should be used as the whole proper name only."

47.c. "An addition may be made to a short-form word, provided it does not result in incorrect spelling."

47.d. "An addition may be made to a short-form word only if it retains its original meaning and would not obscure recognition of the word."

47.e. "An addition may be made to a short-form word provided the combination does not violate lower-sign rules."

47.f. "An addition may be made to a short-form word provided that the combination could not be mistaken for, or have the appearance of, another word. The short-form words for `after,´ `blind,´ or `friend´ should not be used when followed by a vowel. However, they may be used when followed by a consonant, or a hyphen in a divided word."

47.g. "A short-form word must not be used if it would cause confusion in pronunciation or in the recognition of an unusual word."

47.h. "The apostrophe should always be inserted in the exclamation `h´m!´ (hm!) to distinguish it from the short-form word for `him´ (hm)."

47.i. "When the proper names `Al´ or `Ab´ appear at the beginning of a sentence, they should be preceded by the letter sign to distinguish them from the short-form words for `also´ and `about.´"

English Braille: Its Standardization for Computers

by Peter Duran, Director

ARTS Service Bureau

TRANSLATION AND TRANSCRIPTION

Before one can discuss the certification of computer braille, one has to have a clear conception of the nature of computer braille. Unfortunately, a clear conception is lacking!

When one thinks of computer braille, it is usually assumed that a braille translating program has been written. A braille translating program takes English words and phrases and translates them into contracted words and phrases. However, just a braille translating program is insufficient for producing computer braille--not to mention good quality computer braille.

Computer braille must embody an entire braille transcription system. A braille transcription system consists of three items: a braille translating program, a formatter, and an editor.

The translating program must contract words and phrases according to the current braille rules governing contractions. Unfortunately, these rules are not algorithmic and syntactic. That is, they are not precisely stated and appeal to notions such as meaning. In spite of these difficulties, adequate translating programs are now being written.

The formatter must arrange text according to the braille rules governing formatting. These rules are also not algorithmic. Writing an efficient, easy-to-use formatter is as difficult as writing an adequate translating program.

The editor must be able to alter the text according to the braille rules. Many rules of braille require that the ink-print text be altered before being translated and formatted. For example, an ellipsis must be substituted for asterisks.

If a computer braille system is to be adequate, it must be able to translate, format, and edit according to the braille rules. I suggest that each of these areas be considered in detail before deciding upon a certification procedure.

ARTS Associates, Inc. in conjunction with American Systems, Inc., has, after many years of tedious labor, arrived at a braille transcription system that can do all three tasks reliably. Our experiences strongly indicate that the formatting and editing problems are as difficult and crucial as the translation problem. Our experience is similar to Mr. Bagley's; the formatting and editing time far outweighs the translation time.

LEARNING BRAILLE

Why do so few persons read braille? No one seems to know, and few have made a substantial effort to find the reasons for the small number of braille readers. In our (limited) experience, a major reason is "learnability." Braille is just too difficult to learn! There are literally dozens of rules to master--many of which the braille system itself violates. There are dozens of exceptions to these rules to keep in mind. For example: (a) One of the rules governing contractions asserts that a contraction should not be used if a syllabic boundary is crossed. However, if one refers to the "typical and problem words" in the standard texts, one finds dozens of cases where syllabic crossings are demanded. Also, one can't use contractions uniformly. "Partial" and "partake" sound alike, but the contraction for "part" is permitted in "partial" but not in "partake."

The braille system is not uniform in difficulty; that is, some rules are trivial and others are complex. This variation is due in part to attitudes about blind people. The braille code tacitly assumes, on the one hand, that the average blind person is more ignorant than the average sighted person, and, on the other hand, that he is quite capable. For example: (a) One rule requires that a hyphen be substitued for a slash in dates. This rule is presuming that blind people are ignorant of the slash and are incapable of using it. (b) The rules governing initial-letter contractions have extensive lists of exceptions. These rules are presuming that blind people are quite capable of mastering numerous details.

To be useful and readable, the braille code must be "learnable." Presently most of the braille system is too inconsistent and complex to be readily learned. The difficulty of the code is clearly indicated by the fact that it is so difficult to achieve certification as a volunteer transcriber.

I suggest that qualified learning theorists and educators be asked to compile a list of the most important factors that insure learnability. These factors should then be incorporated in computer braille.

READABILITY

In the area of what is best for the braille reader, there are many prevailing opinions about what makes good braille but very few facts. For example, the braille code tries to preserve pronunciation under the assumption that this preservation aids reading. What evidence is there for this assumption? From what I know about cognition, I doubt there is any evidence for this assumption, and there is a lot against it.

What makes a code readable? First, it must be learnable by the users. As indicated above, braille is not easily learned. Second, it must be "recognizable." That is, it must facilitate the recognition of patterns! For, good perceivers (be it of print, braille, or Morse code) do not attend to the elements of the code, but attend to patterns. These patterns do not, in themselves, have meaning--semantic content; it is left up to the perceiver to impose meaning on them. For example: When reading "care" in print or listening to "care" in Morse code, one does not infer the word "car" as a meaningful constituent. Unlike most other codes, braille attempts to impose meaning on the constituents of patterns. For example, the contraction for the letter sequence "n-a-m-e" can't be used in a larger pattern unless it sounds like the word "name." Contrary to popular opinion, this attempt to preserve semantic content of constituents of patterns decreases rather than enhances readability.

BRAILLE QUALITY

Braille is a historical phenomenon. As such it has the typical inconsistencies and anomalies that most natural languages often possess. The only "pure" and consistent languages and codes are those developed in the last few decades under the influence of the "logistic" school of mathematics. The development of computer braille offers an opportunity to reformulate braille from a logical rather than a historical point of view. I would suggest that the fear that computer braille will be less readable than English braille is unfounded. On the contrary, if a logical approach is taken, computer braille can embody the most desirable features that a code can possess. I don't believe that computer braille should try to meet the standards of English braille but rather should surpass them.

Position Paper: English Braille

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May 11, 1976

The three reasons that occur to me for wanting to change the braille code are (a) to improve readability, (b) to save space, and (c) to make the code more amenable to mechanical translation. I will comment upon these three types of changes serially, although it must be kept in mind that they interact. That is, a change that is intended to increase the accuracy of translation by machine will have implications for readability and for the saving of space, and its desirability must therefore be judged against all three criteria.

