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B R A I L L E: New Codes for Early Music Notations, Long Cells, and Exploratory Coding Analysis

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SUMMARY

Braille is a wonderful system: it has empowered millions of blind people the world over, and will continue to do so. In order to expand the access which it can provide, more codes are needed for specialist areas, and for these, more tactile patterns are also needed.

Early music manuscripts have not previously been available to blind students and professionals, since the standard braille music code can only express the forms and conventions used in modern editions, not those of the originals. Exact codes for the notations of the original manuscripts are clearly necessary as a basis for any serious musicological research.

New codes are here presented for mensural notation, lute and plucked string tablature, and baroque figured bass. They are designed to be like a diplomatic transcript of the original: fully accurate to that point. Obviously they cannot be a replica physically, since tactile scripts work so differently from visually perceived symbologies. This presentation constitutes Part One. Some of these new codes utilise long cells, a matrix of 8 dots instead of 6: some study is included of this new departure.

Part Two examines the underlying structures of present braille codes, literary and musical. Louis Braille's work is the foundation of all: finding the coding strategies which make his work so effective to the reading fingers was the task here. In addition to general understanding, this was done with a view to providing a reliable basis for the development of new codes as they are needed.
# Table of Contents

Foreword ............................................. 1  
Introduction:  Background to braille ................ 9

## Part One

### Actual New Codes

Chapter 1:  What any new code will need .............. 31
Chapter 2:  Main introduction [to the new musicological codes] and HEXIMUS Code ...................... 63
Chapter 3:  PASCO Code .................................... 93
Chapter 4:  LUTAB Code .................................... 119
Chapter 5:  FIGBY Code .................................... 137

## Part Two

### Present Literary Code

Chapter 6:  CODEWORKS 1-8; [How all braille works] .... 151
Chapter 7:  CODEWORKS 9-22: Linguistic considerations .... 187
Chapter 8:  Haptic aspects of CODEWORKS ................. 201
Chapter 9:  Coding Strategies 1: 1 - 22 .................... 215

### Present Music Code

Chapter 10: Coding Construction in Braille Music ........ 221
Chapter 11: MUSI-CODEWORKS, extra strategies ........... 239
Chapter 12: Coding Strategies 2: M 1 - M 14 ............... 255

## Appendices

Appendix 1:  Musical examples in staff notation ............ 261
Appendix 2:  Translation of Louis Braille's 1829 Procédé 267
Appendix 3:  Coding Strategies 3: Long cells: ............... 279
  including row numberings & pictures ................... 280
  Montpellier Codex folio 1 in dots ..................... 297
Appendix 4:  Pictures of brailling equipment ................ 301
Bibliography ............................................. 315
LIST OF ILLUSTRATIONS

'Deus in adiutorium' (F-Mo H196, f. 1) .................. 76
Table of Ligatures ........................................... 84
Rivafrecha, 'Salve regina' (E-Sc 5-5-20, f. 25") ........ 92
[Fantasia for lute] (GB-Eu Dc. 5. 125) .................. 118
Couperin, F., 'Les Nations', figured bass part ............ 136
Braille, L., Procédé, 1829 title page ..................... 266

(This is a visual version, shadows of the original raised letters, no ink was used.)

Appendix 4, various equipment ......................... 301 - 315
FOREWORD

This work, like many before it, has sprung from the strong desire to meet a need, and curiosity aroused in the course of devising the solutions and means of meeting it.

The particular perceived need was for accurate musicological data to be available to those citizens who happen to be blind, and whose literacy medium is braille their (our) right of access to educational, cultural, and intellectual resources. Louis Braille gave us the first means; now we must add to his work such codes as suit the needs of our own time and situation. Music has always been one of the areas of strong interest to blind people, and it is highly desirable that we can also participate in the present flowering of musicological study.

Curiosity prompted a thorough investigation of what makes Braille's ground-breaking codes, and my new ones, effective; tactually and codicologically. Teaching and learning of braille has normally been very goal-directed — towards fluent reading and writing for the blind, or toward accurate transcribing for the sighted. Questions which are more basic philosophically, are typically not asked by either of these groups of learners.

This investigation also prompted translation of Braille's 1829 Method — the first exposition of his dot codes — and some study of his life and times. The former appears in the Appendices.

As described in much more detail later, there is a compelling need for more symbols in braille: the original set of 64 cannot continue to carry all knowledge. Already each symbol is used for many different meanings and purposes, as the identical signs must be re-used in each code. We must have some new shapes for new meanings, so as to have access to new knowledge, while keeping the present codes intact and functioning well.

We also need some new thoughts about how we use what we already have: making sure that braille continues to empower us into the 21st century. It was impossible not to comment on some of these issues in the course of the study: as they are so deeply relevant to our lives, and are not necessarily evident to an outsider.

Sometimes matters have had to be stated more than once, as they arise in different contexts: the demands of clarity have been given precedence over occasional minor redundancy.

* * *
The entire present braille system has only 64 characters: that is all that can be had with combinations of six dots. One is absence of all dots, the space. That is, only combinations, not permutations can be had, since dots 2 3 feel just like dots 3 2. Put another way, there are only six dot-locations, and only the binary code of a dot or not-a-dot in each. See the second page of Chapter 6, analysis of Literary Braille, for the full Braille Code Statement picture: where all the 63 possible patterns are set out. A loose card of this page is also provided, for reader convenience.

These 63 signs are coded intensively, used and re-used in every kind of braille code. There comes a point where a new meaning cannot be expressed, because of the complexity of ambiguities among all the possible meanings already attached to each sign— even though all of these are individually severely governed, to try to preserve clarity in all their different natural contexts.

If we need any more specialist codes — and we do — new signs will have to be made available somehow. In my field, music, there was no way for a blind person to have proper access to either early music notations and manuscripts, or avant-garde scores: since neither of these can be brailed in the normal Braille Music Code. Symbologies and conventions are just too different.

This consciousness has been the propeller for the present study: first making available the riches of early music manuscripts, because of their great intrinsic interest; but then to consider tactile coding itself, and its effective methodologies. It is most unlikely that these would be evident to those who use vision and do not depend on their sense of touch.

WAYS OF EXTENDING BRAILLE:

To begin to get your eye into gear for braille, here is this heading written in (simulated, non-tactile) braille. The third letter, y, gives almost the whole cell, likewise the fifth, the sign for 'OF'; only one dot location empty. The last word has three cells, then punctuation, since 'brl' = 'braille'.

WAYS OF EXTENDING BRL

Dr. Emerson Foulke, an eminent blind psychologist in charge of the Perceptual Alternatives Laboratory attached to the University of Louisville, Kentucky, carried out a body of experiments on tactual perception of extended dot configurations, i.e. shapes consisting of more rows and/or more columns than the normal braille cell, to determine their legibility. The results were very positive:
The experiment reported ... evaluates the legibility of dot patterns that can be made available by either of two logical extensions of the standard braille cell — the addition of two dot locations by the incorporation of an additional row in the braille cell, and the addition of three dot locations by the incorporation of an additional column to the braille cell. The results of this experiment indicate that, in general, either extension provides dot patterns that can be recognized and identified with enough speed and accuracy to warrant their consideration for inclusion in an expanded braille code. [Foulke 1973:iii]

My informal experiments in the early 1980's, confirmed ease and accuracy criteria. They were done on various blind friends, and on the children I was teaching at the two blind schools in Melbourne: St. Paul's School for the Blind and Visually Handicapped, and the Royal Victorian Institute for the Blind school. Both adults and children described clearly and without hesitation, the features of the notes and ligature-shapes from a folio of the Montpellier manuscript, [F-Mo H 196] that I had represented as closely as possible in dots with a 16 dot matrix.

(The particular folio is used as the facsimile example for Chapter 2, HEXIMUS Code; and dot pictures of it appear at the end of Appendix 3. See also the Equipment Appendix for the specially built 16-dot frame on which it was first written out.)

Thus encouraged, I set about developing complete codes for the several areas that seemed most urgent, and for which I had

(a) enough sight, with photocopier enlargement, to study the sources; not all of which are available in high-quality copies which will enlarge effectively, and

(b) enough opportunity, other interested musicians around me, with whom to play the music; so as to become a sufficiently knowledgeable and fluent user for the task.

Much of this work was completed by 1985, when Long Service Leave offered me the opportunity, for six months, to present my work overseas, to many blind individuals, and schools and centres for the blind. Since then, several trips to overseas manuscript libraries have tried to ensure that my codes contain signs and strategies sufficient for the expression of all the material within the ranges specified. More codes are needed, for notations outside these limits; this can be a task for some other enthusiast.

With work, teaching, lecturing, concert-giving etc. it was then several more years before higher degree candidature was offered, and the related work on implicit coding methods of braille begun.

This analysis, like the musicological codes, is new work; and I believe, has brought out quite new understandings. Indeed, the understandings mostly came out of attempts to devise the new codes. Sets which seemed fine and promising intellectually would
unaccountably fall apart for tactile reasons at certain places. Thus, from the experiential evidence of what I found difficult to feel, came the realization of how tactile codes need to be internally organized.

The full discussion which culminates in an understanding of coding strategies, is given for Literary Braille. It is based on the English Primer and rules, which although slightly amended from time to time, have been in use consistently since the 1920s. It has been prepared from the point of view and the manuals of the 1960s and 70s, but includes those rephrasings and terminology differences which are introduced in the 1992 documents. The strategies are not affected by these minor differences in documentation.

An additional group of strategies emerged from the study of Braille Music Code. However, the corresponding analytical chapter concerning music has had to be left out, for reasons of bulk. It is hoped that the parts excerpted give enough information for a general understanding of those strategies.

The study took into account all the signs and rules that I have known about in thirty years of working with, and teaching, braille music; up to and including the proposals in the Second Draft Manual of 1993, prepared by Bettye Krolick of USA for the International Committee. Her work will be carried to fruition by several countries, to produce the final Braille Music Code Manual in print and braille in the next few months.

The previous music code authorities, Spanner 1956 for English-speaking countries, and Reuss 1964 for the rest of Europe, were based on agreements reached at the Paris conference of 1954. Before that, our practice was based on the 1922 Key: so as can be seen, braille moves quite slowly. It is, after all, still almost entirely Louis Braille's code. My codes flow on from braille music, but are deliberately quite distinct from it.

Four of the new musicological codes are here presented, along with these other matters just mentioned. They are ready for immediate use by blind students and professionals, and I welcome communication from such people. One of the strongest reasons for presenting this work through a university was to make the codes known in that context — since it is the context in which most students come upon early music manuscripts for the first time. Obviously these codes can only be useful if they are known to exist!

THE REASON FOR PART TWO

Until now, nobody who is not themselves blind, has managed to devise full, usable codes suitable for the majority of other braille-users to share. In the course of living, many blind people and their non-blind friends develop small or partial codes for the recording of information of interest to them, and these work perfectly well in their limited situation. Here the
context of people and activities gives the support for the non-recorded part — that which the protagonists all know, or take for granted, or can ask each other, and so have no need to record.

These are true purpose-built codes, but contain many 'blank areas', so are not readily transferable. Because braille is already so intensively coded, and there are no signs available to use which have not already been used a great deal, it is virtually impossible to come 'cold' to someone else's code and be able to work it out. One has to be told the sign-meanings adopted, and instructed in the conventions observed, as well as the non-notated meanings. Otherwise the possibilities are endless of what it might all mean.

To develop fully integrated codes is quite a difference of magnitude from the above, where information is efficient and sufficient for anyone in the probable clientele of a knowledge area. Obviously it would be tedious for the genuine clientele, to encode what all interested in the knowledge area will already understand, although those outside it may not. That is just to acknowledge that almost any code is a form of shorthand — consisting of the appropriate essentials for its users.

But we have a 'catch 22' situation: if blind people are the only ones who can understand tactility well enough to devise adequate codes, how, before such devising, do blind people learn the information, how can we become fluent in the field of inquiry? One can never say with safety that something cannot be done — but it is not easy!! and would have to wait for very gifted individuals to do it.

If on the other hand, we can show forth the essential coding strategies which underlie the present codes, causing them to work, then a much wider variety of people could approach the matter of devising usable codes for us, and thus open opportunities for study and work that do not presently exist. The benefits of this would work two ways: broadening the range of options for those citizens who happen to be blind, and giving other disciplines the power of our potential considerable intellectual input.

With an understanding of 'Codeworks' I believe this is quite possible. Checking with a 'real braille user' will always be essential for many things: but in this way much of the groundwork of a new code's design could be prepared, a good many decisions made and traps avoided.

* * *

In the whole study, there has had to be explanation of braille matters which would be unnecessary if the reader were familiar with these. If the topic were a more 'standard musicological' one, all this space could have been saved, since the area would already be familiar to readers. Braille pictures are almost real size, consequently they take up a good deal of space: but it is
believed they will be helpful enough to a reader to justify their inclusion. So the document is unavoidably a little longer. Please believe that every effort has been made to be concise.

* * *

CONCLUSION

Consideration ought to be given to how to extend the symbol-set of braille. From all the foregoing it is clear that however ingeniously used, the 63 positive symbols need support. New knowledge areas need new codes, which will be much more accessible with some new signs, and codes devised specifically around these, to suit the internal meaning imperatives of the knowledge area.

If the material they must express is simple, maybe re-assignment of existing patterns is adequate. But if complex, demanding a good many different signs, they really need to include long cells, thus distinguishing these new meanings from all the previously known ones. And if pictorial elements are part of the material, new long-cell patterns are certainly better suited to expressing these.

Musicological study is a very natural flow-on for musical blind students, so codes in this area have a good chance of being found really useful. And because there are usually enough numbers in the field of music, the codes may be widely enough spread to act as practical and conceptual models for other long-cell codes.

New codes, naturally, are chiefly needed in 'new' knowledge areas: i.e. areas presently less available to us than to sighted people. So we would have more hope of a code being devised in co-operation with us, if both we and those sighted people with the subject knowledge had some reliable structures to begin with. Certainly without such structures, the possibility must be deemed more remote.

* * *

ORGANIZATION AND PROCEDURE

The Introduction concerns braille: a gathering of information of a general nature to make a context for specialist codes, such as these new musicological codes, and more about long cells. Anyone thoroughly familiar with braille may not need the background section of the introduction.

Preliminary comments and the new musicological codes themselves constitute Part One, Chapters 1-5. The code booklets are of course available separately in braille to potential users.

Part Two then contains the studies of how present braille works codicologically and tactually. It begins with particular reference to basic issues, such as would apply to all dot-pattern codes, chapter 6: then examines those exemplified by language,
in this case English literary braille, in chapter 7. Relevant aspects of touch perception are considered in chapter 8. All the coding strategies thus found and discussed, and collectively called 'Codeworks', are then put into chapter 9 by themselves, for easier reference.

Chapters 10-12 concern braille music code: chapter 10 underlying coding construction, chapter 11 the extra strategies it employs, in addition to most of the strategies which apply for literary code. These are called 'Musi-codeworks'. Chapter 12 is the quick reference list of these, corresponding to chapter 9.

Appendices give the usual relevant 'extras'; the first, staff notation of the braille music examples. Appendix 2 is a translation of the 1829 Procédé by Louis Braille, his first exposé of his codes. It seems unlikely that it would not have been translated from the French and made available long before now: yet as I can find no trace of it, it is included here. Some of it is what we still use, other parts not: it was a brilliant beginning.

Appendix 3 gives very briefly some extra matters concerning long cells, and a taxonomy for 8 and 10-dot patterns. Also dot pictures of a HEXIMUS transcript from the Montpellier Codex. Appendix 4 offers pictures of the special equipment used in developing my long cell codes, and also some of the ordinary braille hand-frames and machines as used everywhere.

* * * * *

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You all know why you are here. And there are always so many others whose thought and goodwill and special skills are also written into what appears. I honour you all, and hope our combined efforts will enhance the opportunities for pleasure and professional growth of those musicians who depend upon braille.
INTRODUCTION

BACKGROUND TO BRAILLE

This Introduction is designed mostly for the reader who is not familiar with braille: the code, its ways, and its use and distribution. Entirely new codes such as those propagated here, chapters 1-5, and the coding strategies implicit in regular braille, chapters 6-12, could hardly be understood without some such discussion. Some common abbreviations and definitions are given on page 29. For the reader who does already know these things, indulgence is craved for restating the familiar.

Braille is the 'proper' international system of literacy for capable blind people; containing within its ambit codes for music, mathematics, and other physical sciences, as well as normal literacy in each language. That is, it has gradually supplanted all other tactile scripts because of its demonstrable functional superiority.

To reach each language has been a major operation, and has taken more than a hundred years to complete. Final large-scale efforts were made by UNESCO fifty years ago. Called the 'World Uniformity Program', it brought 'codified braille to a hundred languages and hundreds of dialects' after a request from India to do so in 1949. [Bickel 1988:150-151] In Europe it had already been almost totally accepted since the World Congress for the Blind in 1878. Its adoption has occurred at different times in different places, depending on a multitude of factors. But there is no question that it had been crafted to perfection by Louis Braille and his fellow blind students and teachers at the Paris Institution from the 1820's to 1840's.

State capital cities usually have a Braille Library: which may also contain 'Talking Books', Large Print books, and various taped materials, for the blind citizens of the area. In some countries these non-braille materials are now quite widely spread through regular libraries as well: but braille is too specialized to be satisfactorily decentralized. Up-to-date borrowing arrangements interstate and internationally are in place, as for other specialist libraries.

Schools and centres for the blind may have quite extensive braille libraries, and libraries of braille music: also extensive brailling facilities to get books and music to their students and clients. As an example, RVIBEC in Melbourne, has a permanent staff of 15 involved in braille production: this services all Victorian braille-using students, and does some other work for smaller (in population) Australian states.

Printing presses of places like the Royal National Institute for the Blind, London, have a high reputation and a world market for their books. Many of the RNIB's operations, including braille production, have actually been moved north to Peterborough in recent years.
Though infinitesimal in relation to the range of print magazines, there are nevertheless several hundred magazines published in braille throughout the world, in the languages to serve their peoples. Like any minority group, blind people tend to have strong identity, an active oral contact 'grape-vine', and large well-organized conferences to keep abreast, share resources and ideas, and plan strategies for our benefit. Probably because of braille, blind people have been one of the most articulate of disability groups claiming full equality and professional opportunity.

A Hint of History

Louis Braille was born in 1809. He was blinded in 1812, enrolled in the Paris blind school in 1819, and as one of the bright students, chosen to test Barbier's dotted cards in 1821. By 1824 he had evolved his own superior, more practical code, which was suppressed by the authorities with varying degrees of ferocity until after his death in 1852. Many of us cannot help but feel a passionate solidarity with this remarkable man, much of whose 43 years was spent chronically ill with tuberculosis. One can hardly imagine how he and the other blind tutors managed to perform an incredibly heavy teaching load and supervision duties while almost starved, let alone producing the new code.

The serious attempt to provide whole books for blind people, in raised characters to be felt by the fingers, seems to only start with Valentin Haüy in the 1770's. At first the characters used were raised letter shapes, which are extremely difficult to identify by touch. The volumes were huge, few, and of course located only in the few blind asylums and schools. Such was the conservatism there, and determination of some of the administrators to 'regularize' blind people, and forbid them their own efficient-to-touch alphabet, that these patently less successful scripts persisted into this century in some countries — e.g. United States of America, which finally used braille all over by about 1920 — nearly 70 years after Louis Braille's death.

Whereas others may learn to read from general materials around them, braille has the vulnerability of any minority group's medium — one can only acquire it, or learn it, by deliberative intent and special arrangements. One is not likely to meet braille by chance. We need to defend our right to be taught it, and to preserve some acknowledged expertise. After all, the State provides literacy education to its other children: so it follows that literacy should be a right, not a privilege, for blind children also.

It is important to use capable blind people in all areas of blind welfare, but especially in the teaching of braille: because the sense of touch is so unlike vision. And literacy is such an empowering thing to teach people, it is effort and money well spent by the community. Blind citizens have a high rate of independence and productivity; for instance, academia and the professions are peppered with gifted braille users.
Naturally a continuing supply of professional materials must be produced in braille for such people. Personal readers, tape, and in modern times computer voice output, are also used by most professional blind people. But for some things, a braille copy is essential. How would you be without any of your books?

Groups of blind people have often worked hard to get these brailling services agreed to, and put in place by the big charitable agencies. For any blind student, having to write out their own books, or even make arrangements for others to braille them, is obviously an enormous burden.

Fortunately the braille system is so interesting, that volunteers can almost always be found who enjoy transcribing books into braille. This has been by far the largest and best source of material for us historically, rather than the big agencies for the blind. It is greatly valued.

* * *

OTHER CODES

Have there been other good codes? Not really, as far as I can tell.

Knots in string, blocks and stones, sewn shapes on fabric, bent reeds ... who knows how many ingenuous fairly temporary ways have been tried of making something known pictorially-but-tactually to a blind person. Louis Braille's father made alphabet and number shapes with upholstery tacks hammered into board, after Louis was blinded.

In Germany, Hardsdorffer tried for years to make a script based on raised geometric shapes. A host of codes in many countries were based on raised print letters, variously modified to slightly ease the burden of identification by touch: e.g. the scripts by Gall of Edinburgh, Alston of Glasgow. Some scripts used hooks and lines reminiscent of shorthand: e.g. Lucas of Bristol, Frere, and Moon. Some were based somewhat on Louis Braille's - like 'German Braille' or 'New York Point', but less effective overall, and gradually consigned to oblivion.

An improvement on raised letters was the code of William Moon of Brighton, probably developed in the 1830's, using lines, hooks, right-angles and circles. It has continued to have a small readership, for which RNIB Moon Branch produces materials. It was always a read-only code, there was no way a blind person could make the shapes themselves onto paper - until the early 1980's when some schoolboys in Kent, as a special project, designed a Moonwriter. ['Moonwriter' New Beacon 1986:8]

The chances of it being found widely useful seem remote: certainly there has been no more mention of Moon in the journals since the two fairly thorough articles in New Beacon: Tobin and Hill 1984:173-6, and Maley 1987:109-113. Many of us can read Moon, though have no occasion to wish to, except code research.
One of the prime movers to get the best touch-reading code adopted in England in the 1880's was Dr. Thomas Rhodes Armitage, a person in just the right position to spearhead such a project. Becoming blind in vigorous middle age, he drew together his own council of blind people, and founded the British and Foreign Society for Improving Embossed Literature for the Blind. (This eventually became the RNIB of today.)

This council set out specifications: the adopted code must
- suit the needs of blind people
- be applicable to many languages
- be capable of expressing music.

[see Bickel 1988:149-150]

Apparently there had been a spate of raised scripts developed in England from about 1825 to 1840, perhaps in response to prize-money being offered for the best one. Most of them were developed by printers, who had a somewhat similar range of materials available to them; thus many letters used opposite shapes in different script-systems. A horizontal semicircle facing upwards stood for m in Lucas, p in Frere, and w in Moon: a horizontal line, for s, n, and t, respectively, etc. No-one known to me has ever had direct experience of these codes, but one shudders at the difficulties of identifying many of the signs; for instance, three different-sized C-shapes for letters c d e in Lucas.

Frere 'devised a cheap and very ingenious method of setting-up and stereotyping his books. The letters, formed of copper wire, are laid on a tin plate, previously washed over with a solution of zinc: when heat is applied to the under-surface, the letter becomes soldered on to the plate, and such plates produce extremely good printing.' [Patrick 1924:229] Moon apparently then used this method too: and like Frere, his script used 'boustrophedon', alternate lines reading right-to-left. This apparently does not really work on the Moonwriter.

It seems possible that Louis Braille's work actually woke people up to books for the blind. Of course the sighted were not interested in his method, but all this sudden rush of effort may have stemmed from people 'seeing the books in Paris'. It seems to have caught the public's imagination.

The situation must have been chaotic indeed for those few years: no wonder Dr.- Armitage and his band worked so hard for rationalization. Each person on his committee knew at least three of the current codes or scripts: Braille's system was the one chosen. Its greater effectiveness is incontrovertible.

* * * * *
SOME FACTS AND EXIGENCIES

Braille is Full Literacy, and expects to express the highest demands of full literacy. However, like all language, it can be used at any level, to suit the interests, needs and capabilities of its different users. Braille can be written, as well as read, by a blind person.

Unlike visual reading, the perceptual interface, touch perceiving itself, is the hardest part of braille. It has often been noted that the fastest readers are usually those who began in early childhood. But it is not true that all who begin early read extremely fast. And obviously many who begin later can still achieve a competent fluency that makes the activity thoroughly worthwhile. In any small sample such as the number of totally blind people, there are marked individual differences.

Notwithstanding the other possibilities of acquiring and using information in modern times, the benefit of literacy must still be acknowledged as primary, and those without it, as at a disadvantage. One can probably say that, to read, it would be easier to have sight than not to; but if one does not, one should have the right to the tactile substitute of maximum efficiency. And the right to effective, empowering codes in all possible areas of academic and other study: hence this whole project preparing and propagating new musicological codes. And there is a corollary: to be defended from the imposition of ineffective codes, especially those chosen by the sighted, without regard for tactility.

In the days of blind schools, this right to braille would never need to be said; as it is quite obvious watching children and blind teachers work, how essential and effective braille is. But now in Western society, blind students are more often 'integrated' — in reality isolated — in regular schools without anyone nearby with the least understanding of braille. Naturally it is in danger of being misunderstood, and avoided because of being so unfamiliar to regular teachers.

And students are not necessarily in a position to know what is being denied them; or have the power to demand, even if they did. They sometimes find braille hard too, when it is poorly taught, by those who have no knowledge of appropriate methodologies for touch.

And although in principle the books requested by their teachers are transcribed into braille, and provided in time, there are many hazards and mis-matches in practice — making it less easy for them to be comfortable and efficient with their copies. If other students were given twenty minutes a week from a visiting teacher to learn to read, they would probably experience similar difficulties! Indeed, that such a system can work at all — minimal teaching availability for literacy acquisition and efficient use — bears witness to the enormous effectiveness of braille.
A LITTLE ABOUT THE CODE:

To increase its efficiency there are many short-forms in braille: 'braille' here meaning 'Standard English Braille, Grade Two'. This means the agreed set of contractions and abbreviated words, as set out in the Primer. It is used for all published and transcribed braille. 'Grade One' is letters, numbers and punctuation only; it may be used for beginning foreign language study etc. Grade Two is the norm. In it:

Each single letter stands alone for a full word

Common letter-groups have a sign of their own

One set of signs is used to place before other letters and signs to modify them, and stand for some more common words and common endings

Word abbreviations are made up of a few letters or signs

This abbreviating helps 'close the gap' in speed of perception between sight and touch; it makes more information available for the same time and effort of touch-contact. Right-brain recognition can more readily occur, as with the shape of print words, which can be seen as a unity, a 'gestalt' or picture. This kind of perceiving is much more comfortable and immediate than having to recognize components separately, and add them up to work out a word. One might compare this contraction with sign languages, where the full meaning may be contained in a single gesture. [Maxwell 1992:3]

Contraction and abbreviation are vital aspects of braille - they empower its users. [See also Foulke 1973:307]

There are also context-dependent signs which are absorbed quite naturally with the reading-matter. One may not be conscious of the structures and strictures that preserve clarity in any code or language, when just using it. Clearly all of the 63 characters are recognizable to touch, haptically discriminable; a few, for instance the single columns, need some context.

Almost every sign is used in several ways in each code. Short forms are somewhat arbitrary, in the sense that an agreed symbol is chosen, just as it is in print symbologies. Some detailed examples will illustrate the idea.

All contractions and abbreviations are for common, frequently-occurring words; and there is a general underlying logic in symbol choice for them. The sentence 'But can I be like you?' appears in braille as all single characters.

```
b c i BE l y?
```
Capitalization indicates contracted forms, a convention used in braille textbooks. In this case, letter b in the lower cell, dots 23, stands for BE when used alone.

Dot 5-m means 'mother'; not 'motorbike' or 'macaroni' or 'music' or something else. Standard English Braille is all fixed, for accuracy; one simply learns these signs.

It is spelling-based so that the contraction for THE can be used in 'gather' or 'Matthew' as well as alone for the word 'the'.

A letter f alone stands for 'from'; but f in the lower cell (dots 2-3-5) stands for the preposition 'to' at the beginning of a word, for 'ff' in the middle, and for an exclamation mark at the end of a word.

Dots 3-4-5-6 as an initial sign turn letters a-j into numerals 1-0; whereas if this dot-pattern occurs as a medial or terminal sign, in a literary context, it stands for the letter-group -BLE.

Such matters are more fully discussed in the Coding Strategies.

As can be seen — like English spelling, or Latin grammar, or Chinese pronunciation — braille is actually quite complex. Like all of the above, it is managed by millions, so can't be impossible in its context: but it is complex. And without some idea of this, it would hardly be possible to read about the new codes with proper understanding.

* * * * *

Most of the details above refer to Literary Code: all the same signs have more and multiple meanings in other codes such as Mathematics or Music Code. And this means you must expect every code 'on the way up' - for instance music will still contain words, headings, instructions etc. - so the codes are usually to some extent intermingled in practice.

There is no similar difficulty in print, as the sets of signs are preselected and dissimilar. That is, a letter does not look like a note, nor look like a figure, nor like a certain particular convention of letter. In braille, in addition to a small sign-bank, there is no way to make such distinctions of size or script, spacing or colour.

So there are special demands on the user who needs to be fluent in these extra codes.

Like any code, braille works best, the closer it is to its conception, representing what it was designed to represent. If it must be used to represent more extended meanings, those not originally intended or provided for, it works much less well. How can it be made clear to a reader what level of modification
is to be carried by a sign, without a lot of extra tedium of explanation? It still has to carry its old meaning too.

Under present circumstances it cannot just be modified — e.g. with a different dot-face, or other recognizable shape-distinguishing device, which could make a distinction between a sign used in a known way from one used in a new way — all shapes are used up, and that is that — if we stick to six dots.

Said another way: if symbol volume or complexity increases, more doubling-up is needed; there are no more signs, so in re-using the existing ones, a form of ambiguity is automatically created. There comes a point where this ambiguity from multi-meanings is untenable within existing codes. This has restricted our knowledge access.

* * *

There is a partial natural corrective to the ambiguities in reality. People are usually reading what interests them, and the expression of the particularities of a subject, even if they are actually quite complex, are usually readily understood. For instance, those who understand what knitting patterns are about, read the knitting patterns easily. Those who are reading music know what to think about and work it out. Those reading the football fixtures understand the subject matter, and suffer no comprehension problems. Coming to any of these areas 'cold', without any idea of the nature of the content, they could seem obscure — even in print, let alone in braille.

But there is still a limit on how much ambiguity can be carried: and we limit our knowledge if we must limit our codes. So we must stop limiting our codes, and have more shapes available by using extended cells.

* * *

WHY HAVE WE GOT STUCK ON SIX?

Mostly because of the difficulty of making any other shapes, I believe, it has not been possible for blind people to do the experimenting necessary to devise good extended-cell codes. The hand-frames and machinery for making the characters mostly preclude any variation of this in-built parameter. They have been designed to give good clear dots in a good clear cell-configuration on base-six.

One of the Marburg machines (made in Germany) is an exception: it can be set for different line breaks, one of which will take the new line right up to the bottom of the old line. This makes extended columns possible indefinitely down the page, in theory. But it was not very accurate, and tended to squash the dots in the lowest positions of the old line as the new ones were added in, so was not very satisfactory for long cell production. It is believed that the Austrians did have an 8-dot Shorthand machine at one time: evidently not made now.
Dots cannot be made just anywhere, or onto nothing. Only a carefully controlled match between a minuscule pestle and mortar, a mortar of exactly the right size to receive the pestle, results in the amount of paper deformation that will form a clear rounded dot. Any mis-match between these two objects on either side of the paper tears the fibres of the paper, resulting in a messy hole, with ragged edges. Combinations of such holes are usually unreadable — perhaps the tactile equivalent of a pile of white-out. They feel very bad.

So almost all new codes so far devised to represent different knowledge areas, and different symbologies, have chosen to re-use the same configurations in six. There really was not much choice.

* * *

Conceptually however, as already mentioned, braille need not be a closed system in six. Louis Braille would probably have been the first to utilize extended cells for new purposes. He certainly used patterns which were 6-deep in Barbier's original configurations, only 'twisting them back up' into two columns of three for ease of use. And he deliberately used a depth of only two dots for his Stenographic system. He was flexible! So there is no philosophical reason to abstain from extended cells.

Dr. Emerson Foulke, [Foulke 1973] among others, has shown that both longer cells and wider cells can be successfully discriminated by both braille-skilled and non-braille-skilled reading fingers, and informal experience certainly bears this out. So neither is there any tactile reason to abstain from extended cells.

It has been shown that both experienced and naive observers can tactually discriminate, recognize, and identify dot patterns formed in cells with as many as six rows and six columns of dot locations. A substantial number of the patterns that can be formed in cells with as many as four rows and four columns of dot locations can be recognized by touch with enough speed and accuracy to warrant consideration of their inclusion in an expanded touch reading code. [Foulke 1973:147]

His original bank of tests on blind and sighted subjects concerned matching two configurations of extended patterns, testing speed and accuracy of basic tactual recognition.

He was only able to use six braille-reading high school subjects for a final testing of cells with assigned meanings. Here 40 characters were chosen, 20 from a cell 3 x 3, 20 from a cell 4 x 2, (naturally using shapes which do not also occur in regular braille) and there was an attempt to compare the efficacy of 3 x 3 shapes with 4 x 2 shapes. The sample is really too small to show much; but his conclusion was that the best way for braille to grow is by proliferation of vertical columns, still of the depth of 3 as now.
My thesis is that the other alternative is vastly more practical and efficient, using long cells, and retaining the two-column structure of present braille. The intensive study of coding strategies, part two of the present work, illuminates why this is so. Two of the codes offered in part one show the long cells at work, and Appendix 3 completes some technical information.

Both 8 and 10 dot patterns feel good, offer a vastly enriched sign-bank, and can be used much more 'pictorially' as tactile indicators, making new styles of coding possible. However, these must still obey tactile perception laws, and not become confused with visual perception laws — hence the following detailed examination of how braille really works; see chapters 6-12.

Here follows a brief examination of the theoretical possibilities for cell extension.

* * *

WAYS OF EXTENDING THE
PRESENT 6 - DOT CELL CONFIGURATION

(1) Another column: 3 x 3, = 9-dot:

Several disadvantages:

1. This notion is in a way worked out already by the use of the Right-hand-side dots as in Codeworks 5: see chapter 6, page 164.

2. Horizontal orientation discrimination is not easy: even in regular braille, dots in a single column with a space each side can only be used as either one or the other column, since it would not always be possible tactually to perceive this difference. A single dot in the top row is agreed in the rules to be an 'a', not a dot 4 because of this. Displacement across an extra blank column would worsen this situation.

3. No machinery makes this possible at present.

4. Since your finger arrives first at the near (left) columns, the first judgement will give the established two-column sign, then that is found to be wrong, there are more dots ... everything added on the right negates what has just been found. This must happen to a small degree already, but since two columns seem able to be covered, perceived and mentally processed simultaneously, it seems wise to stay with that.

(2) Add dots above the cell:

Disadvantages:

1. It became clear when writing and reading back the original experiments, that the finger actually works 'from the top' as its primary line. This was an important discovery: it was quite
disorienting to have to re-think the shapes as basically in the lower cell and affixed above.

Also the orientation was difficult to feel when there were no affixes - unless there was a fully shaped 4-deep column - which of course there sometimes isn't - as in Codeworks 1, Row one IS only the top 4 dots - this means that 'normal' words and signs will not always have a three-deep to affix to.

2. No equipment at present: though this is not insurmountable, the same technique of moving the roller of the Perkins by hand was used as for the deep dots. However, then a distance of more than a normal line-depth has to be allowed for in advance, or it will crowd the line above. This proved hard to align in practice, with the machine's built-in lines.

3. It just feels backwards from how braille works, 'reading against the grain', somehow: going off the top of the finger, off the edge of the tactile field. In contrast, dots below are still under the finger, against the skin, will not be 'lost' as the finger moves along at a certain level.

(3) Adding dots below:

This turns out to be the best answer:

1. It does not disturb the codicological method of all present braille codes, working from the top and adding: as in Codeworks 1 & 5, see pages 153, 164

2. It means you feel the modifier at the same moment as you feel the basic shape, so do not make any wrong judgement first

3. It takes the same time to read as present braille because of being 'in the existing space' - that is, an extra column on the right, as in 3 x 3, must take more movement and therefore more touch-time overall. This would be especially so if applying to a whole row of such cells, one has had to travel further to cover them. This is before considering intellectual recognition time.

4. It is more possible on common machines not designed for it, and is now in the concept of modern machines, e.g. the Mountbatten Brailler.

5. On many more subjects than Foulke was able to use, it has been tested. Both in the context of an early music notation built upon it, in my pilot study, and in a general reading context, it has been found satisfactory. See the Mittagong Tests below for the latter.

Events have also showed its efficacy incidentally, by its use as a cursor on the 'Navigator' braille display device, which is used as a computer screen read-out by blind operators.

* * *

19
DIFFERENT SYMBOLOGIES

Early music notations present several significantly different symbologies. Some contain a certain degree of overlap with current music notational practice; or with literary or mathematical practice, in the case of letter and number codes.

It was going to be very problematic to express these notations using braille music code, or one of the braille mathematics codes. How could it be made clear which signs meant something very like one of their present meanings, and which were completely 'new' or outside what has been needed during the last two hundred years notationally, if the same sign had to be used?

Disturbance of the existing codes seemed a very bad idea, given the amount of context-dependence described above that is already built into them all, and with which users must cope. A simpler solution seemed to be completely new, purpose-built codes, for the specific notations having a significant literature of interest to musicologists.

Although this would still mean re-using many individual signs, the codes could be logical, well-integrated, and contain no superfluous signs, such as are inevitable in the more generalized codes like braille music, which need to express many different styles and informations. And if long cells were used, the 'feel' would be different enough to relieve the mind from a whole range of ambiguities, since such signs have no pre-existing meanings assigned to them. One is starting afresh. Hence the new codes which are the chief motivation of this project.

* * * * *

THE MITTAGONG

LONG-CELL TESTS, 1991

Because Foulke's extended-cell experimental materials were shapes without any assigned meaning, and presented in a fairly static manner to his test subjects, we did some testing in 1991 to demonstrate the efficacy of long cells in a more normal reading context.

Also, Foulke's subjects, sighted and blind, had to match two shapes containing variously complex formations, shown singly, as 'the same' or 'not the same'. The equipment looks as if there was really only room for one index finger to explore the contours and details of any shape. He also tried other perceptual possibilities, like rotating shapes somewhat; these, he found were very much harder for subjects to identify and match:

differential orientation degraded both the accuracy and speed of recognition [Foulke 1973:40]

The greatest number of braille-competent people assembled together in Australia is probably at the annual National Braille
Music Camp, Mittagong, New South Wales; so the tests were
carried out there, and afterwards with some more subjects in
Melbourne.

We used long cells for the character-names in a well-known story
as the test sheet, ten sentences, and a control sheet in regular
braille of another ten sentences. Individual times were recorded
for the reading aloud of each. Then the reading time of the
long-cell page was made into a percentage of that for the regular
page, since the point was not the actual reading speed, but
comparative ease of use. The music camp has a packed program,
so students and staff were slipped in for testing whenever they
could be spared from other activities during four days. An hour
was spent all together the night before individual testing began,
for opening the idea, and imaginative exploration of long-cell
picture-patterns without any assigned meaning, to demonstrate
some of the tactile possibilities.

We did not use anything that was not a potentially successful
communicating shape, so kept a strong vertical axis, such as
would empower reading. Informally for practice we used signs of
several depths, 8, 10, 12 dots, but in the test sheet, only 8-dot
shapes for the new characters.

The positive results reaffirmed that there was no tactile barrier
to developing specialist codes using extended cell patterns; or
to combining them freely with existing code patterns and shapes.
This was already known from the success of the new codes, which
did just that, but provided friendly corroboration. With 34
subjects, the corrected average time for reading the general
questions was 78.298 seconds, compared with 88.12 for the long-
cell page. Some subjects read the long cell page faster:
preumably because of the tactile efficiency of the shapes.

This was comparing signs known and used fluently over at least
several years, with those met only the night before, and with an
exposure of less than an hour, none of which time was used to
train for the signs, only to approach the idea. This sample was
as large as could ever be done in Australia, and considerably
larger than Foulke's. [Williams, Maxwell & Kelly 1991:10]

* * *

The early music codes were devised long before the tests and
I have wished to make them known and available. At every stage
in their development, they were tested on groups of blind
professionals, friends and colleagues, and adjustments made on
the basis of their responses. Fortunate coincidence brought
enough of such people together at once — a rare thing indeed —
since not every braille reader can cope with completely new codes
in a new knowledge area, such as mensural notation in this case,
learning enough about both in a few hours to make codicological*
evaluation possible.

* * *

21

* see page 325
Estimates of the proportion of blind people who actively use braille differ, and depend partly on each country's definition of 'blindness'. In Australia it is generous to low vision citizens; a visual acuity of less than 6/60ths permits entitlement to services.

However, that therefore includes a great many people whose sight is weak, but not nearly weak enough to need to use braille. ('Below 6/60ths' means what the normal eye can see at 60 metres, the 'blind person's eye' cannot see at 6 metres, even with all possible optical correction such as spectacles.) Many countries use a figure of visual acuity below 3/60ths; some 1/60th. If this last definition applies, almost all people in the category would need braille if they need literacy.

Even then, real life is variable. Some people who retain a tiny undamaged part of their visual system, may be able to see print, perhaps only a letter at a time, although they have almost no sight for moving around. Whereas those with macula losses may move around easily, and appear to have quite a deal of sight, but cannot read print, or perform other fine visual tasks. Simple figures as given above are not very accurately descriptive of visual performance, or therefore of visual disability level.

But braille readership is always quite a small percentage of those citizens who are 'blind', for reasons like the following.

1. The vast majority of blind people are elderly, and mostly lose sight gradually, and may never lose it all.

2. There is quite significant provision nowadays of large print books, and taped materials, as well as comprehensive general media, including RPH - Radio for the Print-Handicapped - so not everyone desires such active independent literacy as to learn braille.

3. For students and professional blind people, in economically privileged situations, computers, word processors, and scanners now have good voice output: this gives an access alternative for technical information.

For anyone of professional age who loses sight it is wise to choose literacy by learning braille - as it is a pity to be at any greater-than-necessary disadvantage. And many older people also do choose braille literacy over, or in addition to, the available alternatives. However, those who do not learn as young children rarely become really fast readers. And some people, e.g. some diabetics, cannot easily feel the dot-patterns due to losses in the more distal nerves and capillaries, affecting skin sensitivity; this naturally reduces reading efficiency.

* * *
Braille writing must be done on heavy paper or light cardboard, if it is to 'hold the dot' properly: the dots will disappear back into softer or thinner paper with the weight of the other pages, and pressure of the reading fingers. Obviously for ephemeral work, we all use scraps of anything, since such heavy paper is very expensive. Lucy Ching tells of having to use folded newspaper, in isolation as a child in China ... more than sobering for us to hear these stories.

A common way of duplicating braille over the last thirty years, was on plastic sheets moulded by steam-heat to the original paper copy, on the 'Thermoform' machine. These plastic sheets hold the dots against pressure, but are extremely heat-sensitive - nearly all teachers have tales of woe of books melted back into flatness from being in their cars for a few minutes too long on a sunny day!

Writing can be done with a variety of equipment from 'low-tech to hi-tech' - and as previously mentioned, all of it designed for six dots only, and most of it impossible to force any more from.

The humblest writing tools are the ingenious original hand-frames and pocket frames, Louis Braille's 'planchette' with 'stylet' to operate it. On these one must obviously 'write backwards': i.e. make downward dents in the paper with a little awl or stylus, so that when the sheet is turned over, there will be upward bumps in the right order for reading. (See Appendix 4 pictures, page 301.)

Automated writing in the form of braille machines are of many designs, but now normally upward-writing. The most ubiquitous is the Perkins Braillet, an excellent and sturdy American machine designed in the 1940's, and only now being somewhat replaced by computer-activated embossers. Perkins is a very famous blind school in Boston, Massachusetts - the equivalent of Ivy League in blind schools.

Blind students can use speech output on computer for regular literary matters, so processing their work before embossing or printing, just like other computer-users.

Some computers have special programs where certain keys are assigned a braille dot number, usually s-d-f and j-k-l from a Qwerty keyboard, so one can enter material as if braililing on a six-key braille. Or there may be a plug-in keyboard that looks like a braille machine, with just the dot-keys. This means that either literary or special codes can be entered; but naturally there is no voice output for the special codes, so no indication or check of what is going in.

Electronic equipment has been designed which can display from a computer screen, a few cells at a time: usually 1, 10 or 40 cells (which is one full braille line) called 'refreshable braille'. It is vastly expensive and only owned by the big
agencies, or situations of government subsidy. There are probably only 6 or 8 in Australia of the 40-cell ones, for instance.