The improvement of readability seems to me to be the most convincing reason for contemplating changes in the braille code. If changes of this sort are to be considered, they must be evaluated in a context of awareness of the difficulty with which current standardization has been achieved. If changes intended to improve readability are to be proposed, it should not be a piecemeal undertaking. That is, we should not just call people together and ask them for suggestions concerning what might be good contractions or abbreviations. Instead, there should be a thorough going, computer-assisted examination of English text in order to assess such factors as word frequency, syllable frequency, and the frequency of occurrence of various letter sequences. The availability of such information would enable a rational selection of contractions and abbreviations. If this were done, it would undoubtedly be found that many of the contractions and abbreviations included in the present code would be retained in a revised code. Some new contractions and abbreviations, not in the current code, would be indicated by such a study, and in deciding whether or not to include them, certain tests would have to be applied. For instance, it would seem reasonable to stipulate that a contraction must save a significant percentage of letter spaces. For instance, "antidisestablishmentarianis" might be proposed as a contraction for the word "antidisestablishmentarianism." Of course, this is an extreme example, but I think we would agree that such a contraction is hardly worth the trouble. To cite a more reasonable example, Gerald Staack has proposed "als" as an abbreviation for "also," and I wonder if an abbreviation that saves only one letter in a four-letter word is worth the trouble of learning it. I have said that a contraction or abbreviation should save a significant number of letters, and

I am not, at present, able to state what I mean by significant, but it is an issue that may be worth considering. If new contractions and abbreviations are to be added to the code, the number of contractions will be increased, and if too many contractions are used, it is possible that the code will become perceptually difficult. The processing time required for the identification of words could be increased with a reduction of reading speed as a result, and this would be undesirable. Of course, the mere number of contractions in the code may not be the critical factor. The results reported by Ashcroft suggest that some contractions are more interpretable than others, and it may be important to isolate those characteristics that distinguish between interpretable and uninterpretable contractions. If number of contractions in the code is a factor that must be considered, then in order to add some new contractions and abbreviations to the code, it may be necessary to drop some of the contractions and abbreviations in the current code. If some contractions and abbreviations are to be dropped, we should start by dropping the ones which are rarely needed, such as the abbreviations for rejoicing, declaring, spirit, and so forth.

Reading matter written in braille takes up a great deal of space, and I certainly have no objection to saving some of that space. However, I would not want to save space at the expense of readability. Readability is the most important factor to be considered, and it should not be sacrificed either for saving space or for facilitating mechanical translation. In fact, I would not object to a slight increase in the space required for braille volumes if it could be shown that such an increase would bring about an improvement in readability.

I would have no objection to a few minor changes in the rules governing the use of contractions and abbreviations in order to facilitate machine translation, but I think it would be unnecessary and wrong to allow facilitation of the machine translation of braille to shape the rules governing the use of contractions and abbreviations. The cost of computers and the cost of extended memory are falling rapidly, and new approaches to the translation of languages are being developed. I think we can write computer programs that are sophisticated enough to abide by rules which have been devised to facilitate the reader's task. Let me give you an obvious example. If I remember correctly, Gerald Staack has proposed that a contraction for a letter sequence be used wherever that sequence occurs, without regard to the possibility that a contracted letter sequence may span a syllable boundary. This rule change would undoubtedly make things easier for the programmer, but since contractions impose structure on the words examined by readers, the failure to respect syllable boundaries would increase perceptual difficulty for the reader. Instead of changing the rule, I would prefer a program that takes syllable boundaries into account.

So far, I have been talking about translation programs of the sort that might be used by publishing companies, such as the American Printing House for the Blind. I think the standard observed by publishing companies might be relaxed to some extent in order to take advantage of minicomputers and even microprocessors in preparing braille reading matter for special purposes. With a minicomputer and a braille page embosser, such as the LED-120, it is possible to put together a system that is able to respond rapidly to the needs of individuals. For some readers, such as the lawyer who needs material from a law book in order to prepare a brief, or a student who needs a journal article in order to complete a class assignment, rapidity of response is undoubtedly a more important factor than perceptual difficulty. If we are going to recommend standards, it might be a good idea to recommend two standards, one to be observed by publishers, and one to be observed by quick response services that use minicomputers.

The approach we took in writing our program for translation from print to Grade II braille is unsophisticated, but it does avoid some of the problems that arise when you attempt to follow a set of rules. We have a 512 K word, fixed-head disc. On this disc, we have written a table with the 80,000 words in the Thorndike-Barnhardt dictionary. Each entry includes instructions for contracting the word, if it is contractable, and instructions for hyphenating it, if it has more than one syllable. Each word supplied to the computer is referred to this table. If an entry for that word is found, the computer knows how to contract and hyphenate it. If an entry is not found, the word is simply written in Grade I braille and is not hyphenated. Under this approach, when words are contracted, they are properly contracted, but opportunities for contracting and hyphenating words are missed. However, since the table has 80,000 entries, not many opportunities are missed.

We may be much freer to consider changing the rules that govern format in order to facilitate machine translation. I am sure that the average reader does not know the rules governing formats. I am sure that, in most cases, the average reader would not detect the consequences of changing these rules. Although I am not well informed, I have the impression that some of the most serious problems confronting computer programmers are those problems relating to format rules. This is one case in which the consideration of changes made for the purpose of facilitating programming can be given a higher priority.

Well, these are my comments. I am afraid they are rather general in character, and they do not refer to specific rules in the code as you requested. This is partly a consequence of the fact that our approach to the translation problem has

not required me to come to grips with those rules, and as a result, I do not know them very well.

By the time you receive this memorandum, I will be off to England, and I will not return until a couple of days before the conference. I hope that what I have said will suffice to earn me an invitation to the conference, because I am quite interested in the topics under discussion.

Letter

from Ralph E. McCracken, Editor
and Robert L. Haynes, Data Processing Manager
American Printing House for the Blind
May 6, 1976

Dear Mr. Berkowitz:

This is in response to your call for position papers on changes to the rules of English braille and changes to the policy and procedures for Library of Congress certification of transcribers.

We feel that the rules of the code should not be changed to accommodate the computer. Any changes that are made should be made with the braille reader in mind and should improve the readability of the code. None of the changes suggested by Mr. Staak in his 1961 study would, in our opinion, measurably enhance readability of braille.

We believe that changing the contraction rules could cause more problems than are solved. For example, if we discontinued the use of dot 5 f for father, we would be faced with the possibilities of always spelling father out, spelling father fa(the)r or fa(th)(er). This would increase the decision making rather than decreasing it. Consider also the impact of this type of change on the reader who already knows braille and also the student beginning to learn braille. Both would have to assimilate two codes. The expert braille reader would be reading older material in one code and new material in the other. The student, (at least in the beginning) would have very little material available to reinforce the newly learned reading skills and probably be quite confused in trying to read the older code. This is analogous to print students learning to read the Initial Teaching Alphabet and then changing over to the standard English alphabet.

We were asked not to include the textbook code in our discussion. If this means that the literary code would be changed for literary material and not for textbook, you would again have confusion. The textbook and literary code can not be treated independently (in the area of contractions) since the literary code is the parent code.

We note that you called for position papers from those who had recommendations for changes. We, who do not recommend major changes, ask that we also be included in your workshop.

Sincerely yours,

Ralph E. McCracken
Editor

Robert L. Haynes
Data Processing Manager

Position Paper on Braille

by Marjorie S. Hooper

The following material includes my comments on the material sent to me, as well as some suggestions of my own.

ATTACHMENTS 5 AND 6

I could not agree more with what Abe Nemeth has set forth in his comments on the Staack material, at least in general. He has commented on most items as I would, so there is no point in repeating my same statements.

However, I would like to say that he does not bring out the need for real research on what many of the changes Mr. Staack suggested would mean to blind readers who have become familiar with how braille is now written. I am quite sure many changes could be made for the beginner, provided he has not learned the way things are now written--and this may be the crux of the whole suggestion for changes. Much can be done by trying things out on present braille adult readers, but if the changes were made to start with in teaching young children, the result would be much different, I am sure. Familiarity is the essence of reading braille, and if changes are made, there will be much objection from present readers who have read braille as is for so long. This we should not forget when we start making changes.

ATTACHMENT 7

Again, I take my hat off to Abe Nemeth for his comments, although I do not agree with him all the way, primarily because of my comments in my second paragraph above on Attachments 5 and 6. My comments follow:

RULE 1, SECTION 2a--Agree.

RULE 1, SECTION 3--Agree, but see no way to change the symbol.

RULE 1, SECTION 4a--Agree. I never understood why it should be different in braille from the print.

RULE 2, SECTION 8--Do <u>not</u> agree with Abe. Think present format is better.

RULE 2, SECTION 12--Agree.

RULE 3, SECTION 19--Agree.

RULE 4, SECTION 23--Agree. I never did understand this idea, except that it is made for saving space.

RULE 6, SECTION 27e--I am on the fence on this. If you will look at the illustrations in this section, you will see that the stroke is not necessarily the only way such a combination of numbers is written. I think it was the intention of the British, who originated this idea, that no matter how it was presented in print, it should always be presented the same way in braille. Abe is a highly educated and intelligent person, but the average blind person may not be familiar with the oblique stroke, even in such a combination as "and/or," and will read it as the st sign. I would leave things as is.

RULE 7, SECTION 28a, NOTE--Agree.

RULE 7, SECTION 29--If you follow Abe's idea, you must insert a letter sign before the "d," taking the same amount of space. If he wants to see what it is like in print, I go along.

RULE 8, SECTION 31--I quite agree with Abe; it should be written using the same abbreviations as appear in print, and in the same position. This was a device developed by the British and accepted as a trade-off in 1931, when the US took on English braille Grade 2.

RULE 11, SECTION 36b--I could not agree more about his objection, but I would just use the combinations with the apostrophe as they happen. Why should not blind people worry about the queer words as well as sighted people? Do not put a list into the memory of a computer, as he suggests.

RULE 11, SECTION 37--Do not agree with his suggestion. I would just let the words run together wherever they occur. I think most people would not take a second look, and so what, if they have to stop a second for meaning? Do not make a list for the computer memory.

RULE 13, SECTION 41--I do not agree about his listing: forget it. If you want to take out about the "natural pause," okay, but I would otherwise let the rule alone.

RULE 14, SECTION 45--Abe gives a good analysis and suggested memory for certain words. But what about the small computer which does not have this memory capacity? I do not know the answer on this. I still object to a list which should be put in the computer memory; what about the changes in the English language that are bound to come along, like APH ran into "Vietnamese"?

RULE 15, SECTION 47b--See immediately above. Same reasoning.

RULE 16--Abe makes a good point about "Doolittle," but I again want to avoid setting up tables of where you can use the short-form words--or cannot. The English language changes from day to day, and this list could become obsolete. I do not know the answer.

MY THOUGHTS

RULE 1, SECTION 5a--I have long wondered why we bother with dividing words at the ends of lines, just to save space. I get particularly upset when there is just one cell, plus the hyphen, at the end of the first line. This usage teaches blind children wrong tricks when they come to type. If we avoided all hyphenation of words at the end of the line, except at the hyphen in hyphenated compound words, we could save countless hours of stereotypers and volunteers' time looking up how to syllabize words, and I do not think we would lose so much space. (I think Bernard Krebs said he saved 8 braille pages in something like 300 pages. Nuts!)

Let us remember that even the Federal Government now never divides words at the ends of lines, because, I presume, the modern typist does not know how to divide them, and it takes too much time to try to get her to learn.

I do wish to put myself on record as against making up special tables of where you can, or cannot, use contractions. The use of such tables is limited by the size of the computer available and its memory capacity, and the English language seems to change with each passing year. I can visualize when mini-computers will be able to do the job of making single braille copies at a reasonable price, which would do away with a lot of volunteer braille, unless, perhaps, volunteers can be taught to do the original input. If, of course, original print tapes of material can be obtained which are reasonably correct, this would be great. And, also, if scanning of corrected inkprint output can become available at a reasonable cost, that would be great, too. And I can foresee both of the things.

There is one other problem which will have to be considered, and that is: What do we do about agreement with the British in changing the fundamental code for all English-speaking countries? There was a tacit agreement at the 1956 London Conference that no changes would be made without cross consultation. Actually, I am not sure that they might want to make changes. I have not kept up with their work on computerized braille, although I am sure they have the same problems as we do. I do know that the Germans long ago decided to forget about the formation of so many of their

words which are long ones composed of a combination of smaller ones, and just go ahead and contract wherever their contractions fell. Would it not be a good idea to check with them to see how they came out with the German braille-reading public? I am sorry I do not have the address for you, but I am sure you can get it. Anyhow, I am sure the Braille Authority would have to check with the British before any changes could be officially adopted, and this fact must be considered. Also, how about the Braille Committee of the World Council for the Welfare of the Blind? I am quite sure they will want to be consulted.

Letter

from Marjorie S. Hooper

Braille Authority
April 30, 1976

Dear Bob:

Back in the ´40s, all by myself I made an intensive statistical study of the braille Grade 2 signs entitled Braille Contractions and Children´s Reading Vocabularies, which was published in the AAIB Convention Report for, I think, 1944. It was designed to put some facts into hands of teachers, to decide whether or not to change the then methods of teaching braille to children progressively, first braille Grade 1, then braille Grade 1-1/2, and finally braille Grade 2--the latter, in most cases, not until high school--all of which seemed quite silly to me. How our children ever learned braille well is beyond me, having, in many cases (such as the words "father" and "mother") to learn them in three different forms! Anyhow, the study was happily received, and most schools immediately started teaching braille Grade 2 from the beginning.

I do not suppose you ever heard of my study, since it has been buried all these years in the AAIB Proceedings, but APH kindly had three copies made for me, and I am sending one to you, one to Dr. Berkowitz (with a copy of this letter), and keeping the third for myself. Attached is your copy.