The big agencies for the blind, and those who wish to sell computers, constantly assure the community of how wonderful technology is for blind people. But consider: how many sighted people would tolerate only this amount of their screen visible at once — 10 letters at a time, or 40, about half a line of normal screen? This is the best we ever get, remember, not the worst. Blind users of such equipment need to do a good deal more in their heads to compensate for the less ready reference of such a small display area.

An eight-dot brailler, the Mountbatten, is now being marketed: we argued loud and long to make this happen. Unfortunately its storage capacity is severely limited, a byte limit, and it will not hold more than 20 files; the plan was that one would copy such files onto another computer or word processor. However, as it will not save 8-dot material onto a regular computer, but breaks it down into 6 dots again, and cannot reconstitute them, effectively files cannot be saved. So one is not greatly better off than with hand-made copies on a Perkins; any paper copy can be kept, and laboriously thermoformed, a sheet at a time, if more copies are desired. This was very disappointing.

Some of the other features we badly wanted were not able to be done: like a 'graphics mode', and more than one size of dot, or 'dot-face', such that text could be distinguished from music, or quotes from text etc - both of these would have been enormously useful, and empowering to users. The main concern of the designers (quite reasonably) was to make their machine attachable to computers as an input or output device, for a price not prohibitive to blind individuals owning one - i.e. c. $2000.

Graphics 'picture braille' is just becoming available through scanners, early 1994; but that means only under visual control until printed. Still, this is exciting, it could be important for extending our access to knowledge. There will be a period when we learn how it can be made useful; there is much more to it than just raising up a picture — this is often tactually unintelligible.

NEW VENTURES AND NEEDS

With all our present codes already stuffed full of multiply-used signs, these signs simply cannot continue to be loaded with more and more meanings, without increasing the burden of ambiguity to the point of perplexity.

Put another way, this limit of 63 positive characters is no longer sufficient to express all the knowledge that is needed in modern life — any more than it would be for sighted people, who have, in contrast, an infinite array of signs available for their symbologies to express meaning. If there is a new meaning, it can have a new sign.
It seems therefore highly desirable that new codes should feel quite distinct from, and therefore not be confusible with, already-existing codes - which should be left alone to keep working well. New patterns or formats should be developed, and the greatest possible correlation provided with the regular expression of that knowledge-area, so the flow-on is as natural as possible.

Coding procedures should be kept as simple as practical, since such codes are not likely to be as everyday - and must be memorable with less use. Dots are known to be the clearest tactile signal, and all our available equipment is capable of making them, so we are talking of dot patterns.

Each new dot added will double the number of available patterns, i.e. can be combined with all existing patterns once. Thus 6 dots offer 64 combinations (one is no dots, a space), 7 will give 128, 8 256, 9 512, 10 1024, 11 2048, 12 4096 etc.

To use long cells is really coming back to an old concept. Captain Barbier's original 'night writing' which set Louis Braille and the other students on the path of discovery, had a depth of 6 dots per column. So obviously they were considered feelable, even by the tactually unskilled non-blind army captains for whom they were designed. One of the reasons they were reduced to a depth of three by Louis Braille, is that they were cumbersome to write and read, and so many signs were actually unnecessary - superfluous to requirements! For specific codes, with limited symbologies, this was true. And for army messages, wasting a bit of paper was not important, they would not be terribly long in any case. But whole books were a different matter, economy was essential: of movement in operation, reading or writing; and of paper, both for cost and bulk.

All this long cell material was radical when I first wrote it and took my examples to overseas blind schools in 1985. Now it is not, although no-one else to my knowledge has actually developed any hard-dot codes using an 8-dot base or larger. 'Hard-dot codes' mean those which produce real dots under the fingers. Computer Code is said to be 'in 8-dot' - but it apparently never comes out of the computer in that form, so never needs 8-dot embossing facilities. At our large centre, which prides itself on its specialized equipment, none of the embossers will accept or produce 8-dot material. But the concept is reasonably respectable now. Blind operators are using 8-dot patterns without comment in refreshable braille, on the 'Navigator' equipment, where the two extra lower dots act as a cursor.

It is important to develop 10's and 12's as well, 2 x 5-deep, and 2 x 6-deep: but on present equipment, it was too difficult to do this - it was difficult enough to force the machines to do 8. And indeed, the lower dots had to be used most sparingly in my codes because of the practical difficulties with accuracy when turning the roller of the Perkins brailer where it was never meant to go.
The Mountbatten braille machine that is capable of embossing 8 dots, can be extended with a little trouble. Since its line-break on one of the settings is exactly one dot-row deep, it can be set for 6-dot braille, emboss 8-dot – thereby filling up what would have been the line break – and line up the cells in the row below for 10 and 12. This means many more codes can be developed and experimented with, if anyone has the patience. The only problem is that they cannot be stored in that form, as explained above.

This extra length could be especially useful with avant-garde music, since the musical or performing idea is usually contained in the pictorial elements. So it would be really helpful if these could more nearly be shown 'uncoded', or as little coded as possible. Even if they cannot, with the greatly increased sign-bank, it will be possible to use signs that have not previously meant something else.

The same may also be true for ethno-musicological notations as well: someone may have an opportunity to study these areas sufficiently to make preliminary coding sketches, also for early Byzantine music. Notations like German organ tablature, and German Lute tablature are still crying out to be done: long cells would be very suitable for these codes. The codes already developed will be laid out in full in Part One, with their discussion.

Musicology is of enormous interest, and now need not be denied to blind students and professionals. A vast number of manuscripts are quite plain, and no problem to transcribe, once there is a suitable code to transcribe them into - a code which faithfully sets out what is on the manuscript, all ready for study. [Williams 1985]

It is also important to transcribe more samples of the significant literature into the new codes: e.g. in PASCO, the Mensural Notation code, more examples of Machaut, Landini, Jacopo, Dufay, etc. whereas in the case of LUTAB code, Francesco da Milano, Dalza, Dowland etc. Study materials are also necessary, e.g. how to read Ligatures. Some are done, of course, in all areas, but someone with better sight would be able to get more done than I can in such tasks. Now anyone else can do this transcribing, the codes are ready.

It has always been my aim to develop accurate, comfortable, and efficient tactile codes for any notations not available through the present systems: and to have them so integrated and logical, that they feel just as natural as the codes we have grown up with. Then braille users can bring their considerable talents to these areas.

* * *
SETTING THE SCENE FOR
GOOD NEW CODES

A mass of new signs or data does not by itself turn into new and beautiful codes: the component of how to relate it all arises. Methods of systematizing and relating signs are almost certainly best based on the Master's, and present braille habits and assumptions. So in Part Two there follows an analysis to find the principles embedded in existing codes, especially literary and music code. The latter, fortunately, is international, although it only applies to Western music. To date no comparable compilation seems to exist for the other musics of the world.

Hence this section: an investigation of what these principles and operating characteristics might be, and the reasons for them - haptic, psycho-linguistic, or codicological - because failure in any of these areas will mean failure of a new code. In other words, you have to be able to feel it, understand it, and remember it because it is part of a logical system. And you have to find it quick and comfortable in practical use, or you will not want to.

With the practical principles which have emerged from the analysis, perhaps others will undertake code development in their fields as I have in musicology.

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SO IN SUMMARY:

Drawing the threads together concerning the context and nature of this study:

The basic everyday codes - language literacy, maths and the sciences, (several different codes in some areas), computer code, music and its sub-codes - are done; complete, world-wide, and functioning pretty well:

However, in order to express many other areas of human knowledge, there is an urgent need for more signs. The best way to get these is to start using long cells in specialist codes. There are a great many things we do not presently have direct access to, and for which part of the reason is the difficulty of representing them properly in a tactile medium. New cell-shapes offer some strong possibilities.

In a practical sense, the most promising areas for growth are obviously those which flow on from a place which is already strong for blind people, where resources do exist and there is active culture. Music is just such an area, already vigorous; so ripe for the extra knowledge areas my new codes can provide. They are a beginning: offering PASCO for Mensural Notations, which of course covers an enormous and magnificent literature and repertoire spanning several hundred years; LUTAB, a code for
tablature of the golden age of lute and other plucked strings; FIGBY, figured bass code for baroque continuo playing; and several small codes to deal with aspects of essential study within these — HEXIMUS for pictorial features, SYLCO for syllable underlay etc. described in detail in Part One.

It seems reasonable to hope that this offering will be genuinely useful, opening up more manuscript study, and perhaps musicology as a profession for blind people interested in the early periods.

The other arm of the study, the exploratory analysis of two present braille codes, is of interest to quite a different clientele: those interested in coding procedure, those interested in tactility, and perhaps thoughtful braille-competent individuals.
NOTES & DEFINITIONS:


RVIB & RVIBEC = Royal Victorian Institute for the Blind, 557 St. Kilda Road, Melbourne, Australia, and its Education Centre at 333 Burwood Highway, Burwood 3125, where much of my research has been carried out.

SEB = Standard English Braille: Grade Two implied.

'Grade Two braille' means using the agreed set of contractions and abbreviated words, as set out in the Primer. It is used for all published and transcribed braille. New terminology appears in the 1992 Primer as follows:

- the term 'contraction' has been replaced by 'groupsign', and the term 'abbreviation' has been replaced by 'shortform'. [Primer 1992:v]

The older terms are more widely understood, so I have used them.

'Grade One braille' uses no contractions, only the letters, numerals and punctuation. It is far too cumbersome for normal reading, but is used for example in the beginning of foreign language learning texts - before the student is advanced enough to accept the contractions and rules of that language.

'Grade Three braille' is a more highly contracted form again, but the only people known to me to use it are elderly Americans; it was not used for publications.

Braille Code Textbooks are listed in the main bibliography. Each country has its own: Australia uses British systems chiefly, and American sometimes, and sometimes has its own mix.

* * *

BOC = Braille: User-Oriented Code, by Rebecca Maxwell. This is an add-on up-date to SEB being proposed to bring braille into our modern age. It helps students and professionals to keep up, and helps weaker readers and the newly-blind by having more short forms, which are easier to read, for words which are common now. The bulk of SEB was agreed upon in the 1920's, and very little has become redundant, but a good deal needs to be added to keep pace with language.

* * *

The Thermoform machine for braille duplication became available in the 1960's. Previously metal plates had had to be embossed and then paper put through a roller against them, which meant that most things were simply recopied by hand on paper if another
copy was needed. The Thermoform used plastic sheets moulded by steam: the braille-paper master copy had a sheet of plastic 'Braillon' placed over it and clamped, then an oven-top was pulled out over it for several seconds, and pushed away again when 'cooked' to take the whole thing apart for insertion of the next sheet.

The good news was that it would melt onto any shape at all, and could even cope with small objects like shells. The less good news was how labour-intensive it was to produce the copies, and that they could only be made from single-sided masters. Also the plastic was less pleasant to handle, bulky and floppy, an odd size, and inclined to get full of static electricity, and so jump around sticking to other pages, also causing more friction onto the reading hand.

We still have volunteers coming in to our centre to thermoform books and music for students, as there is an enormous library accumulated in this form before computer production was the usual way to produce material.

* * *

There are various computer translation programs for braille: the Duxbury Systems for IBM are widely used in America and here. They can either be used for 'direct entry' of braille, 'Edgar' program, when sdf-jkl keys are used like a brailler, producing a screen full of dots which can be word processed like other text, or used to translate words entered by normal qwerty typing. Special codes such as music must be entered directly via Edgar.

* * * * *

The 'Charter for the Blind of the World' was adopted at the conference of the International Federation of the Blind 1969, at the instigation of an eminent Australian, Hugh Jeffrey; also a music teacher, lecturer and broadcaster. This organization of (mostly) blind people had split off from the WCWB (World Council for the Welfare of the Blind), which it felt was too oriented to sighted people's version of service provision, and wanting much more self-determination for blind people. But eventually the two organizations re-united, together forming the World Blind Union of today.

______________________________________
PART ONE: ACTUAL NEW CODES

Chapter 1

This chapter contains first some discussion of what any new braille or dot code will need, then the more specific requirements for codes designed to offer Early Music Notations to blind students and professionals. Some prefatory material is then provided for each of the Code Booklets, which constitute chapters 2-5, since these are unavoidably written from a perspective of braille and braille music code competence.

The booklets, naturally, are the main source for all code information; signs, circumstances, and detailed knowledge necessary to a blind person wishing to embark on the particular field of study. As in the pilot publication, they are:

Main Introduction and HEXIMUS Code Booklet
PASCO Code Booklet
LUTAB Code Booklet
FIGBY Code Booklet

and were also made available together under the heading
"Making a Start on Braille Codes for Non-Standard Music Notations: Part One - Four Early Music Codes"
(Williams 1985)

They belong to an overall intention to provide braille / tactile copies for any and all kinds of music notation which cannot be represented by the international standard Braille Music Code. This includes avant-garde notations, etc, on which work has also been done - but that field is still too fluid for definitive codes to be developed. However, communication is warmly invited by interested blind users. Hirose Meditation and Waechter Joke are examples of avant-garde scores already transcribed.

* * *

WHAT ANY NEW CODE WILL NEED

Any new code will presume some attachment to existing knowledge, and some part of the braille code will show itself as suitable. The ideas should be built from whichever branch of braille this is, retaining its concepts and style where possible, with every effort being made to make the flow-on logical and easily accepted.

The retention of specific meanings for signs may or may not be possible. Sometimes a completely new set of characters is better, in long cells which can give the extended knowledge in its fuller logical order; sometimes using a broken series of partly old symbols and partly new works most naturally.

Characteristics must be decided for symbol sets. Long cells give an excellent opportunity to have distinguishing component-type markers, added to an otherwise regular (known) set - e.g. all
Greek letter signs be marked with a new long sign in a certain way, or all arrow signs showing a particular type of valency be part of a matching set. At present a Greek lambda can only be shown as an English l preceded by some general sign such as an italic or letter-sign; the user has to work out the intended meaning. There are no unused signs left to mark with.

The advantage of having more shapes is to be able to specifically distinguish each kind of information unit, rather than all signs having so many meanings as at present. One to one correspondence is practically unknown in braille, and makes 'working it out' much more tedious than for the same information in print symbologies, where each new meaning-symbol has a distinctive new shape.

In the case of my manuscript codes, obviously they presuppose some familiarity with, and skill in reading, the normal braille music code, since that would be the usual starting place for anyone interested in more specialist musics. So wherever possible, the regular coding features of Braille Music Code should be followed: sign-sets used in the same order, concepts given a clear - but only one stage different - meaning.

That is, if the meanings are too divergent, it is probably better to have new signs altogether. But if with one conceptual leap, a set in its sequence can hold good, we know from practical experience that it is going to be easier for a user to remember than a new list of signs not previously associated together. It must be understood that braille is 'all code' - any pattern could be used to stand for anything.

The number of people who read braille is already quite small compared with other literacies, so these specialist codes will be used by only smaller-still numbers of people. Therefore people who do use them will quite likely be isolated in their study from other blind people similarly interested, other potential users. So as a practicality, 'user friendliness' is crucial to their success: there is not likely to be anyone nearby to ask about the braille aspects of the knowledge area, whereas there more often would be for print-users. Codes must be usable completely independently to be found useful at all.

For this reason, their manner of expression should match as closely as possible the way in which other participants in that discipline speak of it, and record their observations. What matters is not so much the braille 'looking like' the equivalent printed expressions, but the verbal habits being similarly ordered in the braille expression.

Always the neater the better from a braille point of view, so for best results, the kind of signs chosen should be such as to facilitate their sequential writing, without the need for too many blank-cell breaks. For this, a mix of cell-types is best; i.e. upper, lower, long, right hand side signs, etc. to represent the different distinctions of the expression.
In choice of any specific sign, some have argued that similar features to the print sign may make correspondences and help more available to the braille user. But logical coding as above will be infinitely more helpful than this. If the coding itself is logical, any intelligent person can make at least some reliable deductions concerning signs. If not, anything could stand for anything, and each sign would have to be individually memorized, without any support at all from context. This would be foolish code-design.

Another desirable feature concerns difficulty. If possible the level of simplicity / complexity should be comparable between visual and tactile sources: a match with the kind of person who would normally use this kind of material, and this kind of code. If not, obviously a code is not likely to be used.

Now to focus in on the area of early music manuscripts, and the specific requirements for effective codes to represent them.

**MUSICOLOGICAL AND PRACTICAL NEEDS OF NEW CODES**

List of Parameters:

1. The codes must sufficiently faithfully represent manuscript sources to be adequate for musicological study, preparation of scholarly editions, authentic performances etc.

2. They must be 'user-friendly' - i.e. easily memorized codicologically, and not readily confusable with other codes in common use, such as braille music code.

3. They must be able to be produced domestically, without the need for extraordinary equipment, or great experts to do the transcribing; as these are not likely to be available.

4. They must be no more trouble to use than a braille music copy is now, and if possible offer the same fluency and speed as the original source does to sighted people.

5. They must cope with all the known manuscript sources of that type around the world. Since this is quite a tall order, small discussion notes or adjustments may be expected to be necessary.

6. They must follow speech patterns wherever possible, so it is equally obvious to the braille user as to the rest of the class, what is being spoken about by the lecturer.
7. They must be logically coded. What is significant must be isolated to codify, since there is no way to reproduce the actual variety of spatial features of hand-writing and layout found on manuscripts.

8. Possibly codes of different levels of rigour may be needed: i.e. rigour as to faithfulness to the above-mentioned orthographic features; since any two hands will contain trivial differences of calligraphy etc., which do not normally affect the meaning. Printing automatically suppresses most of these. But if their triviality is questioned, it would be good to have a way of presenting the original situation in more detail. (For instance, a transcript in PASCO may need a small doubtful area represented in HEXIMUS, and some sub-codes are suggested within PASCO for very precise text-placement information.)

9. The method of coding for the earlier manuscripts must be 'positive signal based', so that even fragments can be represented faithfully. (E.g. pitch cannot be determined if clefs are missing; so it is no good making a code which records specific pitches, thereby depending on always having this information.)

PREFATORY COMMENTS UPON THE FOUR NEW CODES:

For the full description of each code, please see the Code Booklets, which constitute the following four chapters. These Booklets are designed to be available in braille to potential users, and in print only for those sighted people who are closely associated with braille music, or with interested blind students or professionals. Clearly the material is addressed to blind people, to whom its usefulness is unique, and it must contain all that a blind person will need to know to pursue the area of study.

So each code booklet is viewed as a chrestomathy, and may contain a variety of information which a sighted person would learn from different kinds of sources, or from just handling the manuscripts. For instance, the reason for inclusion of various explanatory material - such as the other uses of the word 'tablature' in the LUTAB booklet, which may not seem directly relevant - is to make sure that blind students are defended from falling into some of the traps from reasonable assumptions which turn out not to be true. To arrive with a reader all ready for dictating some lute music, get hold of the book from the library, and then find it is not what was expected at all, even though called 'Intavolatura' is undermining and confusing, as well as time wasting. So I would rather alert the user to such things.
Similarly, as none of the usual references are in braille, I have quoted more lengthily than others would need to, from some of the standard sources, such as from C.P.E. Bach in the FIGBY booklet.

* * *

All those really using the booklets will be greatly helped by also studying the braille copies of works transcribed in each code; naturally these demonstrate the ideas more fully.

The booklets are not intended to be a complete self-teacher for the notations themselves, since such instructional material is already available. Also each institution will teach, say, mensural notation, slightly differently, depending on where it wishes to start historically, or what literature area it wishes to focus upon. They are intended to be the bridge into braille, for whatever the course-content happens to be.

The emphasis in HEXIMUS and PASCO is more on the needs of students in undergraduate university studies of early music, where manuscripts are first encountered, so they can learn the notations and 'do the set work' pertaining to manuscripts. Of course the codes will then carry them as far as they want to go - as with anyone else, once the notation is learned, the world of manuscripts is open.

Indeed it has been an object to make all the codes as easily and quickly learnable as possible. But if a study course is too brief, e.g. those which glance at the manuscript sources as they go, in the course of wider understandings of musical and cultural trends, it might scarcely be possible for a blind student to do all the work of learning a special code and transcribing the materials of study, in time to join in.

Where the code booklets would be insufficient, however, other material of a kind designed to be a self-teacher, has always been brailled. This is to cater for those who are not part of any organized course of study.

These preparatory comments therefore concern

1. Codicological considerations: things that showed up in the preparation of codes, decisions which went into the code design etc. This is so someone does not have to do it all again when approaching designing another code.

2. Musicological considerations, discussion of reasons from the wider literature, limits of applicability, areas awaiting research etc. This includes things that have had to be thought about, but which are not useful to someone beginning the study area, so are not included in the code booklets.

3. Those things which a blind person already knows, but those reading this work may not.
The appearance in schools and libraries of photocopiern capable of enlarging, provided a new world of access to those of us with poor sight. Great was our delight to find all the things we could now do because we could see them! They were made visible. Things could enter our world for the first time, and many practical things could be made a great deal easier.

Once we could see our instrumental parts, the burden of memorizing was enormously lightened; and it enabled casual participation in all sorts of amateur music groups, by simply stating on the enrolment form, 'large print copy please', or getting hold of the music in advance to make one ourselves. We could undertake many more tasks, because of being confident that we really had the information.

 Anything already in a large or spread-out format obviously could not be easily used this way - too many pages, hard to recombine without the resulting copy being too large to hold or see from top to bottom without moving one's body around it, too many turns, won't stand on a music stand etc. - so there were limits, but it was still a great 'enabler'.

I can remember the tremendous excitement of first seeing a medieval manuscript well enough to identify the shapes of its signs, and so appreciate its notation. It was a facsimile used as frontispiece to a modern edition of fourteenth-century Istampittas, (RISM siglum GB-Lbl Add. 29987) [Ulsamer 1978]. Here began the enthusiastic study of the originals, and the wish to make the same knowledge area available in braille.

As discussed elsewhere, Braille Music Code re-uses the signs of Literary Braille. To express music, it is already highly integrated internally, as well as considerably context-dependent. It really could not carry another major set of meanings - the characters in medieval notations - on these same signs without introducing confusion.

Not only individual signs, but some of the tenets upon which braille music code is built are too different from those operating in the early notations. Take something as basic as the expression of rhythm, for example: braille music code re-uses signs, thus depending on bar-lines to determine which value, greater or lesser, is intended. Bar-lines are mostly not present in early periods, so the whole way of expressing rhythm would have to be altered and re-thought. Since in braille music rhythm attaches to pitch, once you must take out such a major component, the whole code would be quite distorted - so would really have to be 'done again'. Other things too, seemed just too different to be re-using signs in a patched-up way.
New codes were going to be needed, preferably using shapes not previously assigned any meaning, for new meanings. The only way to provide this was larger cells. So I began experimenting with 16 dots, 4 x 4, in discrete cells, using a handframe designed and made by my late father, Fred Russell Williams, in his home workshop. It was brilliant and simple, and a tribute to his skills. See the pictures in the Equipment Appendix.

Like any handframe, this had to be used 'backwards', i.e. the dots had to be pushed downwards into the little saucer-points, so one wrote right-to-left, with the shapes in reverse. Then when the sheet of paper is turned over, the bumps to be felt are the right way round. Louis Braille describes this in his first presentation of his Method in 1829 - see translation in the Appendix. It works, but is labour-intensive ... and demanding of formidable concentration, especially when doing new things!

At the same time, it was important to try out patterns from horizontally-equidistant dots: so the Industrial Training department of RVIB (Royal Victorian Institute for the Blind) made a 'continuous 8-dot' guide. This looked like a regular hand-frame guide, but had the same distance between cells as between columns; so a shape of any width was possible, with depth of up to 4 dots.

These two hand-frames, now abandoned, were the beginning of understanding how tactile dot-codes really work - and how they can work best if more are developed. A fuller description of some of this occurs below, as "Codeworks", a study of English Literary Braille, which is then quick-listed as 'Coding Strategies 1'. Then 'Coding Strategies 2' gives the additional ones used in Braille Music Code.

My codes are all perfectly feasible on a Perkins Brailler, which is very widespread throughout the world. The roller must be moved up (down the page) to make the deep dots, a thing it was never meant to do; but anyone capable of reading medieval manuscripts should not find this prohibitively complex. An 8-dot brailler would be a boon when transcribing works into HEXIMUS however, because the low dots are constantly needed.

Preparatory Comments to HEXIMUS

There was obviously a need for a code which showed the plain shape of signs as they appear on manuscripts: a square shape for a square note, a line for a line, an oblique for an oblique, the forms of the ligatures, etc. There was no way to do the diamond-shape of semibreves, and it would all be rather approximate; but it was a case of seeing what could be done. Anything would be an advance on nothing. The manuscripts I knew at that time, like the Montpellier Codex (RISM F-Mo H 196), or the Manuscrit du Roi (RISM F-Pn fr. 844), had not such a large sign-bank, and a fairly square look, so it all seemed quite possible.
So the signs worked out then, and called HEXIMUS - 'hexadecimal music manuscript code' - can stand as an example; even though they only account directly for certain notations - the square-look ones - and the system may be totally inapplicable to some other early notations, especially those which use fluid cursive signs. Unless it turns out, with enough certainty to proceed, that their meanings are quite similar to the square-look meanings; in which case a good deal of coding might be shared, in spite of the very different visual appearance. This would certainly make them available sooner to a student, than waiting until a new code again is devised.

On the other hand, maybe nothing less than dot-graphics will be able to represent some of these cursive styles faithfully. But to be represented at all (pictorially), these would have to be very much enlarged. So it seems likely that they would still have to be specifically encoded; that is, a picture alone would not be sufficient to be efficient enough for a significant body of work to be prepared in them. For if someone needs to study the area, clearly they need a bank of information and musical examples, preferably in a code which can be easily written as well as read. For such coding, the ordinary 8 or 6-dot patterns would be the logical systems to use.

So the idea of visual correspondence is not always sustainable, except as an 'extra' to the real code information. Once there is expectation, coding is easier than pictures. But when expectation is too uncertain, HEXIMUS would have to be used: with the information provided as neutrally as possible, for study. After the advent of mensural notations, HEXIMUS may be useful for small chunks of disputed territory, or fragments, rather than for whole works, which are easier to prepare in PASCO. This is especially true if one is managing on a 6-dot machine.

Description would always have to go with a HEXIMUS piece or fragment, since if there is that degree of doubt, all information should be given which might offer clues to the context and nature of the manuscript.

* * * * *

As always, the actual stave cannot be shown. Tactile perception usually cannot discriminate lines through other lines, or the whole notion of superimposition, at all readily. This is partly just a fact of life for the sense of touch, but partly because there is no corresponding density difference in dots to relate the matching parts of the different signal-lines. Whereas visually a thinner line can be picked up as relating to the next bit of thinner line, its thinness distinguishing it from other thicker lines, it is not possible to make those differences presently in braille. And if one considers that visual superimposition is also much harder to perceive if all lines are of similar density and colour, this is not so surprising - a human perceptual phenomenon, not a defect of the sense of touch.
Even if better graphics become available, touch is not like vision. In any case, a stave is a clear notion; one loses nothing in comprehension whether it is actually there, or only understood to be there implicitly, and its meanings conveyed another way. They are all conveyed another way in braille codes. And in numerous manuscripts the stave-lines are faint to the point of disappearance in places, and most pitch heights are still discernible with a little practice. e.g. the songs in A Fifteenth Century Songbook [RISM GB-Cu 5943] [Rastall 1979]

The only problem occurs when something which was assumed to be known is questioned: then one needs the original information again for evaluation. To my knowledge no-one has yet questioned the nature and purpose of staves, in the context of Franconian and mensural notations; so the stave idea seems safe to regard as a given.

Caution is still advisable of course: some Iberian manuscripts which use a four-line 'stave' are actually tablatures of polyphony, where the lines each carry a polyphonic part in figures, or act as separation lines between the polyphonic parts. But since these hold numbers not notes, they are clearly tablatures, and if codes are devised for them, they will doubtless concentrate on showing the figures. Apel gives examples of these from Bermudo Declaracion de instrumentos musicales (Ossuna 1555), and Antonio da Cabezón Obras de musica para tecla, arpa y vihuela (Madrid 1578. [Apel 1942/61:49-53]

* * * *

The Continuous 8-dot idea:

When creating new codes, one explores amongst all the possible variations from what we already have: one variation was to use only equidistant columns. Originally, to express these manuscript note-shapes, my wish was to try out dot patterns of 4 x 4, 5 x 5, 6 x 6 dots etc, following on from the research project of Emerson Foulke. [Foulke 1973] However, it was so obvious once there was an equidistant 8-dot frame to experiment upon, that this was vastly less efficient and comfortable to use than the present two-column cell-sets, whose inter-cell gap is fractionally larger than the intra-cell gap between columns.

So these others were left to be theoretical possibilities only, while the practical codes were all based on long or regular cells using the current horizontal spacing parameters, the variation consisting of just extending them downwards for the 8-dot and 10-dot cells.

* * *

With equidistant columns, the most immediate problem was that there was no boundary to anything. In normal braille, the finger can feel by the spacing whether one is in the middle of a cell, or at the edge of it. Full blank columns had to be put in all over the place between signs just to separate them, whereas...
previously, unlike signs merely followed each other, distinct because of being in their own notional cell-space, after the very-slightly-wider intercell gap.

For instance: a common coding strategy of braille is to modify a sign by the preceding one, or the following one. If a full blank column had to be left between each sign, as the basic sign separator, then more blank columns, a wider gap, had to be left whenever such a pair had to be shown. That is, they had to be more separated from surrounding signs than from each other to make the relationship between them clear to the reading fingers.

This meant that at least a three-column - i.e. a more-than-two-column - gap had to be left for any actual space, since the break of two was already needed to make clear a relating-space. And there were always many different amounts of space on manuscripts to be made clear somehow. This need for more and more columns left blank, was making them too wide for the finger-pad to cover, while still being in contact with the dot-columns, which make space discriminable.

So this was quite a disaster. Distinguishing different amounts of wide, un-boundaried space is very difficult and inefficient by touch - like trying to work out 'non-signal' in any medium.

And for different amounts of meaning-break, as well as being too big to interpret tactually, the wide spaces became very wasteful; restricting how many symbols, how much meaning, could be fitted onto a braille line. This is always less than on most print lines, and each break has its attendant interruption and consequent obstruction to comprehension of the message of the material.

Theoretically it is possible to have a machine with two (or more) different spacings, and use the wider spacing when a boundary is desired; but in practice this did not exist. The 'Continuous 8-dot Hand-frame' showed up what was important to be known - that we need two spacing increments, of a size small enough to still fit easily under the finger-pad when combined with the positive-signal dot-columns.

In effect, to lose the two spacing increments took away half the possible meanings of the same dot configurations - a devastating loss - and obvious, once stated.

There was another problem: as the finger moves, left to right, touching each new column, the brain jumps to known meanings; for instance if first meeting dots 123, one thinks 'Here is letter l'; but then, 'oh no, there is more, another column, it is now dots 123456, the sign for FOR; oh no, there is more, so it is not that either'.

That is, one is constantly wrong on the way to being right, because the fewer columns already have meanings. One can suspend judgement, but this is tedious. And if there are many columns used for a shape, it often requires back-tracking to verify it,
since the finger cannot cover them all at once. In other words, the reader loses confidence and focus, from distraction from the real intended meaning, as well as losing signs by the sameness.

The above is only given as an example; a competent blind reader would not really make a judgement before checking the surrounding spaces - such checking happens in milliseconds, fingers flying over the tops of the dots - but the idea is still true. If the finger jumps over the intercell space, the dots are immediately perceived as modifiers which precede.

So it is by a positive boundary signal, the feel of that intercell space bounded by the dot-shapes, that the judgement is made that 'This is dots 456' (and not 123) - rather than from the 'no-signal' space before the column, which would have to be the indicator, for the above reasons, in equidistant columns. In present braille, if a sign is unspaced, position judgements are already made from what has preceded.

But probably the most interesting thing to come from all my testing, was that braille is a code - it is the brain and its expectation that does all the sorting. The fingers felt it just as well if the spread-out shape contained column-breaks, as if it did not. As long as the brain knew what was to be joined together, and what separated, there was no need for the picture to be so literal. Rather, the meaning must be coded in, so the brain knows this information. Perhaps this also, should have been obvious!

What also became clear with all the experimenting with ligature shapes, is that they often fit into a notional 16-dot pattern, but sometimes they do not. So whatever was done with matrices of 8 or 16, it was not going to accommodate all shapes anyway. There have to be ways to 'split a picture' which will otherwise not fit. So being too literal is not especially helpful. However, the name has been retained, because it gives some idea of the nature of the code.

The symbols and rules for HEXIMUS follow this discussion of the less-researched areas.

* * *

THE EARLIER MANUSCRIPTS

It is not certain how many of the earlier manuscripts (Ars Antiqua etc.) can be conveniently expressed in HEXIMUS. The addition of a few extra signs should be adequate for most of the square-look ones, from the time of the rhythmic modes; but they await more research.

I have not experimented with pre-mensural sources, or really early manuscripts: so HEXIMUS has been used quite little yet. But the ligature shapes and placement signs from it which continue in the later notations, are in use all the time in PASCO. Many of the French and Italian collections of the 1300's
are so well-organized notationally, that I found they can safely be brailled in PASCOf, which is quicker to read musically, just with the occasional asterisk when something is slightly doubtful.

Earlier, and in England, more of the sources are fragmentary, or very hard to see - or both! The fragmentary ones may never be able to be resurrected into real music; some of them have been rescued from the dismembered covers of later hymn-books or account books, and the hard-to-see should wait for a keener-sighted researcher. Harrison and Wibberley offer an excellent selection of facsimiles upon which work can be based. [Harrison 1981] These would almost certainly need HEXIMUS.

Even if one can see them, they may be full of problems which are a life-time's work to truly understand. They will have to await other researchers better prepared in that area, for to develop a code without being fluent in the notational material is a recipe for disaster. For instance, if you did not know that any slant might convey meaning, in the middle of an English 14th century ligature, you might overlook it entirely as just an idiosyncrasy of handwriting - it is quite a tiny difference physically.

For the common exigencies: one can use a braille 'd' instead of a 'g' for squares which are actually diamond/lozenge shape, especially in the conjuncturae; and in the above-mentioned series of rising squares etc. where some of the internal breves are actually slanted a little to provide rhythmic information, the 'corner patterns' of braille - d j h f - may have to be used. Or if there are not enough of these rotational possibilities to express the number of variables, a deep dot of some kind to signal the affected pitches.

If the whole score is rhomboid, obviously it is easier merely to say so at the beginning, then braille it as if it were square. E.g. the famous 'Sumer is icumen in' (RISM Lbl Harley 975 f. 1v) uses angled shapes for longs and breves throughout.

There are special logistic difficulties in the English situation - and perhaps in other situations too. Many different notations seem to have been in use at once in England, and in each kind there are not many actual surviving musical examples; and almost no secular ones. So you really need to know your Latin, and a good deal about the liturgy at that time, to make sense of both text and music. It is all a little alarming to modern people, how much variation existed between centres, and that there may be all sorts of traps even in apparently similar notation.

The notations of Doncastre or Trowell, for instance, use different signs for three of the four grades of Semibrevis - viz. semibrevis maior, minor, minorata, minima. [Harrison 1981: xix-xxviii] Doncastre's has the elegant up-stroke-to-diamond for the imperfect semibreve, and the plain diamond for half-of-imperfect-semibreve, semibrevis minima. They both use the down-stem for semibrevis maior, as in many Italian trecento sources.
The 'cauda hirundinis' swallow-tail, a little v on top, or upside-down v hanging below the diamond shape was reputedly Robertus de Brunham's invention, a way of showing the semibrevis maior. Some manuscripts use an upward stem to show sharpening. The signum rotundum little circle, appears, usually showing how semibreves are to be performed, i.e. how fitted into the breve, but sometimes for different meanings.

And if based on the notations imported from France, it can be unclear whether Petronian principles govern the rhythm, or the new ones of Philippe de Vitry - the musical result will be different. This may not involve a coding problem, but makes the initial notation-learning longer and more convoluted.

The up-stroke-to-diamond shape is also used in Italian Trecento notation, but meaning 3 minimae. This is equivalent to our dotted note effect in the 'duple' times of .q. .p. .o. .d.

or the perfect sub-beat in .i. or .n.
when it makes regular S's = only 2 M.

The same shape with an extra stem out of the top is used for the sub-sub-beat, a dotted effect within the minima.

There would have to be more study done before it was clear whether signs which look similar in different notations should use the same braille character, or not.

It would have been a particular pleasure to this researcher to have completed the Italian Trecento work, as the literature in collections like Pantietchi 26 [RISM I-Fn 26] is so rewarding to study and perform, and of course Magister Francesco, Landini, was blind.

For anyone undertaking research now, the Mountbatten 8-dot-capability machine is now available, so there are plenty of new sign-shapes readily available to express the manuscript symbologies. But it does all take a little time: one must

- devise the coding,
- write out some works,
- trial them on other blind people;
- make such adjustments as seem necessary,
- rewrite the pieces,
- trial again;
- transcribe some more works,
- then write up results.

It cannot be fitted into the time-frame for this project.

* * *
The limitations of the available kinds of equipment have been a major retarding influence on any code-growth - there simply was no way to do the experiments and preparation. One of the things we would dearly have loved in a new machine, in addition to 8-dot capability, was to have more than one size of dot and cell at our disposal.

In the context of the present work, ligatures and pictorial information could then be in one of the different typefaces, so they felt different from the cells of purely coded information. In visual display they look different, and are easily distinguished from surrounding shapes. But evidently it was just too expensive or complicated for the machine designers to include it in the end.

Possibly also it was realized that some research would need to be done on how different dot-sizes can be combined; e.g. how far apart does a 'flatter' dot have to be, to be easily felt amongst 'sharper' dots? Will the bulkier ones overshadow the more petite? Can adjacent cells be easily felt, if so in which order? And under what other conditions? Would one space be the best separation, so we could have the equivalent of italics? Or is one line better, avoiding formatting difficulties? One would not actually expect different dot-densities to combine effectively into the same cell-shapes, but these other possibilities could be researched.

Research was done by the Mountbatten designers on the 'best dot', but the tests were on single (isolated) dots: so the results, not surprisingly, seemed to come out as 'just like what we had was fine'. In fact, in isolation like that, it was quite hard to tell the differences: they would have been much more evident in a cell-shape using at least three or four dots.

If only we could get different embossing heads that could be put in, like the 'golfball' design in some old IBM typewriters. These could make available several dot-faces, from the smaller cells, like the English pocket-frame size, which would fit much more on a page, to something that felt distinctly bolder than the norm, for headings etc. At present, with only one cell-size, there is no way to show any of the hierarchy of headings in printed books: and this hierarchy often contains valuable information. The small cells were used only by the skilled, but that is after all the main clientele of this sort of specialist material.

There actually was a braille 'golfball' that fitted this particular kind of IBM machine in the 1960's and 70's, along with the 'golfballs' for Greek and Arabic, as well as different typefaces of Roman lettering. Perhaps this was the first example of using the principle that anyone who could type could produce braille - although of course it would be uncontracted braille if thus simply typed. All the braille characters were on the braille 'golfball'; but to use them a person had to know braille.
contractions and rules, and if they did, it was usually easier to produce copies on normal braille machines. So perhaps it was not a commercial success.

But for brailling foreign language text, which would be uncontracted in any case, this was a wonderful thing: teachers or friends could produce small amounts of work which would be instantly available to a blind colleague or student, simply by the exchange of the golfball, which took only minutes.

Now there are computer programs that translate input by regular typists into Grade Two braille. Machine setting-out naturally cannot compare with that of a real intelligent being, so some of it is clumsy and uncongenial to read. But it makes material available faster, and this is naturally of over-riding importance for many users.

The original fear, valid in the early 1980's, of having to convince people of the efficacy and comfort of long cells has evaporated somewhat. Modern 'refreshable braille' displays - where dots pop up electronically in a one-line frame of dot-locations as needed, usually representing what is on a computer screen - has been used without comment all over the world. These use two dots below the regular 6 as a cursor, thus forming an eight-dot cell wherever the cursor happens to be.

Such displays are obviously used only by blind people, sighted people watch the screen; so there is no doubt about their legibility to the fingers, or it would certainly have shown up by now. We become used to an idea, and then it is no problem.

'Picture Braille' is newly available through scanner technology (early 1994): this uses dot locations which correspond to pixels on the screen, and is designed to make diagrams available in the same computer file as the rest of the text, and in their right place in the book, rather than as loose sheets hand-made by transcribers and added somewhere. Perhaps this will open up new dot-face possibilities, since at least the programs are now written to direct the machines to use their embossing heads in different horizontal and vertical spacing locations, i.e. different from those that are programmed in for plain braille embossing. Such programs might be a beginning.

H E X I M U S : Sign Choice and Rationale

See HEXIMUS Code Booklet, Chapter 2, for a full, but only briefly-stated, sign-list.

The simple aim was to get the note shapes as close as possible to the visual shape: certainly containing the same elements. So a square note would expect to be represented by the nearest-to-square shape in a braille sign, which is letter g. ::
But when a square is attached to a stem to form a longa, it was better to put both elements into a single cell. To use the full g-shape with its side extended down felt rather cluttered and disproportionate, there were not enough dots left to make the proper impression of stem-length. It felt much better to use the 'long TH' sign, dots 14568. This meant that the square idea was carried in just two horizontal dots, a braille c, with three dots left to express the stem. Signs like this with a long column are very fast and comfortable to recognize. It is important that things feel good tactually.

Singly g feels fine; but experimenting showed that g's in a row in composite signs feel very cluttered. One does not need all these dots to get the message. Best coding will be that which uses the simplest sufficient sign. Only three g-patterns will fit rising or falling in an eight-dot cell: whereas four c's will. So c is the way to go when there are more height orientations needing clarification.

However, if standing alone, or the symbol needed to orient a shape, c is barely sufficient, two dots from one horizontal row do not contain much height-orienting information. So for a good secure tactile feeling, it is best to keep g in those circumstances where other height information is not available. When it is, then a c shape is sufficient. The podatus and clivis both feel fine with the short c-shape for the non-stemmed pitch. Clearly c can be thought of as a slightly shrunken g, so the concept is not too different.

One could of course stick to the simple aim, and use adjacent cells to represent the two elements of a longa - square form and stem - using g forms with single columns before or after, depending on where the stem occurred. But this would be foolish codicologically, because one of the most useful coding strategies of braille would then be unavailable - that of using right-hand-side columns to refer forwards, Codeworks 5 discussed in the literary braille chapter 6, and its reverse, M1, discussed in Musi-Codeworks, chapter 11. These are always a sound coding basis for relationships between grades of primary signs.

This illustrates that modifications to the simple aim are found to be desirable almost immediately, to best combine the needs of expressing the material on the manuscripts, with serving tactual effectiveness criteria. See the Haptic Considerations, chapter 8, for more information on perceptual tactility.

Consider the common ternaria ligature of three squares, rise then fall. The first pattern given below is possible, but the second feels better.

```
:::
:::
```

Or taking a more complex example, square rising to an oblique which falls, then rises to a square again. This will have two
forms depending on which way the last square faces, to right or left. Here the square is expressed broadly in the beginning, slimly in the end; with the extra detail, that the dot in the row below the end square implies the joining stem.

Long shapes unfortunately cannot be pictured in this software: imagine these regular shapes extended down by another dot: in the case of the $v$ both the low dots are to be moved down.

\[(p \text{ TH } v)\]

An oblique - braille $e$ and $i$:

These of course can occur alone, or as part of a more complex ligature, and at different heights in relation to stems and other pitches.

Although this single-cell oblique looks a little shrunken horizontally for the two pitches it represents, it feels fine - once the brain is aware that it is a possible configuration, so is ready for it, it is recognized easily. Several of the other forms containing obliques are also contracted, in the sense that all their three elements, two pitches and one stem, are combined into a single braille cell. But they are common, so are easily remembered.

Rests: Braille Music Code rests are $m \ u \ v \ x$: so it seemed a good idea to take the only one of these which is suitable, $u$ for minim rest, retain its meaning, and devolve other rests from it. This somewhat saves signs, and is easy to remember, as long as the suffixes or prefixes which make the distinctions are memorable in some way. The reasons that only $u$ is suitable concern PASCO design more than HEXIMUS, but it was sense to keep them parallel when signs are shared. $M =$ minima in PASCO, and $v \ x$ may be used for small values.

Bearing in mind that we are representing a visual symbology, the solution to match the number of stave-lines involved in a rest by the same number of dots in a single column, seemed both easy to remember, and easy to explain to a dictating reader, so errors are not made.

Because rests are often going to need placement signs before them, these devolving modifiers had to come afterwards. These next examples show $S \ B \ L$, hanging from lines 3, 2, and 4.
Sharp and Flat use their modern symbols, \( \bullet \), \( \circ \).

Clearly it would not be possible to make these physical shapes pictorially, so a coded sign that already exists was the best solution.

A 'doubt symbol' can be needed in any context at all, so must feel quite distinctive, and not be part of any of the series that form other basic sign-sets. This is why something non-braille, the ring-reinforcements is suggested as an alternative to the pleasing 'circle' formed by long \( \text{OW} \) long \( \circ \). Presumably these would eventually dry and fall off, but only after many years.

**Placement of the manuscript symbols:**

This must be shown by a fully encoded series, not at all pictorially. Since there is no stave in the braille copy, each new sign takes a Placement sign, giving its situation on the stave. In HEXIMUS all cells are presumed to belong to the same shape or figure until the next placement sign is met.

Signs chosen for this are the Row 6 set. In braille music code they are Octave Signs, a sort of auditory placement set, indicating in which of the octaves, from first to seventh, a note is to be found. This way of naming is particular to Braille Music, and works thus: 'First octave' begins on the lowest C note of the piano; 'second octave C' is cello C-string; 'third octave C' the viola C string; 'fourth octave C' = middle C etc. Each octave goes from C to the B above it. Examples of octave sign rules are given in the Coding Construction of Braille Music chapter.

Transferring the meaning by one conceptual step: instead of meaning 'first octave' fourth octave' etc - these are now used to mean 'on the first line', 'on the fourth line' etc. Then if the deep dot of their right-hand column is added, dot 8, they mean 'in the first space' 'in the fourth space' etc.

This ensures that a known set are the pitch indicators in each code. It was preferable to quote position, rather than any 'working-out' or naming of the pitch, because some fragments of manuscripts lack their clefs. The purpose of this code is to make available whatever is there, so must be all positive-sign based.

To use the complete set for lines, and then re-use them with the deep dot added for spaces, is efficient for containing all placement. It also uses another of the usual coding features of octave signs - that of a binary system where information is provided if a dot is there, and also provided if it is not there - the dot 8 in this case. If it is there, it is a space pitch, if not, a line pitch.
Being right-hand side dot patterns, they work in the manner described in Codeworks no. 5 of the Literary Braille Analysis: viz. a single column sign modifying the two-column sign that follows them directly. Nothing must therefore come between the placement sign and its note-shape, or the placement sign would be modifying the wrong shape. In HEXIMUS it is kept free from other meanings; so whether preceding notes, rests, accidentals, custodes, it still means placement. But it may need to be used more intensively in other codes, as in braille music.

These of course are purely coded signs, there is no 'shape' matching of any kind. They merely give the information of where the symbol which follows them is placed on the stave. And they use Louis Braille's set, and his binary coding principle to make best use of the set.

Ligatures:

These attempt to be pictorial; at least the elements of information are incorporated in a comparable shape. For some purposes 10- or 12-dot cells would do this better than 8-dot, and can be formed on a Mountbatten Brailler if desired: see the method in HEXIMUS code booklet, point 3 in the Introduction. Or the Perkins roller can be further turned, with very careful balancing! Or the shape will simply have to be shown in sections, perhaps using the 'in-accord' idea, a well-known braille music concept. See chapter 10, Simultaneity (c).

The table used is from The New Oxford History of Music: Vol. II, p. 323; part of Chapter X, "Music in Fixed Rhythm" by Dom. Anselm Hughes. It seemed best to make a fairly comprehensive list from a well-known source, recommending exact tactile forms, most of which have been extensively trialled. Of course users can alter these to suit, or split the picture by in-accords as seems best for the particular case for an unusual ligature.

Once notation becomes mensural, and the written values become smaller, there are some more: see New Oxford History II, p. 351.

Sometimes the forms could be shown without using the 4-dot depth: however, it is preferable to use at least long stems - then the parameters of new code are comfortably established, one's mind is not in danger of slipping back to previously-assigned meanings of the 6-dot signs.

So a judicious mixture of known and new elements are put together in this code, to make what it is meant to show up, the shapes of signs, as immediately as possible. From the trecento onwards, as one gains confidence with the notation, fewer things seem doubtful enough to need HEXIMUS: and since that later period has been where my chief musicological and performance activity has centred, many things are still a little theoretical. The French Ars Antiqua period may be most suitably approached through HEXIMUS, as well as the troubadour literatures; also some chant notations: they await an opportunity to prepare them.
"PASCO"

The code designed to represent Mensural Notations

With a little skill and practice, a sighted person can usually sing or play straight off a manuscript in White Notation. Therefore I was keen for a tactile code which would be 'ready to sing off' - or as close as could be managed to that, where the music flowed easily. So what was barely sufficient had to be worked out. That is, the finger cannot be reading over a whole lot of extra signs if it has to sing the part at the same time, without getting behind the other musicians.

There was no need for every pitch to have a placement sign, once one pitch was noted (by physical position on the stave, as in HEXIMUS) the next few flowed from it: just as in Braille Music Code, where Octave signs are only used as necessary.

If a note looked like a breve, it was considered to be one, and given the letter 'b' rather than a square picture, as it would appear if transcribed in HEXIMUS.

Ligatures would still have to be pictorial: so they use the HEXIMUS signs and conditions. For this reason, one cannot quite do it at appropriate performing speed, at least certainly not the first time, as the complete information cannot be displayed quite as immediately as in visual writing; there is more to 'work out'. This is especially the case if there are larger than adjacent intervals within a ligature; since these have to be shown at the conclusion of its 'shape' information part. Matters of alteration etc. also may take a little thought.

So the following is how it came to be: its working out from an idea of what was wanted, to the final code. It seemed worth including the background thinking for one of the codes, and PASCO has the widest use - almost anyone interested in Early Music would have occasion to read the mensural notations.

* * *

From Where Shall We Take The Signs?

The information provided in Ogni Sorte Editions, and in the New Oxford History of Music, Vols 2 & 3, seemed clear and orderly: and a good place to start, to work out the kind of sign-bank that will be necessary. These also have the advantage that they have given permission for brailling, so there are no Copyright problems. To date only small excerpts have been able to be brailled, as always. One could also study Morley's Plaine and Easie Introduction to Practicall Musick; the first part covers mensural notation [Morley/Harman 1963:19-47] but that is not in braille either.

Much has had to be put in the code booklets that others would expect to get from original sources like Morley, or standard text-books like the New Oxford History.

[ Hughes 1955 ]

50
Naturally the idiosyncrasies of the handwriting, and certain spatial effects like 'layout in choir-book format', instantly obvious to a sighted person, are not going to be evident in the braille code copy, as the way the braille cells follow on is completely rigid and each vocal part will normally be brailled on a sheet by itself. So these things if important will need discussion in the Commentary. However, what is quite feasible to provide is a sort of diplomatic transcript - that is what PASCO really is - all the information in terms of the meaning-carrying symbols, written in a neat tactile information code.

* * *

Sign Selection

Symbols are needed for: Note Shapes -
Maxima Longa Brevis Semibrevis Minima, Semiminima.

and Ligature shapes (see HEXIMUS for a full discussion of these.)
all the common binaria and ternaria,
and ways of extending these to cope with the variety of shapes occasionally encountered.

Concerning those only occasionally encountered: There is always a question in code-making how far to go for the exotic - since one will almost certainly not totally exhaust the possibilities, and it becomes a law of diminishing returns! In the study I have so far been able to do on manuscripts in the British Library, Bodley, Cambridge University, Durham Cathedral, Harvard, Berkeley etc, I have not come across any ligature that cannot be expressed in my codes. Using the 'in-accord' sign saves the day in some cases, see above in HEXIMUS.

Clefs need to be designatable: yet it is desirable that even fragments which lack clefs can be brailled. Morley, writing in 1597 still quotes these clefs: Gam-ut clef; a sort of natural sign on the line above it, (B?); F C G clefs, and on the tenth line (highest line) of his table, dd clef. [Morley, p. 142]

Mensuration signs must be designatable. There must be a clear way to distinguish the actual code from words, either text for the music, or explanatory discussion. This is actually one of the hardest tasks. Layout and expectation are critical factors.

Placement on the stave must be designatable: in the same way as in Braille Music Code there is no stave, it would be an impossible tactile arrangement, the number of lines in the staff should be stated, then a way of showing position - preferably a very simple and neat way - since the idea of the stave in visual music is to make a simple neat way to show pitch relationships.

Since most of the mensurally notated music is linear/melodic, it seemed desirable to represent it as one note moving to another, rather than each with its own individual pitch mark. This also seems to have been the way musicians thought about and sung their
parts - and some theorists suggested it at the time - being more musically atune, it is less tedious to read.

There must be a way to differentiate actual letter or note symbols from ligature pictorial shapes. Every braille cell will 'have a shape' unavoidably, and there is no difference of density or line-style as in handwriting to alert the reader to which is which.

Rest symbols, dots, pictorial markers, such as coronas and congruentiae, custodes, and even modern rehearsal letters need a way to be shown.

With this much, which is actually not too vast, a great many works or parts from works can be written.

* * * *

Signs Chosen:

It was desirable, in keeping with the hoped-for fast reading possibility for this code, to express all note-shapes in a single symbol. So the ordinary braille letters L E S M are chosen for Longa, Brevis, Semibrevis, and Minima: FOR sign (all 6 dots) for the Maxima or double-long and P - a braille composite of the letters S and M for 'Sm' - for Semiminima.

These are preceded in the first instance by placement signs in the manner of Octave Signs from Braille Music Code, and they use this series with the slightly altered meaning of 'on 5th: line' rather than 'in fifth octave'. Then the same octave sign series take a low dot (dot 8) to express a space. So the sign for 5th octave if it took a low dot, would mean 'in the fifth space'. This has proved very elegant and neat! (And is the same series as for HEXIMUS.)

If the stave contains other than 5 lines, this can be mentioned at the beginning.

Once having set up the first note, the next few pitches will devolve from it by intervals. (As in Braille Music Code, it would be tedious and unnecessary for each note to have its own separate placement sign.) A sign-set is necessary that can show upward and downward direction, preferably by the same sign in the upper or lower cell. The rows suitable for this are therefore Rows 1 & 5, used in manner 2 of Codeworks, chapter 6. Since the numbers in ordinary braille use Row 1 a-j for the numbers 1-0, this is also very user-friendly.

Thus, c after a note means 'go up a third', d in the lower after a note means 'go down a fourth': h means 'go up an octave', h in the lower, 'go down an octave'. The important thing is that the number in the higher part of the cell, dots 1245, shows upwards movement, in the lower part, dots 2356 shows downwards movement.
Now there is a small wrinkle: \( b = 2 \) cannot be used, because it already stands for Brevis. The solution I found was that number 1 (dot 1) is not needed as an interval, so can be used like the others (3-9) to mean 'go up one' or in the lower for 'go down one'. So the intervals from 2nd to 9th are now taken care of.

If note letters follow each other without interval, they are at the same pitch - no need to 'go' anywhere - and in that way \( j \) can be used for a 10th interval: normally cypher 0 in the braille number series.

Greater intervals occur only comparatively rarely; so are best expressed by a modifier to the principal set, somewhat in the manner of Codeworks 5. One solution is dot 6 before the interval to mean 'an octave and' whatever interval; in that case 'go up an octave and a fifth' would be dot 6 e. Another is a following \( k \): codicologically more secure because of being a full-height sign, so clarifies whatever it follows; in that case \( e \ k \) would render the above 12th. As with anything rare, this should have an asterisk and an explanatory note.

Placement signs can be given often or infrequently, as seems sensible. Obviously at the beginning, or after an interruption; for a ligature and for the note after a ligature they will be indispensable. Also after large leaps, or regularly, or the beginning of a new text syllable, or a new braille line, would be logical places.

To demonstrate the idea, here are two modern tunes. The underline stands for a letter in the lower cell, thus denoting downward melodic movement.

'The Ash Grove' tune as it would appear: see Appendix 1:

Clef: G2; 5 lines; 5th line #, mensuration 3; \([B = crotch]\)

68 B d B c B c S a S a B c BB a B c S a S a S a S a 48 B c BB

i.e. on the 7th space (the one below line 1) is a breve (B); go up a 4th to another B; up a 3rd to another, a 3rd to an S and down a note to another S, down a note to a B etc.

'Austria' would be:

Clef G 2: 5 lines; 5th line #, mensuration c

45 B. a S a B a B c B a B c B a S c S a B f 58 B a B a B a B a B a 456 S c S e S 5 L

i.e. on the 2nd line is a Breve with a dot: go up one to an S, up to a B, down one to a B, up a third to a B, down one to a B, down one to an S and down another third to another S, up one to a B: up a 6th to a B etc.
Looking at this much from an analytical stance:

Note Shapes would be considered primary hierarchy, so get their normal braille-letter shapes.

Placement signs, second hierarchy, use both the manner 5 of Codeworks, see chapter 6, single right-hand side column modifying a double-column; also manner M 8, see chapter 11, binary code using the principle of omission: i.e. the dot 8 means a space when it is there, and when it is not there, that means a line number.

Relative placement signs, the numbers, third hierarchy, are used as in manner 2 of Codeworks, chapter 6, upper-cell and lower-cell having a directional meaning but of the same musical increment. These use a sort of second hierarchy sign set, in the sense that being numbers, they use signs which in first hierarchy are letters; but are very commonly used in their 2nd hierarchy too, acting as numbers, so this is very easily remembered, and quickly read.

Since Rests, 1st hierarchy like notes, are more the same physical shape, and are rather a matter of extent in mensural notations, it seemed well to choose a sign and show its extent. The m u v x of braille music code would not be enough, and already letter M = Minima.

So U is chosen as a rest sign: it retains its meaning of minim rest if alone; S if followed by a dot 3; B if followed by dots 23; Longa for 2 breves u 123, and Longa for 3 breves, u 1237 (the 4 left-hand side dots of the 8-dot cell.) This is easily remembered too, because however many stave-lines are 'involved' in the rest, however many it touches, it takes that number of dots as a suffix.

Rests take placement signs before them, since this is often information-carrying about the group of notes which form a 'perfection' etc., and is helpful (or even necessary) for working out the rhythm. Codically this is like manner M 1, plus a manner not described because not otherwise used - correspondence between the actual number of dots present with the number of lines touched. It is an extension of the idea of 'dot for dot' with dot 3, touched on in the discussion of Codeworks 22.

Of course in some manuscripts, lines are used as pauses or lengtheners, in chant or perhaps partly-measured music; and there may be a good deal of doubt as to which meaning they are to carry. W.D. Jordan discusses this kind of ambiguity with reference to the Hone fragment in the Australian National Library in Canberra. [Jordan 1992:13] Fortunately from a brailling point of view it does not matter, the picture would be conveyed intact.

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54
Ligatures and other matters:

Ligatures use the 8-dot frame most extensively: as in the HEXIMUS discussion of ligatures above, and as point 18 chapter 2. Likewise for PASCO, the Braille Music Code interval signs are to be used in the lower after a deep dot if there are intervals other than adjacent notes in a ligature. The deep dot is necessary to show where shape representation ends and coded signs begin again. (Dot 8 acts as a code-breaker.) Obviously each interval within the ligature must then be mentioned, not only the non-adjacent ones.

Signs which are not part of the actual 'musical' code of Braille Music Code have generally been retained - like the AR for Wordsign, the asterisk, AR EN IN, the part-bar in-accord 5 2 to make something happen at the same time in the visual sense, to make a 'temporal column' of the information. Anything which is unconfusingly re-usable is obviously best re-used. Only the musical codes themselves must be kept distinct because they are to be thought of differently.

For all words - text, instructions, explanations - the wordsign, literary code prefix, AR, can be used. The old sign for text line, which was 56 23 balancing the music code line prefix 6 3 - might be considered better however, for text which is to match melody. Also the signs such as rehearsal letters, can be letter-signed, spaced and bracketed, or signalled with AR as preferred.

* * *

Practical Setting-Out

To be empowering, this is so different for braille and print: parts will almost always have to be separate, and often broken into sections not completely musically helpful, just to make the meanings clear. It would be natural to start a new braille line at certain places, e.g. at a congruence sign. Strategies are described to deal with braille breaks and joins, which will almost never coincide with the setting-out of the source.

Rehearsal letters, for example, may be on a pitch which is both end for one 'phrase' and beginning for the next. So in-accord to AR, then restate on the next line after the bracketed rehearsal letter: and in another bracket, place the pitch one has already written, with its preceding placement, and following interval of progression. This way both needs are somewhat met - the need for uninterrupted melody, and that of easy location of sections.

This is slightly annoying the first time it is met, or when reading alone: but if a work is difficult, or all parts are not perfectly competent, it is a boon to have the rehearsal letters! Especially if there are long rests to be counted. One can otherwise spend an enormous amount of time going back to the beginning, and never progressing - with some parts just counting rests.
Coloration:

Originally I used low dots under the main note-shape letter to express coloration. But although it sounded good intellectually, it was not particularly convenient to feel; as all note-letters, i.e. any value, might be blackened, and this meant a great many different shapes under the finger for the same meaning. It was also not so common as to warrant tying up so many specific signs. And what about when a ligature was blackened? its shape could not be disturbed by extra low dots, even if there was room for them, which there usually was not - the 8 dots were already needed to express the ligature's natural shape.

The most convenient solution in the end, thinking from White Notation, was to put 'AR bl 3' (no spaces between these in braille), meaning 'the next three pitches are blackened'; thus coping with the fact that they may be expressed as single notes or ligatures, or a mix of these. Of course they may be reddened, or left empty in black notation: this information would occur in the Commentary, in the general discussion of which notation is used, and its characteristics. It may also be convenient for the user, to leave a blank cell after the coloration has finished, just as a helpful signal.

This probably gives enough of an idea of code development and structure. The rest of the necessary signs and meanings are contained in the Code Booklet.

Lists of works brailled in each code appear at the end of each Code Booklet. Dufay has the biggest number of compositions brailled in PASCO, reflecting the ease of use of the wonderful diplomatic transcript by Ross W. Duffin of the Dufay chansons in GB-Ob Canonici 213, published by Ogni Sorte. Naturally in the musical examples transcribed, different ideas have been tried - this is how codes grow up - so not all are identical. But all the earlier ones have commentaries, so I believe all are quite usable, even if they include ideas which were subsequently rejected, and therefore are not in the code booklets.

* * * * * * * * * *

"LUTAB" PREPARATORY REMARKS

LUTAB will be useful to those wanting to play music like the Morley Consort Lessons 1599, pandora, cittern, or lute parts, or the Dowland Lachrimae lute parts. Also Italian, Spanish and French masters of the 16th and 17th centuries.

This code has come about a little differently, because of its probable use - potential players of lute and early plucked strings. Since the purpose of tablatures is to provide an easy shorthand for playing from - they offer a sort of map, which if followed will turn out the desired sounds - the reason for learning to read them is normally a practical one: to play the instruments, and have their natural literatures immediately available, comfortably expressed to make the most of one's
playing skill.

Whereas the purpose of learning mensural notations may be more intellectual than practical, the reverse is true of tablatures. Those who study polyphonic manuscripts during a short course, may not expect to have to sing the parts at sight themselves, although they may have to do some transcription to show understanding of the notation of the originals. But it would be rare for students in that kind of course to be required to have all but the most cursory knowledge of tablatures unless they happen to need to play from them.

For this reason, it was appropriate to braille Diana Poulton's method *Introduction to Lute Playing* and various easy solos, introducing the LUTAB Code signs as needed. Naturally there are also some examples brailled of the more difficult works from famous player-composers, and some of the intabulations with voice - part of a marvellously bountiful and glorious literature. But these would not be useful without the materials for a blind person to learn to play the lute, and become skilled enough to play them.

Tablatures themselves are fairly simple: a line for each string, fret markings on whichever ones are being used at any particular moment, simultaneous sounds shown by vertical alignment, and the other rhythmic information shown separately above the 'stave'.

It would be an excellent thing if more classical guitar music used tablatures in addition to staff notation ... various jazz and flamenco scores do, but there seems to be a false merit attached to staff notation ... especially ridiculous in the case of transcriptions of lute music, which comes originally from tablature!

It was impossible to make this code as physically compact as I would have liked because the visual format is so spatially-oriented. This has to be indicated in the braille text, because it is all meaning-carrying. I believe the solutions are quite workable: certainly no more disparate than contrapuntal keyboard music.

In one method the rhythmic indicator is embedded in the strings-and-frets line; in another, the player memorizes the rhythmic pattern of a chunk first. It depends on the manuscript, which can be faithfully followed; or which is going to be more suitable for the particular work or the player.

But however rhythm is marked, the symbol-set must be differentiated from that of the strings and frets part: this takes a sign. And it seemed unavoidable that each fret would have to have a string number, since the pre-selecting function of the stave has to be expressed somehow.

If the score is voice and lute, there are also lines of words in regular braille, and melody in regular braille music code - so in one sense there may be four codes being used concurrently.
This is true in print too, but in print there is not a problem with duplication of signs: a word does not look like a note, does not look like a tablature sign etc. But this necessary mix of codes was one reason to keep the actual LUTAB code 'simple' - lightly coded rather than intensively coded.

Also there is the practical factor, that for the Great Works on any instrument a blind musician makes an effort to play exactly what is written, studying the copy diligently. But for much else one makes up an appropriate accompaniment or continuo, side-stepping the labour of making and memorizing from a copy. So only the purest distillations will probably ever be brailled! Overall, most blind musicians use a copy much less often than most sighted musicians would expect to, except when teaching.

One of the great uses of computers will be that 'words and voice' copies, or those with the lute part and bass viol part as well, or indeed the lute or bass viol part only, or combinations as desired, can be provided once a score is input. This flexibility should be a good stimulus to all early music, once someone has time to do the input; and it may mean more use is made of copies, because they are more painlessly available.

So far it is not nearly as simple as the corresponding task in computer-generated print music, because so much less fits in a line of braille, and the setting-out takes more trouble for all scores produced.

But at least singers, violists, poets and lutenists might all have an interest in the one work: whereas if one does one's own brailling, one usually only does the most immediately needed part. This was also a reason for keeping LUTAB simple, the possibility of wider distribution in less specialized circumstances.

So signs chosen were of the simplest:

the same numbers or letters as the original, for frets:
preceding octave signs for string signs,
interval signs for added strings forming a chord,
followed by their fret.

Rhythm signs preceded by y, with the corresponding number of dots for their 'flags'.

Of course these last therefore use the same signs as some of the frets. If one does not go outside of six dots, doubling-up is inevitable. But it seemed non-troublesome, from all my experiments. The worst feature about it is that it is not very compact, because of being only lightly coded: one can only have it more compact by being more intensively coded. But it is certainly very easy to take down quickly from dictation.

Other signs concern fingering, holds, ornaments: these are all discussed in the booklet.
Concerning language and lute songs

In the dictating situation, word-text in one's own language is always a boon: but in braille there is added difficulty with using foreign language materials. If say, the chanson texts of Claudin de Sermisy are in braille for French readers, these can only be read by those who know the intricacies of the French Braille contraction system. Theoretically things could be brailed in Grade One, uncontracted. But nobody would choose uncontracted braille for material in their own language, as it makes reading too inefficient. And since things are normally brailed for someone's immediate use, this has mostly not happened.

Here computers may assist: if something is typed in, it can be machine-translated equally easily into contracted or uncontracted braille, thus serving both local and foreign readers. However, it makes our lives instantly easier that a beautiful literature already exists in English.

* * * * * * *

"FIGBY"

Preparatory Explanations -

There have been many different codes used in braille for figured bass; and their design has been to suit the nature of the tasks at that time and place, probably mostly the academic tasks set for students. All obviously have merit, they worked in their situations; but there is no agreement world-wide - and probably there need not be, in the sense that whatever is the prevailing way in a place probably suits as well as it can, the needs of that place, its syllabuses, and the blind students who must battle through this kind of work!

Not that the work is a battle, but the code often is! Braille music code has already used up all the signs, and they must be used again, some of them, as selected, to make clear another set of meanings. One of the reasons there is not world agreement may be that it is so incredibly tedious to learn several systems well enough to evaluate them, that not enough delegates to the international conferences, have ever done this. (One such conference was held in Saanen, Switzerland in 1992, seeking agreement on other braille music matters.) Each country's delegate tends to know just its own ways, if that, and not have the patience to go into all the other ways.

So the reasons for having the temerity to make yet one more way, might be expressed in point form as follows:

1. Present figured bass codes are designed for specific purposes, and do not suit other purposes so well: facsimiles have different dispositions of information from harmony textbooks, and study of them has a different focus.
2. They (present ones) constantly interrupt the bass-line music; this is not always convenient.

3. They are rigid in direction, and often go from the lowest up - 'two-four' instead of 'four-two' - contrary to normal speech and thought patterns in the area, so are thus less immediate for dictation and response.

4. They were often made to correspond to certain methods of setting-out which are no longer current in all places.

5. Figured Bass is meant to be a quick and easy system in the originals - even fervent supporters of some of the present codes could hardly say that of them, I think.

* * *

My code, FIGBY (baroque figured bass code) has the special purpose of representing manuscripts faithfully - being musicologically reliable, and also quick and easy in use, in the manner of the practical habits of the time. Things occur as nearly as possible to the speech habits around them, and also with the recent brailling habits of modern setting-out etc. Many of the present codes were devised when quite different circumstances and brailling conventions were operating.

It does not interfere with any of the existing figured bass codes in use for other purposes: although it may be found easier to use than some of them, and can be used instead if desired.

It is a child of our time, needing upward writing braillers to make it practicable, since it is set out below the bass-line of the ordinary braille music code, aligned at bar beginnings. The exceptions to this are discussed in the FIGBY Code Booklet.

It is modern too in the sense that generating parts from a score on the computer may be reasonably practicable, with not much extra fiddle-around. Examples of this have yet to be entered and tried. My transcripts were all made on a Perkins brailler at home, so are only available in thermoform copies. [The thermoform is a braille duplicating machine using a steam-heat process to produce plastic sheets, each individually moulded to the original paper copy.]

But keeping the figures line out of the bass is one pre-condition for the possibility of this kind of use of computers. In a sense, the most likely need is the negative one, the bass without the figures.

* * *

Signs:

As this is a code only for the figures line, the rest of the music can be brailled conveniently in Louis braille's music code, with only occasional asterisks, there are not many signs needed.
The figures are figures, that is, Row 1, working from the upper cell: so it is as little coded as possible. Then one only needs a limited number of signs for all the other matters, which include:

the slashed figures: dot 6 in same cell

ways of showing height in column:
(i) lower figure, in the lower cell like a fraction
(ii) ST showing 'same column, next position down'

ways of showing continuation lines: ING plus number of notes

ways of separating or binding, made obvious visually by spacing: comma for separating, dot 1 for binding. Codicologically these are the set '1' and '1 in the lower' not needed for meaning as a figure 1 - neat.

dealing conveniently with gaps and alignment: This is a hard area - space and information disposition - the finger just can't cover what the eye can cover - gaps use hyphens and dot 3's to clarify spaces

custodes or other features of the manuscript, or printed edition.
label for figures line: AR numeral sign;
difficulties - scribal alteration, or hard to read, or damaged;
modern intrusion like bar numbers etc.

This is clearly not an enormous lot to code, so there was no need to go beyond the regular six-dot patterns; the thing that was most important was code logic, to be very immediate. Sometimes it is quite a lot of work to achieve beautiful simplicity!

Also it was important to preserve the order of speech patterns - signs represented in the order they would be spoken about - 'six-four' etc. - so blind students have the same convenience of a match between the written and aural environment as other class members.

In conscience I have to mention, that Pasquali 1763 comments

N.B. If he finds now and then some chords with their figures inversed viz. instead of 4/2 9/4 7/4/2 &c. thus 2/4 4/9 4/2/7, [sic] he is not to be alarmed at the difference: for if the chords consist of the same figures, it matters not which way they are marked: Some composers have thereby meant to point to the performers in which of the three ways such chords should be taken. [Pasquali 1974:45]

I have never seen this, but Figby is flexible enough to show it. The meaning, if as in this last sentence, would be interesting.
The Code Booklet also contains information that a blind person would not necessarily know, about publication and setting-out of the originals, things the sighted person learns just looking at and handling the facsimiles. That is, it contains all such things as would be needed to make this area of study properly informed and available. And the encouragement that blind musicians can be excellent and sought-after continuo players, and the reasons for this.

The four codes chosen for Part One are all of immediate possibility for the participation of blind musicians - hence the need to be both scholarly and practical in their discussions.

Here follow the four Code Booklets. Such an apparently modest distillation comes only after massive researching and trialling. Preparation alone of the braille materials by hand is a fairly massive task by itself ... It has all been very interesting, stimulated travel to the famous music manuscript libraries, and brought contact with musicologists, early music performers, and eminent blind musicians from many corners of the world.

* * * * * * *

As mentioned, the code booklets necessarily presume braille and braille music code knowledge, they have had to be written from this perspective. Readers without this knowledge are unavoidably at some disadvantage in approaching the work. It is hoped that its purpose, to remove some of the usual disadvantage to those musicians who need to use braille, and offer empowerment to them for musicological study, will make it more easily tolerated. Its eventual dissemination would expect to be chiefly in braille. Your scholarly forbearance is appreciated.
Chapter 2 - HEXIMUS

MAKING A START ON
BRAILLE CODES
FOR
NON-STANDARD MUSIC NOTATIONS:

Part One:
Four Early Music Codes.

Main Introduction and HEXIMUS Code
PASCO code booklet
LUTAB code booklet
FIGBY code booklet

by Barbara C. Williams
(Melbourne, Australia)

Available in Braille or Print, from
R V I B E C Music Library,
(Royal Victorian Institute for the Blind, Education Centre)
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63
Making a Start on Braille Codes for Non-Standard Music Notations

MAIN INTRODUCTION

This is the first stage of providing codes for the many music notations which are sufficiently unlike the current conventional one, as to be unbraillable in the normal Braille Music Code.

The following approach appeared in my article in Braille Music Magazine, April 1984: and although much research has gone on since then, it seems as good a way as any to explain the background and purpose of these codes.

* * *

It seems scarcely possible to overstate the value of the braille system to the intelligent blind of the world. The brilliant simplicity of the concept of 'a little awl' as implement; the superiority of dots over all other types of tactile signal; the masterly elegance of the code itself, set out in decimal logic; all eminently graspable and intellectually compact ... truly a marvellous system.

However, it was never meant to be only aesthetic: it is the content that counts. Braille must be like living language - capable of expressing all the current range of ideas and information in our communications-conscious world - and express them unobstructively, so that a blind person has the same level of access to them as anyone else.

There's the rub: most of our specialist codes are unreasonably difficult, compared with the way the same information is presented to sighted people. Why? One reason is because we have been using the same six dot symbols over and over again.

So: we need some more dots. It is not possible any longer to manage on just six. After all, the system was 'full' in the 1820's, Louis Braille had already used all the signs, and some of them quite intricately, in literary, mathematics, and music codes. Is it any wonder that by now we need some more signs?

Since Louis Braille was born in the year Haydn died, his musical environment was a precise one, gracious but limited. The code he devised was excellently suited to this musical style. Indeed the print notation of the time was also a fairly effective code for representing the desired sounds - compared with say, Jazz, where the notation gives quite little of the information which will make the music come alive in performance. At some times in history there has been a more 'natural match' between the material to be expressed and the code to express it, than at others.
Louis Braille seems to have worked from first principles to develop his music code:

Question: What do we need to know, in order to recreate a musical work?
Answer: Which notes and how long to sound them.

Question: How can this information be shown tactually?
Answer: By re-assigning the symbols from literary braille to cover these meanings.

Given the quite small number of notes, where 'notes' means basically those found on the piano, and the quite small number of related rhythmic increments that need to be shown, the method chosen shows impeccable logic and great practicality - given these and some other assumptions.

But of course those assumptions were only current for a certain limited period. Before and after it, different assumptions and habits of thought apply. And the further away one gets historically, the more divergent some of the assumptions may become. Some will persist, of course: the most likely thing is that some will change and some stay steady.

Louis Braille's assumptions might include:

- a pitch set consisting of twelve discrete more-or-less equal semitones, replicating in octaves
- diatonic arrangement of these as the norm
- steady pulse with regular accent
- the kind of rhythms used being of a 'moderate' type physically and psychologically
- note values which halved - binary progression - with special arrangements for threes
- 'clean harmony', concords which are based on the natural harmonic series, the resonance patterns of acoustics
- discord flowing to concord
- overall euphony and beauty, the purpose of music being the uplifting of the spirit
- a strong degree of 'naturalness' and courteous predictability

I consider that these all have some impact on the way he built his music code: that assumptions connected to the style of the time shaped it, and that if we now need to represent musics with entirely different assumptions and content, like medieval or avant-garde musics, we may need to look at entirely different codes, and different code bases, for representing them.
Where enough of the original assumptions hold good, the code is fine, and this applies to most music now, as then, at least notationally. That is, the notation of that time seems to have persisted, in spite of changes of style, and it even gets used in situations of reduced applicability, such as the above-mentioned jazz.

So it is natural that now we have come to think of braille music as representing a notation more than an aural message, whereas its conception was probably aurally centred, and notationally checked. Louis Braille was professionally active as an organist, and involved with high-level musicians of his day, so he certainly knew about notation as well as aural learning.

My work is for the other notations: its area of enquiry is anything which is significantly different from our current Western music notation system, the one with crotchets and quavers and bar-lines. So it is in these special areas, different notations, that new codes seem a better solution than either greatly deforming the present one, or sacrificing the true spirit of a different music by built-in assumptions not proper to it.

And conscience demands remarking that concerning the above assumptions, these are obviously mine, and may mis-represent Louis Braille himself, especially in the implication of conservatism. For instance, concerning the first point, he may indeed have been more aware of unequal semitones and their use, from the just intonation of the Paris organs, than we are. Such things would not appear in notation, at that time or now, so are not evident. His friends and fellow-students included composers, who may have had a lively consciousness of the new and different. Information is lacking on the matter.

However, these seem to be his starting point, and the reason certain things are built into his music code. From the perspective of that time, the above assumptions are entirely reasonable, and do seem basic to 'music'. We now know, they are not, or only sometimes! Perhaps he knew this too, but had to be practical for the scores most needed at the time and assumed, quite reasonably, that if print notation users survived with their skeleton signs, i.e. with that level of notating, so could dot users.

Let us briefly consider the features and assumptions of some of the other notations: those that could be called 'non-standard' with respect to the generally-understood one.

**AREAS OF DIFFERENCE:**

Some of the notation systems developed before 1600 and after 1900 look and are quite different from 'normal' music and they cannot, I believe, be properly expressed in Braille Music Code.

Take avant-garde music: the notations are simply different, modified and entirely new signs abound, and sometimes with levels
of non-specificity of pitch and time which are virtually unexpressable in a system built on specific pitch and specific rhythm. Pictorial content may be suggestive rather than directive, or great precision may be expressed, but by vertical disposition of different modality information, e.g. a matching time-line in seconds in parallel with the notes. Works may use maps and plans set out as a cluster to maximize the relationship of all the sections to each other: an internal logic quite unlike classical development, and not easy to present serially, as one usually must in braille.

Various works have been brailled; but each has really had to have its own code. Long cells are a great help. A code developer runs into another problem in this area - fewer people like to play the music, so it is quite difficult to find trial subjects.

Take early music, Mensural notation:

- many of the note-types (shapes and meaning) are quite different

- groups of notes heaped together called ligatures, have no modern equivalent

- there are no bar lines, so value/rhythm cannot afford to be context dependent in the same way as it is in Braille's system: mensural notation is context dependent in quite different ways.

- rhythm was conceived as basically ternary unless otherwise stated, that is, three breves in a longa, not like our two minims equal one semibreve.

- colour and part-colouring of shapes may express rhythmic variation

There is scholarly debate about so many matters, especially in really early manuscripts, that it is unwise to code them too prescriptively. What we have is a visual symbology to communicate, no auditory evidence; whereas Louis Braille's first basis would have been the auditory evidence. So our first principles are bound to be different.

The whole matter of notation is so enormously variable across time and country that many codes may be needed, in order to be faithful to the manuscripts. Such faithfulness is essential to our purpose, of offering braille users 'the real thing' as nearly as maybe, for study.

* * *

For all these reasons I have developed completely new codes for certain areas, some using long cells, based on what seems to me to be the requirements of the sources. The four codes chosen for inclusion in Part One are:
HEXIMUS 'Hexadecimal Music Manuscript Code', for music 1200-1500; on a sixteen dot base originally. It is designed to give the braille user the pictorial information about signs on the manuscript - to give it 'bare', uninterpreted, not turned into anything else, to think about.

PASCO 'Place And Shape Code', is a practical code for Mensural Notations, Black and White; for sources 1300-1650. In order to be really useful, this must be readable at performing speed, or nearly so; at least as easy as Words and Voice setting-out is in Braille Music Code. It is on an eight dot base, and some assumptions are made - whereas in HEXIMUS assumptions are avoided where possible.

LUTAB is for lute tablatures and those of other plucked strings, 1500-1700, of the English, French and Italian schools. (German lute tablature works on completely different principles, and will need a different code altogether. See Poulton 1957 Appendix II.)

FIGBY is a code just for the figures, as used in Baroque Continuo parts, sources 1600-1800. The rest of the music is in normal braille music code, since the notation is not different enough from our own to warrant anything else.

These are intended to open up different 'patches' of music history - to provide braille users with access to some of the same materials that are giving sighted musicians such joy! The real materials are the music: this document is an annotated list of symbols used for the recreation of the manuscripts that contain it. See the list of works brailled in each code, point numbers 99, 399, 599, 799. Some of these works will be needed as well as the code booklets, by anyone wishing to become fluent in the notations.

It is also to some extent braille research, through the medium of wanted codes.

My braille-reading days began at 20, while at University, so I am not a high-skill braille reader. This meant I could be fairly certain that if I could easily do it, anyone else also could. Once a code was fairly firm, I used other blind friends to test it out. But at the beginning, when something had been transcribed, I would leave it for three weeks; then, if when I came back to it, I could work it out straight away I considered it possible. If not, I knew there was insufficient internal logic, and I would have to think of a better idea.

Many schemes were tried and discarded: either because they were found not sufficiently memorable, or because they had tactile weaknesses. This was especially likely if I followed a promising theoretical scheme, there would come a place in the natural sequence where height orientation was doubtful under some
circumstances - i.e. there was no full-height cell nearby, or a
definite top-dot 1 or 4 from which to make tactile judgements.
Clearly that was not satisfactory. With persistence, naturally
appropriate schemes and patterns gradually emerged.

Code descriptions are deliberately 'bald' - just the essentials:
expansions to make them more intelligible, and some useful
asides, are found in the Explanations section, using the point
number 40 further on. This means that if there is more to add
concerning point 15, it will be found as point 55 in the
Explanations section.

In the case of LUTAB, however, many explanations occur in the
Tutors already fully brailled so these will not usually be
restated in the LUTAB booklet.

There are still great numbers of notation systems needing codes,
there is a long way to go yet before braille users have access
to anything like the full range of early music codes! but these
four are functionally complete.

To have anything like parity with print users, we need a machine
that will do whatever dots we need, have variable line spacing,
have several recognizably different 'dot-faces', and be small,
cheap, and charming! However, until this magic machine appears,
all of my codes can be written on a Perkins brailler.

Modern scanner technology is making some line-diagram material
newly available: but all controlled from a visual screen, so a
blind person only has access to it after printing.

In the case of early music, however, I think there is no
reasonable doubt that the notations will need a code - that a
visual picture alone made tactile will be too cumbersome to use,
and basically inefficient. The same may be found for avant-garde
scores - that they will need a code in addition to pictures.
Still, the pictures will teach us some things.

CODING METHOD

Coding method has tended to reflect probable use. Tablatures are
more for playing the music, than for thinking about notationally
for their own sake, although naturally any amount of study is
possible on the musical content, or the notation. In contrast,
mensural notation may be subjected to considerable musicological
scrutiny, only peripherally being the means to perform one's
part, and recreate the music.

FIGBY is designed to be easy to refer to, or easy to ignore, in
keeping with the purpose of figured bass, and it uses the plain
figures of literary braille. In contrast, HEXIMUS is designed
to be as like the manuscript (literally meaning 'handwritten')
shapes as possible. If a note has a stem down on the right, its
braille symbol will also have one there. If a ligature has three
falling pitches, the braille symbol will similarly have them.
At all times I have tried to use known sets, in cases where coding must apply. E.g. Braille's 'auditory placement signs' octave signs, are in use for line-number signs in PASCO and HEXIMUS, and as string-number signs in LUTAB. Thus they stay in their order to form 'conceptual placement signs' or 'visual placement signs' if you like. Numbers are used in FIGBY for figures, and in PASCO in upper and lower, for where to go next melodically; basically in their regular order.

Long cells have been used often enough to ensure that when the hand touches the paper they define it as new code, but only as needed in the context of the code. It would have been possible to decide to do all signs in long format, thereby totally avoiding all existing meanings. However, after experimenting, that did not seem the most natural thing - the musical message was more quickly conveyed by a judicious mix of new and known.

Where practical, long shapes were used for pictorial shapes, to distinguish them from non-pictorial, coded signs; especially in the matter of stems: i.e. a long TH was preferable to an ordinary TH if the intended message was pictorial, as it is when it means 'a square with a right down-stem'.

* * *

The braille copy and its matching print copy of these booklets are not identical. Many things had to be set out differently to be as clear and concise as possible in each medium. Even so, only with a knowledge of braille and braille music, will the print copy make much sense. It is only done in print to be available to sighted teachers of blind students. The braille copy is the real source, and the works brailled, which demonstrate the ideas.

* * *

Although the whole tenor of this study is to give braille users what the composers wrote, without anybody pre-digesting it, there is one area where this cannot really work: that of setting-out. Because of the multiple meanings for every braille cell-formation, to replicate the actual trivial divergences and varieties of manuscript layout, would produce unreadable copy.

Any music score is going to contain at least two codes - literary (ordinary words) as well as music signs - sometimes more, and these may well use the identical physical shapes. So some degree of predictability, and careful naming, is essential for efficient user-handling of copies.

One could use signs for 'words' and 'music', but there are so many other things that sometimes occur, for which signs do not currently exist, that it seems preferable to just write things as needed; but in such an order as they will be readily understood. When making a transcription always code-label, and part-label, each page of work.
For sighted transcribers: think of how braille is. Imagine if there were only lower-case letters in one type-face available to you: titles were letters, notes were letters, lines were letters, numbers were letters, words of foreign text were letters, instructions were letters ... EVERYTHING just more lower-case letters .... well, that's how braille is. It can easily become a jumble unless there are fairly fixed expectations of what you can find, and where.

So say what is coming: e.g. 'Latin words and voice' 'Melody and LUTAB' 'Keyboard score in 4-line systems' etc. Be liberal with blank lines to separate information sets; but within sets, be as compact as possible, so as not to have to explain it all again. A Commentary separate from a clean score or coded part is the most comfortable arrangement if it can be done.

The use of eight-dot cells has made some alleviation to the multiple possible meanings of symbols, clearly they will only mean the one thing assigned to them in the new code. There will be only one meaning assigned to them, in all possible instances. But if other people begin to use the long cells for other knowledge areas, which I hope they will, there will possibly be some doubling-up once again. Hopefully since there are so many more shapes available, it will be more avoidable. At all events, minimization of ambiguities and tediums is greatly to be wished!

It is recognized that only a very small number of transcribers would be involved in the production of these specialist materials: however, the present four codes are quite easy to do compared with braille music code itself. And as there is an ever-increasing interest in early music literatures and many more people are becoming skilled with their original notations, perhaps there is more hope of a substantial corpus being transcribed for us by such people, than might at first appear likely. It would be a wonderful thing if a reasonable corpus of standard works could be prepared, of Machaut and Landini, Dufay, Binchois and Josquin, ready for the use of students of early music.

* * *
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[from the January 1985 edition.]

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Performing groups like 'La Romanesca' in Melbourne, who keep our ears open ... the list becomes very long.

John Stinson at Latrobe University is not responsible for what I still do not know about manuscripts!

* * *

Extra acknowledgements, closer to 1994 appear on page 7, after the Foreword.

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* * * * *

[Although readers of this dissertation are not likely to be blind people, the following 'Preface to Braille Users' from the original booklet has been retained, on the grounds that it makes clear what kind and range of extra information will be needed by the natural clientele of the codes, and is therefore part of the provision of effective codes.]
Preface to Braille Users

Musicological statements made are to the best of my knowledge and belief true. However, to do this kind of task it has been necessary to access a wide variety of fields; this must mean some limitations on depth.

Codes are practical, designed for ordinary life, as approached by the serious amateur or student. It is likely that anyone becoming interested in the field, will have to do a good deal of their own transcribing, with their friends dictating: so codes must be approachable enough to do that.

Almost every manuscript will have unique features, so start off expecting to have to do a Commentary. If you have two braille machines, manuscript and commentary can be done in parallel—much more satisfactory and time-efficient. Try to keep the coded part clean to reduce the chances of confusion with existing codes, and remember to code-label all material.

In the works I have transcribed there are often trials of method—something done in more than one way. This seems better than me making all decisions about method: one person in their spare time cannot possibly braille out a sufficient quantity of material to make good decisions about everything! So please be tolerant of that, it is not just 'inconsistent', but demonstrating alternatives. Often the commentary follows my thinking as I do a work, and although with contemporary pieces I have sometimes written out a page five times before being satisfied with the disposition of the information—that it demonstrates the composer's intention as smoothly as possible—there is not time to do this with everything.

There might also be deficiencies due to my poor sight—I do not apologize for this, since it can't be helped, but hope that any such, do not greatly inconvenience anyone.