The purpose of this study, of course, is not connected with your project for the simplification of braille Grade 2. However, when I made the study I backed up my findings by comparison of the usefulness of all braille Grade 2 contractions and abbreviations with Thorndike´s 20,000 Word List. My findings in this connection will be found on pages 28-36, on the right of the line I have drawn in pen-and-ink on each page. This information, it seems to me, should be useful at the meeting in June.

In the meantime, I have long sent in my position paper, and sincerely hope I shall be invited to the meeting.

Sincerely,

Marjorie S. Hooper

Position Paper

by Kenneth R. Ingham
American Systems, Inc.

RECOMMENDATIONS FOR CHANGING ENGLISH BRAILLE RULE

Attachment 1

a. Rule 1: Punctuation Signs

b. Interchange the braille signs for parentheses by the opening and closing double quotation marks.

c. This idea, first suggested by Abe Nemeth, permits the print-to-braille differentiation of these characters.

Attachment 2

a. Rule 1: Punctuation Signs

b. Suppress all end-of-line hyphenation in braille.

Attachment 3

a. Rule X: General Use of Contractions

b. Contractions should be permitted to cross syllable boundaries.

Attachment 4

a. Rules X-XVI: Contractions

b. Suppress all contractions.

c. I do not recommend this change to be done out of hand. However, given that contractions result in a savings of only 20% with regard to space, and that systems are becoming available which provide erasable braille, the usefulness of contractions may be minimal. Furthermore, contractions, even common ones, can slow the reader and if a careful study is made of reading speeds achieved by braillists skilled in Grade I vs. Grade II, I would not be surprised to find that the Grade I braillists are at least as fast, if not faster, than the Grade II braillists. Obviously, the complete elimination of rules X--XVI would make the braille production problem, in so far as translation is concerned, a trivial one. I do not believe that

the resulting extra pages produced when Grade I braille is used offsets the advantages to be gained by quick and easy translation.

RECOMMENDATION FOR CHANGING TRANSCRIBER CERTIFICATION

The acceptance by the Library of Congress of braille produced by a computer should be based upon the submission by the program's operators of braille output produced from a standard text provided to all such operators. Separate text should be available for Grade I, Grade II, music and Nemeth Code, and such acceptance or certification should be granted, not to the program, but to the agency or its authorized typists. Certification may be extended to a program when both the input and translation processes are totally automatic provided the output achieves the Library of Congress' standards.

Position Paper

by Mrs. Herbert H. Katz
Braille Authority
May 3, 1976

Dear Mr. Berkowitz:

I have received your "Call for Position Papers for the Workshop on Compliance of Computer Programs with English Braille, American Edition." You mention a workshop to be held in New York City on June 7 and 8. As a member of the Braille Authority, I should like to attend such a workshop. I would question the suggestion that the workshop consider recommending changes listed under Type B. As I understand it, the certification of transcribers is based upon the rules incorporated in the braille code. I certainly think that the present qualifying trial manuscript is a good idea.

I think Dr. Nemeth's comments as listed in Attachments 6 and 7 are excellent. Many of mine would be a repetition of his so I will try not to duplicate what he has said. I also go along with his suggestion of providing a list of Do's or Don't's for the computer, rather than changing the rules of braille itself. I think it would be helpful if the entire codebook were carefully examined to determine where differences will soon occur between literary and textbook formats. Then, decisions could be arrived at to determine whether these differences are necessary and desirable and if they are advantageous to make changes in the literary code to conform with practices which will occur in textbook format when released. None of these changes involves contractions, short-form words, or in general the rules concerning the use of these short-form words and contractions. However Rules II, IV, VII, VIII and Appendix A would be affected as indicated below:

RULE II--I would like to add the boldface indicator for those instances when additional changes of type are needed. This could come from the textbook format code when released.

RULE V--Here, too, I think the new textbook format should be carefully studied, because some changes have been introduced here.

RULE VII--In the effort to achieve uniformity, I wonder if consideration could be given to allowing numbers to appear in the lower part of the cell wherever they appear. This would alleviate the problem of letters

following numbers and the showing of numbers in two ways. Since the configuration is the same in upper or lower part of cell, readability would not be lost, and as the number would be preceded by the number sign, no confusion would result. I realize this would also require the addition of a punctuation indicator. I would also like to include some of the simple signs of operation.

RULE VIII--SECTION 31. I think the suggested list should be studied to conform with current practices and should include abbreviations of the metric system, which is rapidly creeping into our midst. Some of the foreign coins and archaic terms could certainly be eliminated, especially those whose abbreviations are letters. It is helpful to show how symbols such as "percent" and "ampersand" should be handled. I agree with Dr. Nemeth, who says that the letters or symbols should appear in the same position relative to the numbers as they do in print. I also think capitalization, spacing and punctuation of the abbreviations should conform to that found in print.

RULE XIII--SECTION 41. Dr. Nemeth's list just scratches the surface here and omits too many cases. Here, a list of when TO, INTO and BY cannot be contracted might be more helpful.

APPENDIX A--Again I think the new textbook format code should be studied to see what parts should be included in literary braille, if any.

I would be most loathe to approve of changes which would make the wealth of braille material now available become obsolete. Two codes can rarely be used interchangeably with equal fluency. In the literary code, changes in format should not slow down the reader, but are made in an effort to more accurately bring to his copy a faithful representation of the print page. If any changes are made in the braille code, I would favor adding some of the contractions and short forms that are now part of Grade III braille, if it were found that they are part of a high frequency list.

In conclusion, I think that Dr. Nemeth's comments both on the suggested changes and his own proposals for changes are most worthwhile and should have your careful consideration.

Very sincerely yours,

Virginia B. Katz

Position Paper

by Donald Keeping, Supervisor

Computer Braille Service
The University of Manitoba

I have gone over the material you sent me and enclosed my comments.

ATTACHMENT 2

In connection with Attachment 2 regarding Type B, the following might be of interest to you. I am currently sitting as a guest on a Task Force for the development of Educational Materials for Handicapped Children in Canada. That task force has recently made 3 recommendations which, as there is no other body dealing with braille in this country, will probably become the rule; (a) Some agency, probably the CNIB, is to be responsible for certified braille procedures, (b) The standards followed in Canada are to be those approved by the Library of Congress in the United States, and (c) Canadian representatives are to be encouraged to sit on groups such as this workshop which are concerned with braille standards. These recommendations will be submitted to the Canadian Council of Ministers of Education.