The musicological basis for the study has been the available facsimiles in local university libraries, and later, original manuscripts, especially in Britain, United States and Italy. Our medieval group proudly performs from these sources, although of course we have consulted modern editions as well, and singers usually prefer these—the words are a good deal easier to read! So I know that the codes are reliable, and that the transcribed works ARE sufficient to get going on, and take you a good long way in, for any of the areas. Where things have got out of my depth, e.g. some of the contingencies in the advanced lute repertoire, that is stated.

Since the first purpose of my efforts is to offer anyone interested the chance to get going—to provide that kind of material which will open up skills—the music I have brailled is mostly 'backed up' with necessary surrounding knowledge. This includes articles and extracts, modern scores with their explanatory notes; and sometimes information that I had gleaned somewhere, which seemed helpful.
And since this work is now being re-issued in 1994, we have been studying the manuscripts, and performing concerts from them for another six years, I can be quite confident of the efficacy and truth of the codes; that they are indeed in harmony with the spirit and content of the originals.

All codes have been trialled on other blind musician friends, and for most choices of signs and rules there were fairly compelling reasons. However, if things need changing, or you use the codes in a different way, and they work, obviously that is fine. Or if you find inconsistencies which can be painlessly corrected, I will be glad to hear your solutions.

General information helpful to early music students and players may be sought from program notes, and tape, record and CD covers of performances of early music. These are the kind of length that one can ask friends and acquaintances to read out to one without making a big thing of it. Introductory notes to editions such as London Pro Musica (GB), Antico (GB), Musica Sacra et Profana (USA) try to bring the point of scholarship to the ordinary performer. Some of the more mainstream publications from Moeck, Zenon, OUP, Schott also have good explanatory material. When buying print music, try to get the editions that do provide information, and perhaps facsimiles of the original.

No-one claims that this sort of source is infallible, but neither are reputable academic editions infallible, as more is always being learned. It is always better to have a feeling and idea about things than not to, even if some ideas or details must be revised or re-evaluated from sources which are not geared to encouraging a purchaser.

Articles in journals like Early Music (an OUP quarterly) and specialist journals like that of the Viola da Gamba Society or the Lute Society contain medium-length good value material. The latter are more likely to contain the ideas of scholar-players, so have the reality sometimes lacking in the more formal academic journals.

The New Grove has excellent material once you know where to locate it. These articles are obviously much longer, you need a more academic reader to get the best from them. Under 'Sources' is a wonderful article on manuscript sources; under L is a splendid article on the 'Low Countries'! Entries on 'Notation' and 'Performing Practice' are of particular interest.

The Ogni Sorte editions are terrific, providing diplomatic transcripts of the parts for players to use, and modern editions in score. This means one can study White Mensural Notation in its true spirit, by doing; playing a whole range of the famous music that was set down in it. If you can work with a group that plays and sings as well as studies the manuscripts, the rewards are manifold.

If transcribing away from the group, you may need to get precise details about where the piece starts on the page, how many parts
there are to find etc.; or your reader, if familiar only with modern music notation, may become quite perplexed. Decorated capitals can be hard to work out, or be missing; often space was left for them, but they were never filled in.

Titles as we know them, mostly do not occur. A composer's name may head the page. The composer we call Landini is actually 'Magister Francesco' or merely D F in a cursive script, at the top of many of the pages of a wonderful Florentine manuscript collection, now known as Panciatichi 26.

Words and part-names are generally under their notes. As well as being in foreign languages, or obsolete forms of them, these may be corrupt or abbreviated, so not at all instantly obvious. In church music, a polyphonic section may follow a phrase in Gregorian Chant, and this means that one must know the second line of that part of the liturgy as well as the first, to recognize it. For example, something beginning 'Vita dulcedo' is probably part of the 'Salve Regina' text. Works may often be for parts of the Office, which may be less well known today.

At first you and the person dictating might feel a little lost, but as you get to know your way round, comfort and confidence will grow. Like any other knowledge area, it is a matter of knowing enough to enquire effectively. There is so much to be learned from what the composers and scribes at the time actually wrote down, and their schemes are mostly quite efficient for their purposes. To learn more about the purposes may be one reason for studying the manuscript evidence.

These codes are not difficult to learn. In 600 years of music, 1200-1800, there will surely be something you can really enjoy - be encouraged to give it a try.

* * *

Useful materials in braille:


Montpellier Codex, folio 1. [F-Mo H 196]

For dot-pictures of this folio, see the end of Appendix 3: also some of the photographs in the Equipment Appendix, 4.
"HEXIMUS"  Hexadecimal Music Manuscript Code

1. This began by using a 16 dot format, but later just two consecutive 8's were found to be just as satisfactory.

2. The picture on the preceding page is of folio 1 from the Montpellier manuscript, whose RISM siglum is F-Mo H 196. This is brailled independently, with a modern score to match, etc. See the beginning of the Explanations section for information about RISM, which is a musicological system for manuscript identity.

3 . . . . . . . HEXIMUS Introduction.

There is clearly a need for a code which shows just what is there on the manuscript, without any comment on the meaning of the shapes. Philosophically of course this is scarcely possible, but the need for brevity precludes that discussion!

In HEXIMUS I have tried to keep the braille shape as like the written shape as possible, that is, to keep one-to-one correspondence of its information units. Hopefully this makes the same descriptive terminology appropriate for braille and print users, better for class discussion in our probable learning situations, at colleges and universities. And also because the homework for next week in these situations will probably have to be dictated to us by some willing but non-expert other class member; so must be easily communicated.

Thus, if a note in the manuscripts has a stem down on the right, it will have one there in braille; if three notes of a ligature descend, they will; obliques will be coded by the braille letter-shape for e or i in appropriate orientation.

There is no way on a grid of 16 that one can show precise lengths of stems, or exact angles; but these appear to be scribal preference. A note about them in the manuscript description or commentary will alert to anything unusual which may have a bearing on musical significance.

Obliques tend to look very large and strong; but are actually only expressing the two notes of their extremes - the pitches at beginning and ending height. They look quite dramatic when they stretch a long way; unfortunately this extra visual excitement cannot be replicated in braille!

Within a ligature, for anything other than adjacent notes, an interval sign must follow the coded forms to show that. The shape of the ligature must first be completed, then dot 8, then interval signs in their order, to be understood in the direction of travel given by the shape. Interval signs are the braille music set but they are used melodically here.

To replicate the 'square look' of many manuscripts, I originally imagined equal increments on horizontal and vertical axes were
necessary; so the first aim was to use a 16-dot cell, 4 x 4. My father, the late Fred Russell Williams, managed to make a hand-frame with a guide of 10 sixteen-dot cells, from an old piece of iron, on his home work-bench. It was on this that all the early experiments were carried out. As mentioned before, many schemes were tried and discarded.

The good news was that, properly coded, this 4 x 4 format was perfectly easy to feel; neither adults nor children had the least difficulty recognizing and describing the shapes.

The bad news was: that it was rather laborious to write; the fact that only one such frame existed in the world was a trifle limiting. And many of the ligature shapes encountered in earlier manuscripts still went beyond its edges, needing 5 x 5, or 6 x 6, or 7 x 7 to maintain their original shape integrity, which was one of the chief aims of the exercise, but obviously not quite realizable.

The Royal Victorian Institute for the Blind (Industrial Dept) then managed to make a 'continuous 8-dot' hand-frame, i.e. the distance between cells was the same as the distance between the two columns within a cell. But this arrangement was found to have drawbacks; the worst of which was the loss of a 'relating space' which made something before or after the central cell-idea impractical to express tactually: i.e. only by leaving enormous spaces could one feel clearly what was intended to be considered 'before' and what 'after' rather than an independent shape.

So it became clear that only a machine with two spacings would do this precisely helpful thing, the one spacing for column to column, the other wider for between-cells, just as in regular braille now.

It also became clear that because of the orientation of the reading finger to the dots, the maximum information load should be carried on the vertical, not the horizontal axis - as indeed Louis Braille realized, using a cell-shape longer than it was wide, and coding from the top.

Another matter that became clear was that as long as your finger and brain knew what was supposed to be joined, and what separated, the actual separation did not bother it - a between-cell gap instead of close-column gap did not confuse or impede perception of a complete shape at all.

This meant that most things could be faked on a Perkins Brailler - and doubtless on other machines too - using two or more cells, and tipping the roller upwards for the deep dots - slightly risky and awkward to correct, but much less tiring and slow to produce than working in reverse on a hand-frame. Also other people have one: materials can be shared. Whenever 8-dot cells are used, naturally the next line must be blank, so it was also a little wasteful of paper - but this was a small price to pay for its convenience.
Then along came the Mountbatten Project, to develop a flexible modern electronic braille machine, which will emboss 8-dot shapes, and can be used through computers and word processors, as an input or output device. This work done by hand was consequently deferred for a time, awaiting developments.

The Mountbatten Brailler is now available, with its good points and weaknesses. Its enormous advantage for this work is that it will produce hard codes of 8-dot braille comfortably, and of even longer cells with persuasion; and that it will store them as a computer file and reproduce them at need.* It is just waiting for someone to take up the challenge, and make transcripts of the early periods.

The 'persuasion' referred to is possible because the interline spacing is exactly equal to the absence of one dot-row. This means that by setting the control to 'six-dot' but actually brailing in 8-dot, one can extend downwards to 10-dot: filling the usual line space with dots 7 and 8, and writing in dot locations 1 and 4 of the line below, just under the 8's.

12-dot can thus be similarly created by using Row 1 as needed under the 8's: and one could go on adding dots continuously in the lines below as desired.

* * *

But although much of the code can be 'put on hold' until an 8-dot embosser arrived, one area could not wait: ligature shapes. These are needed for Mensural Notation, which is the chief subject of PASCO code. They are listed here as they appear in the New Oxford History of Music, Vol. II, pp. 323 and 381 and following.

The necessary explanations and knowledge about reading ligatures, have also been excerpted from this source, pages marked in the copy. Also other helpful articles like that by Irving Godt: "Reading Ligatures from their Ground State", Early Music, no. 4, January 1976, pp. 44-45.

Warning:

The activity of hand-writing shapes might be compared to breathing: we can do it deeply or less so, quickly or slowly, quickly in one direction, slowly the other ... similarly there are infinite variations in the actual shapes drawn by scribes: yet the overall effect makes recognizable notes, sometimes also very beautiful; the intention is usually clear.

The clarity of a discrete system like braille rather belies the vagaries of hand-writing: let alone the 'thousand natural shocks' the manuscript may be heir to! which can cause doubt as to many symbols and meanings - blobs acquired, ink faded, water smearing, worms devouring, parts cut or maimed with paste to make covers for new choir-books ... there are hazards in reading them.

* see page 325
However: In spite of this, I believe most discoveries come from thought and awareness; in which case blind people are well placed to make valuable musical and intellectual deductions on the basis of even a less than perfect transcriptual congruence. We are, after all, quite used to getting a lot out of a little. In this faith, I offer the following.

* * *

4. The numbering system for each point was conceived thus:

Each code has the possibility of 100 points: but the following hundred are left blank in case sub-codes related to it turn out to be needed. Thus HEXIMUS uses nos. 1-99: PASCO uses 300-399: LUTAB uses 500-599: FIGBY uses 700-799.

Within each hundred:

Nos. 1-10 of each code for any introductory material. All of the numbers may not be needed.

Nos. 11-50 for Description, the basic working operations of the code.

Nos. 51-90 offering extra explanations to the corresponding point in the Description. Not all points need this - but if say, point 17 needs explanation, that will appear as point 57 in the Explanations section.

Nos. 91-99 any Appendices needed: such as Works brailled in that particular code, uses no. 99, or references. All of the numbers may not be needed.

Nos. 5-10 are not presently needed for any other introductory material for HEXIMUS.

* * * * *

H E X I M U S Description

11. It is designed for music on staves.

12. 'Placement signs' as for PASCO code: denote the position of a sign on the line or space of the stave. Lines are numbered from the lowest upwards.

The seven right hand side characters which act as octave signs in braille music code here mean 'on the first line' or 'on the fourth line' rather than 'first octave' or 'fourth octave'. If a space is to be expressed, dot 8 will be added below the octave sign for that number; so that for 'third space' all four right-hand dots will precede the shape.

'First space' is the space just above first line: so on a 5-line stave 'fifth space' will mean the note peeping over the top line. Sixth line and space are deemed the first leger above, and the space above it. 'Seventh space' is that below first line, and 'seventh line' is the leger-line below line one.
In print convention, only the main stave lines would normally be referred to by number, one would be more likely to say 'the first leger above' or 'the second leger-line below' - so this use of sixth and seventh is purely my suggestion, a braille convention for the immediate purpose.

Each new note in HEXIMUS must have a placement sign; otherwise it is presumed to be the extension of the preceding sign.

13 . . . . . . . . . . . Note Shapes

Square forms; 2 forms in braille for the one visual one: g & c;
when used alone, or when beginning a ligature-form without other long signs adjacent, use the g - it feels better
when the square is the second or subsequent sign in a ligature, or when it is the first, but has a long sign adjacent to it, use c - this gives more orientation possibilities, which are often needed.

Oblique forms; e or i in appropriate orientation

Stems: combined into their note shape;
square with down-stem on the right - long TH
down-stem on left - long P
up-stem on left - long V
up-stem from oblique - 123 8

As seen here, obliques with stems often form rather contracted braille shapes, all three elements in one cell; but these are easy to read, and very common, so are easily remembered.

'Diamond-shaped' notes, also called 'lozenge' shape:
use d in appropriate orientation; or j may be preferable in situations like 3 falling diamonds of a 'conjunctura' (common) after the long TH shape: since it offers 3 positions, still feeling as if the first is lower than the pitch of the TH note. i.e. 3 d-shapes can only be written in 8-dot if the first is level with the top of the TH-sign, and it is almost always lower in the visual picture.

For ordinary semibreves, which are habitually written as diamonds, it may be deemed preferable to use one of the other 'corner patterns' i.e. f h or j

Or if all pitches have diamond note-heads, asterisk the fact and then act as if all are square.

14. Long lines down through stave: long 1 123 7

These may be rests, or just a marking-off - or other meanings. If it is clearly rests, rest signs, which are the same as in PASCO may be preferred.
15. Rests: These base on u from Braille Music Code, taking suffix dots to the number of lines 'involved' in the rest-line: viz.

one dot following means touching only one line,  
i.e. u 3 is a semibreve rest, hanging from the line;

if followed by 2 dots, u 23 it is a breve rest,  
i.e. 'filling up between two adjacent lines';

followed by 3 dots, u 123 touching 3 lines, is an Imperfect  
Longa rest, i.e. for 2 breves; or

4 dots following, using 123 plus deep dot 7, Perfect Longa  
rest, i.e. 3 breves.

It will often be important to prefix rests with their placement:  
sometimes this offers rhythmic information, showing where to  
complete one perfection and start on another.


16. Sharp and Flat use modern symbols, : :  
but probably preceded by a placement sign, certainly if different  
from the following adjacent note-shape, which is quite common.

17. Doubt symbol: long OW o makes a lovely tactile 'circle'  
which can be used for doubt. So can any sticker-type symbols,  
such as commercially available ring-binder reinforcement circles.  
These have the advantage of being distinct, and able to be placed  
in any context, words, music, commentary.

* * *

18 . . . . . . . . . . . . . Ligatures:

In his Plaine and Easie Introduction to Practicall Musicke Thomas  
Morley has a nice description of what a ligature is:

It is a combination or knitting together of two or  
more notes, altering (by their situation and order)  
the value of the same. [Morley 1597, modern ed. by  
Alec Harman, p. 19]

These are also to be as near to the print shape as possible.

The order of shapes presented here is that in the table from The  
New Oxford History of Music, Vol. II, p. 323; it is from Chapter  
X, 'Music in Fixed Rhythm' by Dom. Anselm Hughes.
Each symbol will be listed with its braille form - by dot numbers in the print copy.

The notes which follow the table, variously asterisked in the source, have had to be presented slightly differently here.

When ligatures include non-adjacent pitches, see page 88, 'Intervals for Ligatures' for a method that has worked well.

* * *

[See over for the chart: adjacent pages have been used to facilitate reference.]

[There are, unfortunately, no dot-pictures available for the long cells in this computer program. The braille copy will be able to display the signs as they have been conceived. So a sighted person will need to visualize the cell, with dot-numbers 1237 down the left, 4568 down the right, to make sense of the next part.]

* * *
values were no longer merely hinted at but were precisely indicated. For the present it will be sufficient if we set down the series of ligatures in their orthodox, proper, form—cum proprietate, as the mensuralists later described them to distinguish them from their modified shapes without propriety or with opposite propriety (sine proprietate, cum opposita proprietate)—see p. 382:

Ligatures of—

two notes: Rising  or  † Falling

three notes: Rise & fall  Rise & rise  or
Fall & fall † Fall & rise

four notes: Rise, fall, fall  or  † Rise, rise, fall
Four rising  or  † Four falling  § or  †
Fall, rise, fall  Rise, fall, rise  or  †
Fall, rise, rise Fall, fall, rise  or  †

† Forms so marked are not strict plainsong forms but are found in the modal manuscripts of this period.

‡ In polyphonic notation  is more often used for this group in a modal passage.

sometimes indicates  as distinct from  or  , but this will normally occur in a syllabic text, not in a melismatic modal part.

§ This is the conjunctura (see next page).
2 pitches: rising = y or long y; (lower one to sound first) or 78 long-p if the 2nd one's head turns to the right instead of being placed exactly above it.

2 falling: long p middle c (lower c's are possible, but feel less good; intervals follow if larger than a 2nd.)

['Lower' means normal braille usage, using dots 2356, or in the case of a longer shape like y, 237568: 'lowest' means using dots 3768. 'middle c' means dots 25.]

3 pitches: rise and fall = lower g c middle c
rise and rise = lower y long TH
or 78 y if thus written

fall and fall = long TH low d lowest d,
(or long p middle c hyphen)

fall and rise = 1537 d
(Here 15 is the oblique part, 37 the stem: then the d is higher than the end of the oblique)

4 pitches: rise fall fall = y lower d lowest d
or lower g c middle c hyphen
rise rise fall = lower y c middle c
rise rise rise = either: 2 rising y's, 78652 36541 asterisked to explain that the second really begins higher than the first ends:
or with in-accord sign between and placements for each y: with interval signs to follow if desired.

if written as diamonds, probably write
78 36 25 14 - but asterisk and explain.

four falling: shown two ways on mss:
long TH d lower d lowest d asterisked to explain that the first 2 pitches actually also fall:
or use the j instead of d, as above: long TH j lower j lowest j
or long p 25 36 78 (It fits if shown thus.)

Clearly four in the same direction can only be shown 'properly' with the 4 c's, and this is not how they usually appear; so explanation of some sort is inevitable.

(4 pitches cont.) fall rise fall = 1537 c lower c
rise fall rise = lowest g EN d or lowest g EN f depending on the direction in which the last head is turned; it is to be a longa if turned back over the oblique end, a breve if turned to the right. Some of these also look fine as lower g e plus either the d or f - not really needing the deep dots to preserve the shape feeling of rise fall rise.

fall rise rise = 1537 in-accord (placement) y perhaps:
or shapes like lower o y, or lowest e y with asterisk to note stem - all with explanation
Clearly none of these last quite manage the necessary shape: o means the downward oblique with down left-stem, 1537 which has to lose its usual lowest dot to fit.

fall fall rise = long TH lower d lowest d middle c
(the d's are shown as diamonds, c as square)
or long p middle c hyphen middle c

* * *

There are explanatory notes given below this table on p. 323; [New Oxford History II]

1. that the following 'are not strict plainsong forms, but are found in the modal manuscripts of the period' - (viz. recopied)
   78 long p
   lower g c middle c hyphen
   4 separated rising diamonds
   long p middle c hyphen lowest c
   lower g e f
   long p middle c hyphen middle c

2. Re: long TH lower d lowest d 'In polyphonic notation [long p middle c hyphen] is more often used for this group in a modal passage. [long TH lower d lowest d] sometimes indicates three quaver notes as distinct from quaver, crotchet, dotted crotchet or dotted crotchet, quaver, crotchet,
   but this will normally occur in a syllabic text, not in a melismatic modal part.'

3. Falling diamonds after a long TH are called a conjunctura: there may be 3 of these, 4, or even more at cadences, when they may be called a copula. See p. 324 for the examples, one of 6 from Wolfenbüttel 677, f. 125v. Theoretically the last note is equal to the sum of all the other time values in a conjunctura.

* * *

Once notation becomes definitely 'mensural', and the written values become smaller, there are some more: see New Oxford History II p. 381.

Here they are:

2 descending breves: this ligature consists of the down-slope and a down-left-stem:
   1537 - here 15 is the oblique, 37 the stem information

If all three notes are to be breves, these will be the forms:
   36 25 14 (or even better to feel, 3678 25 14 )
   long p EN
   lower g e
   dots 1537 f (i.e. head turned to the right.) Or 1537 c.

Here is the first of these, the BBB form, compared with the
original 'proper' form, BBL

\[ \ldots \ldots \]  (the TH would ideally be long)

The **sine proprietate** forms - those which gain or lose a stem 'improperly' - thereby turning breves into longs and longs into breves, are:

- lower p d or 145637 (with explanation)
- g lower c or g hyphen

Some of these can have slightly different dot solutions: one cannot have the 'true middle' with a stem, in braille it must be attached to, i.e. part of, either the left or the right symbol.

Using **L = Longa**, **B = Brevis**: Combinations to produce:

- **L B L**: lowest f middle c d or lower p y with explanation
  - g 36 78
  - lower p c lower c
  - EN d

- **L B B**: lowest f middle c c (or f to end)
  - g EN
  - lower p e
  - EN f or e f

Only the 2nd and 4th of the above examples can be shown here:

\[ \ldots \ldots \]

With ligatures **cum opposita proprietate**, where the up-left stem is added, to designate two semibreves, forms like these emerge:

- long GH = 1238 (= left up-stem to a down-slope)
- long v hyphen (and further extensions)
- (occasionally) 1276 (= left up-stem to an up-slope)
- h 36 78 (less good: OF 36 78) (with explanation)
- long v EN or long v 68 (less good, v EN or v e )
- long v 36 78
- long GH lowest d
- long GH lowest f

As can be seen, sometimes the forms could be shown without using the 4-dot depth: however, it is preferable to use it - then there is absolutely no chance of one's brain-cells registering an old meaning (a previously assigned meaning) out of a six-dot known code. The sense of length feels very nice.

Obviously there are an infinite variety of possible ligatures: hugely complex ones are not common, but something sensible must be done when they occur. For the 5-square-notes descent with upstems to pitches 1 and 3, therefore SS SS L -

- v 78 5 2 h 36 78

87
i.e. first two in-accorded with last three - would still need explanation, obviously, but is a logical possibility.

The meanings of most ligature forms are accepted as fixed: but some caution is advisable. There are some differences between Gafurius and Tinctoris concerning the rising oblique, and rising oblique with left down-stem; mercifully it is very rare: examples occur in the Old Hall manuscript, and the Chantilly Codex. Apel [Apel 1948/61: 90] and footnotes, and Morley's Plaine and Easie Introduction, p. 21 with Harman's footnotes, explain the situation.

Intervals for ligatures:

Much the commonest melodic movement is adjoining pitches, so any shape is presumed to be adjoining in the current direction of travel for the shape sequence - unless intervals in the lowest part of the cell follow the ligature shape, separated from it by a dot 8 (dot 16 in the original transcripts).

The Intervals are the braille music interval set -
ST ING BLE IN WAS CON COM = intervals 2nd to 8th;
and if any interval is other than a 2nd obviously the whole row will have to be quoted.
  e.g. Notes (pitches) d c d e c if ligated, would require
dot 8 ST ST ST ING after their ligature shape.

In the rare cases of longer than octave leaps within a ligature, a following k or preceding sign could be used, as in the interval extension system in PASCO: asterisk this and explain. Just occasionally the contratenor of a Burgundian chanson will jump a 12th, and this can be part of a ligature.

The PASCO booklet also gives solutions for when accidentals apply to pitches other than the first, or dots to other than the last pitch in a ligature etc.: see no. 321 p. 101, no. 323 p. 103.

* * * * *

HEXIMUS Explanations:

From the Introduction: Musicological Identification:

'RISM siglum', plural 'sigla':

This is a sign from (French name) 'Répertoire Internationale de Sources Musicales'. It has a short form for all known manuscripts in the world. The first capital letter gives the country, the second the town or city: sometimes there may have to be two letters for either of these. Then small letters give the library name, and other letters and numbers, the manuscript's catalogue or shelf number within that library's own systems.

Thus capiotal-f hyphen capital-p small-n [F-Pn] means France, Paris, (Bibliothèque) Nationale;
GB-Ob means Great Britain, Oxford, Bodley (Library), etc.

A fascicle is usually a group of pages bound together.

A folio is a 'leaf' or page. It has a front called 'recto' and a back, 'verso', what you get when you turn it over.

Thus f. ii r (or simply f. ii) means the front of leaf 2; f. ii j' or f. ii j v means the back of leaf three, which will be the left-hand page of an 'opening' if bound in together with others. The last i of a number in lower-case Roman figures is often drawn long, so looks like a j.

* * *

51. Music on staves has been the only sort explored yet - and not all of what is on staves. Some mss have a completely different vocabulary of signs but still use a stave; eg. nothing like square or oblique on Hildegard von Bingen's Ordo Virtutum according to the facsimile page in the record box. [Thornton 1982]

On some earlier chant mss, just one clefless line was written in dry-point ink above the text, with music neumes above and below it, giving the approximate pitches for the words to be sung, and possibly including some now uncertain rhythmic indicators. Dr Mary Berry suggests that the shapes of the neumes correspond to the natural movements of a conductor guiding the singers with the phrase-shape. Chants would all have been known by heart, but the choir members may have needed reminding of the more infrequent ones. [Berry 1979: 5]

HEXIMUS may be useful just for difficult passages rather than whole works, or at the beginning of study, when getting to know the signs used. It is a little cumbersome. Once you know the signs, it is quicker to call them by name, and use PASCO.

* * *

53. Warning about the visual aspects of manuscripts:

Before you understand the signs sometimes it seems impossible to know whether a stem is on the right side of one note, or the left side of the one after it - this 'true middle' cannot be shown in braille properly, of course, so it takes a little knowledge to know where it is really attached.

Or a stem-like line may not really be a stem; eg. in a ligature that rises and falls, if the centre pitch is much higher than the outer pitches, a line will go up to it and down from it - if not, it would not be ligated together - but in fact the way of decoding that is the same as it would be for adjacent notes where there is no need for a stem, as the squares are corner to corner.

Rests are often only thread-like lines. And sometimes lines do appear to mean only an ending-off.
Notes from a semibreve down (Semibreve and smaller) have a
diamond-shaped head as their norm, whereas breves are 'square',
or often rectangular, wider than deep, and the pitch part of
longas is usually rectangular. The maxima has a distinctly wider
rectangle, as it is otherwise just like a longa.

57. Warning also about the different proportions in braille
shapes - these can only combine elements of the visual shape, not
be quite faithful to its variations.

Although the normal decoding can be learned from rules, other
rhythmic conventions like 'alteration' apply to all notes,
ligated or not; these depend on context, so all may not be as
it first appears. The rules for these practices are also in the
brailled Notation Guides etc. however.

* * * * *

Nos. 91-98 are not needed for this code.

* * * * *

99 . . . . . Works brailed in HEXIMUS code:

'Constantes estote / Gloria Patri', Lbl Add. 27.630, f. 58.
Facsimile and edition by Wolfgang Dömling, Bärenreiter,
Kassel 1972 (tiny work).

'Deus adiutorium' from Montpellier Codex, fascicle 1, folio 1
F-Mo H 196. (See page 76.) Polyphonies du XIIIe Siècle,
Also modern score from here.
Ribastraha:

i Tā dul ce do s pes nra. al

Se Àd te suspira

mus. Et flentes in hac lucrima ru' val

le

TENOR:

i Tā dul ce do s pes nra. al

de Àd te

suspīramus. Eternus. Et flentes.

in hac lachri maru ru' val le

Chapter 3 "PASCO" CODE

INTRODUCTION

301. PASCO = 'Place and shape code', in eight dots, such that the left-hand column of dots shall be called 1237, the right-hand column, 4568 - i.e. the two new low dots are 7,8; and the present cell dot-numbering is retained.

It is suitable for White Mensural Notation i.e. 'measured', where the notes have definitely indicated lengths: also for some Black notations, and by extension, with a little more code-working, any position-based notation with standardized symbols.

It is to work thus: On the --th line (or space) is a -- note-shape; now go -- interval up (or down) to a -- (next note shape) and then -- interval up (or down) to the next note shape. ('Note shape' means: Longa, brevis, semibrevis, etc.)

302. The manuscript on the previous page is Cantus and Tenor of Rivafrecha's 4-part 'Salve Regina' [E-Sc 5-5-20].

303. In white notation, as now, pitch is indicated by a clef and placement on the stave, rhythm by the shape of the symbol so placed. In the old notations, shape is one of the indicators of rhythm, there are others relating to context.

To use PASCO, clearly one needs to become fairly fluent with working out the lines and spaces, and thinking in intervals. This seems to be the way people who read these notations do it; and although they are used to lines and spaces, which braille users may not be, they are not used to so many different clefs!

We know that G-clef on 2nd line, normal treble clef, means that middle G is on that 2nd line; therefore A is second space, B third line, C third space etc. If a C-clef is on the bottom line, like most of Bach's choral soprano parts and the upper stave of the '48', that bottom line is middle C. Thus middle G will be up on third line. If C clef is on the fourth line, the lowest line must be the D below middle C. One just counts down, C 4th line, so B on third space, A third line, G 2nd space, F on 2nd line, E first space, D first line.

304. So the system for pitch is the same as now, though with many more clefs / starting-points; but the system for rhythm is not, it relies on a genuinely different set of conventions.

We should be aware that rhythmic conventions are operating in our modern system too -- it is not by any means totally accurate. Do you play the 4 crotchets in a bar identically? or the 8 quavers, or 16 semiquavers? Well, how do you know which ways not to? The differences might be in milliseconds, but they are certainly very audible, and not in the notation. Jazz is especially notorious: or thinking of it the other way, only partially notated by the present method.
But even to our most fully and accurately notated works, we bring the rhythmic conventions that we believe proper to them. Haydn and Franck, Mozart and Brahms, Sculthorpe and Rachmaninov; we bring something quite different into our rhythmic expectations to these composers. Thinking earlier, one does not articulate Byrd like Bach, Frescobaldi like Paisible, and Landini like Josquin, Machaut like Dufay ... Perhaps the best that can be said of any written code, is that it communicates more or less between people who understand the same aural language.

So for white notation, one should just be geared to learning the language, including the rhythmic conventions, without resenting their apparent ambiguities; although it is only truthful to say that these can be frustrating to the 20th century mind. But there is no doubt that to use the original notation brings us into contact with the composers as nothing else can. For one thing, it teaches us a different approach to rhythm, which we would never think of, while using ordinary modern copies.

305. Of course to learn white notation, one should use the books and articles to teach it; e.g. the Ogni Sorte editions, Notation Guide, New Oxford History of Music; or in the originals, Morley's Plain and Easy Introduction ... (1597), etc. See list of material brailled at the end of this booklet - unfortunately Morley's is not - that would be an enormous project.

When you look at a page of white notation it does not look like our music now. The note-shapes are all different; clefs occur in all positions, and some are of quite unfamiliar shapes themselves; there are no bar-lines; and there are often vestiges of an older practice, a sort of scribal shorthand, called Ligatures; these are totally unfamiliar.

Sometimes it is baffling to know where to look for things on the page. Names usually appear under their first line of music; you may find the Contratenor under the (unlabelled) Cantus, or on the next page, or on the page before. Or parts of something else may be inserted to save precious space on the parchment.

Visually something a millimeter higher or lower on a grid is very obvious; tactually, it can be difficult or impossible to distinguish. Hence an entirely different coding style was adopted by Louis Braille for music code. Similarly with PASCO; it is to some extent arbitrary, but I hope sufficiently logical to be memorable, and sufficiently colloquial to be easily dictated by any member of the class - using the same thought processes and language that they would be using to think about it to themselves.

306. PASCO is only designed to work when there is a fair degree of certainty about the note shapes etc. Even then, it cannot convey the doubt of a slightly irregular shape, or faint stem, or other doubt-inducing phenomena into braille. One can only asterisk the worst cases, or use a 'doubt symbol' - such as the long O\over W long o, which makes a fine tactile circle, or an external thing, like self-adhesive ring-reinforcements or stickers.
Naturally uncertainties increase the earlier one goes, and the hazards of legibility as well as all the other difficulties of increased distance from the fact pertain. Elizabeth A. Keitel has exposed a case in Machaut, where two bars (in modern transcription, that is) believed 'missing' may be the result of a later scribe re-drawing faded stems, and accidentally putting in one c.o.p. ligature stem that was not intended in the original. This made semibreves where there should have been longer values.

It is in the Ballade "Seur Toute Créature Humeinne" - which appeared as EM 31, a supplement to the Machaut number, with a matching article "The Musical Manuscripts of Guillaume de Machaut", in Early Music, 5/4 (1977): 469-472.

This is just to warn braille users that what appears cut-and-dried is often not, and that a great many things seem rather doubtful when one first looks at real manuscripts. To start from diplomatic transcripts, like Ogni Sorte edition original notation volumes, is safest - to get to know the notation before being faced with worm-holes, faint ink, and scribal idiosyncrasy, as well as occasional error.

Following the method outlined in the end of the Main Introduction to HEXIMUS, PASCO descriptions start from 311, therefore extra explanation of any of the points starts from 351; the matching paragraphs 40 further on. That is, if any further explanation should be needed for point 316, it will be found as point 356 in the Explanations section. A spare hundred has been left between each new code for things that may arise and need special codes or sub-codes: such things will only be known as transcription occurs. Other really early or base codes would occupy the 200's.

Nos. 307-310 are not needed for this code.

* * * * *

PASCO: DESCRIPTION

These first points are expressed as it works for White Mensural Notation: the more complex matters being introduced gradually.

311 . . Note shapes: the usual letters from print.

L = longa, long
B = brevis, breve
S = semibrevis, semibreve
M = minima, minim
P = semiminima, Sm in print, braille conflated to p
F = fusa - f in print, = 'foot', as quaver today
ER = semifusa, Sf in print.
FOR = maxima, often Mx in print, duplex long, double long.
    Morley uses the term 'Large' for maxima. [Morley 1973:19]

**::**
Placement signs: as for HEXIMUS:

The braille music code octave-sign set, but with the special meaning, 'first line', 'fifth line' etc instead of 'first octave' 'fifth octave' etc. To each of these may be added the deep dot, dot 8, to make the meaning 'first space' 'fifth space' etc.

'First line' is always the lowest of the set, no matter how many lines make up the stave: 'first space' is one note higher than first line.

Full list of the lines:

Lines 1-5: (before an S for semibreve: they also apply to L B M etc. naturally.)

dot-4 S 45 S 456 S 5 S 46 S

Lines 6 and 7, or leger lines 1 and 2 above the stave: sixth and double-sixth octave; 56 S 56 56 S

Leger-lines 1 and 2 below: seventh and double-seventh octave: 6 S 6 6 S

Full list of the spaces: *

Dots 48 before any of the note-types L B S M P F ER
for first space;
dots 458 for 2nd space;
dots 4568 third space;
58 4th space;
468 for fifth space; (fifth space is 'above' the five-line stave)

Above line 6 and 7, or above leger lines 1 and 2 above the stave: 568 and 568 568 for above first and 2nd leger lines respectively.

Space 'below' the stave, i.e. just under line one: 68 (seventh octave plus deep dot);
below leger lines 1 and 2 below the stave: 'eighth octave',
dot 8 = below first leger, and
double dot 8 for below second leger line.

Any unusual leger-lines should have a confirmatory sentence asterisked. 7th space, being just below, is common, and 6th space; but the others are rare.
313. Placement signs should be used:

At any beginning;
    after a large interval (after the interval indication, which is always helpful to have, see 314);
    after rests;
    after ligatures;
    and whenever else it reassures without obstructing the flow of the music.

*  *  *

314. Melodic interval indicators: i.e. where to go next from where you are now - could be called 'relative placement signs'.

These use the set of braille numbers in upper or lower cell, with the following special meanings:

one (dot 1) 'go up one'

one in the lower (dot 2) 'go down one'

c-i as numbers 3-9 = go up a
    third, fourth, fifth, sixth, seventh, eighth or ninth:
lower c-i, numbers 3-9 in the lower; go down a
    third, fourth, fifth, sixth, seventh, eighth or ninth.

j, nought; go no distance, stay on the same pitch:
    or no sign, note-shapes following without intervals interpolated are presumed to be the same pitch.

Intervals greater than a ninth:

Perhaps dot 6 preceding the c-d-e etc. where the dot 6 is 'an octave plus a' third, fourth, fifth etc. Similarly before the 3-9 in the lower.

An alternative is k to follow: going upwards; ck dk ek or going down; 25k 256k 26k drop down an octave and a third, fourth, fifth. These are fairly rare, so should be asterisked.

Long intervals are so rare, this has not been much trialled. Possibly k is preferable, since it is full height and therefore clear against upper or lower signs. Also then it can have the same meaning in the melodic intervals after ligatures.

*  *  *

315. Dot of addition, as Braille Music Code, dot 3 after note-shape letter. See Ligatures for more complicated situations.

*  *  *

316. Dot of division in black and white notations, k alone i.e. a space before and after it.

If the following cell does not have any left-hand dots, e.g. if a placement sign follows, it is probably not necessary to leave
another full space after, as the k feels alone. The same concept as in regular braille music code, regarding the use of dot 3 after expression markings etc.

* * *

317 . . . Rest Symbols: L B S M base on u,

longa (depending on mensuration) u123 or u 1237
breve u23
semibreve u3
minim u

semiminim = v ?
fusa, x semifusa, AND ? or v23 v123 ?

These last two have not occurred in sources so far brilled: if they do, suffixed v may be a more consistent solution. But by the time these small values come into use, the material can usually be brailled in normal Braille Music Code.

Rests take placement signs 'from the top' for SBL: so 456u3 means 'from the third line hangs an S rest'.

Values from M down (smaller) are on top of the line, but it is always clear which line, as none of these shapes reach up to the next highest line: i.e. shape defines these, not length of line.

Rests are not dotted in old notations; hence u3 is considered safe. u2 is also possible if any difficulty should arise.

* * *

318 . . . . . . Miscellaneous signs: I.

These are based closely on braille music code signs.

Braille interruption sign: dot 5 (as bar hyphen);
'Stop-sign': 46 13 (e.g. after blackening);
In-accord: 5 2 (usually with a sign of congruence etc);
Music code prefix when amongst words: 6 3
Corona: GH 123 (same picture as our modern fermata);

Double-bar or similarly functioning line: GH k with a space before it:
GH k k k = 3 vertical lines.
Four vertical braille dots, for a single line spaced

Sometimes braille needs closing-off where cues other than a double-bar make the end obvious in the source: so GHk should be

98
regarded as a practical sign, not a technical one. Use it for any ending-off.

319 . . . . More miscellaneous signs, II:

Wordsign in amongst music: AR with a space before it.

Custodes: e.g. AR 45c3 means ‘custos on 2nd line’.
(i.e. wordsign, placement sign, letter c for custos, dot 3 to end the sign tidily)

Asterisk: AR ENIN3 and ENIN to start the explanation line. Put the explanation in a line close to the asterisk if possible.

Signs which occur above the stave:

Sign of congruence:
5 2 AR CONgr' after affected note, (as if 'in-accorded') so as not to interrupt the flow of the music; or AR CONgr' before the affected note (or rest).

(Modern) Rehearsal letters: 5 2 [A] [B] etc. after the relevant note, thereby not interrupting the flow of the music: or as above, space and AR preceding.

Often it is desirable to start a new braille line from such a congruence or rehearsal letter; so that note, if marked as above, would be restated in brackets:
[A] (456S lower-c) 45M2M etc.

Line numbers, or simple page-and-line: 1#2 (spaced) or p#58#3

but if it is complicated, use a bar hyphen and enclose the number in brackets: e.g. 5 (lxvij56v) translates as p#67 verso.

* * *

320 . . . . . . . . . Clefs and mensuration:

Except for abbreviating circle ccl, stroke STk, dot dt, it is safest to write clef and time in full, thus:
‘clef: c4 time: ccl with STk’

99
When figures are part of the mensuration sign, be very clear: 'ccl cypher 3'

Changes during the work: 3 or 2 are often slipped in just for a few notes, so should just be spaced each side, not interrupting the flow more than necessary. For major changes, take a new line, starting '(c with dt)' etc.

Sometimes it is helpful to give the list of mensuration signs all together in the commentary; this shows the shape of the work - especially if isorhythmic tenors must be fitted in.

Sometimes there will be a change into 3/2 and later 2/3 - 'two-three' is simply revoking the 3/2; (Frescobaldi etc.)

Since these could easily be something else, they could have either an asterisk, or be written a little more fully: '(time: 3/2)' spaced etc.

* * *

321 ............ Accidental:

Appearing as a signature;
SH or GH signs preceded by placement signs either in the line with clef and mensuration, or down with the music, i.e. at the start of the music, as convenient.

Occurring in the course of the music,
if before their own note, before it;
if the note needs a placement, before that: just as in braille music code rules.

Occurring several notes early: interruption (dot 5) then space, placement sign, accidental, space.
Or: just asterisk the fact, but put the accidental where it applies. Also see 361.

Accidentals above the stave:
preceded by parenthesis, 6 3, or asterisked;
or just without placement sign could mean 'unplaced' on the stave: but this is less clear.
Or a placement of 5th space or seventh space could be used, meaning above fifth line, or below first line respectively, to indicate this.

If it seems absolutely clear which note is intended, you may not deem all this necessary: it depends on the context, and the desired level of faithfulnes to detail.

Accidental applying to the first pitch in ligatures:
placement sign as for note, but with a space afterward to separate it from the main ligature shape and its preceding placement.
Accidental applying to a pitch other than the first in a ligature:

written before the ligature as above but with the placement sign of the pitch it will apply to;
or if intervals are following, in its place there, preceding the interval of application, correspondingly lowered in the cell.

Codicologically, one could use another prefix first - before the placement - to warn that it was not the first note, but there is no handy one left over, and the ligature's placement sign follows immediately - that should be enough to alert the reader: asterisk it and explain if desired. Or the style indicated below in 323.

In the commentary you might list 'signatures' together; quite often there will be a flat in some parts and not in others. If the affected note occurs on 2 places on the stave with the chosen clef, it is often marked on both. (In the later Italian 8-line staves, it might be marked three times!) e.g.

clef: f3 4 GH 58 GH = flat on 1st line, & 4th space

* * *

322. Blackening:

After trial, the best solution is: space, wordsign, number of pitches affected, with stopsign to return to white: e.g.

ARbl4 ... 46 k Asterisk if necessary.

::: ::::

If only 2 or 3 notes are blackened, just a space (rather than a terminating stop-sign) may be enough.

* * *

323 . . . . . . . . Ligatures:

The same symbols and rules that would apply in HEXIMUS code: placement sign, followed by coded shape of ligature.

If any interval within the shape is other than the neighbouring note, the list of intervals after a dot 8 to separate them from the shape itself: intervals to be written in the lowest part of the cell, i.e. using only dots 237 568.

Interval signs as for braille music code;

2 - 8 = ST ING BLE IN 356 25 36
and if longer than 8: STk INGk BLEk INk - the k adding the octave: this is fairly rare.

[The specific braille equivalents which would follow the chart have not been restated in this dissertation: they appear in Chapter 2, point no. 18, pp. 82-88.]
values were no longer merely hinted at but were precisely indicated. For the present it will be sufficient if we set down the series of ligatures in their orthodox, proper, form—cum proprietate, as the mensuralists later described them to distinguish them from their modified shapes without propriety or with opposite propriety (sine proprietate, cum opposita proprietate)—see p. 382:

Ligatures of—

- **two notes:** Rising \( \uparrow \) or \( \uparrow \uparrow \) † Falling \( \downarrow \)
- **three notes:** Rise & fall \( \uparrow \downarrow \) Rise & rise \( \uparrow \uparrow \) or \( \uparrow \downarrow \)
  Fall & fall \( \downarrow \downarrow \) † Fall & rise \( \downarrow \uparrow \)
- **four notes:** Rise, fall, fall \( \uparrow \downarrow \downarrow \) or \( \downarrow \downarrow \uparrow \) † Rise, rise, fall \( \uparrow \uparrow \downarrow \)
  Four rising \( \uparrow \uparrow \) or \( \uparrow \uparrow \uparrow \) † Four falling \( \downarrow \downarrow \) § or \( \downarrow \downarrow \downarrow \) †
  Fall, rise, fall \( \downarrow \uparrow \downarrow \) Rise, fall, rise \( \downarrow \uparrow \uparrow \) or \( \downarrow \uparrow \downarrow \) †
  Fall, rise, rise \( \downarrow \downarrow \uparrow \) Fall, fall, rise \( \downarrow \downarrow \uparrow \) or \( \downarrow \downarrow \downarrow \) †

† Forms so marked are not strict plainsong forms but are found in the modal manuscripts of this period.

‡ In polyphonic notation \( \uparrow \downarrow \) is more often used for this group in a modal passage.