ATTACHMENT 6

In Attachment 6 Dr. Nemeth makes a point that there is a readability line somewhere between Grade II and Grade III braille such that Grade II braille is perfectly readable to the average reader and Grade III is difficult. Even though I am not in favour of adding more contractions to braille I should like to point out that this need not be so. Learning braille of any kind is more difficult for an adult, and of course the more complicated the braille, the more difficult will be the learning process. It would not be for a child learning braille. Similarly, learning a foreign language is extremely difficult at the age of six or thereabout. However, as it is not difficult for a child to learn to speak several foreign languages at an early age, it should not be difficult to learn and read a more complicated braille system.

For the most part, Dr. Nemeth is correct in his criticism of the 1962 study by Mr. G. Staack. It is perfectly obvious that Mr. Staack does not know braille very well. Changing contractions such as "g" and "r" to represent different words is, as was pointed out, not only confusing but useless.

However, there is one point in Dr. Nemeth's critique which I should like to comment upon; that is, that pronunciation should be considered in braille. He points out differences in British and American pronunciation such as the words "reduce" and "derive" as reasons for using contractions in one country and not in another. If this reason is a good one, what are you going to do about the differences in pronunciation between braille users in Minneapolis and New Orleans or the Bronx?

Dr. Nemeth claims, and rightly so, that braille users should be confronted with the same inconsistencies as print users. When print users look at the word "sentiment," they see "time" in the middle in the same way that a braille user does albeit braille is contracted. It seems to me that contractions such as "time," "where," "some," etc., should be thought of as a short form for a string of characters, not as word contractions. As a conclusion, it should be pointed out that English spelling in many cases tends to ignore pronunciation with words "tough" and "through." Braille shouldn't be concerned with pronunciation any more than print is.

ATTACHMENT 7

RULE 1 SECTION 2--Punctuation Signs, Quotation Marks.

My comment here is that I do not believe that it is possible to correlate exactly the Grade II braille with print any more than it is possible to correlate one language with another exactly. One looks for correlation of meaning not exactness of words. Braille of course is far from being a language but I think the argument still holds. I believe that braille should be simplified as much as possible. There is nothing more annoying to me as a braille reader, than to come up against a contrivance such as 2 capital signs, 2 underline characters, and a letter sign before I get to the actual braille word. The print person sees a big outstanding word; the braille person sees an antagonizing mess and then the word which is the same size as normal words.

Take as an example the outstanding words on a paper DRINK INDIA BEER. The print reader is struck between the eyes by this phrase whereas the braille reader must first meet 2 capital signs, 2 underline characters, before he gets to the word "drink," which does not stand out at all, and then 2 more capital signs before the other words. The print reader would probably run to his refrigerator, the braille reader will probably be put off his drink completely. I really don't know the solution to this.

RULE 1 SECTION 3--Parentheses and Brackets.

The only comment I have here is that I personally, have never been confused by the brackets.

RULE 1 SECTION 4 SUBSECTION A--Apostrophe.

In replacing the apostrophe in 1930's with a letter sign is only preferring one discrimination to another; agreed the apostrophe is not used in print but neither is the letter sign.

RULE 2 SECTION 8--Special Braille Composition Signs.

See comment on Rule 1 Section 2 in paragraph 2. I do realize that such punctuation and composition signs are of course necessary and since this is true, some standard or order should be imposed on them. I still say it's a mess. I wonder if we sometimes don't try to be too exact at the expense of comfortable reading.

RULE 2 SECTION 12--The Letter Sign.

No comment.

RULE 3 SECTION 19--Omission of Copy.

I am in complete agreement with Dr. Nemeth here. Perhaps I would go further and say that even a photograph which is not directly involved in the text should be noted in braille and some attempt made at describing it. However, the attempt should be closely supervised and not left to the discretion of the individual translator. It must be done objectively and in very few words.

RULE 4 SECTION 23--References.

With regard to this section I agree with both of Dr. Nemeth's observations here. Who is to be permitted to decide whether the meaning is obvious enough to be condensed. The Roman numeral function is quite adequate in braille, why not use it.

RULE 6 SECTION 27 SUBSECTION E--Abbreviations.

Here, Dr. Nemeth is driving home the point that print should not be distorted unnecessarily and I agree.

RULE 7 SECTIONS 28 AND 29--Cardinal Numerals, Ordinal Numerals.

Again hammering home the point about distorting print. However, with regard to Ordinal numbers "2nd, 3rd, 22nd, etc." Dr. Nemeth does not indicate that a letter sign must be included if the letters "n" or "r" are removed. I am sure he means this. Personally, I would rather see "2nd" than "2 letter sign d," but I am willing to go along with the letter sign in order to uphold the general rule. In this context I suggest that some thought be given to dropping the numbering system that we now use in braille in favour of the numbering system used in Nemeth code; that is, the numbers would be in the lower part of the braille cell. This would eliminate such problems as the one discussed here. It would give rise to other problems mainly connected with punctuation marks but the Nemeth code solution to these latter problems seems to be quite adequate. I have not thought this out clearly and there may be objections which have not occurred to me.

RULE 8 SECTION 31--Coinage, Weight and Other Special Symbols.

I agree, a stupid rule. Get rid of it.

RULE 11 SECTION 36, SUBSECTION B--One-Cell Whole-Word Contractions.

I object to the list for 2 reasons; one general, which I will elaborate on later and the other particular to this section. All the apostrophized words in this list represent a kind of slang speech. The area of slang is the area in any language which is most susceptible of change. This list would probably become obsolete in a few years and would continually need revision. We should try to find some rule that does not require lists and does not need revision every few years.

RULE 11 SECTION 37--Signs for "and," "for," "of," etc.

Although it is premature I may as well express my opinion generally with regard to lists. They, as near as I can make them: (1) can become overwhelming; that is, they can become so long that no human mind can hope to retain them all. Also a lengthy list tends to drive the cost up of computer braille enormously and by the way, makes it impossible to transcribe braille on a small computer. (2) Lists can become very cumbersome. No one knows whether the list is complete and indeed because of the changing language it can never be complete. (3) Lists usually generate more lists; that is, exceptions generate exceptions to the exceptions and on and on. We are better off with a few errors. A comment here: let us try to reduce braille to sensible rules which tend to

eliminate lists. With regard to this particular section about "and," "for," "the," "of," "with," etc., no list of possible combinations is adequate because no set of combinations is always correct; why not simply separate them?

RULE 13 SECTION 41--Lower signs.

Another list!!! The same objections, why not just separate "by," "to," and "into" from the following word. Of course we would then have to find a suitable contraction for them.

RULE 14 SECTION 45--Initial-Letter Contractions.

Still another table??? As I mentioned in my comments on Attachment 6, if we regard short forms such as "day," "dis," "ing," "ation" as a string of characters rather than a word or part word with a definite meaning, the problem would be much closer to a solution and no table or list would be required. After all the print reader cannot tell from the spelling of the word itself whether the "day" in "whaddaya" does or does not have a meaning similar to the "day" in "holiday." Why should blind people be helped in this way. This is only carrying Dr. Nemeth's rule of distorting print one step further.