\( \uparrow \uparrow \) sometimes indicates \( \uparrow \uparrow \uparrow \) as distinct from \( \uparrow \downarrow \downarrow \) or \( \downarrow \uparrow \uparrow \), but this will normally occur in a syllabic text, not in a melismatic modal part.

§ This is the *conjuncta* (see next page).
Intervals, like neighbouring notes, are to be read in the direction of the particular ligature's shape: if it goes up in the middle and down again, you must follow this with the melodic interval directions. In practice this seems easy enough: of course signs could be used in the interval set to mark going up or down if desired, a higher dot preceding interval for 'go upwards', a lower dot or combined dots for 'go downwards' etc. It has not seemed necessary.

When anything occurs in a ligature that cannot be put in its normal place, while retaining the shape integrity of the ligature, these solutions have worked well:

Dot after note or dot after the last pitch of a ligature, dot 3; but dot placed so as to apply to some note other than the last, either asterisk and explain, or perhaps the following style:

ARlig#3 dt#1. = 3-note lig, dot after first pitch

Accidental above or before a pitch other than the first:

ARlig#3 468 GH#2' = 3 pitches, flat over 2.

(The flat's placement sign with deep dot cannot be pictured.)

When the new international Manual of braille Music comes out, dot 6 will be listed as the prefix to be used for an accidental above or below the stave. [Krolick 1993: xiii] So to avoid all possible conflict or confusion, use placement signs; e.g. 5th space, dots 468 can precede any above-stave accidental. In any case of difficulty, it is always possible to asterisk and list the pitches, thus putting sharps etc where they occur.

If you can imagine a common situation: sharp-sign below the stave, then left-up-stem oblique ligature sloping downwards from first line into the space below: in braille, (PASCO), imagine 7th space, 68 SH; space, then dot 4 long GH (1238) lig. This decodes as:

first-line S down one to sharpened 7th space S; in C4 this = third octave D-C#.

In the long-GH ligature, dots 38 express the down-sloping oblique, dots 12 the up-stem; see Ligature section.

Left up-stem = c.o.p., = rhythm of SS - though subject to all the modifications of all notes, depending on the mensuration sign: in this case c-with-dot so each will equal 3 minims, if no minim follows to come out of the end of the second one ... see rules quoted in New Oxford History II, Ogni Sorte Edition Notation Guide, etc.
This is black, at that early date, and the following signs have not been adequately trialled yet, but are the suggested signs.

The Extra note-shapes:
(All note-heads are diamond-shaped in this notation.)

Z = head with a down-stem S major
R = dragma, stem out of both bottom and top
O = 'S obliqua' left-stem sloping up to the note-head
N = 'M obliqua' left stem sloping up, and vertical stem out the top
T = vertical stem with hook pointing left out the top
(This last may be only orthographic, it gets used for triplet groups etc.)

Mensural signs: .q. .i. .p. .o. .n. .d. 
(i.e. dot 6 before, dot 3 after the letter)

These stand for: (4) quarternaria, (6) senaria imperfecta, senaria perfecta; ottonaria, novenaria, (12) duodenaria.

Suggested format 'Clef C4 Time .O.' etc.

It is a myth that they are always marked - mostly one deduces the rhythm from the spatial layout, and the melodic values of the parts. Small values tend to be clustered in the Cantus; and the ligature shapes in Tenore give clues.

It is possible that open and close phrase or some such sign, could be used informally to identify clusters; spatial relationships do give some added information over and above the values themselves. Even if only corroborative, it might still be helpful to the working-out process for the user.

Dot of Division k spaced out; see 316

Nos. 325-329 left blank for things that will arise in this notation, once transcriptions start to be made.

* * *

Underlay of words is sometimes a vexed question: the 'words and voice' method is the easiest to use, but unless the syllables are very clearly placed, it is harder to get dictated ... Sometimes words are somewhere else on the page, and it is all up to the singer where to place them with respect to pitches.

Words and Voice is a regular Braille Music Code setting out: line of poetry hard-left, matching music indented two cells underneath. Because of PASCO being an 8-dot code, a blank line is necessary under the music on present (6-dot) machinery.
In both modern or PASCO transcripts it can be helpful to put the number of notes for a syllable in the words line - a plain number after a word, a number between hyphens in the middle of a word. It is not exactly that one counts the pitches, but one is ready for a little melisma, and one puts it together quicker with this knowledge. There are no slurs in White Notation. Example:

"Mille regretz 7 de vous habondonner"
means the 'gretz' carries across 7 pitches;
"et deslon-3-ger" means 'lon' has 3.

For the benefit of the whole poetry line fitting on one braille line, it often seems worth breaking the rule which forbids any English contractions in foreign text. Music usually takes up much less space than words, sometimes the last syllables or words can be fitted into the extreme right of the line above, left blank for the 8-dot cells to stretch down into, rather than taking another whole line. Any overflow should be signified so the finger is not in danger of missing it; dot 5 can work for this meaning.

If syllable placement is not clear, and it matters, do a SYLCO or LETCO version, as below in 331 & 332, to have the precise details of where words or letters are placed in relation to the notes. The commentary should say something about the impression the words give - it is like learning to understand the speech of someone with a strong accent - once you get used to the scribe's 'accent' many things will fall into place.

Sing over the line a few times, then try introducing the words, see where they seem to sit. Then look at SYLCO and see what needs changing in your decisions. If using SYLCO sing 'one, 2, 3, 4 ...' to the tune, so as to find the notes without too much bother.

* * *

331 . . . . . . . . . SYLCO code
(just a setting-out)

First quote the complete line of poetry or liturgy; then each syllable down the left of the page, followed by the extent of it measured in pitch-numbers, and also with music prefix 6 3 and the actual notes if desired.

e.g. from Rivafrecha's "Salve Regina": see facsimile page 92:
'Vita dulcedo spes nostra [nra] salve'

Vita - very large capital V; -ita - under notes 1-4
dul- - under ligature 5-6 (i.e. pitches 5-6)
-ce- - before and under 10, third-line B (clef C1)
do - between 14 and 15
spes - under 16-17 etc.

* * *
332. LETCO code: for great detail only, of a tiny disputed passage perhaps. Every letter listed in the lower line, spread out to leave room for all the information above: viz. what sort of letter it is, and whether it is before, after, or under, the numbered note from the music line.

Naturally for practical reasons, this information about the detail of a letter is all brailled first, then place the letter under it in the line below.

Letter style categories: all upper signs:

- decorated capital
- large capital
- capital, but similar size to smalls (= lower case)
- small
- unreadable
- unusual

<table>
<thead>
<tr>
<th>dec.</th>
<th>l.cap.</th>
<th>cap.</th>
<th>small</th>
<th>unr.</th>
<th>unusual</th>
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</thead>
<tbody>
<tr>
<td>dFOR</td>
<td>FOR</td>
<td>CH</td>
<td>ING</td>
<td>GH</td>
<td>OW</td>
</tr>
</tbody>
</table>

Position in relation to note: all lower-signs:

- before
- after
- under

lower b (23), a (2), hyphen (36)

Under but tending before, under but tending after,

lower h
lower j

Pitch (note) numbers, like one kind of braille calendar, so as to express each pitch in one cell, up to 39 anyway: if there are more than that, they will have to be expressed the ordinary way. Or if the user would prefer the ordinary way for all numbers, that is also fine.

The calendar way: (this looks a bit odd in print, it is very comfortable in braille: see the complete Statement.)

1-9 = a-i  (j = o if a word should precede the music)
10-19 = t-s  i.e. adding dot 3 to 0-9 = t k l m n o p q r s
20-29 = WITH - THE  i.e. adding both bottom dots to 0-9;
30-39 = w - ow  i.e. adding dot 6 below 0-9.

Using all of these rows, there is a possibility of conflict between the above letter-style signs and note-numbers: prefix the style with 456, if it should ever occur. e.g. if the letter is unusual, 456 ow, under pitch 31, ow,

So the same example as in 331, see facsimile on page 92, Rivafrecha, would appear thus:
In braille one line gets to the end of spes - much more compact than this looks. Not all pitches get a mention, only those which carry a letter.

This example comes out meaning:

V = large cap. before pitch 1,
i = cap. under pitch 1,
t = cap. under 3,
a = cap. under 4;
doubled sign for small (meaning a row of them now)

d = under pitch 5, a bit tending after

The stem of a lower-case d may go further right than the 'body' of it; the one for 'do' begun under pitch 14 does, till it nearly touches pitch 15. Musical sense would probably put this syllable on note 15, the d breve anyway, but this method at least gives the braille user the facts about where it is written.

u = under 6,
l = before 7,
c = after 9,
e = under 10 (4)
d = under-and-after 14,
o = under-tending-before 15;
so the 'ce' and 'do' are obviously written close together;
s = under-after note 16,
pes = all almost under pitch 17 (q) ...
nra = 18-20 = r - WITH
Sal- = under 21, and

line 2, first 7 pitches then double-bar:
v = after 5

e = under 6 - but note 7 is the Longa, end of section,
so would probably take the -ve.
Making sense of this musically: one has 2 syllables, Vita and 4 pitches; they are a 3-note ligature and a single, so probably one would decide on three pitches to Vi- and one for -ta, perhaps especially because of the drop of a 5th there. dul- obviously takes 4 or 5 pitches - depending on whether one sings -ce- on the f S, (9) or the g B (10) (my choice). Since s cannot very well be sung on its own, spee probably has to be sung as a syllable, on the f B (16) with no- S B S and -stra on a B (20). Clearly everyone will not have the tolerance for this level of detail! And such things need the input of gifted singers, to make the most practical arrangements.

* * * * *

PASCO EXPLANATIONS
Extra to the Description:

350. A note about colour:

'Black' notations precede 'white' ones chronologically - black only means solid, blacked-in, a filled shape; in contrast to open, just the outside of the shape drawn with the paper or vellum showing through, called 'white' or 'void'.

At different times and places different conventions have been applied to the same shapes: in black mensural notation note-shapes left empty or filled with red ink usually are of a different length, often two-thirds, from their corresponding black shapes; and in white notation obviously blackening can be used as a variant, often showing a passage that runs counter to the prevailing rhythm - if in threes to make it duple, (especially long hemiola effects), if in duple, to tripletize it.

So both systems are really mixed, as is our modern system - semibreves and minims are 'white' open, while crotchets and all smaller values are 'black', filled. In the actual manuscripts many wonderful colours of ink are used: but whether the long values are filled or open determines whether it is called 'black' or 'white' As in chess rules, 'there shall be 2 colours which shall be called black and white ...': the actual colours can be anything you like. The Rossi Codex, in the Vatican library, [I-Rvat 215] is all in red; most beautiful!

The shapes of notes reflect the shape of the reed-pen used to write - at least at some periods and places, the semibreve 'diamond' was the cut edge of reed put down flat. One then tipped it to make only a tiny bit of edge write a fine line.

The staves were pricked out down each side of the vellum, then drawn between the pricks, sometimes with a rastrum to do several lines at a time. Sometimes words would be put in next, sometimes music. Often whichever was second never got filled in completely for all pieces or parts. It is common for room to be left, at the beginning of a Cantus part especially, for a decorated capital, which no-one ever got around to - so the first letter of the
words is missing. Practical considerations have quite a bearing on what happened, then as now.

351. The last 3 of these note-shapes have not been properly trialled, as they have not occurred in the material so far brailled. In the print abbreviations for semiminima and semifusa, the s is capital, the other letter small: it was preferable to use a one-letter symbol in braille, so superimposed s and m = p. There are two forms of this note, blackened m, or an open m with ‘foot’ so a proper fusa in this system must have double-foot. Letter f was not available for fusa, because of its ‘up-a-sixth’ function.

Although semifusae do occur in cadential figures by the 1550's, and are used freely in Divisions by the time of Morley etc., e.g. the Consort Lessons (1611) - by this time they are behaving so much like modern notes, that they are brailable in Louis Braille’s music code. For the rare occurrence in 15th century, q and er are suggested.

One would expect the double-ongs to occur in earlier mss where there are long-held tenors etc - clearly no notation normally needs both extremes at once.

352. Octave Signs are a sort of auditory placement sign - so by extension are here used for physical placement. Binary coding is the way to get most mileage out of the set: the regular set for lines, then with a deep dot added for spaces.

Having to double an octave sign for the extremes is not very convenient for the reader; but still seemed the best solution. Fortunately in this music the clefs are mostly chosen to avoid leger lines.

353. Placement signs could also be used after rests: whatever suits the user. On the Perkins brailer, sometimes one waits for a line note to mark, so as not to have the inconvenience of moving the roller - but as we move onto 8-dot machines, things will be easier.

354. Tinctoris apparently suggested a notation which worked by sequential intervals: so the idea is not wholly ‘unauthentic’ to the times and notation.*

Observe the nifty way 2 has been avoided, so as not to clash with B for breve!

‘Upper cell’ means using dots 1245; ‘lower cell’ means dots 2356 - not the lowest possible square in an 8-dot cell.

For tactile reasons the following k might be preferred for the octave-plus intervals - it is more definitive for both upper and lower cell situations. Large intervals are not common in cantus or tenor, but contratenors can be quite angular, and jump a 12th.

* See Page 325.
355-6. The dot of addition looks identical to the dot of division, and is recognized only by context. One must go back and forth to assess the context. Because this is done visually with so much less trouble than tactually, I felt the k for 'punctus divisionis' was justified. If anyone disagrees, obviously, either sign can be used for any dot.

357. All the original rests are a vertical line, longer for longer rests. On mss they are sometimes hard to be sure about, since where they start and end seems a bit casual.

It seems that S rest is anything that stops significantly below a line but without reaching the line below; once it reaches the line below, or goes a bit past, it is a B rest; and if it goes down through 2 or 3 full spaces, i.e. is in contact with 3 or 4 lines respectively, it is an L rest. The reason for commenting on 'lines in contact' is that that will be the number of dots after the u:

S rest is only in contact with 1 line, so a 1-dot suffix: u 3
B is in contact with 2 lines, u 23
L u123 or u long-L, = u dots 1237.

It seems the L is inclined to tell you how many B's are in it, whereas B rest does not say whether it contains SS or SSS. In print editions, S rest hangs down exactly half-way to the next line.

For the main rest symbol u was chosen because minima rest is the same as now, going up from the line halfway to the next line.

The positioning of rests in the old mss often gives clues to the rhythm patterns intended, so they should be given placement signs.

X and AND are hypothetical, they have not occurred in the material so far brailled. I have never met a dot-cf-addition after a rest, and other musicologists to whom I have spoken believe that it does not occur; but if it does, it could be represented by dot 7: asterisk and explain it.

358. One of the great difficulties with braille is that there are no unattached signs, everything means something already - trying to find stoppers can be quite challenging!

<table>
<thead>
<tr>
<th>FOR</th>
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<th>xx</th>
<th>CH</th>
<th>CH</th>
<th>46</th>
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</table>

A decorated capital might open a new part, thus closing off the previous one; or a set of words provide a barrier ... in braille it is really best to take a new sheet for each part. A Cantus of a Dufay chanson takes about a page, anyway.

110
Custodes were used right up into baroque times: e.g. Telemann's *Der Getreue Music-meister* has one on every stave-end where the movement continues. They should be included in the transcript of a real manuscript, but perhaps not necessarily in a recopy. I notice in some American books, this sign is called a 'direct'.

One wonders why such a good idea dropped out of use: very helpful, even though we are not usually trying to manage in flickering candlelight any more. Piano duets used sometimes to have a couple of bars of the next page in small print at the bottom, in case whoever was turning did not quite manage it in time. e.g. Allan's series *Melodious Pieces for Piano Duet*.

* * *

Signs of congruence seem to have been used for a variety of purposes: e.g. the entry of a canon; or a natural resting-spot where all parts come together. Sometimes they may show where the 'A section' ends in one of the *Formes Fixes* (poetry), where sections of music repeat according to a plan that fits the poem. It is not always clear exactly how much of the musical material repeats, before and after the text entry - which is normally only underlaid for the first appearance of the music. The remaining words are often set out like the poem they are, in some place where there happens to be room on the page.

Various shapes and patterns are used for congruentiae: three dots in triangle formation, horizontal wavy line and dots, corona, vertical wavy line ... but it is usually clear that it is such a mark.

* * *

If anything has to be enclosed in brackets, leave a space both before and after. Line and page can also just be spaced each side.

Beware of the different conventions in page-numbering: commonly only the right-hand page has a number, called recto (right), and the back of it, what you get when you have turned over, is the same number 'verso'. In modern practice the r and v which stand for these are always in lower-case script, sometimes italic, or may be superscripted. A plain number means recto, and sometimes an apostrophe is used for verso. Figures can be Roman or Arabic, or a mix of numbers and letters.

It is known that an 'opening', i.e. front, 2 inside pages and a back, was a common way of carrying manuscripts around in medieval times. English publications about 1600 often had pagination like A1 A2 A3 A4 then B1 B2 etc, at bottoms of pages: it is not totally clear to me why. Perhaps this was to do with the gatherings, how to collate when printed.

* * *

111
360. Beware that a mensuration change, like a figure 3 may occur after the new rhythm is already in motion - in a modern edition the change would be marked earlier.

The clef was essential, but apparently it was felt that a mensuration sign was not; perhaps the configurations of notes, ligatures etc. made it entirely clear to contemporary users.

C F and G clefs seem recognizable enough to a modern user, but there are some others: e.g. a 'gamma-ut clef', shaped like the Greek letter gamma (vertical with a right-hand beam from the top; so like the left and top of a square, or a braille f, longer lines each way); which marked 'gam-ut' 2nd octave g, the lowest theoretical tone of the hexachord system.

* * *

361. For accidentals above the stave in modern editions of early music, I have used dot 4 preceding. However, in the Second Draft Manual of Braille Music [Krolick 1993: xiii], 6 SH 6 GH are given. Dots 4 SH and 456 SH are to be used for quarter-tone and three-quarters of a tone sharpening henceforth. At least these should not cause confusion in the materials already brailled using dot 4: it does not seem a likely meaning in the context.

Musica Ficta may never be fully resolved; but it is clear that the original signs only applied to one note, though the music may also 'shift gears' into another hexachord or set of expectations, and so cause an accidental to persist. And sometimes a main note will have the marking, but it clearly applies backwards to the ornaments which belong to that note and idea; for example the English Tudor composers.

There is a wonderful essay recently brailled (1994): 'Musica Ficta' by Rob C. Wegman, from Companion to Medieval and Renaissance Music ed. Knighton and Fallows. One can have a much better grasp of the whole hexachord system after studying it.

Concerning accidentals which appear several pitches early:

Another alternative is to just use the placement sign for the accidental, then for the following note, so the reader knows they are not the same. If this is done, it seems helpful to either leave a space before the note that the accidental does apply to, or give it a placement sign too. One puts in as much or little as is helpful.

* * *

362. Blackening seems to be highly sensitive to context - you get the way it works for one manuscript, and then that doesn't work for the next one! Even into Baroque music, blackening was used for various purposes: e.g.
to express minim-semibreve rhythm in compound minim times; at hemiola cadences: in 3/2 time, 3 black semibreves would express what is really '2 bars-worth' penultimately.

Examples of both of these occur in the Rosenmiller Sonatas, 1682; basso continuo part-book, pp. 2, 10, 22 etc. solo bass instrument part-book p. 8 etc.

The most obvious codicological solution for black notes was adding dots 7 and 8 below the affected notes. But that did not feel very satisfactory to my fingers: also, it will not be available for any ligature in the part, which usually needs the low dots to express its real shape. So the uncoded format seems most efficient. (This is common, so has been well trialled.)

* * *

363 . . . . . . . . . . Ligatures

HEXIMUS was obviously planned to be in 16 dots: but it also works perfectly well in two sets of eight, so all the same shapes can be used in PASCO. Since ligatures are for long values, and by the time of white notation, values were tending to be shorter, much the commonest ligatures are those with 'opposite propriety': cum opposita proprietate with an up-stem on the left; these all decode as 2 semibreves. The 'oppositeness' is presumably expressed by the stem direction; ligating of breves and longas uses down-stems.

The rules for decoding ligatures are brailled from several sources, from Chapters IX and X of New Oxford History II; Ogni Sorte 'Notation Guide'; article from Early Music etc. Because they are unfamiliar, they are at first a little alarming: but do follow a logical pattern, once you know it.

It seemed important to preserve shape integrity of ligatures as nearly as possible in braille, so the description given in a student's class or tutorial fits the elements of each sign. Left up-stem to a downward oblique, (2 semibreves) and left down-stem from a downward oblique (2 breves) are the most highly contracted forms. But they are very common, so there is no problem remembering them. They are contracted in the sense that their three elements, stem, starting pitch and ending pitch - each end of the oblique - are all fitted into one cell of braille.

Square forms are more likely to take a cell per element: e.g. 4 squares, rise-fall-fall appear as lower g, c, middle c, lowest c. (Here the g is used for a firmer feel.)

3 rising squares but with left up-stem to the first, would appear as long v, then c 's, each one a level higher in the cell, in this case it is better to use a long v, even though three could be accommodated with a normal v - but if long it is clearly a ligature shape, not merely some sort of v: the 2nd sign should be written at the 'next-level' height above the bottom of the v.
Stems obviously have to be part of their note, and on an 8-dot machine, one draws them as long as possible, so they are instantly perceived as a graphic shape. Imagine a long GH - letter l with a dot 8 - l gives the idea of stem, and the braille e-shape in the bottom is the oblique.

Long v is also a common beginning to a ligature. Left lower-stem with sloping part above. The ligature to give descending BB, has the e in the top, with the stem suggested by dots 37. All the others are pretty much how they feel, though the proportions of the print cannot be shown exactly.

* * *

370. What to do with words depends on both the manuscript and what the user wants to do with the copy.

In Latin, '4 4 nra' means a sort of long 'tilde' accent over the nr as a short form for 'nostra': it also often occurs over some other letters, like u to mean um, especially as a final syllable. These are standard abbreviations.

Spelling is, even so, fairly haphazard in many Latin manuscripts. Several of the words are spelt differently in the different parts of the Rivafrecha 'Salve Regina' pictured at the beginning of PASCO which is in 'Choir-book format'; i.e. on 2 flat opening pages. This means Superius is written in the top left corner, Tenor in lower left, Altus top right-hand page, Bassus in right lower page. This is one of the standard ways for choir music.

There is a trap if you do not know the liturgy well - many of these pieces were introduced by a segment of chant - in this case 'Salve regina mater misericordiae' which, of course, does not appear in the choir parts: they start 'Vita dulcedo ...'

Almost always I have done a (modern) score as well, and whatever surrounding information I could find.

* * *

Concerning setting-out:

It would be natural to start a new braille line at certain places, e.g. at a congruence sign. If it is obstructive to have one's melody thus interrupted before it however, (I find it so); rather than interrupt, use an In-accord then 'AR CONg.' after it.

Rehearsal letters, similarly, may be on a pitch which is both end for one 'phrase' and beginning for the next. So in-accord to AR, then restate on the next line after the bracketed rehearsal letter; and in another bracket, place the pitch one has already written, with its preceding placement, and following interval of progression. This way both needs are somewhat met - the need for uninterrupted melody, and that of easy location of sections.
This is slightly annoying the first time it is met, or when reading alone: but if a work is difficult, or all parts are not perfectly competent, it is a boon to have the rehearsal letters! Especially if there are long rests to be counted. One can otherwise spend an enormous amount of time going back to the beginning - with some parts just counting rests.

* * * * *

399 . . . . . Works brailled in PASCO code:

[These are listed by title as well as composer, in cases when this might facilitate retrieval.]


Anon. Fifteenth Century Anonymous Chansons from Bologna Q 16, see below.


Bologna, Jacopo da. See below.

Busnois ?. 'Je ne fay plus', Sevilla, d2r f. 26 r; Modern score from The Penguin Book of Early Music, ed. Anthony Rooley, p. 28 ff.


Notation Manual and Textual Forms

44. Adieu ces bons vins de Lannoy
2. Ce jour de l'an
1. Craindre vous vueil
4. Je me complains
31. Navre je sui
5. Pour ce que veoir
37. Resvellies vous et faites chierey
13. Resvellons nous (fax)
39. Vergine bella

Fifteenth century Anonymous Chansons from Bologna Q 16. Ogni Sorte diplomatic transcript for the parts, with modern score, ed. Mary Benton (I-Bc Q 16). (The first few; awaiting completion: modern score complete)
Isaac, Heinrich. 'Coment peult avoir joye / Wohlauf gut gesell' von hinnen' and Agnus III. Ogni Sorte diplomatic transcript RS 1, *Coment peult avoir joye / Wohlauf gut Gesell von hinnen*, c. 1799.

Jacopo da Bologna. 'Di novo e giunt' in cavalier errante' from Squarcialupi Codex (I-FI 87), ff. 11v-12r. Quoted in Reese, *Music in the Middle Ages*, and his modern transcription p. 363.

Ribafrecha. 'Salve, Regina' from Seville, Biblioteca Colombina, MS 5-5-20, ff. 25v-27. Facsimile in Greenberg and Maynard, *Anthology of Early Renaissance Music*.


* * *


'Notation Guide' from Ogni Sorte editions 'RS' series: R S = Renaissance Standards, where all the known versions of each work are gathered into a volume, which has part-books in original notation, and a modern score: the same Guide goes with each volume.

Fragment from Marcantonio da Bologna, keyboard 2-stave. Facsimile in Apel, facsimile 1, p. 5, and modern, p. 467, from Appendix of transcriptions [Apel 1942/61].

Edinburgh University manuscript Dc. 5. 125, quoted in Rooley 1980

'21 Renaissance Lute Fantasias'
Chapter 4

"LUTAB" CODE

INTRODUCTION

About Tablature:

Lutes are not the only instruments to use tablature; some Flamenco and Jazz Guitar is published that way today, and many other plucked stringed instruments of Elizabethan and earlier times use it - e.g. bandora, cittern, mandora, gittern, orpharion. These are the sources which LUTAB is designed to express. Because it is a relatively simple code, neatly fitted to the way of playing the instrument, LUTAB is a simple code in braille also, and in only six dots.

A warning is in order about the word tablature, however, since it can have more generalist as well as particular meanings. There are other, quite different, 'tablatures' not expressed by this code. 'German organ tablature' for instance, reputedly invented by a blind organist, Conrad Paumann, contains a mixture of notes on a stave, letters and numbers. Baroque guitar 'tablatures' may contain stave and letters, or letters and strum patterns: in these, 'A' might mean the home key of the piece, (maybe G, or D minor); nothing to do with the chord of A, as it would be understood now. And nothing to do with the lower-case letter-a meaning open string in French/English lute tablature, which is faithfully represented by LUTAB. See also the Explanations section.

LUTAB code is concerned only with the particular meaning: in which horizontal lines represent the strings of an instrument, and letters or figures upon them indicate the fret/position on the strings, which will produce the desired pitch outcomes. Concerning it, Stanley Buetens, in The First Book of Tablature 1964 (inside cover), comments:

The system of tablature ... popular in Europe in the late 15th, 16th and 17th centuries, is probably the most accurate and exact notation which could be devised for this type of instrument. With this notation the composer himself guides the fingers of the performer over the fingerboard of the instrument. The lute composer of old was always a lute player, and his notation is at once the music and the means to play it.

* * *

The Oxford Companion says the lute is 'of unknown antiquity and of almost universal habitat' and that the British Court had an official lutenist until 1752; there are also records of the engaging of 40 lutes for a Masque for Charles II! [Spanner 1951: 3:13 (from Scholes 1942)]
In many ways lute seems a good instrument for blind musicians. It has an enormous and beautiful literature, so is worth the effort. It is physically compact and not too cruel on the finger sensitivity with its gut strings - for braille we must keep our fingers in good order! It readily combines with many other instruments and voices, or alone, so provides flexibility and variety of opportunity; and lutenists are normally given time to prepare a work, so we are not at a disadvantage from music being passed around, expecting instant performing.

Theorbo or bass lute (also chitarone, archlute) was often used as a continuo instrument like harpsichord or organ, or harp, in chamber music right up until Baroque times. Such parts however, would normally not have been specially prepared in tablature, but deduced/created by players from the figured bass or score.

Renaissance Lute Songs and solos are a high point in music history; and the natural literature includes both carefully-crafted composed works, and improvisation and elaboration of known music, such as we blind musicians can excel in.

Also, since music printing began in 1501, many of the sources are printed collections; these are clearer to read than many manuscript copies, so the original source can be dictated by any intelligent person, who need not have any skills with music or with lute-playing. The earliest printed lute music is from 1507, when Petrucci published 2 books of Intavolatura by Spinacino.

The many excellent recordings make it an accessible area from which to select one's preferred music, and much of the great voice and lute literature is English - a bonus.

* * *

Tablature is a really effective, easy-to-use code, and as there would be no reason for learning it except to play one of the instruments that use it, my main effort has gone into provision of learners books and straight-forward ensemble music. (See the Lists of Works.) The learners' books which have been brailled naturally teach tablature, and contain much other information; as well as sufficient LUTAB description for the music they contain.

No suggestion is intended that English and Italian tablature deserve any more attention than others, it is just where I began. There are gaps yet at the advanced level - both in what has been brailled, and in the best ways of representing neatly in braille what is on the manuscript or early printed page. They would be filled more appropriately by a good lute player, and may have to await the advent of one. This code is "Making a start ..." 'German lute tablature' works on entirely different principles, it will have to have its own code eventually. As yet it is less used in English-speaking countries.
If there are explanations to add to the Description, they will be found in the matching point numbers 40 further on: i.e. if there is further explanation to a point in 512, it will be called 552, and occur in the Explanation section, which follows the Description section.

Nos. 504-510 are not needed for this code.

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L U T A B    Description

The first points concern basic English and French tablature, which use the same method. Later French composer / players became more French, and used their own special extra signs for each publication. However, the following still applies. See points 525ff for Italian Tablature.

511. Fret letters a b c d e f etc use braille a b c d e f ...

512. String information: i.e. line number on the stave = string/course number on the lute. These use braille music code octave-signs as Placement signs, with the special meaning 'First line' 'fifth line' etc. rather than 'first octave' 'fifth octave' etc.

In English/French tablatures, the highest line and pitch is called 1; down to lowest line and pitch, called 6, as with modern guitar string numbering and tablatures. Table of braille signs for courses: these are placed before the fret letter.

Course:    1    2    3    4    5    6    bass    1    2    3
Braille:   

Extra bass courses: extending this system, place dot 6 before the numbers 4, 5, 6 etc. (dot 6 then means 'bass course') if they are not on the finger-board, and therefore only used open. If they are to be fingered, another system may be better: see below No. 513. In print and handwriting

Bass course 1 is written below line 6,
bass course 2 is below a slash below line 6,
course 3 below 2 slashes, 4 below 3 slashes, or the system may break into figures (4, 5, 6 etc.)

513. Vertical alignment of fret letters = chords: use placement sign and fret-letter for the highest in the column, then mark added courses by interval sign, with the special meanings below, followed by the fret-letter for that string:

ST add course 2 (with the fret-letter following)
ING add course 3
BLE add course 4
IN add course 5
WAS add course 6
For basses: The simplest system when only 3 diapasons are needed: for 7th, 8th, 9th course use 25, 36, 6 36

This means Braille Music Code intervals 2-6 for the main courses, 7th & 8th interval for bass courses 1 & 2, slightly modified 8th interval for bass 3. They are of course not 'intervals' here: ING always means to add something 'on third string', IN always means 'add on fifth string' whatever fret letter follows it.

Otherwise, if there are more, 4-8, this was originally proposed as a possible: (no works needing more have been brailed)

dots 25 add first bass course,
   6 25, 56 25, 456 25 add bass 2, 3, 4
dots 36, add fifth bass course;
   6 36, 56 36, 456 36 basses 6 7 8.

Another way many bass courses could be accommodated would be to use a sign to 'add 7' to existing signs; e.g.

for initial placement, x between string-sign and fret-letter for part of a chord, 46 before the interval signs.

Thus for initial placements:

456 x a = 10th course open, (3 + 7), a = open
4xd = 8th course fret 3, 'string (1 + 7)'
6xa = 14th course open, (7 + 7)

(These higher numbers were commoner with Italian instruments, so the last would more likely occur in the form 6xj where j = open: see 527, in the Italian tablature.)

Basses as part of a chord: here the 46 adds the 7.
46 ST b = 9th course first fret, (7 + 2)
46 BLE a = 11th course open, (7 + 4)

Course 8 can still use 36, 8th interval, or lower-h if 36 is being used for the slur in certain sources. Again, being more Italianate, 46 BLE j would be more likely in reality.

See 527: the complexities of many more bass courses in the later music have not really been addressed yet.

For the normal English repertoire up to and including Dowland, since 3 or fewer diapasons are needed, and they are used only open, the simple solution seems best - 25 and 36 as for 7th and 8th interval, 6 36 and 6 6 36 for 9th and 10th course. Such signs would be listed on a score, since there are various ways of writing them in print too.

122
514. Rhythm signs: rhythm prefix = braille letter y

Print uses a plain vertical stroke, or stroke with backward (left-facing) flag, for the longest value sign; then constantly halving, a stem with single, double, triple, quadruple, or quintuple flags toward the right. These look similar to modern quaver, semiquaver, 32nd, 64th, 128th note beams.

Braille: FOR = longest, a b l p AND = the rest.
That is, after the longest, the number of dots is the
number of 'flags'.

Print/handwriting has 2 common ways of writing rhythm, 'sparse'
and 'full'. They form a separate information row above the
tablature itself.

515. 'Sparse' is where a rhythm sign is presumed to continue
until a different one is written over the appropriate fret or
column. These can be shown integrated into the braille tab after
a 'y' for rhythm-sign. Or if the rhythm is isolated in the line
above in the braille copy, since alignment is not practical, a
sign must follow them to show the number of unmarked columns
which continue to use that value. Dot 5 preceding the number in
the lower has been used in some transcripts; but maybe a full-
height sign such as dots 3456 followed by the number in the lower
would feel even better.

Examples of sparse manuscripts are: Edinburgh University Library
Dc 5 125, see page 118 above; Francesco da Milano's works.
Printed editions include: Adrissen's 1584 Pratum Musicum,
Robert Dowland's Varietie of Lute Lessons 1610, and the song
books and Ayres by various composers published in London, e.g.
Attey 1622. In this last, rhythm-signs use note-shapes not stems
and flags.

516. 'full' is where every column has a rhythm sign, and flags
are usually joined into rhythmic groups as with modern semiquaver
beams. Where there are no blanks, lower g can be used with its
braille music meaning of repeat beat.

Examples of originals using this method: Cambridge University
Library Dd 2 11, and Add. 3056; "Jane Pickering's Lute Book" in
the British Library. Printed editions: John Dowland's most
famous work, Lachrimae or Seaven Teares of c. 1605.

Here is a comparison of 'full' and 'sparse' for the same music:
last 2 bars of a Ferrabosco Fantasia, GB-Cu Dd 2 11, f. 17. The
source uses 'full'. The bar-number 40 begins each. [Rooley
For comfort of using, I have found that two or three bars of rhythm followed by that amount of tablature set out below it, is best. This will usually take several braille lines, as above. And I have found 'full' the quickest and clearest in braille. But of course if complete faithfulness to the manuscript is required, nothing should be converted into anything else. Musical meaning is unaffected however, so such differences are only relevant in deciding extrinsic factors, e.g. possible scribe or provenance of a manuscript. See 556 for other practical solutions.

As can be seen, in a coding sense: one has to decide either to have the next octave sign as the next temporal happening, so each 'interval' in chords will take up two cells, but runs can run on; or to run intervals on, but have to take a space between all columns and all single florid notes, which are each the next temporal happening. I have opted for the first way.

517. In the rhythm line, these braille music code meanings apply:

- space means barline
- dot 3 means dot after a stem
- lower g repeat bar, or in obvious cases repeat beat
- wordsign AR
- music hyphen dot 5
- double-bar and its variants, GH-lower-b etc double-bar with dots to the left, section repeat.
518. Note that in the main tablature line only certain signs can occur: placement signs; fret-letter, additional placement signs for chords (fret-letters after ING BLE etc.); right-hand fingering; ornaments; spaced L for barline; wordsign AR; music hyphen or interruption dot 5; double-bar and its variants.

If barring is regular and numbers are being used (at the beginning of the rhythm line, or other logical place) the braille music convention in which numbers in the lower cell mean repeat those exact bars, can be used. But a note for transcribers - be kind to the user, short-cuts can be a real nuisance to search out. Except for clearly marked repeats, sighted people are not expected to dive around their copies like this.

519. Finger numbers for right hand: in real manuscripts usually only single or double dots occur; use braille dot 3 or 23. Careful study must always be made of the composer's instructions, as a dot can have many meanings.

[The set, 3 36 236 2356 used in my transcript of the Poulton method, where each finger has a sign to assist learners, is not suitable for wider application - such signs do not occur in the originals.]

520. Finger numbers for left hand, similarly do not occur in real sources: in modern learners books they appear either under the tablature or up beside the fret-letter. Regular braille music fingering 'a b l ', or numbers in the lower may suffice for these temporary situations - say in the commentary what you are doing.

If using a current popular approach to brailling - placing fingering in the line below the tablature if it is so placed in print - use left-hand prefix 456 AR numeral sign (3456) and just numbers. If thus in a row, each new number is presumed to apply to the next column, except if it be 'pushed under' the preceding sign, either by being in the lower, or following an ST sign e.g. for whole chord fingerings. If using this system, remember to insert a j = 0 for each unfingered column. Explain what you have done in the commentary, or by music asterisk.

521. Ornament signs: these vary in shape and meaning, so must be described in the commentary. In the earlier music only two or three are ever needed at once: I have used SH for the one that looks somewhat like a modern sharp-sign, CH for the one that looks like a cross. See notes to 560.

The later French composers like the Gaultiers, Gallot and Mouton, use more and/or different signs. Mace in Musick's Monument 1676, gives more like a dozen when discussing the later French compositions. [Mace 1676:101] See section 6 "Ornamentation" in the entry "Lute" in New Grove Dictionary of Musical Instruments. [Sadie 1984: 2:563-566]
For brailing, 3 ideas come to mind to express many ornaments:

1. Use Row 4 of braille code - CH GH SH TH WH ED ER OU OW W

2. Use lower d-f inflected before or after by the row 6 series - 4 45 456 5 46 56 6 if before - or its mirror if after.

3. Use FOR 1, For 2, ... FOR 12 with a matching list in the commentary, or as in Gallot, an orderly list in the front of the book, giving sign with its interpretation.

Since in the manuscripts ornaments are written before, or after, or merely somewhere near the note to which they apply, describe the situation and what you have done, in the commentary - whether you have brailled all before, or all after and left a space between them and the next symbol ... it is best for users to decide on the most practical arrangements in context.

522. Slurs and holds: Slur bottom c (3 6) or u: slurs appear in Italian sources e.g. Intavolatura... of Pietro Paolo Melii, 1614 [Sadie 1984: 2:563].

Hold prefix z: use plain z if it seems obvious where to hold till, or if not obvious, followed by a number in the lower for the number of columns the hold-line crosses (passes under). So z lower d would mean 'hold through 4 more columns'. Due to the acoustic decay characteristics of lutes, shorter lengths, 3 or 4 notes, are more usual.

But if it is desired to mark the end of a hold-line, either zz and that string and fret then space, or 456 z after that fret-letter when it duly appears. These systems will need more testing when advanced user-players become available.

For music before 1600, when the right-hand fingering was only a dot or not-a-dot, I placed it in the same cell as the fret-letter, as a dot 6. Its usual purpose was showing which finger to begin a trill on, whether middle or index - and one must read the composer's introduction to find out which is intended, there was no standard meaning.

For music after 1600, clearly one cannot do this, or there will not be enough sign-sets for the necessary ornaments, slurs, and hold-lines etc. unless the inflected lower d-f series is invoked for ornaments. Again, users need to decide which is most convenient.

523. 524. blank for other matters which may arise.

* * *
525 . . . . . . . . . Italian Tablature

See 550 for notes for some Spanish manuscripts also.

526. Fret numbers 0 1 2 3 4 5 ... = braille 0 1 2 3 4 5 ...
(i.e. braille j a b c d e ...)
Visually these really are written 'on the line' - half above and half below it.

527. Placement signs for string / course numbers: same braille set as for English and French, but this time 'line 1' is at the bottom of the set, 'line 6' at the top; therefore bass courses are written above the stave, above line 6, in the print copy.

Apparantly six-course lutes were usual until the 1550's, then a 7th course was added, then quickly many more, till by 1600 13 courses were fairly standard in Italy and Germany, 11 in England and France. The theorbo was often 14-course, and its Italian counterpart the chitarrone: this means up to 8 bass courses.

The following, now relevant, is abbreviated from point 513. Another way that many bass courses could be accommodated would be to use a sign to 'add 7' to existing signs; e.g.

for initial placement, x between string-sign and fret-letter for part of a chord, 46 before the interval signs.

Thus for initial placements:

456 x j = 10th course open, (3 + 7), j = open
4x3 = 8th course, fret 3, 'string (1 + 7)'
6xj = 14th course open, (7 + 7)

As part of a chord: here the 46 adds the 7.
46 ST 1 = 9th course first fret, (7 + 2)
46 BLE j = 11th course open, (7 + 4)

Course 7 can still use 25, 7th interval, at any time. But course 8 may be better as above, 46 ST, freeing dots 36 for other meanings. Or lower-h may also be possible if 36 is being used for the slur in certain manuscripts.

The complexities of many more bass courses in the later music have not really been addressed yet. One manuscript I saw used the nomenclature '7 8 9 X V 12 13 14' for the bass courses.

It seems that several of these courses were over the fingerboard, so could be fingered, as well as the normal six. The Dowland I have brailled only goes to 3 basses, and they were only used open, so nothing is properly trialled yet in this matter.

528. Vertically-aligned figures, chords: The same system operates as for French and English, but begin from the fret number lowest in the column, since course 1 is lowest.
529. Rhythm signs: as for English / French: see 514-5-6

Point numbers 530 - 549 are left blank, to be available for Spanish, German (quite different) tablature etc.

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L U T A B: Explanations

Further Explanations from the Introduction:

Regarding the warning about terminology, the uses of the term tablature, and intabulation: Irene Cholij gives this very clear generalist description, in her essay comparing all the known versions of 'Allez Regretz'.

An intabulation was essentially an arrangement of a vocal piece for an instrument such as lute or organ, transcribed into a system of musical notation for instrumentalists. Ornnamentation was often added, using figures idiosyncratic to the instrument for which the intabulation was intended, thus transforming the original composition. [Knighton et al. 1992:165]

Of the three intabulations she mentions, two are actually lute arrangements, and are therefore in lute tablature, and one is for keyboard. The lute versions are from Vicenzo Capirola's Lute Book, c.1517, and Hans Gerle's Tablatur auff die Laudten 1533.

Diruta and the Venetian composers, used the word 'Intavolatura' for the writing out of diminutions into keyboard score (on staves) from short-score or open score. A typical example might be the canzonas of Mortaro, a facsimile [Sachs and Ife 1981:50] shows them set out with divisions below an open 4-part score, thus, 'partita, & intavolata'. The divisions have an 8-line lower stave, with 2 clefs, F3 and C5, and a flat on line 8; and a 5-line upper stave, clef C2, flat on line 5.

And Monsieur de Saint Lambert's harpsichord method, Paris 1702 was headed: Les Principes / du / Clavecin / Contenant une Explication exacte de tous ce qui concerne / la Tablature & la Clavier .... and it seems to contain only what we would call staff notation. Clearly one must say Tablature for the Lute. [Saint Lambert 1702, trans. Harris-Warrick 1984:vii]

* * *

550. It appears that English tablature has virtually no independence from French tablature originally. The main song repertory published in England around 1600 was in this kind of tablature. But there is also some evidence of the use of Italian tablature in manuscripts in England; as in the Paston Lute Books.

The three lute tutors which were published in England between 1560 and 1570 were all translated from the French, according to
Dart in his Introduction to Harman's annotated edition of Morley's A Plaine and Easie Introduction to Practicall Musicke 1597 [Harman 1963:iix]. Dart also comments on the 'sadly meagre results of the music printing monopoly' when in the hands of Tallis and Byrd: after Tallis died in 1585 Byrd assigned Tallis's part to East. Then there was a huge flowering of English Lute books, particularly lute with voice, around 1600: John Dowland most famously, (his First Booke 1597), but also Campian, Coprario, Pilkington, Danyel, Corkine, Attey, Bartlet etc. And John's son Robert Dowland's Varietie of Lute Lessons 1610 for solo lute, contains works from many Continental composers as well as English ones.

* * *

Although French and English tablatures are basically the same, each manuscript and printed collection seems to have its own way of doing things: so you are probably going to have to describe in the Commentary how your English, French, or any other tablature is set up.

For instance the earliest surviving French tutor of 1529, and an English one of 1568, use only 5 lines. The first uses 'full', the second 'sparse' rhythmic notation. The earliest Italian and Spanish sources, 1507 and 1535 respectively, use 6 lines; with rhythms marked in 'full' notation, but by stem, and whole note-shapes respectively.