RULE 15 SECTION 47 SUBSECTION B--Final-Letter Contractions.

List of exceptions rather than list of uses!!! List! List! List! The same comments apply as in the previous paragraphs.

RULE 16--Short-form Words.

With regard to Short-form words, I believe that we simply should use short-form words inside longer words. I note with some satisfaction that Dr. Nemeth admits to a realization that his lists are going to cause trouble. I think we should simplify the braille rules so as to minimize the necessity for lists. Admittedly, this would cause some little increase in bulk. The changes that I have suggested such as (a) separating "and," "for," etc. (b) separating "by" and "to" from the following word, and (c) eliminating the use of short-form words with longer words might increase a 100-page volume to 102 pages. It would affect readability very little, if any at all. It would make braille rules much simpler, both for the hand transcriber and the computer.

Thank you, Bob, for giving me an opportunity to express my opinion. I didn't know braille was so interesting.

Position Paper

by Bernard M. Krebs

Before entering upon a discussion of the background material being used as the springboard for position papers, I wish to express my view that the English Braille Code as it is now developed is a remarkably logical and efficient instrument for transmitting information. The standardization of the use of contractions and other formats has implemented the flow of information and has minimized the necessity for pausing to interpret a configuration.

The production of braille reading matter through the facility of the computer is a vital breakthrough and its use can extend the breadth of information and literature to meet general or individual interests. The computer has already been programmed to cope with all but a comparatively few provisions of the English Braille Code. The barrier occurs primarily where human judgment is required. An attempt to bring closer correlation between human and computer produced braille is a highly desirable goal.

Just as in speed writing and other shorthand systems, the contractions of braille allow the presentation of information in the shortest space. The value of some braille contractions has been questioned due to the fact that the letter combinations or words occur infrequently. Their use has been continued since most, such as the short-form words, have an obvious meaning. At the international conference in 1956, a comprehensive study of braille contractions and rules was undertaken by representatives of England and the United States. One of the sources used was a study of the frequency of occurrence of contractions which had been compiled by Lockhead et al in 1954. More recent studies vary little from their findings. As a result of the conference, a few rules were modified and only four new contractions which appeared of value were added.

Upon examining the background papers, it was disappointing to find that both Mr. Staack and Dr. Nemeth were not aware of much pertinent information. Although Mr. Staack's investigation of braille was comprehensive, his lack of understanding of the implications of rules made his suggestions of little value. Likewise, some of the items of Dr. Nemeth's presentation were based upon an early edition of the English Braille Code and therefore were no longer valid. The suggested changes by Dr. Nemeth in sections 36B, 45, 46B and 47 are already in the official rules and have been stored in the computer.

A primary point of disagreement between Dr. Nemeth and myself is that he believes it imperative to reproduce in braille the exact equivalent of the print copy regardless of its effect on reading ease in order to make the blind person aware of different printing practices. On the other hand, I believe that a standard form of presenting material is preferable since it facilitates reading. For example, why should it be necessary for the braille reader to be impeded by having to cope with a two-cell symbol for the outer quotation mark just because a book published in England used single instead of double quotation marks? Similarly, why is it necessary for the reader to be burdened by the publisher's preference for periods or diagonal strokes instead of hyphens in writing dates? If the difference in style is important, a transcriber's note could be used to point out the change from print.

Webster's Collegiate Dictionary, Fifth Edition, contains the following statements: "An apostrophe followed by an s is used to form the plural of figures and letters and signs, ... but forms omitting the apostrophe are gaining ground." "The apostrophe followed by an s may be used to form the possessive with initials, I.W.W.'s." Since the use of the apostrophe in such instances is a standard practice, there seems to be little reason to vary the presentation at the whim of the publisher. The insertion of the letter sign instead of the apostrophe may easily add confusion, e.g., gadoliniums gd(letter sign)s.

The order of punctuation and composition signs as presented in the code is logical. The "globbing" of punctuation marks separately from composition signs does not give the required information. Both a quotation mark and an italic sign are indicators affecting the word that follows even if one of its letters is represented by an apostrophe. If the word "'Tis" were underlined instead of italicized, the underlining would start under the apostrophe and not under the "t."

It makes sense to use a letter sign only where confusion would occur and not where the meaning would be obvious without it. Most of us only put on rubbers when we are going out in the rain.

Dr. Nemeth is also disturbed by the braillism of placing the abbreviations for weights, measures and coinage before the letter or number to which it applies. This has been a helpful practice in cook books and instruction manuals since it provides for the presentation of information in a succinct manner.

Because of the need for judgment, it is difficult and perhaps even impossible for the computer to recognize where to, into and by as well as and, for, of, with, the, and a

occur at the end of an idea and thus should not be joined. If editing is too costly or not feasible there are three possible approaches to the solution of this problem which may be worthy of consideration. 1. The contractions might be joined despite the occasional confusion which could occur. 2. The principle of unspaced combinations might be eliminated. 3. It may be feasible to allow the braille produced by transcribers to vary from computer braille in order to assure a broader and greater production of diversified reading matter.

It is important to keep in mind the fact that the reduction of bulk is not the primary object of the rules and contractions for braille. The most efficient braille code is the one which permits for a smooth flow of information to be received while the finger travels the shortest distance.

It is encouraging to witness the meeting of the minds of experts in both braille and computer science. With a little give and take, changes may be effected which will permit the computer to bring forth high quality braille output.

Position Paper

by Norm Loeber

IBM

April 19, 1976

Dear Bob:

Thank you for including me on your distribution list calling for position papers on "Compliance of Computer Programs With English Braille." I am definitely interested in the translation and production of braille by computers. However, my two primary interests are in the area of terminal/word processing systems that produce braille and very high volume braille (5,000 to 10,000 copies of one hundred-page interpointed books).

Depending on the application, I feel terminal-produced braille offers much more to the blind community than the batch processed, centrally located embossing facility. The inkprint/embossing terminal or free-standing word processing system would not only facilitate the production of braille in response to an individual's need, but could provide direct employment and advancement opportunities to the visually impaired. These opportunities apply to both the individual using the terminal or word processing system as a tool in their occupation and to the person needing readily available braille as working paper for instructions and reference.

A terminal/word processing system could be built to provide translation to simple braille without an extensive program to produce Grade 2 braille. In some applications, such as the secretary who wants a braille copy to proofread and then an inkprint copy for her boss, a direct one-for-one equivalency is essential. Experimental devices have shown the feasibility of an inkprint and braille embosser capability on the same basic machine that can be easily changed from one mode to the other.