The 1535 volume is that of Luys de Milan who used the English way up, i.e. string one as the highest line, but the Italian way of using figures for frets - which is really the best way of all, according to many lute-players. He was certainly a virtuoso player as well. It would certainly be the most convenient in braille, too. Slight temporary orientation problems can occur from all these variable factors, so be patient with your readers and transcribers.

* * *

551. Fret letters: 'a' means open string, b fret 1, c fret 2 etc. Some little irregularities are common: and it is necessary for a blind person to know this so as to understand what sighted readers tell them about the manuscript.

i-j-y are all variously used for the fret between h and k. Fret c uses a shape that looks more like a letter r: fret d's stem often goes over the top and left, or the whole letter is sloped hard left.

Fret letters appear above their lines visually, so a letter appearing between lines 2 and 3 applies to 3rd line (3rd course).

552. Placement signs - means 'the place where the fret letter appears' - i.e. on which line. Only the highest course on most lutes is a single string, the others are double-strung in unison
or octaves, hence the word 'course' rather than 'string'. But most often each pair is used together like a single string. Baroque guitars were usually similarly double-strung except for their first course. Compare this idea to a modern 12-string guitar.

554. In connection with rhythm, Apel warns that what appear to be bar-lines are often more like 'beat-lines', the logical true natural rhythm of the piece has to be worked out. [Apel 1942/61:65-67]

If whole note-shapes appear in the rhythm line, and it is desired not to turn them into the usual lute signs, the following braille signs may be used. Say in the commentary what is being done.

s m c q ER ... can follow the y -
(semibreve, minim, crotchet, quaver, semiquaver)

Rhythm stems and notes can be dotted, as stems can, dot 3.

If 'q' for quaver feels horribly cluttered, the old word Fusa would yield 'f', and perhaps f-with-dot-6 = ED for semifusa ... as long as you say what you are using in the commentary.

The French words as given by a self-tutor published by Attaignant in 1529, are 'semibreve, minime, semiminime, crochue, frédon' - so there is no establishing an international set - fortunately this publication uses the regular stems with flags, in 'full' to indicate rhythm.

556. Sometimes it is convenient to fill up a line of rhythm, say four bars, and under it do the matching tablature, perhaps 3 or 4 braille lines. Bar numbers seem comfortable in the beginning of the rhythm line. Naturally these do not occur on any real manuscript, but they are so useful to modern scholars, it seems not unreasonable to put them in.

If rhythm is integrated, the piece can simply be paragraphed for musical sense, with a couple of cells indent, or indented every 5 bars; whatever suits the manuscript and the user. Older sources seem much more aware of what is convenient to the players than modern scores now - one can be authentic by being as practical as possible. See the entry on setting-out of ensemble music, 590, for a historical print method and its braille match.

557 - 558. To avoid any confusion, it seems necessary to be strict about what can appear where: the bad news of using only the normal 6-dot braille-cell, is the number of meanings every shape already has. Tablature is a plain code in print, if possible it should be plain in braille too; but there will be some duplications, unavoidably.
The set of signs used for right-hand fingering in the Poulton method are explained there; but dots 36 are needed (i.e. are the best sign) for a slur. So stick to dots 3, 23 for single and double dots. In this way any stray dot is a dot 3: and since sometimes it may not be clear what it is there for, it is much better to record its presence without having to assign a meaning which may not turn out to be the right one. See the article "Lute" in New Grove Dictionary of Musical Instruments, especially section 6 "Ornamentation", for more information. [Sadie 1984: 2:563-566]

For instance, in keyboard music one dot sometimes meant the appropriate place for an ornament, e.g. Tomas de Santa Maria:

- a dot will be placed over the head of each crotchet on which a quiebro should be played ... fo. 50

It also sometimes meant inflection, sharpening or flattening; fortunately that is not a possible confusion for lutes, since the correct fret gives the exact pitch, relative to open strings.

In Robert Dowland's Varietie of Lute Lessons (1610), pp. 5-12 there is a wonderful section for learners entitled "Necessarie Observations belonging to the Lute and Lute playing, by John Baptisto Besardo of Visonti". These give full fingerings for the Examples to illustrate the various Rules, to engender good habits of playing.

Left and Right hand are dealt with quite separately however, so there may be no need to have more than one set of signs in braille to represent these examples faithfully - e.g. nos. 1 2 3 4 in the lower. (No fingering of any kind appears in the subsequent pieces, pages 20-72, only in these initial instructions.) Thumb seems never to be marked:

the letters you shall finde without a pricke added to them, must be stroke with the right hand Thombe: those which have a pricke set by them or under them, with the fore-finger, the other numbers doe shew the application of other letters played together: the number of 2 signifieth the middle finger; the number of 3 the next finger. [Dowland 1610:11]

So the dot is used only in running passages, with the blank for thumb; and in chords there is no marking beside any fret or open string which would logically be played with the thumb.

Since thumb is behind the neck, left-hand fingers are 1-4 index to small. In my experience they do not occur outside learner materials.

If left-hand fingering figures should ever occur, a possibility is using 46 with number in the lower cell; or just number in the lower cell - 2 23 25 256, as above. If preferring to
braille in the line-below method, but sometimes only occasional figures mean that allotting a whole line seems wasteful. 46 lower number feels all right: but has not been properly trialled, due to its non-occurrence! Asterisk it.

561. Ornaments: The meaning of some signs, including ornaments, is still disputed; in the earlier period, it seems no-one explained the well-known ones in writing at the time, and usages differ greatly at different times.

By the time of Mace, not only the ornaments were different (and mostly explained by the composers) but a new tuning, 'D minor tuning' had become general: viz. going down;

expressed as note-names, descending:
F above middle C, D A F D A one tone above Gam-ut

expressed as in proper lute tuning tables: dfedf

expressed in braille pitch designation:
fourth octave F D, 3rd octave A F D, 2nd octave A:

As one would expect, many 'scordatura' tunings were tried for their special effects and resonances, especially by René Mezangeau, whose works were widely anthologised in the 1630s. See Rollin's entry for Mesangeau in New Grove. [Sadie 1984: vol. 12] [Rollin 1980]

It is not exactly an ornament, but Piccinini used a back-and-forth way of using the index fingernail for the 'croppp' at cadences. Alonso Mudarra used this to give a different effect in runs; and marked under them which ones he did in the ordinary way, thumb index thumb index, and which with the zig-zag action called 'dedilla'. The habit of using alternations of index and medial only, some scholars believe, began when bass courses were added in runs, so the thumb was occupied with them.*

562. Holds and slurs are somewhat speculative, they only occur in certain manuscripts, and are best tried out by users.

There are no rests in tablature since it is a positive code, showing only what the player is to do. Apel mentions numbers in the staff standing for rests from the 1529 Tutor [Apel 1953:65]. but gaps are commoner, simply no fret letter under the rhythm-sign. e.g. Danyel 1606 song XX, Canto Secondo's lute part.

And because of the fairly rapid decay of lute string sound, there hardly ever are gaps - there is nearly always something happening to resonate. If rests are required, either u or 36 can be used; note it with asterisk or in the Commentary. Do not use an x if it is already being used for the extra bass courses.

* [Poulten 1980:561]
567. Regarding Italian tablature direction: It is just as logical to use the lowest line as course 1, since it is the lowest to the ground when the lute is in playing position.

569. In printed editions rhythm signs are inclined to be written near to wherever the column ends, so may be all amongst the 'stave' if only top strings are being used at the particular moment. This can be a little hard to read. In French and English printing, they are always above, clear of the tablature stave.

* * *

590. Setting-out of lute and lute ensemble music in print.

When only lute and voice is envisaged, the systems are just as you would expect: staff at the top, words under that aligned with their notes, and tablature under that, also aligned. So all the things which are to happen at the same moment in time are in the same (imaginary) vertical column.

When voice, lute-player, and bass viol player had to share the copy, it was too awkward and crowded to all look at the page from the same side, so the bass was printed 'upside down' so the viol-player could sit the other side of the table and read their part the right way up. Viols, unlike lutes, need a good bit of room around them for bow movement. The following book provides typical examples. Danyel's name was John, but I and J were used interchangeably sometimes.

_Songs / for the Lute Viol / and Voice / composed by I Danyel, / Batchelor in Musicke / 1606 / To Mris Anne Grene ..._

_Song I. has voice and lute aligned on the left-hand page, basso upside down on the top right, poem set out lower right. Bass violist will thus face lute and singer. Songs II & III each take only a page: a decorated initial capital (first letter of the song's words) binds the 3 information sets (melody, words, lute tab) together, but starting lower down the page so the bass viol part can be written the other way, top to top; again the bass musician faces the other two. Most of the songs use one of those two ways of setting out. If the table were small enough, this would work all right for braille readers too._

_In the last song, No. XX "Now the earth" there are parts for Canto Primo and Canto Secondo with a lute each, plus Tenore and Basso, so they are set out in 4 directions, tops toward the middle. Imagine a square table, Canto Primo and its lute have Tenore on their left, so Tenore music is written sideways to them; Secondo and its lute sit opposite Primo, with Basso on their left. So the right-hand page has the Canto 2 upside down at the top, and the Basso sideways at the bottom. Eminently practical._

133
The volume ends with a lute solo "Mis Anne Grenne her leaues bee grene", 14 variations on the well-known tune. The scordatura tuning direction for this piece gives 9 lines, which in a mean type of tuning from A (440 approx.) for course 1, gives A E C G C Bb with basses F G and low C.

A braille transcript is available of "Mistresse Nichols Almand", No. 20 from John Dowland's Lachrimae or Seven Teares ... with divers other Pavans, Galliards, and Almands ... and shows this kind of setting-out. This, the shortest piece, will just fit in braille in the same way as the original. See 599, list of works.

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599 . . List of works brailed in LUTAB:

Anon. 3 Chansons for voice and lute, 1529, from Six Chansons for Voice and Lute. LPM edition, London, PC 10a, 1977. LPM PC 10 is the same songs, and many more, for three voices or instruments. Nos. 9, 12, 23 brailed.


Dowland, John. "Mistress Nichols Almand" from Lachrimae ... c. 1604, brailed to show its ensemble setting-out for lute and four viols.


Poulton, Diana. An Introduction to Lute Playing. Schott 10656, London, c. 1957. Complete. This contains the main text, exercises & pieces in LUTAB, and pieces also in modern score.

Verdelot, Philippe. "Quanto sia liet' al giorno" (facsimile) intabulated by Adriano (Willaert?) 1556, based on the 4-part madrigal in Il Primo Libro di Madrigali (1533); Modern score of madrigal also brailed, with translation of text, etc. as in London Pro Musica edition LPM MA3, 1980. Also a stereocopy (raised-line) of the beginning of the voice and tablature version, much enlarged.

__________________________________________________________________
Troisième Ordre
Basse chiffrée

L'Imperiale

F. Couperin: 'Les Nations', Basse Chiffrée
Chapter 5

"FIGBY" CODE

INTRODUCTION

This is a figured Bass Code suitable for representing the figures line for Baroque continuo playing: particularly the faithful representation in braille of the original manuscripts and printed editions from this time.

701. Introduction and background for braille users:

These are some of the ways baroque music was published:

1. Part books:

This followed on from renaissance practice, where almost all printed ensemble instrumental and vocal music was published in sets of part-books; e.g. Attaignant in Paris, Jean de Castro in Antwerp, da Nola in Venice, Byrd or Holborne in London.

The four part-books of Couperin's Les Nations (1726) are labelled: Premier Dessus; Second Dessus; Basse d'Archet; Basse Chifrée; and could be had from the composer for 10 francs for the 4 books. The picture on the previous page is from here.

Solos for a flute and a bass by Arcangelo Corelli, could be had in their two part-books (flute, figured bass) from publisher 'I Walsh', London, no date.

2. Score

Some, like Pièces pour la Luth of Robert de Visée (lute and theorbo pieces), were published "Mises en Partition Dessus et Basse" (put into score top and bass) so they could also be used by keyboard players.

Solos for a German Flute, a Hautboy, or Violin, for a thorough bass for the Harpsicord or bass violin composed by 'Mr Handel', were published this way, i.e. 2 line score, solo and bass, with the figures above the bass notes.

[In spite of the title, this book contains the 4 well-known recorder sonatas: at the bottom of the first page of each sonata the preferred instrument is designated, 'Traversa Solo', 'Flauto Solo', 'Violino Solo' etc.]

Telemann had a great idea, and published fortnightly to subscribers one fascicle at a time (i.e. one folded sheet, 4 pages of music writing, pages 2-3 forming the 'opening') a series of 25 'Lessons', for all kinds of instruments and voices, which when he finally published them all together in 1728 were called Der Getreue Music-Meister.
What is clear, is that the Continuo player got the bass-line, usually with figures, with or without the solo line or lines.

The notation of the music by this time in history is sufficiently like our own to be represented quite faithfully with Louis Braille's music code, with just the addition of a few comments about the clefs, custodes, placement of names, and minor differences of orthography or meaning. But the figures are a special kind of shorthand; we need a braille coding method purpose-built to match them in their context. Then we can think like the baroque musicians again, and re-learn the flexibility that comes from realizing figures.

Modern editions usually realize the part for continuo on 2 staves, with a view to piano sonority. When this is put onto the harpsichord it is so bad it is amusing. But good modern editions retain the figures, printing them under the bass in the score: even sometimes in the 'Basso Continuo' part. This part is usually labelled 'Violoncello or Viola da Gamba' although the original is usually unnamed.

To use these figures recreates for the modern musician, the same latitude to interpret, the exercise of personal style and flair, the right climate of spontaneity and order: so it is quite exciting to do. And now, as then, one has a choice of continuo instrument; harp, theorbo or lute, organ, spinet.

In the manuscripts, figures are more usually above the bass, but after experimenting with setting-out, I have concluded that they are best placed below the bass in braille scores, thus keeping the regular braille music code parts together, with the new code beneath. So for a Trio Sonata, there is really a five-braille-line system: the two solo lines, bass-line, figures line, and a blank line between the systems.

I have not come across this, but Pasquale says: 'N.B. In printed songs the figures are generally placed under the bass-notes, to prevent their mingling with the words.' [Pasquali 1763:47]

My reason for deliberately keeping the figures separate from the bass-line, in contrast to other figured bass codes, is this:

When you approach a work, the first time you check all the figures to be sure of what they are saying;
the second time you only look at the ones that you wouldn't guess, that say something less obvious;
the third time you hardly consult them at all.

So they must be easy to refer to, but not in the way of the bass-line, which one must be free to memorize quickly. And if you are the basso continuo player, bass viol, cello etc, rather than the harmonic continuo, you need not necessarily be encumbered with them at all.

* * *
Guidance for harpsichordists

Since harpsichords are likely to be the most available of the instruments upon which to perform from figures, a few remarks from the sources, on harpsichord in relation to figured bass, may be useful.

Lighter textures are usual in the Baroque, compared to now. With harpsichord accompaniment, one often has to develop habits of leaving out notes, rather than putting them in. Some composers mark 'Tasto Solo' for certain parts (i.e. play only the bass notes, no chords) e.g. Rosenmiller's Sonata 2, the Basso Continuo part-book; this leaves plenty of musical space for Violino Primo & Secondo to have dramatic and slightly fugal Allegros. [Rosenmiller 1682:3]

Bass octaves must be used most sparingly, and very rarely with any note shorter than a crotchet; 'in very loud and noisy places it will not be amiss' to use them. [Pasquali 1763:44] But not only should they be omitted in soft parts, but 'in order to make those soft parts even more tender and soothing, it will be proper to leave out the octaves in the chords above, especially in the chord of the sixth; and in some cases to leave out the chords altogether ...' [Pasquali 1763:43]

In 'How to accompany Songs and Solos for single Instruments' [the performer depends on] judgment, taste and discretion ... and 'must be a servant in every respect to the voice; therefore the thinner the chords the better ...' [Pasquali 1763:45]: but for Recitatives he advises 'filling up the harmony as much as possible, and therefore the left hand strikes the chords in it as well as the right. Care must be taken not to strike abruptly, but in the harpeggio way ... for common speech a quick harpeggio, for the tender a slow one; and, for any thing of passion, where anger, surprise &c. is expressed, little or no harpeggio ...' [Pasquali 1763:47-48]

Much useful advice on keyboard techniques is contained in Anthology of Early Keyboard Methods, edited and translated by Barbara Sachs and Barry Ife, 1981, for those who wish for serious authenticity. Such authenticity takes a good deal of practice, since approaches to fingering, style, ornamentation etc. are quite different from ours. The starting point for most of its contributors was the organ; and the dates covered are 1520-1620, obviously earlier than a lot of the music we would probably be playing.

Later treatises like that of Mersenne 1636, Saint Lambert 1702, and Couperin 1716, should also be consulted - remembering the famous comment by Burney, of Couperin, that [although still good], 'his pieces are so crouded and deformed by beats, trills, and shakes, that no plain note was left to enable the hearer of them to judge whether the tone of the instrument on which they were played, was good or bad'. This surely has implications for harpsichord style. [Quoted in Halford's translation of Couperin's L'Art de Toucher le Clavecin, 1974, p. 3.]
Interpreting the figures

Until you get used to realizing figures, it is important to have the solo parts as well, because often the figures are only informing you of what the solo parts do: the continuo player will probably deliberately avoid those notes, especially suspensions etc, which the soloists will probably ornament.

Some figures are just there to reassure you about the harmonic structure; e.g. bass part G-D-G with 6/4 over the D, tells you the bass is just playing around and outlining the G chord, don't go to D harmony as you would otherwise expect - telling you what not to do, really.

But some figures give a pattern that nobody else has, and which you must bring to the ensemble. Nothing in the way the figures are written tells you which function they serve, so it is a matter of practice, and habit, and rehearsal. In all chamber music players must be responsive, but it is particularly exciting and satisfying to be creating your own part as you go. I assure you it is a fascinating study; and one in which blind people can excel, exploring the natural sonority more freely than most sighted people can, and on the continuo instrument of their choice - theorbo, harp, organ, virginal, spinet, lute, guitar, clavichord etc.

I feel that keeping the figures separate is faithful to the mental conception of the original composers: a separate information line, unevenly marked, sometimes dense with figures, sometimes blank, but providing a very practical shorthand - and one that respects your skill. Obviously with these different accompanying instruments, quite different actual parts will result.

Further to the choice of continuo and basso continuo instruments: sometimes it is suggested that instruments should be matched; that say bassoon and organ should be continuo for an oboe sonata, whereas a bowed string and theorbo should go with a violin ... but this is probably a bit specialized for real life.

Serious players of baroque instruments use low pitches, A = 415 down to A = 392 for some of the French music, and one plays with the available corresponding low-pitched instruments.

It goes without saying that the vocal music of the baroque used these same conventions of figured bass, as the instrumental music quoted as my examples. By chance I happen to have done more of the non-vocal. Perhaps there is a language barrier to many English speakers; much is in Italian, and German -- and the German is often in the old Gothic writing, very hard to read.

For explanations beyond the description, go to the paragraph number 40 further on: e.g. if there is any extra discussion relating to point no. 717, it will be called 757 etc.
This was to keep the basic description from getting too convoluted. There are plenty of blank numbers in between for things that are yet to come up, that will emerge as more manuscripts are studied and transcribed.

Nos. 706-710 are not needed for this code.

* * * * *

DESCRIPTION of FIBGY code

711. Where to place the figures: When there is a fair sprinkling of figures, place them in the line below the bass, prefixed by AR-numeral, and with a blank line below that. If the figures are too sparse to warrant a line of their own, they can be placed after GH-AR at the end of the bass's line. See 751-3.

712. Since every bass note is the potential bearer of a figure, or column of figures, there should be as many columns represented in the figures line as notes in the bass part. Except perhaps if the first note is the only one figured, or only the 3rd quaver of 8 - it may not seem useful to fill in the remaining blanks; e.g. 3 3 124 - meaning 6 under third note. This should only be done if it is quite clearly an abbreviation - just so there is no delay for doubting.

713. Figures are figures, braille b-i = 2-9. For blank columns, use a hyphen or dot 3. Blanks may mean a 5/3 chord implied, or sometimes just omissions, see 753. A judicious mix will help make the rhythm clear: dot 3's can start a bar, but once figures occur use hyphen, thus:

          . . . . .  .....

714. Sharps and flats: these can occur alone as a column, (applying to the third of the chord), or as one level of a column. Or they can occur before a figure, or after a figure. Because it is important to follow the original source, i.e. to place them as it does, two braille-only signs are needed:

            Binding sign and Separating sign:

Any confusion from sign flow-on (obvious visually by spacing) can thus be avoided by using a 'binding-sign', dot 1 placed between the signs that do belong together; or a 'separating sign', dot 2 (comma), between things that do not. Use these only if needed.

715. The next symbol is presumed to be the next column, i.e. under the next bass note, unless:

(i) it is in the lower cell, or
(ii) it follows an ST:
Both of these 'push it back' under the preceding symbol, part of its information column. E.g. in the following 4 columns, the centre 2 can be done simply as fractions but the outside pair need the ST slash to express their positions:

```
6  6  6  9  
#4  3  4  7  
2  #
```

Notice that in braille ST's are needed for the first column, but in the next three, the 3, 4 and 7 can be written in the lower cell, so ST is only needed before the last sharp sign.

716. A figure with a slash through it takes a dot 6 within the cell: e.g. ED represents 6-slaied. Beware of some stylized shapes, and quick handwriting, sometimes the slash slightly misses the figure.

717. If there is more than one figure or column under one bass-note: place moving-part sign (dot 6) before the second and subsequent symbols; or double moving-part sign (dots 56) before subsequent columns.

As in braille music code rules, this assumes obvious rhythm. If otherwise, one can asterisk it and add a rhythmic profile in some way. This can be done after an in-accord; with stem-signs, or with bass-notes or melody of the piece, in the desired rhythmic configuration. Or it can be done separately. If it is a characteristic rhythm already heard, you may not think it necessary. It rarely occurs except at cadences: one may merely roll dramatically and leave the soloists to go for it.

718. When there is a horizontal 'bar' above or below a group of bass notes, (indicating steady harmony through them) use ING with number of notes, written straight after the figure or blank to which they apply, thus:

```
\[ \text{ING } \]
```

This would mean 4 notes of that 6 harmony, 4 for the root harmony, denoted by the blank. This is suggesting that the number given should include the figure that gives the harmony - since one must either include or exclude it consistently in braille, it is irregular but usually quite clear in sources. See 758 for further discussion.
Some practical considerations:

1. Gaps: sometimes once the harmony has been established there are no figures for a while: dot 6 numeral 4 might stand for 'blank for 4 bars' either in the figures line, or after a GH AR which follows the bass.

2. Alignment: in this literature there are often a terrific lot of notes in the solo parts, so no good purpose is served in my opinion by trying to align all parts. Bass and figures should be aligned at bar beginnings. Obviously the overall number of bars in a system must be the same: get as much as possible of the busy parts into a line, then if bass and figures lines keep left, there will probably be space at the end of their lines for solo part overflow. Otherwise the score can become enormously - unhelpfully - spread out.

3. Bar numbers: It is good to have them in for study, although originals never do. But since the solo line is too full to waste its first 3 cells at every appearance, it is more effective to relocate them. They can appear before the figures line, or indented or at the left in the blank line; or above every bar of the top line, as with orchestral scores. Modern print editions tend to number bars at the beginning of each new system, or every 5 or 10 bars.

Page and line numbers can also go in the blank line, though it would be counterproductive for it to become too full.

If in the left, before any line, bar numbers would not take a numeral sign, of course, as per Bar Over Bar but if in the blank line, they may have to. If tactually there seems any danger of a mis-read with the figures from the line above, perhaps a preceding dot 5 could be used for bar numbers: dot-5 BLE ff = bar 66, whereas 'BLEff' = figures six, six. A numeral sign would only be present at all if there had been a large gap. As such circumstances are rare, one must just be adaptable.

4. Identifying Prefixes: These only need to be stated for the first system of a page, or when there is anything unusual. When there are overflows into a convenient space, dot-5 AR for a solo line; or Roman i or ii if there are 2 solo lines: make it easy to find.

Manuscripts frequently break the line at a half-bar, to make best use of space, so we can be comfortable doing this in braille copies too.

* * * * *
EXPLANATIONS extra to Description:

Further to 703: Here follow some remarks from C.P.E. Bach, writing at the late end, 1753, in connection with continuo keyboard playing. He begins The True Art of Playing upon Keyboard Instruments thus:

Keyboard instruments have many merits but are beset by just as many difficulties. Were it necessary, their excellence would be easy to prove, for in them are combined all the individual features of many other instruments. Full harmony, which required three, four, or more other instruments, can be expressed by the keyboard alone. And there are many similar advantages. At the same time, who is not aware of the many demands that are made upon it; how it is considered insufficient for the keyboardist merely to discharge the normal task of every executant, namely, to play in accordance with the rules of good performance compositions written for his instrument? How, beyond this, he must be able to improvise fantasies in all styles, to work out extemporaneously any requested setting after the strictest rules of harmony and melody; how he must be at home in all keys and transpose instantly and faultlessly; and play everything at sight whether designed for his instrument or not; how he must have at his command a comprehensive knowledge of thorough bass, which he must play with discrimination, often departing from the notation, sometimes in many voices, again in few, strictly as well as in the galant manner; from both excessive and insufficient symbols, or unfigured or incorrectly figured basses; how he must often extract this thorough bass from large scores with unfigured or even pausing basses (when other voices serve as harmonic fundament) and with it reinforce the ensemble; and who knows how many other things? All this must be done competently, often on an unfamiliar instrument which has not been tested to determine whether it is good or bad, whether it is playable or not, in which latter case extenuation is but rarely granted. On the contrary, it can be expected that, normally, improvisations will be solicited without anyone's being concerned whether the performer is in the proper mood, and if he is not, without any effort being made to create or maintain the proper disposition by providing a good instrument.

Notwithstanding these demands, the keyboard has always found its admirers, as well it might. Its difficulties are not enough to discourage the study of an instrument whose superior charms are ample compensation for attendant time and trouble. Moreover, not all amateurs feel obliged to fulfill all of the requirements. They satisfy as many of them as they care to or as their innate talents permit. [Bach 1753:27-8, Foreword to Part One, translation by William J. Mitchell, 1949/1974]
Considering the appropriate place of the continuo in the ensemble big enough for concertos etc., he speaks of

... my conviction that the keyboard is and must always remain the guardian of the beat ... [Bach 1753:33]

and comments on the danger of hand stiffness, that anathema to good playing, from busy bass-parts:

... a good argument against those who ask expressly that all notes written for the left hand be performed. Certainly the right hand is not required to accompany all notes, particularly when the bass contains so common a device as the passing tone. The quick repetitions of whose hazards I speak are eighth notes in rapid and sixteenth notes in more moderate tempos. [Bach 1753:33]

(There is some context here: Quantz was the one who wanted 'all notes in', but being a flute player, his natural duties were not nearly as heavy as those of the continuo player who might have to play without respite for several hours each night, all through all works. It seems as if Bach was trying to avoid RSI and retain some sensitivity for the player.)

As musicians from every age have agreed -

The whole approach to performance will be greatly aided and simplified by the supplementary study of voice wherever possible and by listening closely to good singers. [Bach 1753:39]

And an interesting remark for blind musicians -

In order to become oriented at the keyboard and thus make easier the acquisition of a necessary skill at sight reading, it is a good practice to play memorized pieces in the dark. [also Bach 1753:39]

A very detailed chapter on fingering, which he considers of first importance, shows both the 'modern' use of the thumb, and the older way of putting tall over ring finger in right-hand runs which ascend, and left-hand runs which descend. Treble notes c d e f g a are fingered 123434 - however rhythmic and musical considerations are very much part of what he considers good fingering, this might not do for any rhythm or context. [Bach 1753:47]

On Accompaniment, Chapter 6

Italians ... can play scarcely any chord without rolling it ... [Bach 1753:316]
When the principal part of solos or other pieces requiring a delicate accompaniment has many appoggiaturas in a slow tempo, the accompanist, in order to avoid an obscuring of the melody, should not play all of the ornaments. Those that cannot be readily omitted should be modified by the introduction of partial rests as a means of differentiating the accompaniment from the solo. A momentary withholding of the accompaniment gives the soloist an opportunity to introduce the appoggiaturas alone. This modification, brought about by rests, is increased in effectiveness when the bass maintains a uniform pattern throughout the passage. ... [Bach 1753:341]

Liberal samples of lively examples are given, most rewarding to study: e.g. organ points, pp. 320 ff.

* * *

751. There is enormous variety in how much is figured - perhaps if the composer was playing continuo hardly any was needed; whereas works for amateurs, like Telemann's "Music Master" are quite thoroughly figured. Sometimes there will be figures for a while, and then they just drop out: evidently one is expected to have grasped the style by then.

AR BLE was chosen to say: 'what follows is figures'

752. GH AR is thought of as 'the longer in-accord sign' - here meaning for the whole chunk which fitted on the bass-line, which means what fitted of the solo lines - the bass for that much. Sparse figures often mean decorated solo parts, so it is only likely to be 2 or 3 bars. All this is only tactics to make best use of space, while still knowing quickly where to find things, and not needing to waste too many cells identifying what is coming next. Plenty of other schemes would work too.

In my transcripts I have mostly not bothered to prefix lines after the first system, relying on the blank line to make all structure clear. Except at new braille pages, it is helpful to restate key and time signatures and line prefixes there. If there is any change, naturally it would have to be prefixed again: sometimes in Bach arias the voice is missing for quite long stretches; I do not give it a line through these. For the uses I have made of this literature, it has been more sensible to do a 'Words and Voice' copy in detail for the singer, containing all the different language slurs etc, and to have just the melody of the voice-part in the score - i.e. not try to do text.

However, if it is desired to have the words in the score, or to prefix each line, and even omit blank lines, obviously this can be done. If it is, overflows are probably less appropriate or convenient.
753. More than a couple of hyphens just feel like a line, and are hard to count: hence suggestions of dot 3. In amongst active figuring, I feel hyphen is more neutral and expressive of a blank. But maybe tactile sensitivities differ.

754. Binding and separating signs: these need not be used if there would be no confusion anyway:

_SHf under a bass of 2 minims is obviously 2 columns, root and sharp-six: whereas
_SHf under 3 crotchets is obviously 3 columns, root, sharp, and six.

But if you have a very tidy mind, you may prefer

..:* :..:* respectively.

It seems that accidentals more commonly precede their figures. When something like 4# occurs in a modern edition it might only be an inappropriately squashed 4 and sharp, i.e. 4 onto #3 suspension. On manuscripts things are often squashed-up, but usually clear.

In some early transcripts I used k as a binding mark, but then when a flat has to be bound, then GHk [means double-bar]. Or perhaps it would not matter, one of the less alarming re-uses of signs.

755. ST is chosen because of its use as a fraction slash: there is no fraction line there of course, just the positioning achieves the effect visually.

756. Slashed figures seem to mean 'use the inflected form of this note' rather than the normal or 'perfect' form: so where ED 'slashed 6' mostly means sharpened-6, WH 'slashed 5' commonly means the diminished chord produced by flat fifth.

Beware of some of the stylized shapes: the slash may be a little to the right, as in Der Getreue Music-Meister where '41' turns out to be slashed 4, meaning sharpened four. Our modern natural sign is not common in earlier sources: a sharp raises a flat from the signature to what we would call a natural. Apparently notes were thought of as in their 'sharp form' or their 'flat form'. From the old Hexachord thinking, mi-fa gave a rising semitone, whereas one would call it other solfège names, like re-mi if desiring the sharper form.

757. If many figures occur under one note of the bass, as can happen at cadences, it might be necessary to give some rhythmic profile, if you only have bass and figures. Asterisk and perhaps use stem-signs after music-sign 6 3, or as suggested above, GHAR and profile. Usually they are just accounting for the solo lines; so if you have those, obviously you already have the profile.
758. ING chosen as a sort of 'start-segno' for 'start line'. Lines may be rather casually drawn, however; indicative rather than accurate! so their meaning has to be expressed. It is generally obvious in context visually; but if there is doubt, asterisk and describe.

Reasons preventing a very exact practice include:
that in modern editions also, if root harmony is intended, the line usually starts right under that note;
whereas if a figure or accidental is present, it usually starts after it.

In original sources it is just too variable, the figures usually being above, sometimes the line is also above, sometimes below - it depends on the clef and pitches in use, and where the beams are drawn in etc. Obviously in braille it must be one or the other, otherwise confusion will result.

Perhaps it is worth mentioning that c-four tenor and c-three alto clefs are quite common in 'bass' parts, sometimes changing frequently back and forth; there was fairly active avoidance of leger-lines. In earlier times, there was even a 'gamma-ut' clef, whose designation was 2nd octave g, the lowest theoretical note in the hexachord system: so if it were placed on 3rd line, that gave down to cello C still on the stave. Of course there is no certainty about what actual pitches were used.

Also, there is often a tradition of beauty, flourishes etc, in music writing, so the orthography contains artistic decisions, like the angle of the line, which do not alter the meaning.
In some comparable situations the braille music code rules are to exclude - e.g. the word-repeat convention, where the surrounding IN-signs give how many 'more' Alleluias must be sung - so it could have been done this way. Mostly I have tried to keep as many meaning correspondences as possible; but I think it helps one's quick decoding to use the inclusive method. But if anyone prefers the other, naturally they can use that.

759. If aligning all parts, and tracker-dots are needed, perhaps they could be in the bass line and not in the figures line? This is in order to avoid any ambiguity with meaning-carrying dot 3's.

Reminder of the feel of the possible 'lines' in braille:

• • • • • 6 3, 6 3, 6 3 - makes a nice line.
• • • • all 3's or 6's - rough (unpleasant) on the finger:
• • • • • • 36 36 solid, comfortable - but not good for cell-counting.
    * * * * *
List of Works brailled in FIGBY code:


Mr. Handel. "Traverso Solo" no. 5 from Solos for a German flute, / a hobbay or a violin, / With a / Thorough Basses for the / Harpsicord / or/ bass Violin / compos'd by Mr. Handel .... I. Walsh, London [no date]

Purcell, D. Sonata 1 in F from 3 Sonatas for recorder, keyboard, & basso continuo, ed. F. Giesbert. Schott OFB 78, London, 1940.


149
PART TWO: PRESENT BRAILLE

Chapter 6
"CODWORKS"

CODE ANALYSIS OF LITERARY BRAILLE

THE 63 CHARACTERS

According to mathematics, the number of Combinations of 6 (6 dots in this case) is 64 — one of which is the absence of all 6, a space: hence the 63 positive characters of Braille. This may sound like quite a lot, as we think of the alphabet having 26 letters in it. However, on the IBM keyboard in front of me, there are 101 keys. The 47 character keys can also take Shift, thus producing 94 character shapes. These are all considered indispensable, or at least sufficiently regularly necessary to be included on a standard keyboard. Obviously braille will have to be particularly efficient in its code management to render these and all the other not-included signs possible with a non-extendable character set of 63.

As can be seen from the following Statement, next page, the symbols are in a sense arbitrary; the code has only its internal logic. The symbols do not relate to any other literacy symbology or code. As described elsewhere, this may have had more to do with the constraints of writing, than those of reading or conceptualizing.

Louis Braille wrote only very simply and concisely on his codes, never expounding the underlying theoretical principles that shaped them. From a knowledge of braille, I believe that its codicological aspects can be deduced and analyzed. There will be numerous occasions to refer to this analysis, so I have called it 'Codeworks'.

The first 8 points of Codeworks concern Braille's choices of underlying structure: and therefore hold for all braille codes of whatsoever sort. Points 9-21 relate specifically to English language, point 22 to presentation factors, like setting-out.

Please find enclosed the extra detached card of the Braille System Statement if reference to it is desired along the way.
THE BRAILLE SYSTEM STATEMENT:

LOUIS BRAILLE'S 6 - DOT SYSTEM

Dots 1, 2, 3 down the left, dots 4, 5, 6 down the right.

THE SEVEN ROWS

Row 1: Using only the top four dots:

a  b  c  d  e  f  g  h  i  j

Row 2: Add dot three to Row 1:

k  l  m  n  o  p  q  r  s  t

Row 3: Adding dots three and six to Row 1:

u  v  x  y  z  AND  FOR  OF  THE  WITH

Row 4: Adding dot six to Row 1:

CH  GH  SH  TH  WH  ED  ER  OU  OW  w

Row 5: Row 1 in the lower cell:

,  ;  :  .  EN  !  (  )  ?  IN  "

Row 6: All possible Right-hand-side patterns:

Row 7: Any patterns left over:

ST  ING  #  AR  -  '

152
IMPLICIT PRINCIPLES:

THE WAYS BRAILLE IS CODED

Most of the following applies to other languages and other codes, that is, it is presumed to hold for extra codes; but this analysis starts with Literary Code, i.e. 'Standard English Braille, Grade Two'. 'Grade Two' means using the agreed set of contractions and abbreviated words, as set out in the Primer. It is used for all published and transcribed braille. The practical reasons for this codicological necessity will be discussed below, after no. 8, and elsewhere.

An indented summary will appear before the heavy discussion, in the long point numbers, where a lot of detail is unavoidable; this should ensure that the central observations remain clear. Shorter points dispense with a summary.

1. 'From the top-left':

The vast majority (48) of signs contain a high dot, dots 1 or 4. And if they do not, there are rules built in to ensure that their proximity to a 'higher sign' is such that the finger can readily perceive this. See the Braille Statement card for these points.

If the script goes from left to right, obviously the reading finger/s will first meet the left-hand column of each new cell: so the first information-byte, for first sorting process, should be carried in the top left dot. Since the first 8 symbols do contain this dot 1, and their shapes are replicated at the top in the first 4 rows, 32 symbols contain a dot 1.

So the tactile 'notional line' of braille is the top. And meaning-carrying is heaviest in the left-hand column; the right-hand column being often used to throw the meaning across the inter-cell gap, into the following left-hand column, as in manner 5 and 6 below.

1 a . From the top: relation of tall to short characters:

48 of the 63 characters are 'upper signs' i.e. contain a high dot - dots 1 or 4. [Also called 'higher signs' in some textbooks.] So 15 do not, and are called 'lower signs'. This can be seen from the statement, and could also be known mathematically - using only the four lower dots - dots 2356 - a total of 16 signs are possible, but one is the absence of all, the space.

The way the code is designed, one's finger orients to the top row of dots, 'collecting in' so to speak, the others in passing: there is always information in the top two dots, even if they are both absent, since this throws one into the sub-sets of meaning described below. Whereas, absence of the lower dots only means
you haven't got that far along in the series yet, still using high patterns, whose shape integrity is complete without reference to lower dots. It presumably had to go one way or the other with the 2-across by 3-down configuration: and Louis Braille chose to start at the top. Some of the practical advantages of this choice are discussed below.

1 b. From the left: co-operation with the haptic faculty.

Not only at the top, but at the top left. Consider the coding strategy for Row 1: Beginning with the four possibilities of dots 1 and 2: call these possibilities 1-4.

1-4 1 1 - -
   - 2 2 -

Add this series in the right-hand column to each of these in turn:

5-8:  1 1 1 1 1 - 1 -
     - - - 2 - 2 - -

9-12: 1 1 1 1 1 - 1 -
      2 - 2 2 2 2 2 -

13-16 - 1 - 1 - - - -
      2 - 2 2 2 2 2 -

17-20 - 1 - 1 - - - -
     - - - 2 - 2 - -

When the duplicates are removed, 1=8, 2=12, 3=16, 4=20 — space = space — the 16 possibilities of these 4 dots are revealed. Louis Braille extracted 3 and 15 so the whole row would be usable in the lower, (i.e. would be lowerable) as in manner 2: and extracted 17-19 to be part of the right-hand row to be used as in manner 5. The space is removed because it will be the same in 6 as 4. The remaining 10 then form Row 1:

1 2 5 6 7 9 10 11 13 14.

This is the sort of implicit coding that should be recognized, and may be used in the design of any new codes.

When first experimenting, I tried all sorts of sets, light and dense, extending horizontally, angles and zig-zags, vertically down, vertically up, i.e. using upper projections from a notional clump etc. — and it soon became clear that an enormous loss of confidence accompanied any departure from top-left precedence. It felt stronger than mere preference or habit-breaking — after all I was seeking new shapes and ideas of shapes, using 16-dot patterns etc — it just felt confusing when even simple and easily felt shapes turned up in doubtful orientation to the top. Or to say it another way, it had to be clear where the top was supposed to be.
I feel sure that, as well as being what we are all used to, this phenomenon will be found to have a good physiological or neurophysiological reason — whether it be in the distribution or profusion of tactile nerve- endings, neural transmission thresholds, or the need for certain intellectual parameters for haptic/tactile perception of such a specific kind, to be achievable.

Certainly there is the ordinary motor factor that the fingers must be passed over the bumps as lightly as is perceptually practical. This is firstly to avoid undue friction, causing resistance, slowing down contact movement; secondly to avoid fatigue of cells in the skin, causing depressed neural response. So the higher the terminal phalanx, the last finger joint, can be held, while still in contact with the bumps, the better. And the hand has a natural curve when at rest palm-down.

Therefore it makes sense to have the most meaning-carrying part of the cell touching the patch of finger nearer the tip — if nearer the palm, the hand would have to be used flatter, and thus be more cumbersome. So the first vital implicit condition is to work from the top left.

This is then confirmed by a close look at the Statement. The first 8 signs have dot 1, not till i and j is it omitted — which means the top dot is in the first column encountered by the reading finger for the first 4 rows, i.e. nearly all of the alphabet and several contractions. Row 6 begins from the top also; and Row 5, though lower, has the shape integrity of Row 1, so still works in its own way from its top left for another 8. No wonder the expectation is built up.

i and j have a dot 4, so height orientation is not lost — it feels quite dramatic when there is suddenly No Dot One! In any case the shape integrity of Row 1 is 'dominant'; one will assume that height unless otherwise informed. Of course in real reading, meaning and context expedite recognition of signs: indeed, one is not conscious of the signs at all, ideally; they merely convey the message.

Concern for the clarity and accuracy of the message led to strict rules in all of braille, but particularly with Lower Signs: see analysis page 175. However, more recently people's usage has relaxed, in places where clarity is unimpaired. BUOC supports several such rationalizations, see page 29. [Maxwell 1992/2:12]

Proximity to a Higher Sign must be such that the finger can readily perceive that a sign is indeed lower. The general practice is that a lower sign should be in contact with a higher sign in at least one direction; but this need not mean exactly adjacent, several common words use lone (i.e. spaced) lower signs.

When in contact with higher signs they are extremely easily felt, and are the most intensively coded portion of English literary braille. All have multiple meanings depending on their position
in the letter-group: e.g. lower b, dots 23 at the front of a word means be-; in the middle means -bb-; at the end, a semicolon.

So Lower Signs are a small, but vital part of the reading code. Punctuation for instance, is obviously indispensable to meaning, even though its signs actually occur less commonly than many letters. Lower signs may only number about a twentieth of the number of cells on a page, but are most valuable for all that. Their variability also points up the more immutable character and dominance of the upper signs, confirming the 'from the top' hierarchy feeling.

In the same way, the use of the second-last row as right-hand-side illustrates the dominance of the 'from the left' principle of the rest.

Higher signs, obviously much more common, normally retain their meanings in any part of a word – their coding consists of being used alone for extra common words, and prefixed by Row 6 signs for yet more common words. These will be discussed in more detail under the numbers in chapter 7, 'Linguistic Considerations'. Slightly exceptional signs like the Numeral Sign, and the Poetry Sign will be discussed under Codeworks 6, code changers.

What must be understood is the relationship of Upper and Lower signs, and how they demonstrate the implicit coding strategy of braille, as From The Top Left: because I believe this to be the first vital rule for any new code design.

A sidelight on the capital sign, dot 6:

The English have always thought of braille as block lettering, not needing a Capital Sign as a general rule: there was provision for it in the code, and it could be used when a capital letter conveyed meaning – as in 'the Court ruling' etc. but not in merely typographical conventions such as sentence-beginnings.

The Americans, on the other hand, became very concerned for the braille to exactly parallel the print, and use capital signs everywhere; also doubling them before each word of a heading, even when due to normal braille contraction, a word is expressed in a single cell, as in the following heading. Here it is, first without, then with the capital sign: 'A DAY IN THE LIFE OF X'
Now for the first time it is clear why this sign feels so bad, especially to poorer readers, and is so disruptive to fast reading. It is in the lowest right-hand-side place, which looks well enough visually, but contravenes the natural order of braille coding: since it aligns the hand to the wrong place – the bottom of the cell instead of the meaning-carrying top.

Fuller discussion of this belongs with Codeworks manner 5 below, use of Row 6: but it demonstrates misuse of height orientation from lack of tactile understanding. Most of the motivation for insisting on this sign comes from a desire to automate braille transcription: the big agencies for the blind believe it will be cheaper to computer-translate than to pay intelligent human beings who know braille. It has yet to be proved that it actually does save any money in the overall production costs, but user comfort is a much lower priority to the agencies than the urge towards computerization.

* * *

2. As two convergent 4's (Relation of rows 1 and 5):

This distinction can be very useful in practice, differentiating between letters and punctuation, numbers and fractions, compact forms of telephone numbers and dates, or any binary series or accepted-order series demanding no more than 10 characters per set. In music code, lower signs appear for nuances, ornaments and repeats, where the same shapes in the upper cell are note-signs. In computer and some math codes, all numbers appear in the lower cell.

2. as two convergent 4's: ☀ ☀

This is clearly a sub-species of the above discussion, which included the relation of tall to short characters, noting that punctuation is always in the lower cell. Many of the practical uses of convergent fours are informal, and to do with numbers.

This is natural when one considers that the first ten letters of the alphabet do not have much of a use, without all the others: whereas there are only ten numbers, since we use a decimal system; so that for numbers it is a complete-in-itself set. Telephone numbers, dates, times, and fractions, are examples of the use of height difference as a sorting mechanism.


I have exploited this fairly fully in my new codes. In PASCO, the code for mensural notations, an upward direction of the melody-part is expressed by the letter, acting as a number, in the upper
cell, a downward direction by the letter, number, in the lower cell.

Another use is in representing two-digit columns of figured-bass in FIGBY Code. Of course sometimes the columns are longer than two-deep, then the slash must be employed to place the next number below what you already have: but at least the common doubles are neatly managed.

```
  ... ... ... ... ... ... ... ...
  6  5  4  5  6
  4  3  2  2  3
```

The three convergent fours of eight-dot cells are most useful for many ligature formations, such as the three falling diamonds which are common conjunctura patterns in very early manuscripts. Three falling d's or j's would appear for this formation in HEXIMUS Code. (For more information about these matters, see the sections on Ligatures in Part One, HEXIMUS point 18 page 82-88 and PASCO point 323 page 101-103.)

As long as there is contact with a higher sign, one containing a top dot, these are easily recognized, to make the three-tier possibility viable in other ways. Codicologically this means offering a plain 3-tier, or 2 sub-sets of 10 signs; or a double-subset, offering a hundred possible sets — each one combinable with ten of the opposite height. In 6 dots, it is just a two-tier 10-character set available, very easily felt.

The process signs, + - x -= are all in the lower cell in the English maths code: with numbers to be processed in the top: if not in the top, they will be against a numeral sign which is a full-height sign. In American math codes, and some computer codes, the lower cell is used for all numbers, so process signs must have extra prefixing: there is then only intellectual distinction between numerals and process signs. For this reason, although the American codes were developed for, and doubtless are more suitable for high-level mathematics, the English system has proved much more satisfactory at primary school level — perhaps because it is making better use of the available distinctions within the code.

* * *

3. As a potential four on top with modifiers below:
   (The relation of row 1 to 2, 3, and 4)

A glance at the Statement above shows this as the most obvious structural feature of the braille system. However, as a coding strategy it is exploited far more fully in the specialist sub-codes. From the point of view of literary braille, it only provides the ordering mechanism, the basic seriality, for the letters and signs.
For example, in music code it is basic, by providing the expression of rhythm. The potential 4 shape gives the note-name, then the presence or absence of lower dots, provides the rhythmic status.

So although this method is only lightly used as a coding device in literary braille, clearly its beautiful logic makes it a strong possibility for new codes: either as a memorable ordering device, or as in music code, to express meaning relationships.

Longer cells obviously particularly favour this way of coding.

3. As a potential four on top with modifiers below: the re-using of the first 10 shapes with added lower dots, in the order: left, both, then right.

All the letters, and most of the common contractions are part of this; but only as an ordering system. That is, 'a' does not bear any relation to 'k' or 'u' or 'CH' morphologically or any other way. So in one sense, this most obvious coding strategy is not used at all for Literary Code.

It is used for Music Code: the letter shapes 'd e f g h i j' are selected for the note-names 'doh re mi fa sol la si' = our English-language note-names C D E F G A B: these are taken as quavers (8ths), to which may be added dot 6 to become crotchets (quarters), dot 3 to become minims (halves) and dots 36 to become semibreves (whole notes). So from symbols 4-10: Row 1 gives 8ths, Row 2 halves, Row 3 wholes, Row 4 4ths. Perhaps the reason for the slightly odd order may be the idea of longest possible note having the maximum number of dots.

Of course there are more complexities; these will be discussed in chapter 10, the basics of music section.

But what long cells offer particularly is this very coding strategy: building on to the bottom. Also lowering the bottom, hollowing out the middle so to speak; or lowering all the 3-deep cells to be used next to cells containing a high dot. There are many possibilities.
Another practical example of this strategy:

There are various ways of making a braille calendar; some thought has to be given to it, however, as braille cell-size is unmodifiable, so two figures cannot be crowded under one, and it is tactually unsatisfactory to leave big gaps between the single numbers to allow for the later double ones.

One way is to express all numbers in one cell, so that alignment can be preserved. This method is also used in PASCO / LETCO, point 332 page 106 for a slightly different economy. No numeral sign is needed for this way. So it all could feel like letters if one did not know the convention: viz.

use a-i for 1-9 as usual
add dot 3 under these numbers for 10-19,
therefore t.= 10, (t = j with dot 3), k - s = 11 - 19
add dots 36 underneath for 20-29,
thus WITH = 20, u - THE = 21 - 29;
add dot 6 for the 30's, thus w and CH = 30 and 31.

This makes all figures one cell, so the feature of compactness is met, also alignment patterns can be easily achieved. This fits each month onto a sheet a couple of inches square, leaving a blank cell between each entry.

Braille cannot be confined by a grid to keep it orderly without enormous waste of space: so it has to keep itself orderly by planned perfect alignment, if as in this context, alignment is necessary for the meaning-content – all the Thursdays in their own column etc. Hence the need for a strategy like the above.

If a person is needing a calendar for a longer time, say the next three or four years, this kind would probably not be compact enough. Then something like the Vietnamese way might be used. For this only the first seven days of each month are given, and the user does the rest of the calculating in their head – e.g. by looking at the last initial; that day will obviously be the 7th, 14th, 21st 28th of the month etc.

This method fits a year onto a piece of paper a couple of inches square (6 months either side of the fold), as no spaces are left between the day-letters. For these, m t w TH f s THE are used; THE is really like an s with dot 6. Then on the back can be another year. Unable to have small print and pocket-size aids, it is marvellous what blind people have thought up. Clearly this is a case of combining mental strategies plus abbreviation, plus imaginatively extended signs.

* * *

4. As a 2-column set, with internal space recognizably smaller tactually than the inter-cell space:

This is essential for the balance of readability with space efficiency. It maintains the tactually recognizable shape-
integrity of signs — where one configuration ends and another begins. It actually provides the 3 basic and 4 subsidiary spatial distinctions necessary. Recognition of different spaces convey vital messages to the reader. It is space that makes possible Row 6 coding, Codeworks 5.

I consider it essential to maintain the two column set in any new codes. The present spacing increments work well.

4. As a 2-column set, with a different internal from external space increment: i.e. the relationship of all adjacent symbols, the basic boundaries of the cells.

Here are the 3 basic spaces and their meanings.
  intra-cell space = these dots all go together;
  inter-cell space = now this is the next configuration;
  full cell-space left blank = this is the end of the word.

The subsidiary spacings which occur incidentally, as part of the cell structure containing dots and spaces, are;

if a single left-column is followed by a double-column sign within a word; e.g. any, keep

```
any keep
```

the reverse of this, when a right-hand column follows a double-column sign within a word;
  e.g. mountain, publicity

```
mountain publicity
```

if a single column left-hand-side sign is followed within the word by a right-hand-side sign;
  e.g. alone, mutuality

```
alone mutuality
```

the longer space that occurs by chance if the last sign before a cell-space is one-column;
  e.g. 'annual income' 'like to like'

```
annual income like
```

the reverse of this, when the sign after a cell-space is a right-hand-side sign; e.g. 'so many of the workers ..'

```
so many of the workers
```
and the longest one when both of these last occur by chance. e.g. 'Violence and Sexual Assault'.

If we use i and j for the intra- and inter-cell spaces, i = internal, j = jump to next cell, then some of the spacings from the above list might be expressed as follows:

within the word, between the l and -ENCE the distance = iji;
one full cell space, between e and AND = jij;
a cell and a half, between AND and .S = jiji;
the longest one, between last two words = ijiji.

Of course one is actually also jumping over the amount of space taken up by the dot columns themselves, when they are absent.

This fixed location of dot positions is necessary to make both single columns independently useful. They cannot be crowded up, as in print justification practices. Put another way, the space it occupies is part of the shape information of the cell-symbol. b has to feel different from its mirror, dots 45, or ambiguity and meaning loss must occur.

A most significant use for the two-increment space system is for the way it makes possible right hand side columns going forwards, (see manner 5 below) and left-hand side single columns referring backwards, (see manner M1, M2 in the music strategies).

Without the inter-cell space, something untenable would occur — 'ma' would feel identical to 'kc' 'o,' would be identical with 'k:' etc. unless a whole column were left blank between each letter. This is how these examples appear now: a small difference, but readily apparent tactually, as well as visually.

```
*: :*: :*: :
*: :*: :*: :*
```

Order and proportion probably play a large role in all perception, especially of beauty: our minds seem to feel better when order is evident. Tactual space is quite a different matter from visual space perception, aesthetically and cognitively; and it works sensitively only in small increments — once there is a large space, it is relatively undifferentiable haptically. So this tiny contained variation is perfect for maximizing haptic boundary-recognition, with the finger-pads as sensing agents.

Dr. Emerson Foulke's research pioneered orderly experiment on different shapes for an extended braille cell [Foulke 1973]; after trying 4 x 4, 5 x 5 and even 6 x 6 formats, with a surprising amount of tactile legibility reported by blind and
sighted subjects, he concentrated on single 4 x 2 and 3 x 3 shapes — checking for speed and accuracy — and concluded that the best way for new research to go was 3 x n where n is any number of columns.

No real live hard-dot codes actually grew from this exciting research however; as he well knew, there are many more matters to a code than the tactile legibility of its symbols, although that is obviously one of the fundamental requirements. As discussed in more detail elsewhere, my researches lead me to take the other option — preserving the double column, and extending the length: and some functional codes have been devised using this format.

As discussed in Chapters 1-2, when first experimenting with new code possibilities, one of the hand-frames I had built was a 'continuous 8-dot frame' — where all columns were equidistant. This gave an interesting regularity to certain shapes, but was otherwise extremely inefficient — needing to use

one whole blank column for letter spacing,
thus at least two columns for the gap between any single column sign and its further double-column sign, as between the k and e in 'keep' or the 1 and -ence in 'violence' in the examples above
then at least 3 columns for word spacing:
more, if a sense of forwards and backwards was needed.

It actually halved the number of relationships available between columns! Louis Braille was wisest again.

Barbier's original dotted night-writing system had used 6 dots, but in a single vertical line. This was much more cumbersome to feel than the 6 arranged in two 3's; and again had only half the number of possibilities of column-relating spatially.

It also became clear that in practice, horizontally larger shapes were perceived just as easily when written as an accumulant of double columns, as with this massed format. That is, the inter-cell gap did not detract from the perceived sense of the shape, if the brain did not set it up as a boundary. On the basis of this discovery, or rediscovery, all my codes use double column shapes as in regular braille.

With the two spacing increments, a right-hand column sign will naturally relate the reading finger to the following cell; a left-hand column cell to the preceding one. In literary braille codes, from the European languages at least, the left hand side patterns are not isolated, most are just used as letters in the order they occur in the Statement, as in manner 3 in this discussion. But in music, both directions make compounds, and carry specific (though variable, depending on what signs they attach to) information.

This directional strategy should be exploited in any new codes, because of its great clarity and flexibility.
5. As double cells, with a fixed group modifying all other signs: as in the Statement, Row 6 relating to all else.

In braille coding, Row 6 signs do not have an independent existence: since the difference between them alone and their left-hand-side mirrors alone would be tactually undetectable by most people. So the agreement is that if you meet a lone top dot, it will be dot 1, an 'a', not a dot 4. Here is a dot 1 occurring alone, for the word 'a', and a dot 4 acting as an accent sign:

Have a nice day  étude

Here is a sentence demonstrating manner 5 by using common words which all except 'ARE' have a wordsign.

There are many words here ...

This is a brilliantly efficient use of this row, yielding a potential of $7 \times 56 = 392$ character-sets. All of the possibilities are not used in any one code: a few for tactile reasons, some for reasons relating to the coding needs of the content; some perhaps just for a sense of load -- any system which is totally crammed may begin to lose user-friendliness.

Although we have found that user-friendliness actually depends almost entirely on the skill with which the coding is arranged, the natural matching between known concepts and the configurations chosen. Given good conditions in this way the amount is unnoticed: so this part of braille can be further developed to excellent effect.

5. As double cells, with a fixed group of single column signs modifying all other signs: as in the Statement, Row 6 relating to all signs that follow it; and as its mirror patterns in the left relating to signs which precede them in some non-literary codes.

In Standard English Braille, right hand side dots will always appear attached to -- which means followed immediately by, unspaced from -- other signs. As mentioned earlier, this is a brilliantly efficient use of this row, yielding a theoretical potential of $7 \times 56$ -- row 6 by all the rest, $= 392$ character-sets. Starting from 63 characters, this is a liberating increase!
And of course in theory (not in practice) it can be double that number if the signs were all to be used medially with a different meaning from their initial-position meaning, or treble if they are used terminally with different meanings yet again. All the possibilities are not usually taken up.

However, one could think about sign use the other way: the only actual constraint, the tactile reason that is certainly true, is that they should not stand alone. There seems no barrier to using them any other way. Sometimes the avoidance reasons we have been taught or assumed, turn out not to be valid – are actually no problem when sensibly coded. One finds, for instance, something we have avoided in English is part of the German code. It is just a question of appropriate use.

A great deal of the efficiency of braille reading is in the mind – it is the mind which reads – and it must train the fingers to respond to its sensible expectation. If an unexpected sign is met, one will 'unconsciously' alter it to an expected sign; so that in a test situation, it will appear to be a sign that causes error. But when expected, errors are not made. It seems possible that this is the reason for some rejections of signs which have subsequently been found perfectly usable.

Looking at it this way, it is clear that Row 6 signs are actually greatly under-used in English literary code as prefixes to other letters and signs. For instance they are not used at all as terminal signs. Some Shorthand systems, including English, did use some as terminal signs, with excellent success.

The skilful extension of this coding principle plays a strong part in the success of BUOC, showing how a great deal more can be added without pain, and with much gain. Some changes which appear obvious are not able to be included in BUOC, because of its undertaking not to alter any present braille – only to add useful words and ideas to it. Thus, any BUOC user reading what is now standard will never be confused by change; they will only be reading in a longer, more cumbersome way, what they have already been used to in BUOC.

Here is the present canon with regard to Row 6:

Dots 5, 45, 456, are used before letters and signs for whole words; these can then also be part of other whole words.

Dots 46, 56, 6 are used terminally for common endings, before the last letter of the ending: other letters may still follow these compounds since they are 'complete'

as initial signs, they are used as generalist indicators before whole words – 46 for Italic, 56 for 'letter sign', (see below), dot 6 for capital sign.

The Italic sign is presumed to apply to the whole word, or letter-group. If there is a whole passage in Italics, the italic
sign will be doubled before the first affected letter, and appear again once before the last word of the italicized portion. BUOC has a more consistent solution, where it works like brackets and quotes.

Letter-sign applies likewise to one or a group, until a space.

Dot 6 marks just one capital letter, and must be doubled if applying to more than the first letter. See above, discussion under no. 1, page 156 re this sign.

Dot 4 may precede any letter as a non-specific accent sign.

The Letter Sign is used when a sign which would normally be a contraction is desired to stand just as a letter. It is necessary in braille because there are no type-face distinctions, and all letters standing alone mean a whole common word. It can appear when initials are used as an abbreviation, or when another language is being used which uses that sign for a letter. E.g. in French, dots 123456 stands for é, so the word Étude (study) common in music as a title to a piece would look like FORtude in English. To clear such an ambiguity, letter sign precedes; it is then known that the following signs are all single letters.

That does not necessarily help the reader to know what it is, and in more modern times, the accent sign before the e might have been used in preference, as being clearer to the non-specialist. Languages which use accents, naturally have particular single signs allotted for each accented letter; these come from the rows after the alphabetic series finishes. These could usually not be guessed, as print ones can, since they are just coded signs, and may bear no resemblance to their letter. In French the first 5 signs in row 4 are allotted to the â è ï ô ù.

English is fortunate not to need accented letters, as all of those signs can then stand for common letter-groups. Of course the weakness with expressing accents in English is that there is only one accent sign, and many different accents. No superscript or subscript is available in braille typography.

Some examples of the Right Hand Side workings:

Whole words:

Dot 5 before  d = day, k = know, m = mother, p = part.
Before the CH contraction = character, THE contraction = there, WH = where  5 h = here.

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There are 22 dot 5 contracted words.

166
Dots 45 THE = these, 45 TH = those, 45 WH = whose, 45 w = word, 45 u = upon. (There are only these 5.)

Dots 456 m = many, 456 s = spirit, 456 THE = their, 456 h = had, 456 c = cannot, 456 w = world. (There are only these 6.)

Terminal contractions before the last letter:

- 56 t -ment, - 6 y - ally, - 6 n - ation.
- 46 e, - 56 e - ance, - ence; - 46 s, - 56 s - less - ness;
  - 56 y - ity etc.

A nation's independence

Dot 5 words can be part of other words: 5 k correctly appears in the middle of 'unKNOWn', 5 p in PARticular, 5 e = ever, after the n in nEVER etc. Similarly for the 45 and 456: 6 g ER 456 m = (capital) Germany, g ER MANY. Since they are spelling-based, they can be used wherever the letter combination appears, even when it is rather odd - e.g. 'one' dot 5 o in the midst of 'colonel' etc.

* * *

What are called terminal contractions above can also be medial - a word like 'enhancement' would take -ANCE and -MENT (also the lower e for EN of course): 'national' would be written as n 6 n al nATIONal. So keeping these meanings, not using those signs again medially is an appropriate coding procedure for English.

However, there is nothing to prevent 4, 45, 456 being used terminally, i.e. as word-ends with nothing following them: Braille Shorthand Codes have always done this quite extensively. One of the BUOC propositions is to use dots 456 as -ly, an ideal morphological, aesthetic, and haptic choice.

There is no need to include a full list of these contraction sets, as they are all listed in an orderly manner in the ordinary Primer of Standard English Braille, which is widely used to train transcribers.

* * *
Other matters concerning contractions:

There are always heated opinions about the suitability of certain contractions when they occur in slightly unusual places in specific words; and English spelling is not renowned for its regularity! However, clarity should prevail: the system is spelling-based, so if the spelling is accurate, there is no confusion, and should be no argument. One instance of a rejection and correction in the computer translation code is dot 5 m = 'mother' in 'chemotherapy'! But this too was really only amusing, not obstructive to reading efficiency after the first exposure.

If it is felt that reading efficiency is diminished, and syllables or phonetic units should be observed, then some different decisions will have to be made; but the code evidence presently is almost all on the side of spelling. Consider accepted oddities like 'colONEI' above. Some residents of Hereford, England (where the large and famous Royal National College for the Blind is situated) object to the contraction for 'here' being used in the name of their city. They apparently feel quite content with the contraction for ONE being used in 'mONEy', where there seems a comparable non-match between pronunciation and spelling.

And transcribers worry about things like whether to contract the EA in 'pineapple', the TH in 'pohole'. Really, it does not matter enough to worry about; since it is clear if you do, clear if you don't. But there is a punishment of tactile tedium if you don't; contractions have their strong purpose.

BUOC in its proposed up-dates to Braille, increases the number of such signs dramatically, with excellent results in increased fluency, with both reading and writing. Its extra signs are all for words which are extremely common and well-known to everyone.

There have always been periodic changes and additions to braille over the years: so in reading older texts one may come across things in full which are now contracted, like 'friend' or 'first', now 'fr' and 'fST': 't-d' (to-day) has become 'td', also 'tn' 'tm' for 'tonight' and 'tomorrow'. Much more rarely, different signs or abbreviations have been used, an actual meaning change made.

There is a whole set of Biblical short-forms, e.g. 5 l = lord, 5 g = God, 5 j = Jesus, 5 c = Christ, only one of which — lord — is part of current official SEB. (There was also holy, glory, faith etc. hl, gl, fTH.) But naturally those who need this literature still need these words, so the sensible thing is to make them a specialist vocabulary sub-set, and still use them in specialist works. By official denials, we are only making people's lives hard by making such words cumbersome again in official publications of those specialized literatures. Naturally people will continue to use them in anything they produce themselves, because they are fast and convenient.
When reading some Shakespeare brailed in the 1880's, I do remember being a little baffled by odd punctuation, and lack of it, and a spaced lower-e was clearly not the 'enough' that it means now. It turned out to be the old sign for question-mark, which I have only recently learned, was Louis Braille's original sign from the first Method, 1829. But the chances of anyone meeting that material nowadays are minimal! it will almost certainly have been discarded to make room for newer books.

Notions about the number of contractions that it is useful to have, need to keep evolving. The belief in some quarters, that Braille is and should be, immutable, was never true or sensible. Being resistant to the natural evolution of language is only to disadvantage braille readers, leaving them unsupported in the language of their own time.

Likewise the belief in limitation of the number of words we can all remember: in fact we all remember without difficulty the words that are commonly used around us, or which relate to concepts that interest us – the actual number is certainly not fixed, and can be readily extended by any awakening interest on our part. Such beliefs in limitation are stultifying, not protective, as claimed, to braille users.

For example: Leila Berg gives the informal lists in her book 'Reading and Loving' of the 44 words she recognized when spoken by her 18-month old grand-daughter who visited for a couple of hours: also the list made by another family of a two and a half year old – 248 words excluding friends' names [Berg 1977:26-30]. Clearly there are a great many words that are absolutely well-known and memorable, and for which contractions can only assist blind readers. The given reason for staying with the comparatively few contracted words, that people will not be able to remember any more words, has little reality. If the words are common, they are memorable.

* * * * *

6. Other signs as code changers: e.g. Numeral Sign, from Row 7. :

Excluding the Row 6 right-hand-side combinations, the only three higher signs which change meaning, or prescribe a modification of meaning, in English Literary Code are

- Numeral sign dots 3456
- Poetry sign dots 345
- Slash dots 34

They are all from Row 7, and contain a dot 4 and no dot 1. This prompts thought on the construction of Row 7.
Perhaps Louis Braille worked the last line the other way round, combining all the right-hand-sides with dot 3, to complete the full number of possibilities of his set of 6. As the first 10 were arrived at by thinking of a two-deep matrix, dots 1 and 2, so these move down to dot 3, combining it with each in Row 6. This would give

\[
\begin{array}{cccccccc}
34 & 345 & 3456 & 35 & 346 & 356 & 36 & \text{and } 3 \text{ alone.}
\end{array}
\]

35 and 356 are already accounted for as lower i and j in modern Row 5, = Row 1 in the lower. The others do indeed form modern Row 7.

In the 1829 Method things were a little different, as a horizontal stroke also appeared in each level of the cell, making more rows. See the translation in Appendix 2. He still finished off with '6 Supplementary Signs' —

\[
\begin{array}{cccc}
3 & 36 & 345 & 3456, \text{ then } 6 \text{ and 56 with high stroke.}
\end{array}
\]

('high' meaning where dots 1 and 4 are now.)

34 and 346 appeared with a stroke in the middle as the last two signs of his 8th row.

The right-hand-side set were not separated in this early version: dot 5 appeared with a stroke above it as sign 5 of row 5; 4 and 45 are signs 9 and 10 of row 5, no strokes: 46 and 456 do not appear anywhere.

Or what may seem more obvious, given his original last row, is to use 3 36 then combine each of these with 4 and 45 ... thus yielding

\[
\begin{array}{cccccccc}
3 & 36 & 34 & 345 & 364 & 3645
\end{array}
\]

which also 'turns out right', containing all signs from present Row 7. Since information is lacking about the next code statements and revisions, from the 1830's and 40's, these are conjectures.

* * *

There are some other code changers which flow between codes: but they are compound signs, usually in manner 5 above. For instance in Braille Music there is a way of distinguishing text and music — when words are in a foreign language, containing unfamiliar letter-groups, it can take a deal of cogitation to work out which is the melody line! There is usually English as well as whatever the original was; there may be three languages relating to each phrase of tune.
As discussed in the appropriate music section, the way for simple situations is to write the line of words at the left margin, and indent the melody, using only a line-full of words, so there are regular alternating lines, which are easy to follow. If singing from a copy, it is easier to write it out again in the chosen language with just this one-to-one style. If this is done, there is no need for identifying signs, the indents denote the music. See also the discussion on uses of space, below.

The point is, the signs exist: they are dots 56-23 = words, dot 6-3 = music (i.e. 2-cell signs). In didactic works where there is much discussion, it is helpful to mark the musical examples with 6 3: so it has come to be used also in literary braille, a sort of flow-over, if there is a fragment of music in amongst word-text.

* * *

Numeral Sign, row 7 sign 3.

It was a brilliant stroke of sign economy by Louis Braille to use only one sign instead of 10 to represent the numbers, and it is one of the clearest shapes of all, somehow a pleasure to the fingers. Even sighted people find it comfortable and secure to identify by touch.

In a character-set of only 63, 9 signs saved is a great thing: and so simply done, by allotting a sign to turn letters a – j into numbers 1 – 0. An added advantage to using Row 1 thus is that it can also be used as Row 5, in the lower, to make the useful distinctions as described in Codeworks 2, two convergent 4's. The sign chosen is full-length, which makes it useful whether the numerals are in the upper or lower.

The same sign medially or terminally is the contraction -ble: proBLEm, taBLE etc. There are minor variations concerning its status as an initial sign, as km#25 would be rightly understood as 25 km. CONp#12 as 12% etc. The person reading braille must have their intellect firmly engaged to context and meaning.

Since the first hierarchy meaning of these signs is letters, the numeral sign's effect is considered to cease at a space. This means some things will look rather crowded in braille, but usually feel fine.

As well as the height differentiated method described in manner 2 above, the numeral sign is often restated close-up to separate series: a date can be written #25#12#1906, as can any accepted series, such as hours minutes and seconds – hr#10#46#35.
There is a move to undo this convention, to insist on the order of print symbols — 23 km — but it then takes up 7 cells, so is more uncomfortable and inefficient for the tactile reader. It is always a pity when print conventions are slavishly followed — such things are done in print in that way only because they are clear and convenient. The same logic should be applied to braille; things should be written as they are most clear and convenient to the touch.

When using numbers and punctuation, in theory there must be a dot 6 before a lower sign used as punctuation, since one of the conventions of lower-signs is fractions ... e.g. ¼, ⅓, ⅔

and these forms are common when fractions are needed.

In literary braille this would hardly ever be used, as context would normally make the sense clear — e.g.

"[we didn't drive till after 4]:

... (they didn't arrive till after 4) ...

one would not normally be in danger of reading 4/7ths instead of 4, close-bracket!

But when using any electronic aids, such signs must be inserted, since computers need to be told exactly. The Braille-to-Printer System used all around the world, which turns the brailled work of a blind student into print that sighted teachers can quickly check, must be used this way, so the sign is now being taught.

Poetry Sign

345 = contraction 'AR' in any position in a word; it also has a function delineating poetry lines. This function is made necessary because a print line frequently does not fit into a braille line, so setting out is quite disturbed from a print source. Many delightfully compact books of poetry were published by RNIB, in the small-size volumes, with the text flowing on, line-ends marked by this sign. No wasted travelling for the fingers.

In contrast, the Methodist Hymn Book came in 11 large volumes (each 13 by 11 inches) because it was decided to start a new braille line for each new poetry line. At the moment of singing, this was easier, but carrying the 11 volumes was totally prohibitive — one either left them at church or left them at home, and survived on memory. This did somewhat undercut the point of having the hymnbook in braille.
In modern times it would be more usual to start a new braille line for a new print line in verse, even though that can waste a great deal of paper. An AR for line-ends is still desirable. Thus spread out, often over several pages, rather than compactly, it can be much harder to appreciate technical features, form and balance, rhyme-scheme relationships etc.

One is dealing with a different subjective/receptive style through touch than through vision. Things that feel nice may not look nice, and things that look nice may not feel nice. Transcribers have many headaches deciding how to make setting-out in braille give the same impression to the intelligence as the print setting-out is intended to convey. The same physical setting-out is rarely possible — and even if it is, it may not give the same distinctive impression tactually.

If the lines of a poem happen to be short, the setting-out may be clear without recourse to any sign. However, under most circumstances, the line marker is necessary, usually doubled at the end of stanzas. It is used unspaced from end-of-line punctuation, otherwise spaced both sides.

A short extract of poetry quoted during prose may have a double sign before its beginning, the AR to show each line-end, and a double sign to show its end.

The Slash - Row 7 sign 1.

This is quite a troublesome sign, since it means contraction ST in any part of a word, and the whole word 'still' when used alone. It has obviously been adopted by sighted people because of its faint resemblance to the print forward slash.

Between two consonants, such as 'SirSTMadam' is not likely to give meaning trouble: but 'yeARSTage' (= year/age) makes words, and if separated, 'yeAR ST age' the nonsense 'year still age' results. Similar tactile clumsiness and ambiguity occurs with 'like / do not like' etc.

This sign cries out for something less ambiguous and tedious. When meeting letter-sign 'aSTA' once in a braille copy, I could not work out what 'A/A' could possibly stand for in the context — later it was found to be 'ASTA', the American String Teachers Association ... i.e. there was no way for me, the reader, to know whether it was supposed to be an ST or a slash. The person transcribing usually does not realize there will be a difficulty — it is obvious on the print, so its ambiguity to the person coming to it in braille is not recognized.

There are many instances of confusion: and it persists in spite of blind people's efforts to get dot 5 2 (2-cells) used instead;
52 does not already have any other meaning in literary code, and is a natural haptic-conceptual choice, as it feels like a balanced divider.

* * *

7. Using strict rules as to order of signs, so the same shape-symbol may be used as an initial, medial, or terminal sign, with different meanings: i.e. with a space before it, no space either way, or a space after it. In literary code this is used mostly with Row 5, the lower signs: e.g.

lower d = dis- at the beginning,
= -dd- in the middle, and
= . full stop punctuation at the end of a word,
or group of signs:

```
We must discover some middle ground.
```

There are a few contexts where full stop is not followed by a space: as in abbreviations, or when followed by a poetry sign AR etc. In some of these it is preferable to use a letter-sign in braille, rather than full stops as print does, to indicate abbreviation.

In Braille Music Code, many more signs are context-dependent: e.g. GH prefixes double-bars, repeats, beam-breaks, and is central to value signs; though its first hierarchy meaning is Flat — which it means if it stands alone, or before a note, or before an octave sign before a note, or before another flat etc.

7. Using strict rules as to order of signs, so the same sign may be maximally used:

Seriality is the only variable in braille: so naturally it must be intensively cultivated. No subscripts, superscripts, sizes or styles of print for differentiation: only seriality. Good setting-out is important, but the range of useful space relationships is quite small in practice: most of the helpful variations of sighted space have to be understood intellectually by the tactile reader.

Lower-sign usage provides a good example of intra-code seriality maximized. But the wider field of conveying ideas and information tactually, as in a whole book, should ideally be as serial as possible. Or said another way, those books which take this approach, transfer more intelligibly into braille — less is lost in the transference. One almost needs to say transduction, since the constraints are so different moving from medium to medium.
This naturally means that many text-books used in schools which depend on an assortment of ideas gleaned randomly from a cluster, and an educational style to match this, are often messy and inefficient for blind students. It is perfectly possible to raise up lines, but they may chiefly resemble a skein of tangled wool. And because of the size of braille, it is almost impossible to label on diagrams. Linearity co-operates with the 'message' of braille apprehension: conciseness and order help enormously to maximize efficient learning.

LOWER SIGN ANALYSIS

The 3 right hand side patterns, 5, 56, 6, like all right-hand side patterns are not used alone for haptic reasons: they only modify higher (and occasionally lower) signs. See Codeworks 5.

The 2 remaining bottom only signs, dots 3, 36, from Row 7 go with Row 5 (the a-j in the lower) philosophically, to be used for punctuation, contractions, and abbreviated whole words, spaced or unspaced, in the following ways.

As punctuation:

The first 4 give the break-lengths in speech pattern: comma, semi-colon, colon, full stop. Since these only occur at word ends, they can have other meanings assigned to them as initial or medial signs.

Lower f & h = ! & ? respectively;
lower h & j open and close quotation marks,
lower g opens and closes brackets.
(Thus using up lower g and h as initial signs.)

From Row 7, dot 3 = apostrophe, and c-in-the-bottom = hyphen, doubled, 36 36 = dash.

Clearly these last three may occur at beginnings, middles, or ends of words, so must be fairly free of other meanings. However hyphens and dashes are expected to be attached both ends to their words in braille, so that 36 as an initial contraction can stand for 'com', i.e. when there is a space before it. Obviously COM-cannot be contracted after a hyphen or dash, as it would just feel like an extension of it.

As contractions:

Medially

Lower b c d f g = bb cc dd ff gg;
lower a, dot 2 = ea.

Lower h & j do not feature in the middle; as they may occasionally be needed there as quote-markings.

Lower e & i stand for EN & IN wherever they occur. As these are such ubiquitous letter-groups in English, they are not assigned any punctuation meanings.

175
EN alone = 'enough'. IN alone = the word 'in', naturally. ('Alone' means with a cell-space either side of it.)

As starters, lower b c d = be- con- dis- and 36 = com- as already mentioned. For some reason be- is to be used as a syllable only - BEhold or BEGIN, but not BEst or BEEN. This lower b is enormously useful in word abbreviations: because, before, behind, below, beneath, besides, between, beyond - all take only lower b and their next letter.

Lower c & d, con- & dis- have no particular restrictions, only that they are purely initial - if prefixed, (e.g. 'unconscious') they must be written out in full. Informally people often disregard that rule, and indeed it is time it was altered to account for the fact that since cc or dd would be linguistically ridiculous in those situations, it is safe to retain the shape of the original word after the prefix. The canon could perhaps be phrased

'or medially when occurring between two consonants'

to enable the natural thing to occur. Braille is sometimes criticized for being extremely finicky: mostly this is necessary to preserve exactitude, but should not be permitted when not necessary!

In addition to 'be' & 'in' as single words, permitted to stand alone, lower h j g = his was were: and the only restrictions are concerned with establishing height by providing a higher sign somewhere in the sequence.

Lower signs need a higher sign to show the finger that they are lower: so if more than one were to begin a braille line, it would be better form to write out the first word: e.g. 'his were in late' has 3 lower signs available, HIS WERE IN, but only after the 'if' can they all be used. 2nd line 'his' uncontracted.

Similarly, if brackets precede an 'in' at the end of a braille line, it may be written uncontracted. Usage has become a little more flexible in recent years about this. Obviously the more competent braille readers will be going fast enough not to lose height orientation or be upset by lower signs in a row, where slower readers may get deflected and be obstructed in their reading efficiency. On the other hand, the slower readers suffer more if more signs have to be deciphered.
As initial signs, lower f and j stand for the words 'to' and 'by' as prepositions, joined up to their word. Sometimes lower-sign rules prevent their use: usages such as 'it was referred to in the broadcast' cannot contract both 'to' and 'in'. However, [Braille Primer 1992:39-40] 'He WAS refERrED TO/BY/title' appears as acceptable. The word 'into' lower i lower f, behaves like 'to'.

\begin{center}
\begin{tabular}{lll}
  to the park & by heart & into debt \\
\end{tabular}
\end{center}

The official Rules are: (Williams 1969:24-27)

'Any number of Lower Signs may follow one another without an intervening space, provided the sequence is in contact with an Upper Sign.'

Lower b g h & j express the words be, were, his, & was 'only when they are separated by a space from all other Signs. Therefore if the words adjoin punctuation ... they must be spelt out.'

Lower e & i, expressing the words 'enough' & 'in', since they have no punctuation meanings, 'must be spaced from all other Words, but they may be used adjoining punctuation signs provided the whole sequence is in contact with an Upper Sign.'

i.e. they can be used with apostrophe, hyphen, or dash if an Upper Sign occurs close-up before or after that.

Lower f & j, expressing the words to & by, 'may only be used when they can be written unspaced from the word (or part of a word if divided) that follows. 'to' also includes 'into'.

Modern informal research has shown that 'to be' and 'to his' are read fluently when both lower signs are used, and as they are both common, it would be worth freeing-up the rule officially, too. Clearly these Lower Signs are the most intensively coded part of literary braille code: and are valuable, although they may constitute only about a twentieth of the signs on a page.

In the section on Braille Music Code, it will be obvious how strictly order must be preserved, or the meaning alters.

In any new codes, complexity such as the above is doubtless best avoided: the use of a greater variety of signs is probably a better solution.

* * *
8. Mirror signs for matching meanings: e.g. bservable and close quotation marks, lower h & j; Brackets are the identical sign at both ends: but double brackets use dot 6 before lower-g to open and dot 3 after lower-g to close, making a mirrored set. This last practice is also used for internal quotation marks.

This idea is more extensively used in Braille Math and Music Codes. e.g. Open and Close Phrase in braille music:

8. Mirror signs for matching meaning – these are hardly used in literary braille. Here is the look of the internal bracket:
(if the defendant [sic] agree)

English mathematics code uses GH AR, OW o, OF WITH, for different kinds of brackets and braces.

Braille Music Code uses Open and Close phrase, pictured above: also in-accord, part-bar in-accord and its stop-sign, music asterisk ENIN, etc. See chapter 10, ‘Coding construction in braille music’.

* * *

8 a. Ways in which braille is not coded, but that are possible in new codes, include:

rotationally based patterns:
long line (fixed column) with 'moving dot' up one of its sides.

These last two ideas have been used in some avant-garde transcription experiments. But what is not certain, is whether they intrude upon more useful patterns, upsetting other series possibilities already discussed. They feel fine: and presumably any coding that works is also fine.

Concerning rotation: the Taylor Slate

Rotation was an implicit feature of the Taylor Slate, upon which blind students in English-speaking countries, possibly everywhere did all their maths for many years (perhaps 50 years?), before the days of upward braille-writers.
Because that was before my time, and I learned braille as an adult, I never handled this device, so am not the right person to describe it thoroughly. But it was a brilliant and simple system. A large 'board' had many rows and columns of hole locations, into which were set little metal 'counters' so they stood up vertically, held securely, to be felt by the fingers running over them.

Each counter was a little oblong bar with two points on one edge of one end, and a straight-line lip on one edge of the other end. They could be slotted into the board either way up, in each of 8 positions, the 4 square positions, and 4 more at 45 degrees to those. Each of the receiving holes was octagonal, to take the pegs so placed at the square or diamond position. In square, the points or lip could be on the left, top, right, or bottom; and similarly the slanted positions.

Numbers 1-8 used the lip end upwards: 1 3 5 7 the slant positions, beginning lower-left (a downward-slope) and rotating clockwise to upper left, upper right, lower right: 2 4 6 8 used the square positions; left, top, right and bottom. Then 9 0 + - multiply, divide, decimal point, and = used the double-point end, starting lower left slant as for 1: so 0 as for 2, + as for 3 etc, round to = as for 8, at the bottom position.

For algebra there were different counters, i.e. with two different end-markings from the arithmetic set.

The slate was very effective: quick to set up and immediate for reading. All counters were the same: the blind child would just take any one out of the box and feel which way up they wanted it, and in which position, to express the number that was in their mind. Thus all 'sums' could be set out easily in columns with all their working-out. When finished, one simply emptied them all out, with a satisfying racket, remembered with pleasure by all I spoke to! It probably sounded much like a modern gambling machine emptying coins. With the whole class doing it at once, no wonder it was memorable.

Blind people used the counters to play chess also, assigning meanings of the pieces to different number-positions. There were just the right number of pieces in such a set, and the little board that went with it had the number of holes as squares on a chess-board.

I have a memory when first teaching at St. Paul's School, Kew (Melbourne) of a large wooden replica of one hole and one counter in the infant classroom, for the little ones to learn their numbers. This was actually much nicer for small hands to handle than a heavy brailler.

Of the three-dot corner patterns, there are 4 upper cell and four lower cell rotational possibilities: with single cell. Likewise 4 and 4 of the column with moving dot up its side, like a ratchet. This could be enough for some sets of distinctions.

* * *

179
Digression before the Linguistic Points:

The previous 8 points have applied to 'pure shape', general techniques which will work for any coding task. The next set, nos. 9-21, are strategies that concern language itself: how to manage words and sentences efficiently. These principles can apply to any language; my examples of course are for English. There may be other strategies as well that would emerge from the study of other languages, and their contraction systems: and all may not use all of the strategies discussed for English. A good many however, would be common to the widely-used contracted languages.

One of the strong purposes of literacy is whole books, and these were certainly Louis Braille's concern. So it is necessary to comment on some of the reality constraints that occur due to the particular needs of touch-reading, since these differ markedly from those for visual reading. Hence this section preparatory to the detailed discussion of Linguistic Considerations.

WHOLE BOOKS IN BRAILLE:

The Absolute Need for Conciseness

Because the size of a braille cell is virtually fixed, and much larger than an ordinary typed letter; and in order to accommodate the bumps, each page is thicker than several printed pages, bulk of material is always an issue. Every effort is made to economize on space, as much for reading, as for writing and storage — because that which is perceived quickly, at once, as a single image — is comprehended much more rapidly and effectively than that which has had to be built up from a long series of tactile experiences put together.

This section is referring only to English language; where official braille is quite contracted, and almost totally spelling-based. That is, spelling mostly overrides other considerations like syllabification. It is said that French and German are even more highly contracted; and it may now not be knowable how much of a hand (if any) Louis Braille himself had in the systems adopted for languages other than French. It is known that the students at the Paris Institute were taught several foreign languages, so he almost certainly knew some: but his date of death precedes by at least 20 years, the adoption of his system in other countries.

But at least some of the principles must have been his, so it seems worthwhile to present them in this way. These are much better known; as anyone learning to transcribe must be taught many of them. And even to read braille, one must consciously know nos. 9 - 15, 17 etc. — whereas one may read braille perfectly well and never have thought of the previous 8 coding strategies.

180
As in many braille text-books, capital letters are used to denote contracted forms in the following list: but bear in mind that braille is really already 'block lettering' in itself.

Taking up these 3 matters: Cell size; Contracting; Bulk.

* * *

Cell size.

There are slight differences in the cell-size chosen by different countries, and different machines and computer-generated embossers. The regular Perkins Brailler is excellent for spacing, but perhaps the slimmer dot of the old Stainsby machines is less obstructive to the reading finger at speed, and also to the overall thickness of volumes. However, we have become accustomed to the 'fatter' dots of thermoform copies, which are mostly moulded over the Perkins dot.

The Perkins brailler embosses a line of braille every centimetre down the page, cell 6 mm high and interline space 4 mm. Cell width is 3.5 mm. with 3 mm. between cells — i.e. 2 cells and one space between them fit into a centimetre. The blank place on a pocket-frame between the two columns of a cell looks about 1 mm., but what the finger touches, the tops of the little bumps, would be between 2 and 2.5 mm. On the vertical axis, what the finger touches would be probably only 5 mm.

The VTEK MBOSS embosser maintains the 1 cm line-depth, 6 and 4 mm., but has very slightly wider widths; over 20 cells, its line is about 4mm. longer than the Perkins line. My finger's perception is that the intracell space is minimally wider. MBOSS is designed for a 40-cell line, the Perkins for a maximum of 42 cells: but 42 does go very close to the edge of the paper.

The Resus embosser has a smaller dot-head: and cell depth of 6 mm., but because the whole dot is smaller, the tops of the bumps as touched by the finger would be more like 6 mm also. This feels enormously longer and emptier; and perhaps consequently, as the finger has to be flatter to cover the extra depth, the lines feel too close together. That is, it is hard to avoid interference from the edges of the lines above and below — this is annoying for poorer readers, because it is very obstructive to recognizing a tactile shape to have extraneous cutaneous stimulation not far away from the focal area.

Fortunately the new BOOKMAKER double-sided embosser has the stronger dot and more compact cells, more like the Perkins, that gives a much better balance between signals and spaces. It leaves appropriate margins with 40 cells by 25 lines per side of page. The paper is drawn through mechanically in all of the above embossers, so small irregularities are common.

There used to be Jumbo Braille, larger cells believed to assist some learners; but this had to be done by hand-frame on a Jumbo
Guide, which fitted onto the same board as the regular guide. It is by no means certain that bigger means easier to feel, especially for smaller hands. And since the days of upward-writing machines, (like Perkins, Lavender, Marburg) although a few specialist machines have been made, (producing bigger dots and bigger spaces), most learners have had to make do with their braille cells the usual size. Sometimes it is helpful to have the lines double-spaced to leave the signal very clear.

Some hand-frames and pocket frames have a smaller cell, and a shallower dot-well, just to be compact. These are mostly used by the most skilled, as punching out the dots in a smaller configuration takes finer skill. Reading it also takes a little more skill, though the shapes are quite clear. The practical consideration of taking notes fast means that often softer / thinner / less resistant (thus cheaper) paper is used; this is easier on the arm, and less noisy for other people around one; but will squash sooner. Squashed braille is VERY hard to read. Pushing bumps into heavy card, at up to six dots per cell, can become quite tiring after a while.