I have done some experimenting with equating the standard typewriter keyboard to braille codes for such an application. I realize this is not exactly in line with your call for papers, but will include a copy for your information and to emphasize the need for a braille terminal/word processing system code. Special consideration must be given to the use of double cap signs and quotation rules, as well as equivalent signs and symbols. One of the more significant differences is the unique set of numbers which eliminates the usual need for the number sign or relocated punctuation signs when "dropped" numbers are used. Several blind people have used

this number system and find that it avoids confusion and provides an easy exchange between inkprint and braille in secretarial and programming applications.

Thanks again for the information. Wish you lots of success in your efforts to update and clarify the braille codes.

Sincerely,

Norm Loeber

Position Paper

Mrs. Robert W. Loewe

Lutheran Braille Workers, Inc.

May 1, 1976

CHANGE: DELETION OF ALL USE OF THE CAPITAL LETTER SIGN

EFFECT--

Saving of thousands of braille cells

Faster reading

Reduction of the size of braille manuscripts and books with considerable savings in storage space and production costs

Elimination of complicated rules covering use of punctuation and capital letter

COMMENTS--

There is no need for the capital letter sign when punctuation clearly indicates the start of a new sentence. Beginnings of paragraphs are also self-evident so it is not necessary to use the capital sign.

Proper names are almost always preceded by a title so do not need the capital sign. In cases where just the first name is used, the name itself or the contents of the sentence identifies it as a proper name.

Initials are always followed by a period and so are identified.

Symbols can be identified by the braille signs used with them.

Readers of English braille outside of the United States would find our braille more readable since they have not used the capital letter sign for many years.

CHANGE: ADOPTION OF A SYSTEM FOR ALL MEASUREMENTS OF THE METRIC SYSTEM

COMMENTS--

Before long the metric system will be used in the United States. It is essential that the blind be able to clearly understand and use the system. Many need it to carry on their work. Such an important system should be incorporated in computerized braille.

SUGGESTION: USE THE DISCARDED CAPITAL LETTER SIGN TO INDICATE THE USE OF A METRIC SYMBOL

Experience over the past 32 years has led me to feel that estimates of the number of blind, both totally and legally, as well as visually handicapped in the United States and the world are but a fraction of the real number. I do agree rather sadly that a comparatively small percentage of the blind in the United States read braille.

Why do so few blind use what other blind call "the open door to the sighted world?"

REASONS--

1. The physical characteristics of most present day braille:

   Plastic braille--uncomfortable to read.

   Soft paper--rubs off on the fingers, clogs pores--distasteful to read.

   Large and heavy books.

2. Braille codes:

Grade II braille is too complicated for the average and the newly blind person. In Dr. Nemeth's comment to Mr. Staack's braille changes he states: "Grade III has never achieved very much popularity and the reason is that it impairs readability." Grade II has this same effect on average braille readers who do not have Dr. Nemeth's ability. There are thousands of blind who would study and read Grade I and Grade I-1/2 if it were available.

3. Formats:

By trying to make the blind SEE manuscripts and books as we see them, that is with "eye appeal" we burden them with unnecessarily large books, full of empty lines and beautifully centered headings and titles. This is a mistaken kindness. Did you know the average braille reader runs his finger along

the left margin to the third cell and often misses or ignores lines started further in?

4. Readability:

I was taught the fundamentals of braille production 30 years ago at the Braille Institute of America in Los Angeles. One thing was stressed and I have endeavored to follow this rule--READABILITY.

This applies not only to the physical qualities of braille, but to the person reading. You must supply him with braille he can understand and read with ease and pleasure.

Position Paper on Braille Rules

by Joseph E. Sullivan

Duxbury Systems, Inc.

May 25, 1976

QUALIFICATION AND INTRODUCTION

Of the two classes of people invited to submit papers--those expert in the rules of English braille and those expert in computer programming of the translation of English braille--I can claim only to fall into the latter. Despite involvement with two major translator building efforts for a total of about two years exposure (in six years elapsed time) to the braille system, I find I read Grade II braille only with difficulty and couldn't begin to do transcription by hand. Part of the reason for this, no doubt, is that the practical business of building a translator simply does not require detailed memorization of the code; once a rule is programmed (or, in our case, entered in the tables) correctly, it can be forgotten by the programmer. Nevertheless, I have observed that I am not alone in having picked up surprisingly little of the code despite long exposure. Very few sighted people, even among those who work at braille production in some capacity other than directly at transcribing or editing, know the system at all well. Moreover, as we all know, only a minority of blind persons use it at all, and the number of those that know the code well is smaller still. Why is this so? Obviously, it is because the system is too complex. Substitution ciphers and near cousins thereto (e.g. the Greek alphabet) are generally easy to get used to. Grade I braille is in this category, and therefore it is natural to ask whether the 18% space saved by Grade II together with the corresponding increase in reading speed, is worth the increased cost in complexity--to people, primarily, rather than machines; people who do not learn to read braille because it is too much bother; people who do not have braille available to them on an inexpensive and timely basis because scarce skills are required to produce it. Even more to the point, it is natural to ask whether a system could be devised that would be both simpler and more saving of space. Certainly, that 18% figure would seem easy to beat.

I do not pretend to have ready answers to either of these questions. Indeed, we have come neither to praise the English braille system nor to bury it, but (we hope) to improve it in ways beneficial to the readership, both actual and potential. On balance, that purpose would seem to argue for an incremental approach, one that would seek to avoid "throwing the baby out with the bath water."

My position will be expressed in three parts--first, some general principles; second, some immediate consequences of those principles, and third, a point-by-point review of Dr. Abraham Nemeth's position.

GENERAL PRINCIPLES

The following I must label as a bias or axiom that I will use as a starting point: Braille should be nothing more or less than a means of representing English text so that blind persons can have available to them exactly what the sighted person has when reading the corresponding inkprint.

Before getting into the consequences of this axiom, it should be stated that the present Grade II braille system fits it remarkably well, despite its complexity. As Dr. Nemeth points out, for example, the system is very careful to preserve original spelling of words. Therefore, such an axiom does not imply a radical departure from the present system, and I would venture a guess that few would disagree with it as a principle.

There are two immediate corollaries to the principle:

(1) Significant text information should not be lost in the braille;

(2) Text information should not be added in the braille.

At this point, it would be well to consider just what is meant by "text," and "information."

At one level, text is just a stream of characters (symbols); we may call this the "string" level. At this level, one string is as good as another, though we might consider it an error if a symbol not in some predefined "alphabet" occurs.

At the next level, characters are grouped into "words" or other molecular sequences of 1 or more symbols; we may call this the "lexical" (literally, "reading") level. At this level, we might consider it an error if a word composed of legal symbols is not in some predefined "dictionary."

At the next level, words and other groups (e.g. punctuation) are further grouped and moreover set into relationship with each other; we may call this the "syntactic," or grammatical, level. We might consider it an error if a group of words cannot be parsed so as to make a well-formed sentence, e.g. subject, verb, object.

At the next and final level, the meaning of the words and the implication of their relational structure is taken into account to derive meaning, i.e. distinct thoughts; we might call this the "semantic" level or level of meaning. At this level, an error is simply a failure, for whatever reason, to convey meaning. This could arise from an error at any of the four levels. Note, however, that only at this level can an ultimate decision be made as to what is an error at lower levels; a new character or word may be defined, for example, or an ungrammatical sentence quoted and discussed, thus rendering the apparently incorrect both correct and meaningful.

There are many interactions among these levels, which are in practice not really as distinct as presented here. Nevertheless, the points to be derived are:

(1) Extracting meaning from strings of characters is an active constructive process. We may note parenthetically that at present and for the foreseeable future only humans are capable of this process.

(2) Meaning, i.e. information, though present only in the semantic level, may rely on details of the string level not apparent at that level.

(3) The derivation of meaning inevitably involves the addition of information at each level above the string level--i.e. the rules for word and sentence formation and finally the meaning of words and most importantly the prevailing context. This last property may be likened to that of a water pump that must be primed--information must be added before information can be derived.

If we come back to the principle that information should not be added or subtracted, we see that no practical braille system can entirely live up to it. For in deciding that the type font, for example, is an insignificant detail the transcriber is bringing to bear information (his knowledge of the subject matter and its relation or lack of relation to the type font) in deciding how to braille; if he judges wrongly, moreover, the result will be loss of information in the braille. These observations apply, moreover, to almost every use of contractions, excepting only those always used on a string-occurrence basis. As long as the transcriber's assumptions (information) regarding pronunciation (and hence meaning) are correct (i.e. match the author's--and assuming that the author did not intend a multiple meaning or play on words!), no harm is done.

As a practical matter, then, we can only strive to minimize the amount of information added or subtracted, but

not eliminate it altogether. At the least, however, we must insure that after some inevitable judgment about what is significant, the string level of text should be reconstructable exactly from the braille so that the reader has the means, at least, to recover from errors that may have been introduced on his behalf. As Dr. Nemeth put it so well, he has a right to be just as confused as the sighted person.

SOME IMMEDIATE CONSEQUENCES OF THE PRINCIPLES

1. Special symbols that are alike in inkprint should be treated alike in braille--the hyphen (in its various uses) and the minus sign, the apostrophe and the right single quote, and most particularly the decimal point and period. (It is not always certain in inkprint whether a given dot is a period or a decimal.)

2. Distinct inkprint symbols should be distinct in braille--left and right parentheses, for example. This does not mean that context may not play a part in recognizing distinct uses of a given braille sign (e.g. open quote and question mark), as long as the code contains a means of expressing any string, however contrived.

3. (Rule 1, Sections 9b, 11) It should be clarified just how to express unambiguously the presence of intermediate capitals within a word (e.g. SofTech). The cited sections appear to be contradictory on the question of whether a hyphen terminates the effect of double capitals. Section 11a suggests that disambiguation through the use of the termination sign be generally avoided, raising the question of why capitals are used at all where they have no significance worth preserving.

4. At the whole word level, the string alone should decide the brailling. Presumably, this would be based on the most common use of the word. This is not an argument for using the "name" contraction in "Vietnamese," but for using the "do" contraction even when the musical note is meant. The pedantry of (dis)(ea)se vs. (dis)ease (lack of ease) should convince us of the need for such a simplification.

5. On the other hand, because the use of a contraction entails a certain inevitable addition of information (as to meaning and pronunciation), present practice, in general, though perhaps not in every detail, should be followed as regards contractions within a word, so that at least the added information is unlikely to be misleading. In other words, string occurrence alone should not govern.

It may be noted that no mention has been made of making things simpler for machine translation. The issue of machines vs. people, which is bound to be raised by this workshop, is a false one anyway--machines are the servants of people (except for programmers, where it's the other way 'round!) and will do no more than instructed. But in any event the most salient arguments for simplifying the braille code are those relating to making things easier or clearer for people; of the four immediate consequences above, for example, only the fourth makes a significant difference to machines.

A. NEMETH'S POINTS

1. Rule 1, Section 2. Amen, the original string should be reconstructable.

2. Rule 1, Section 3. Again concur, as noted in my point (2) above.

3. Rule 1, Section 4, Subsection A. Again concur, same reason.

4. Rule 2, Section 8. Yes, first because of the general principle of string reconstructability, second because it is more logical to put composition signs (not having distinct inkprint counterparts) nearest the signs that gave rise to them (e.g. "italic-a" for inkprint "underline-a").

5. Rule 2, Section 12. Generally, but weakly, I concur with the desirability of "symmetry." Since string reconstructability is preserved either way, that is not an issue; symmetry, however, is a kind of simplicity. (How much better the code would be if numbers had their own signs and did not require a "mode shift!" But at this point that would doubtless be too large a change.)

6. Rule 3, Section 19. Concur, of course.

7. Rule 4, Section 23. Again, how can I argue?

8. Rule 6, Section 27, Subsection E. Concur, as noted in my point (1) above.

9. Rule 7, Section 28. Ditto.

10. Rule 7, Section 29. Yes.

11. Rule 8, Section 31. I wholeheartedly concur with this one; I have long wondered what possible purpose is served by inverting the order of numerals followed by units of measure, save to ensure that both transcriber and reader are kept on their toes. This is also a rule that gives

a surprising amount of grief to computers. Some of the difficulty is of a technically detailed nature and I will not go into that here, but consider the difficulty of instructing the computer to reverse "100 feet" in cases like "The building is 100 feet in height ..." but not in cases like "Centipedes are supposed to have 100 feet in all ..."

12. Rule 11, Section 36, Subsection B. I don't quite agree that a closed list is the best solution (though it would be ideal for a computer), unless some general criteria were set up for extending the list (without formal amendment) as language usage grows and changes.

13. Rule 11, Section 37. No real opinion, though again I am dubious of the closed-list concept.

14. Rule 13, Section 41. This is in the nature of an implementation suggestion.

15. Rule 14, Section 45. Again, I am dubious about fixed tables.

16. Rule 15, Section 47, Subsection B. Ditto. In fact, fixed tables for the uncontracted case, where, by implication, everything else (a universal negative) is contracted, seems especially dangerous as the expression of a rule. (Of course, it is fine as a heuristic for computer implementation of the rule.) When a new word (say "zuity," pronounced like "fruity"--perhaps denoting a more advanced state of the same condition) enters the language, we may either have to move fast to amend the tabular rule or else accept arbitrary irregularities in the braille treatment of similar words.

17. Rule 16. Concur--the original string should be reconstructable exactly.

Annex 4:

Index of Authors, Correspondents, Recorders and Editors

Annex 5:

Roster of Attendees

Call for Position Papers for Workshop on Compliance of Computer Programs with English Braille, American Edition 22 March 1976

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