There was also a tiny Margin Guide which gave four miniature cells of cueing that one could do in the margins of braille books to facilitate later reference.

But almost all modern machines use the regular cell size, even if they themselves are miniature, e.g. with a short page and short line, such as the Mini-Picht, designed for use beside the telephone etc.

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Need for Contractions for Fluent Reading

It has only quite recently been realized how vital immediacy, and quick perception is, in reading braille. We must make the forms of words as short as possible so they can be perceived at once — as one perceiv, one idea — if we wish to empower tactile reading. The more we spread them out into their components, the harder we make it to read them. [Maxwell 1988 & 1992]

Sighted people have at various times insisted on Grade One braille being taught first — which has only greatly hampered reading skill and pleasure. If we were made to spell out our words before being allowed to speak them, as little children, we would have a harder time learning to speak, too!

This need for the immediacy of short forms may well have been realized by all the early people, who knew worse codes before knowing braille. The present contractions were nearly all in place in the 1920's. And it may have been so obvious as not to be remarked upon in the schools for the blind, where braille was automatically used extensively all the time, and the more experienced helped the less experienced readers there was always a continuum of support, from blind teachers to beginners.
Speeds of braille-reading vary enormously, and go up to about as fast as a person can speak. Good readers record results of about 110 words per minute. But these are nothing like the speeds that the eye can achieve. Having to cover physically this area of paper with an organ the size of the finger-pad, for the signals of literacy is a bigger job than that for the sighted person reading the same amount.

Foulke remarks:

The braille reader's slow reading rate is due to a combination of perceptual and encoding problems. As the visual reader gains experience, he [sic] begins to contend not with single letters, but with patterns composed of groups of letters standing for syllables, words, or entire phrases. He transforms the letter code, given in the display, to a code in which each code unit specifies much more of the material to be read than could be specified with a single letter.

The characteristics of the braille sensing equipment and the braille display compel the braille reader to encounter and perceive braille characters one at a time, for the most part. Because braille characters are relatively large in relation to the fingertip area available for sensing, the width of the 'perceptual window' through which the display is perceived is too narrow to admit much more than one character at a time. The piecemeal perception that results, coupled with an inefficient literal alphabet, yields the unfortunately slow braille reading rate that is generally observed.

One way of solving the problem of piecemeal perception is to attach greater meaning to each dot pattern in the code, as exemplified by the use of contractions. [Foulke 1973:4]

BUOC demonstrates the use of much more 'efficient' signs - by using meanings, rather than merely letter-groups which still have to be 'worked out' to provide the meanings.

The above seems to consider that the chief wish of all people is to read as fast as possible! and although this is not true, the limits do put blind students at a disadvantage in situations where much reading is required: and at a terrible disadvantage if even contractions are denied or reduced.

---

The Bulk Factor:

Bulk is a very practical problem: as almost any print book takes several volumes in braille, and blind students must carry these, with a braille machine (weighing about 10 lbs) to class, on the bus etc. Keeping them orderly in one's study space is obviously that much harder, and ordinary bookshelves are often not large enough to take them.
Old English braille volumes tended to be large, embossed on 13 x 11 inch paper, half-inch fold-back for binding, then made a little larger by the solider bindings of the time. There was also a half-size for small works, usually with lighter binding. More recently a 10 x 10-and-a-half inch volume with soft cover, so the cover is no larger than the sheets themselves, has been commoner. Full height volumes are still needed for most long whole books.

To give an idea of bulk to non-braille users: each issue of the monthly American magazine Readers' Digest takes four tall volumes, interpoint, excluding the advertisements. The book of Acts from New English Bible, published RNIB London 1961 is the middle size volume, and about an inch and a half thick.

'Interpoint' braille is where the dots are fitted ingeniously amongst each other from both sides for greatest economy. By touch one is only aware of the bumps, not the little pits that are the dots on the reverse page; visually interpoint looks quite intricate. Old hand-frame braille was 'interlined' with respect to the two sides of the paper. Braille to be duplicated on plastic Brailion, [see Thermoform machine below] had to use only one side of the sheet.

The New English Bible above, is Interpoint, but sets out verse numbers from older translations on the left, thereby taking up a little more space in the interests of usefulness for quick reference. Such numbers are only needed every few lines, so this involves 'wasting' four cells of all the other lines — but it is a model of clear intelligent setting-out.

Since the 1960's we in Australia have not been able to depend upon overseas publications, and have mostly had to do our own, duplicating them on the American 'Thermoform' machine. This uses a steam process to melt a plastic sheet onto the bumps of a paper one. Each sheet takes several seconds to melt, and each must be done individually, since more than one would all melt together.

The good news is that any shape is duplicable; the bad news is that it is very laborious to make the copies, and only one side of the paper can be used, thus taking twice as many sheets and volumes as double-sided publications would. Size is 11 x 11-and-a-half inches, plus binding, usually a comb-type, adding about half an inch to the width. The thermoform machine also had a smaller sized rack, more like A4, but it was not much used.

As computers take over in publishing, in the industrialized societies, square format might well become standard, with a 40-cell braille line, and 25-line page. This square format of thermoform size and most computer braille paper, is quite convenient for actually handling and reading braille. But the problems of storage are acute, as the size is completely unknown to any business stationery, satchels, filing cabinets or shelving. That is, braille of this size will not fit into a filing cabinet.
Some of the domestic embossers use a sheet-size nearer to A4, allowing one to buy commercial folders, filing equipment, and envelopes. But all of one's books still do not fit. At least there is now a double-sided embosser: that is a wonderful amelioration for our constant problems with bulk.

Some believe that everyone will work through electronic terminals in the near future, and physical books will be a thing of the past... but I think it certain that this only applies to certain types of people, and certain types of materials. While other citizens need, and expect to have, real books, so do we!
Chapter 7

"CODEWORKS" cont.

LINGUISTIC CONSIDERATIONS
AS THEY APPLY TO ENGLISH

9. Principle of commonest letter-groups allotted their own sign. These are now to be called 'groupsign' in braille textbooks, instead of 'contraction': [Primer 1992:v] e.g.

CH SH ST ING EN IN ER OU

Also AND FOR OF THE WITH

9. Principle of commonest letter-groups given an invariant sign:

This is commonsense. The complete list is
Row 4: CH GH SH TH WH, ED ER, OU OW
Row 5: EN IN
Row 7: ST ING AR

Also AND FOR OF THE WITH signs at the end of Row 3, are used as both single words and letter-groups.

WITH/ER gaTHER THEory GHOST/ING SH/ANDy

Going from print to braille, these signs can always be used wherever these letters-groups occur. But the reverse is not always the case: going from braille back to print, such a sign may not always mean exactly those letters. Since there are so few characters in braille, signs must be re-used: e.g.

ININ = asterisk sign, not 'inin'
ST is also used for forward slash discussed earlier
AR may be indicating poetical matters

Efforts have been made to replace ST by dot 5 2 which has no spelling significance, and therefore would be codicologically reliable in back-translation, as well as easier to read - but so far to no avail.

In French braille some of these were needed for accented letters: AND FOR OF THE WITH pictured above, stand for

187
AND = c-cedilla ç:
FOR = e-acute é
OF THE WITH = a o u grave: à ô û

The 5 vowels with circumflex take the first 5 signs in Row 4.

\[
\begin{array}{cccccc}
\hat{a} & \hat{e} & \hat{i} & \hat{o} & \hat{u}
\end{array}
\]

Similarly in other languages, the signs chosen by them for their accented letters must be learned.

* * *

10. Principle of letters and other signs being used alone to stand for a whole common word beginning with that letter; or those letters, in the case of contractions:

e.g. h = have; m = more; CH = child; ST = still

\[
\begin{array}{cccccc}
\hat{h} & \hat{m} & \text{CH} & \text{ST}
\end{array}
\]

Will you still have more children?

10. Principle of Whole Common Words expressed by a single sign:
a i o (A I O) are obviously needed as complete words: of the rest, here is the list, and the cell-savings:

a = a; b = but; c = can; d = do; e = every; f = from; g = go; h = have; i = I; j = just; k = knowledge; l = like; m = more; n = not; o = O; p = people; q = quite; r = rather; s = so; t = that; u = us; v = very; w = will; (x = it); y = you; (z = as).

CH = child; SH = shall; TH = this; WH = which; OU = out.
Lower b = BE; lower e = enough; lower g = were;
lower h = his; lower i = in; lower j = was
ST = still.

Saving of one cell, but common enough to warrant their signs:

\[
\begin{array}{cccc}
d & g & s & u = \text{do go so us}
x & z & = \text{it as _}
\end{array}
\]

OF OU = of, out
lower-b lower-i = BE IN

188
Saving of 2 cells:

b c n y = but can not you
AND FOR THE:
TH = this (would be THis )

lower h & lower j alone = his was
lower-g alone = were ( wERE )

TO BY IN/TO as prepositions run on [17 below] so save 2.
lower-e alone = EN = enough ( EN/OU/GH )

Saving of 3 cells.

f h j l m = from have just like more
T V W = that very will
WITH, [TH = this, lower-g alone = were - see above.]
CH SH WH = child shall which
ST = still

Saving of 4 cells:

e q = every quite

saving of 5:
P r = people rather

saving of 8:
k = knowledge.

These have stood up remarkably well as efficient choices. Only perhaps two reversals, e = ever, k = know, with dot 5 e = every, 5 k = knowledge, would have worked out slightly better, though this might be arguable. Naturally there is hesitation to make changes once there is a lot of literature published using signs a certain way: it has been deemed counter-productive to make changes in these cases.

'Shall' is not used much now in ordinary English: however, it is prolific in legal documents, so they will hold its place - i.e. stop SH from being re-assigned a more widely useful meaning. Not that this would be done for a long time after its demise. Similarly 0 ... when it occurs it could be written preceded by 56 (letter-sign) if it is decided to re-assign it to 'on' or Oh, or some other needy o-word. Solutions in BUOC when too many common words need the same letter include 'understudy signs'.

* * *

11. Principle of needed words over-riding first-letter idea:
x = it;  z = as; lower j and g = was, were:
(For the prepositions 'to' and 'by', see no. 17, p. 195.)
Sentence: 'It was hot as we were going.'
BUOC uses two more signs alone, not based on first letters:

\[ \text{ING} = \text{i is} \quad \text{BLE} = \text{has} \]

* * *

12. Principle of Abbreviated Words: letter-groups standing for a whole common word.

\[ \text{e.g. ag = again tm = tomorrow} \]

These, now to be called 'shortforms', use significant (mnemonic) letters and/or contraction signs; e.g.

\[ \text{ac = according, afn = afternoon, alt = altogether} \]
\[ \text{pERh = perhaps; cd SHd wd = could should would} \]
\[ \text{hm = him, hmf = himself; xs xf = its, itself} \]
\[ \text{CH = child, CHn = children; mCH sCH = much, such} \]
\[ \text{acr alm alr alw = across almost already always; al = also} \]
\[ \text{td tn tm = today tonight tomorrow; alTH = although} \]

Some have been used in print (or more commonly, in hand-writing), too; o'c for o'clock, ab about, yr your, cd, wd, etc.

There are 77 of these; mostly good everyday words — common and useful. e.g.

\[ \text{gd = good, ll = little, nec = necessary, grt = great,} \]
\[ \text{lr = letter, qk = quick, sd = said, pd = paid,} \]
\[ \text{BEc = because, abv BE1 = above below, tgr = together,} \]
\[ \text{ei nei - either neither, BEf = before, af = after,} \]
\[ \text{imm = immediate, rcv = receive, fr = friend, fST = first} \]

Another example, the full list of the BE- words appears in the discussion above, Codeworks 7, 'Lower Sign Analysis'.

A few of the 77 are a bit archaic, THyf = thyself, and the verb and present participle sets:

\[ \text{rjc rjcg, dcl dclg, = rejoice rejoicing, declare declaring} \]

\[ \text{CONcv CONcvg, dcv dcvg, pERcv pERcvg =} \]
\[ \text{conceive conceiving, deceive deceiving, perceive perceiving,} \]
\[ \text{rcv rcvg = receive receiving.} \]

Different parts of these words are now common — e.g. concept, conceptual conceptualize etc. — BUOC addresses this.

There is a full set relating to -self and -selves:
It seems certain that their common occurrence in the Bible was the reason some of these were chosen, a legacy from the days when this was considered the 'properest' thing to braille. Next on the list came law books, then Shakespeare! 'Thyself' would not have been in ordinary speech in 1880's English. But there is a certain formality at the beginning of the provision of a literature; and braille has always been conservative.

---

13. Principle of common letter-groups occurring in particular contexts being given a context-dependent sign:

e.g. con- com- dis-; as initial signs, but meaning -cc- hyphen -dd- when in the middle of a word: numeral sign in the middle meaning -BLE

community conscience acceptable discussion problem

---

This principle mostly concerns lower signs: see the 'Lower Sign Analysis' above, page 175, under no. 7.

For -BLE see numeral sign discussion, under no. 6, page 171.

If you care for an example, using many of these forms, to tease the brain, read on from the print beginning:

["In the Baron's neglected garden there was

* * *

..."]

* * *
14. Principle of initial wordsigns attaching to first letters:
   e.g.

   5 w = work, 45 w = word, 456 w = world;
   5 CH = character, 5 THE = there, 456 THE = their.

A 'Wordsign' is one which uses a Row 6 right-hand-side sign to precede another letter or sign — see Codeworks 5.

There are 22 dot 5 signs, 5 x dots 45, 6 x dots 456, attaching to the first letter or contraction of a word. These can also be used as part of longer words, because there is no actual context dependence: e.g. part-time, workplace, unknowingly:

Other examples, dots 45: these those whose, upon
   5 THE 45 TH 45 WH 45 u

5 m = mother, 5 f = father; 5 y = young;
   (CH = child); 5 CH = character

5 THE = there, 456 THE = their; 5 TH = through

5 s = some, 456 s = spirit;

As can be seen, some just have to account for needed common words, others relate linguistically.

C - can, 456 c = cannot; h = have, 456 h = had

5 h 5 THE 5 WH = here there where
The following all use their first letter:
name part question some time know day one ever under

In compounds:
5 r 5 OU = right ought;
b 5 r b 5 OU = bright brought

* * *

15. Principle of terminal contractions attaching to the final letter of the word: e.g. 45 t = -ment; 6 y = -ally
entertainment actually

Here are some more, with picture examples:
45 y = -ity, 6 n = -ation
45 t = -ment, 45 l = -ful, 45 g = -ong
charity station lament with sorrowful songs

When there are paired endings, principle of
a) Alphabetic series, use first dots 46 then 56

46 e 56 e = -ance -ence;
46 s 56 s = -less -ness;
46 n 56 n = -sion -tion;
6 n = -ation
dance, essence  tireless, wholeness

passion, ignition

b) Phonetic series, only the one, -ound -ount, -46 d -46 t.
sound of a fountain

sand ra fata
It is doubtful whether -ity -ful and -ong save much, only one cell, and not terribly common - but they feel good.

Terminal contractions in Standard English Braille use only dots 46 56 or 6 from Row 6: never dots 5 45 456, because these go with whole words which can then be part of other whole words. This releases dots 46 56 and 6 in Initial position, to stand for other generalist meanings: viz. 46 = Italic, 56 = letter-sign, 6 = Capital sign. See the discussions of these above, under Codeworks 5, page 164: see also page 156.

* * *

16. Principle of logical relationships of signs:

a) Logical sequencing when possible: e.g.
    comma, semicolon, colon, full stop:
    - i.e. shortest to longest speech break,
    use lower a b c d, the first 4 signs from Row 5:
    Terminal contractions in order, as above, no. 15.

b) Various sets: e.g.
    no. 12 Abbreviated Words, the -self / -selves set:
    see above for pictures.
    Wordsigns, attempt to group these logically; e.g.
    dot 5 used for mother, father 5m 5f;
    where there here; dots 45 these those whose
    5 WH 5 THE 5 h 45 THE 45 TH 45 WH

c) General linguistic hierarchy implicit in sign choice:
    the commonest word relating to a letter or sign is
    usually the one Standing Alone;
    the next commonest preceded by dot 5,
    then if more common ones, preceded by 45 or / and 456.

This general hierarchy is mostly good. It would be even better if all the words chosen for the Standing Alone set were complete as they stand, because the limiting factor is that they must stand quite alone: e.g.

p = people, but if 'peoples' one must write it out in full.
1 = like, but 'likely' has nowhere to go.

If 'child-like' is hyphenated, it is acceptable to use both single signs, if not, it must be written in full. Because of the dot 5 for 'ever' and 'know', 'every' and 'knowledge' are ameliorated: so extensions to 'like' & 'people' are the most often noticed as a nuisance.

The best of the Standing Alone series are these totally independent words:
    but, from, more, just, very, not, quite, rather, so, you, it, us, as, that, TH = this, WH = which, EN = enough.
It is worth noting this in new codes, to be sure that any extendable forms have a Row 6 wordsign, not a standing alone sign.

* * *

17. Principle of speech patterns allowing run-on (i.e. no word-break) in very selected cases;

AND FOR OF THE WITH,
prepostions TO and BY.

And with the same pen, sign here.

\[\text{\underline{\text{\begin{tabular}{l}K\textsc{as} \textsc{same} \text{p\textsc{e\textsc{i}}} \text{sign}\end{tabular}}}\] \[\text{\underline{\text{\begin{tabular}{l}Come with a friend to the cottage by the sea.\end{tabular}}}\]

This is excellent tactually, and as a space-saver; other common prepositions could be similarly permitted, even if on a limited basis — perhaps running on only to 'the' and 'a':

\[\text{\underline{\begin{tabular}{l}IN/THE, onTHE, INa ona; orTHE ORa AS/THE ASa\end{tabular}}}\]

Even with these, much space would already be saved, and reading facilitated; with no punishments or confusion.

Many of these are already in BUOC; and 'at' using dot 2 close-up; works beautifully.

* * *

18. Principle of the contraction that saves the most space being the preferred one, naturally; and the one that represents the most letters, if the saving of space is the same.

\[\text{\underline{\begin{tabular}{l}WITH/ER (2 cells), not wiTH/ER (4) or wiTHER (4); aFFORD not aFFord (4 and 5) creATION not crEA/TION - same number of cells.\end{tabular}}}\]

Is there need for a rule when things turn out the same? Is there a conceptual gain by 'working out' only one contraction instead of two in this last example? Doubtful; clearly one uses the EA in all other forms of 'crEAtE'. Why not appreciate variety if there is more than one way to do things equally accurately?

* * *
19. Other principles involved in choice of contraction:
   a) spelling-based
   b) syllable-based where initial contractions occur;
      be- con- dis- com- CONgas, not cONGas
   c) 'Higher Sign' taking precedence over 'Lower Sign'
      if the same saving of space results:
   or is (c) really
   d) earlier-occurring letters/symbols taking precedence
      when the same saving of space results: both are true.

   Office not oFFice; oOTHER not oTH/ER

Spelling versus syllables can be point of view - and a concern
   to transcribers. Most people decide not to contract the EA in
   'pineapple' or the TH in 'hothouse'; but there are enormous grey
   areas. What about Beethoven? There are even more problems when
   a proper name and a foreign word; good sense has to do its best.
   See Codeworks 20 below.

If the book is in English, I contract the names as in English,
   believing that this will be understood. Standard English Braille
   is all spelling-accurate. At least mozArt baCH hANDel, lANd/INI,
   pERgolesi, CHopIN, sCHubERT, STRavINsky, tCHAikOWshy,
   rachMANIN/oFF do not cross a syllable! Of course these names
   would appear differently in their own languages, but so would the
   whole book.

Words in a music copy are a little different: it depends on the
   user and purpose. For a pop-song 'Mañana' one would probably put
   the general accent sign, dot 4, before the first n the first time
   it comes, and not thereafter. (In Spanish, our ER = ñ.)
   However, if someone needs to sing 'Die Forelle' in the original
   German, naturally the words should be fully accurate in 'grade
   one German' - the letters and accents of German, no English
   contractions. (Our English OU OW AR = ü ö å.) It would not be
   usual for our students or transcribers to know fully contracted
   German. Italian words or directions, like 'Andante' or 'Commodo'
   should never take English contractions; but well-known
   composers' names still might.

American and British braille have numerous trivial differences
   in what they will and won't contract - all fairly arbitrary and
   non-useful to recount. e.g. prOFessor in UK, professor in USA.
   For a while spHERE was refused, and sphERE written: WH/ER5e is
   accepted for 'wherever', 5WHvER is not.

In any new codes it seems better sense to make rules only for
   what matters. If a thing can be read accurately and comfortably
   in a choice of ways, that is fine.

For instance, re 'Higher Sign' precedence, or earlier letters:
   British publications until recently contracted -ear words
   with contraction EA and letter r:
      dEAr, hEArt etc.
But for the same words USA uses letter e and contraction AR: heAR, leARn etc.

Hard to see how it could possibly matter, but now there is a big international Rule insisting on AR. They even have the same number of dots!

The variations would probably yield a test result showing that the prevailing habit was quickest for each reader — whichever version they were used to. The fewest signs, the shortest forms, are always going to be the most empowering to our overall speed and comprehension. Hence 20 and 21, and hence BUOC.

* * *

20. Principle of specialized vocabulary contractions or abbreviations, in very limited areas: e.g.

Biblical words;
5 j = Jesus, 5 c = Christ, 5 g = God
(5 l = Lord is also in SEB, not necessarily ith a capital)
hl = holy, gl = glory, 456 u = unto, fTH faith etc.

Blind affairs words:
bl = blind; (beware writing 'bled' for 'blinded')
brl = braille

BUOC adds short forms for 'transcribe' and 'sight' 4 GH and 5 GH — as these words (and their extensions) are needed very often in our informative literatures.

This concept should be developed much further for different subject areas, if we want our students to be able to get through the reading they need for modern tertiary courses. The vocabulary with its short-forms can be listed in the front of volumes of work in that subject, so there is no possibility of confusion.

The idea that we all have the same knowledge area, and all need the same words, and braille has them, has not been true for a long time. Professional literatures and interest areas diverge greatly in their word-usage, and almost all have extensive specific vocabularies, often of long words which would never be needed outside of that context, but which occur very frequently within it. We can only gain from having short-forms for such words in their context of frequent occurrence.

* * *

21. Principle of periodic update — to grow with the language. e.g. td = today, used to be to-d = to-day:
we no longer expect the hyphen in such words.

fST = first and fr = friend added in the 1950's:
There have been some actual changes (very few):
\[ w = \text{work in old Bibles, now } w = \text{will} \]

This process is actually not moving nearly fast enough. Most of
the present contractions were already accepted in the 1920's, and
not much has become totally inapplicable, but it has certainly
not kept pace with modern languaging needs. We are only
disadvantaging our students if we make them read and write all
their frequently-recurring words in 'longhand'.

Especially those words which are long – much of our educational
and psychological jargon is long words, and there is no way they
can be quickly read and written efficiently unless suitable
short-forms are worked out for them.

* * *

22. Style, format, and setting-out considerations:

Setting-out considerations like blank line, indents, appropriate
substitution for underline; use and placement of braille page
numbers, identifying print-page numbers – all these things must
be the most tactile-friendly that can be devised, as they make
a great difference to the readability and general usefulness of
a braille copy.

Remembering that there is no size difference, no colour, no case
(only the artificial insertion of the capital sign) no type-face
alteration of any kind, and also that so much less fits on a
braille line than on a print line ... clearly style, format and
setting-out have to be greatly modified going from print to
braille. The important thing is that they should be clear to the
touch; tactile-friendly.

Sometimes an underline in print is best expressed by italics,
functioning as a 'drawing-attention-to' device. Sometimes a
space in print which is designed to separate sections, is better
shown by a short line in braille: for this, about thirteen
middle-c's centred is common, comfortable, and quick to locate.

A two-cell indent generally marks a paragraph; only for a real
information-break is a blank line desirable. Remembering the
bulk problem, the copy should be kept as compact as possible.

Visual detail that does not carry meaning is unwanted in braille:
since it is merely distracting and tedious. We have quite enough
hassles and obstructions to our reading without creating more.
If there are different ways to convey a meaning, just as in
print, any one of them is fine. As long as they convey it!

With initials and acronyms, letter-sign is the neatest tactually,
and the truest in meaning. However, with a single letter, like
initials to a name, sometimes a following full-stop is used as
in print, or sometimes, more in the past than now, a dot 3. In
the case of dot 3, it could be a principle of 'dot for dot', or
apostrophizing for elision.

198
Here is 'm.d.' = main droite, from a European music copy in paragraph format: and C. of E. meaning Church of England, from an RNIB publication, "1066 and all that", 1931. Dot 3 feels good.

Graphs and tables, maps and diagrams, are quite problematic: as these information displays are 'very visual'. In the first two cases, often a list is just as useful; relating the value sets at a number of points on the graph, or finding a sensible way to order the information relating the variables. A table can often physically be done, but it is usually an uncomfortable way to display to the fingers. The greatest difficulty in maps and diagrams is labelling accurately — since braille labels take up so much more room than print ones, and therefore cover so many possible location points. One must also avoid clutter, or copies will not be usable at all.
Chapter 8

CONSIDERING HAPTIC & PERCEPTUAL ASPECTS OF "CODEWORKS"

These numbers correspond to the original discussion numbers, beginning page 153 after the Braille System Statement Chapter 6.

1. Coding from the top: script and the reading hands

Braille is a script. In most scripts lines or axes are notional, e.g. a notional vertical might be imagined through the centre of Chinese character-row; whereas in others such as the Bengali language, a real line is formed by the tops of the letters. Our Latin alphabet has notional horizontals.

These are either of a line underneath the bowls of letters, but with 'descenders' going below it for the letters g j p q y, plus f & z in some scripts; or else the feeling that the bowls of letters are between 2 lines, with 'ascenders' b d f h k l t going above the upper one, and the descenders going below the lower. This is how copperplate writing was taught at the beginning of the century, and how some medieval manuscripts were set up, to fit the main part of the letter between lines. Our general unconscious view is that if there is a line, one writes on top of it; the line goes underneath the writing.

Braille orients tactually to the top. It is not so much a notional top line, as a faith that the cells will be upper, except in the usual agreed circumstances when they will be soon enough followed by upper or full height characters to identify their height with respect to the top.

When I was first experimenting with new codes I did not observe this convention — not having realized it — and found that an enormous loss of confidence occurred every time the finger came to a less-than full left column, as to what height in the cell it was supposed to be. I also tried out columns which worked from the bottom, but they were slower to feel, and more annoying. So even if some of this was due to habit, it seemed best to go with the way Louis Braille had wisely decided.

Of course there is also the plain physical reason that the flatter you must have your hand, the harder it will be to move across the page, so to have the orientation point nearer to the tip of the finger makes much better sense than to have it nearer the palm.

Since 36 of the 63 shapes are 'full-length', the general effect visually will be of notional top and bottom lines enclosing the information. However, this is much weaker tactually, since the fingers are only conscious of the cells they are in contact with, and do not have that overview which comes visually from apprehending so much at once.
It seems likely that the intellectual part of apprehension is not so different from comparable information clusters in any medium: it is just that due to limitation of the size of the fingertip, one has only such a tiny piece of information to start with. This might be akin perhaps to part of a letter in print, such that one must orientate to find which bit of the letter one is seeing, and whether the space around it is external or internal to its shape. An experiment with vision put under similar limitation is revealing: Troxell (1967) (quoted in Foulke below) arranged visual display through an oscilloscope.

When text was displayed a letter at a time, his subjects achieved a mean reading rate of 19.5 wpm [words per minute]; and when it was displayed a word at a time, 108.5 wpm. [Foulke 1979:306]

... when the conditions of observation for the visual reader of print and the tactual reader of braille are equated by displaying only one character at a time, it appears that sequences of characters can be identified as rapidly by touch as by vision. The finding that visual readers were able to increase their reading rate from 19.5 to 108.5 wpm when they were given the opportunity to experience all of the characters in a word at the same time, suggests that they were able to treat whole words as single patterns. They did not read faster because they identified the same units at a faster rate, but because they identified larger units that provided more information at approximately the same rate. [Foulke 1979:307]

People do not normally experience this, unless they deliberately wear occluding glasses, and then try to perform some visual task. The frustration of orienting is then immediately obvious.

Roving spatially is not very practical tactually, at least, it is possible in diagrams and free shapes, (although meanings are not always easily conveyed like this) but braille is too discrete vertically and horizontally to make the flow of vision practicable. Searching through braille is much more laborious than the same task in print.

Strictly, it is not the tips used for braille reading, but the flat pads of the last joint, good readers being able to use several on each hand, poorer readers, as few as one index finger pad. Some excellent readers use only the two index fingers.

Clarity seems to defy experimenters. In an article combining a literature review with new research, Mommers quotes from the former a host of conflicting opinions and results which must surely reflect assumptions more than anything else: they include

right index finger is the main reader,
left index finger is;
such and such a percent of the best readers used their left/right hand,
subjects read equally well with either hand; both hands were used, one sensory, one motor; (What could this possibly mean?) both hands were used with independently functioning information-seeking units, both hands with both fore-fingers held close together and focused on getting the same information. [Mommers 1980:338-343]

What seems certainly true is that among children, weaker readers almost always had a preferred hand. And Lothman (1975) (quoted in Mommers) noticed a distinct difference between hand-use of those adults born blind and taught braille as children, probably in a good blind school in those days, from those coming to braille-learning as adults – presumably already able to read before loss of sight. Of this latter group, the 'overwhelming majority chose left index finger, though could give no reason for this'. [Mommers 1980:339] Still the actual numbers are small, so must be treated with caution. That finding certainly tallies with my observation and experience.

And we are far from understanding exactly how our brain deals with perceptions. Since braille characters are 'spatially arranged' patterns, it would perhaps be expected that the right hemisphere would be the one to sort such impressions: but the decoding of actual words, according to neurological theory, is a left-hemisphere project.

Thus actual hand-use may be quite peripheral psychophysologically as well as anatomically! i.e. choice of hand may be the end-point made necessary by the particular cortical and other intra-cranial neural pathways that happen to be best developed in an individual. It may well be more a product of personality type and how perceptual experience has been received and handled in the past, than anything to do with braille.

For instance, a training program carried out by Wormsley on 21 blind children tried to enhance their reading skill by teaching them hand movements observed to be associated with good readers. These are that the left hand reads to the middle of the line, then the right hand takes over while the left goes back to the left margin and down to locate the next line-beginning.

... the results indicated that the training had no appreciable effect on the children's hand movements and thus no effect on their reading. [Wormsley 1981:330]

It seems clear that such motor behaviours cannot be superimposed onto perceptual skills; rather, motor behaviours must flow from perceptual style and needs in any perceptual task. Perception cannot really be bullied. So although one might hope that inefficient hand movements will reduce, with improvement in reading skill, anyone teaching should focus on the rewarding aspects of the reading itself, so that the perceptual and motor factors take their own most natural course.
Probably the most important conclusion in Mommers is that 'teachers should not apply too much pressure ... but should allow the pupils to follow their own inclination'. [Mommers 1980:343] It also says 'more research is necessary': but it seems to me, in view of the above, not certain that this peripheral-organ research can yield anything very useful.

Mommers certainly did most apposite and user-friendly testing, e.g. 'Because braille reading becomes more complicated when the reader has to move constantly from one line to another, the words were not printed in columns one under another, but beside one another': and in the numbers test, all were preceded by the numeral sign for best braille comfort. Much research done by sighted people on blind people is extremely poor, due to lack of realization of the different aspects of reality experienced.

Her careful noting of different results for words as compared with numbers, may somewhat suggest cerebral hemispheric dominance factors. [See her Tables, p. 341] For words, a high figure occurred for 'left index more accurate' — 17 — whereas only 1 [subject] measured 'right index more accurate', and 7 either hand equally accurate. In contrast to this, for tests with numbers, 16 were either hand equally accurate, and 5 and 4 respectively for left or right more accurate. Accuracy was also reported as very good, so these are tiny increments being used. However, if it holds true: two-thirds of people handle numbers 'conceptually equally' whereas two-thirds handle words better with the left body-side physical input.

But who knows, we may yet discover that the finger, like the eye's visual field working in halves, has distinct perceptual behaviours. It is known that 'the motor and sensory pathways are almost completely crossed' [Mommers 1980:340 reporting Kimura 1973; see also Kandel 1985:301-330]. But it is almost impossible to check the neural pathways in the last few synaptic jumps before the cortical areas for reading and for touch are reached.

* * * * *

There is no doubt that dots are the clearest tactile signal: their discreteness suits the receptors in the skin. A dotted line in a diagram is also more pleasant and clearer to feel than a continuous one. The germ of Braille's code came from the Barbier dots — it was because they were so much clearer to feel than the smooth-line raised letters, that the whole thing got going! That they could be written was an added excitement — the promise of real literacy for the first time.

The efficiency with which one can perceive rows of dot-patterns may be due to very different psychophysical factors for different people: sensitivity of the finger-pad to identify the number and position of dots is only the beginning. Such a specific active-but-receptive task may necessitate the 'artistic' response side of the brain to perceive it, as for beauty etc: this may account for the greater number of left-index readers, most people being right handed.
Or it may not: such differences may be more to do with cortical 'edge responses', those useful perceptual sharpeners available for several modes including visual perception, which are probably slightly enhanced on the outer edge of the finger as compared with the inner side, which would be the first perceiving surface if the right hand travels to the right. Some people may need to send the signals to their most synthetic and analytical cortex to be worked out, others may snap onto the meanings by the complete shape once it is grasped.

It is not yet at all clear which things take precedence from a neurological point of view, after the tactile-sense pathways to the parietal lobe — just exactly how the information is funnelled and filtered from there through various synapses, to the language comprehension centres for all reading, which are spread over the temporal lobes. One has no choice of direction with the source, braille, like print, must be read from left to right, and clearly the different neural centres must co-operate just as they do for vision.

It is known that the physiological structures and neural networks are highly facilitated for vision. However, the visual system is designed chiefly to bring in copious data for the conscious mind, only a small amount of which acts directly on living processes to the autonomic nervous systems. There are some, such as the amount of light reaching the pituitary gland which keeps hormones in balance: but mostly the visual system is designed for the bringing in of external information for conscious thought.

Touch, by contrast, is concerned chiefly with such information as serves the internal structures of posture and breathing, proprioception, and reflex controls of inner mechanics — only lastly with motor co-ordination for deliberative acts, perception of tactual beauty, or specifically conscious touch-tasks. So the whole neural equipment for touch integration is differently based.

It seems likely that this means different people develop different techniques for reading braille — not just techniques of hand movements, but whole neural pathway differences, as that magnificent organ, the brain, finds ways to get together these unusual requirements.

This makes it easier to understand the fact that a certain number of highly intelligent blind people are not able to read braille, even though their finger sensitivity to a cutaneous stimulus is normal. 'Dyslexia' of the orientation confusion is also known, reversals etc. making reading very difficult. This very specific integration from one tiny patch on the skin is a much more unusual physiological demand than visual interpretation of the signs which lead to reading.

* * *

205
Some of the memory / perceptual techniques:

Tactile perception must be at least partly linear and accumulative; although the nicest bits may be right-brain responsive to a complete image.

Since the finger is actively moving from left to right, the left-hand side of the cells is the first signal contacted. Discrimination may then actually occur in two steps, albeit very close together in time:

first the left column information 'ingested',
then whatever is added by the continued journey to the right-hand column.

Or people may delay attempts at discrimination until the finger has reached the second column so that the overall cell-shape is covered and perceived. After all, the first signal may not be a left-hand column at all, this will not be known until arrival at the next column, and evaluation of the space as inter- or intra-cell width.

Those capable of reading with two hands obviously cover much more at once, and can make many of these discoveries or judgements much faster. Poorer readers typically cannot perceive — or cannot get the information processed? from just having their fingers over the signs; the act of discrimination takes all the available neural energy just on one thing at a time on the one patch of skin.

Since braille uses single letters to stand for whole words, and also right-hand-side dots before letters and other one-cell signs, single letters are commoner in braille than in print. However, letters still occur more commonly in groups; so it is possible that some people wait even longer to pick up combined shapes of letter-configurations in the discrimination process, perhaps especially when the first is a lower sign (e.g. 'to a').

It would be nice if there was more research information on how people actually read, but there are always problems with such testing being set up by those who do not read braille with their fingers. To read it with the eyes, as most sighted teachers of the blind do, is a significantly different experience from the tactile way!

Is apprehension and memory similar once the material reaches the 'thinking zones' of the cortex? Intellectual activity cannot be directly related to measurable neural activity, some things are still quite mysterious. It is amazing that braille works so well. It has sometimes been suggested that where there is damage or cranial nerve blockage of some sort, braille could be used by the non-blind as an alternative entry-point. Has it ever really been tried?

I know from common errors that a certain amount of schematizing goes on — e.g. where tilt is perceived, but not its direction,
giving e-i confusion, and in music, notes d-a confusion. Configurations such as two top and one lower (dot) sometimes lead to m-SH confusion, and its music code equivalents, m = semibreve or semiquaver rest, SH = sharp-sign. Also shadowing can occur, especially of the right-hand middle dot, causing occasional discrimination errors between s and t.

Without a body of pertinent and trustworthy research, it seems worth including some anecdotal evidence from a highly competent trilingual braille reader, who is also a teacher and researcher.*

She says her first perceptual action is to discriminate dots from space — determine 'signal to noise': to orient the page, disregard interline-spaces as far as information goes, (they are only there to separate information chunks) and regard intraline-spaces which reveal the shapes and gaps which determine the sub-units in the braille code.

Concerning orienting of the page, braille is obviously totally reversible; so 'looks the same' upside down, except that it does not make sense.

The next searching action, is to pick up centres and lowers (dots) with middle and index fingers, so that the kind of sign it is, is partly known when the index finger comes to the fine work of reading. The left hand is in effect 'looking at the calligraphy' keeping the orientation of the lines etc, the index fingers are close together; they do the reading.

The two hands together make a small arc on each group of letters so that right hand keeps identifying the lower parts (longer ends) of cells as the hands move along, ready for the left hand. That eliminates some shapes from the possible sets and configurations, so speeds up recognition when the index fingers get there.

I think this level-sharing by the two hands is only done by skilled readers, whose hands co-operate in a way that simply does not seem to work with poorer readers. Adults who learn braille, frequently find that their brain only really receives from one fingertip at a time, the other is just coming for the ride, and periodically drops out anyway.

The active receiver seems most frequently to be the left index tip-pad if the person is right handed: but this may be due to the fact that the direction of travel has to be the same for right or left-handed people, and the left is least encumbered to move forwards in this way. It may also be the case that left-handed readers hold their hand and the copy at a completely different angle to read — as also often happens with left-handers' ordinary writing, the hand being rotated to make the directionality easier to accomplish physically.

* See Page 29 BUOC entry.
There are certainly some bizarre and ungainly-looking braille reading techniques around, as well as the elegant ones! Of course the effectiveness is all that matters. Studies on these matters are not easily undertaken because of the small numbers in statistical terms, of the possible subjects.

The apportioning of information between the hands also is varied according to circumstance by skilled readers, so they adjust automatically to different configurations. But the aim seems still to be how to reduce the number of possibilities so that expectation and verification must occur rather than full-fledged recognition, which is a slower process. Braille does have 63 configurations to recognize, whereas print words only have their 26, plus punctuation and possibly numbers in ordinary reading.

It seems likely that reading by total shape will be a more nearly right-brain function, therefore achieved more lightly, more artistically, and with more pleasure than the left-brain style, which is fully intellectual and analytical. Obviously single signs are easier to get the shape of, in that they are uncluttered by other signs. Now it is perhaps time to discuss the mental appearance of the different types of shapes which occur in braille configurations. All this is unavoidably rather subjective.

One dot is easily felt, but difficult to orientate – it contains no orienting information.

Two dots are always quite good, they are easy to feel and more secure of orientation than one dot, but less secure than 3. Letter e & lower-e may not always be tactualy clear; often meaning makes this information available rather than touch itself. One only recognizes that this is the case when reading in another language, or some situation where there is less predictability, or less skilled expectation.

Three dots are mostly good and clear no matter what the configuration; but the tactile characteristics do differ – those with close corners, spread, blank middle etc.

Four dots are very stable and clear, in some configurations can even feel a bit crowded, and the right hand middle dot can get 'shadowed' by the left. Sometimes meaning will give whether an s or a t is intended rather than touch. If one stops and 'grinds around' a little on the cell, it is usually quite determinable, but naturally this practice is usually discouraged, as detrimental to fluent reading. It also damages the copy, by flattening the dots.
Five dots are easy, because perceptually, one just picks up the gap rather than the dots which are there. And the six is easy. the finger feels fully supported.

\[ \begin{array}{cccc}
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \\
\cdot & \cdot & & \\
\end{array} \]

* * *

The elements of recognition — miniature shape concepts:

Two dots:
2 down
2 across
2 angled down
2 angled up
2 spread (ST CH K)
or between 2 cells, (5 2, cap. a etc.)

\[ \begin{array}{cccc}
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\end{array} \]

Three dots:
3 close corner (f d j h and their lowers)
3 long line
3 broken line — one displaced to the other column,
(GH s o AR WH OW)

There is a different sense of shape when first only one dot is encountered, then the other two later in the right column ...
3 heavy top or heavy bottom, (m u SH ING)

\[ \begin{array}{cccc}
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\end{array} \]

Four dots:
4 as a column plus projection (p v w r)
When one dot encountered first, a sense of coming to rest on the full column (BLE TH w)
the solid 4, g and lower-g, and open 4, x (pictures over)
4 as corner plus displaced one (ED n THE - z less so, feels more like down angle with heavy bottom ... )
4 with heavy middle (t OU)

This can be felt as a double angle, or a corner with projection, depending on what is around it. THE like z, feels like an angle with heavy bottom to me.

Perhaps the less skilled readers stay in the top conceptually, so that the corners only emerge as strong tactile corners if in the top part of the cell.
Five dots:

In all cases, it is the gap perceived I think, the missing dot. Shapes are all good, especially AND and y, which appear to enclose. Others may be perceived more as clump with projection, up or down.

Six dots

6 is good; clearly one clump only.

* * *

THE REST OF "CODEWORKS"

Excellent readers obviously cope with all matters, whereas less experienced or poorer readers can be slightly delayed by certain configurations. This may reflect the relationship between tactile perceiving and intelligent extrapolation, since guessing is an even more important part of effective reading if tactile skills are weaker.

Concerning Codeworks point 2, convergent 4's: Lower cell patterns are usually very comfortable and clear in the middle and end, and only slightly less so at the beginning. Low i may take another millisecond to identify, presumably because of the top-dot-absence.

I have sometimes wondered though, if a full stop could be something more differentiated from the main row of cells than lower-d. It is fairly 'full', heavy in the centre, and thus not easily located, at least by the poorer readers, to find the end or beginning of a sentence that has got out of hand. If stop were a following dot 6, say, instead of the 256, it would be more tactually noticeable among the mass of signs, and make it easier to read aloud, without finding one had mis-phrased a sentence. I feel that all the other punctuation works well.

Concerning Codeworks 3, adding dots below row 1: All full height signs feel very stable. Those with the easiest shapes, like WH, one feels most easily, = fastest. And aside from a little shadowing in the crowded cells, described earlier, they are all fine. It is instantly obvious to the reading finger-pad when a full-length sign follows short signs.

Codeworks 4, 2 columns and 2 spacing increments: Spacings do sometimes need checking, especially by the poorer readers. Space is much more likely to merely feel like an absence of signal, and sometimes two like or identical signs following will temporarily confuse the finger, a little 'déjà vue'.

210
In the course of perceiving, the same phenomenon may occur - one feels as if one has already had this image: that is perhaps imperfect correlation with the shape perception itself and the moving-across motion of the finger-pad over the signs. Once one is moving smoothly, this does not tend to happen, but at an odd place, or start of line where there is something unexpected, a little de-synchronicity can occur.

Height and spacing may have to be checked in the case of a c-pattern. As I was looking through some work, consciously noting tactility, dots 2 5 2 5 were used between a sign and its meaning, where 3 6 3 6 is commoner; a lower sign alone was before it, and one of the sparser signs (ST) after it. That required a little rubbing to and fro to check whether the c's were indeed in the middle or lowest position. Signal and its space must both be recognized.

Length in the middle can also be just a little deceptive - dots 2 5 2 does not feel all that much different from 2 5 2 5 amongst other signs, e.g. the word 'accidentals'. Sometimes it seems as if gaps are differently perceived when there is a dip down and back - 'occasionally' and 'computerisation' both felt almost like two words. Between a and the 4 6 n (oCCaSION) is the widest possible intra-word gap; and because of the shape of s there is room for a full finger-pad of smooth paper between it and the following dot 6 of -ATION - with the medium-to-small size of my finger-pad, anyway.

The leaving of spaces around writing does not act to highlight as print does - centralized lines below, and dashes at the start of the line etc. are far more alerting. A new chapter-heading is most easily located by the lining-off of the previous section.

Indenting can alert a little; sometimes it is the only practical way, so as not to waste much paper. Entries which 'stick out' into the left - meaning the lines below the entry are indented - are easier to find quickly, but this does waste paper - and that acts against our efficient physical handling of material.

Where in print a whole line would be left blank between paragraphs, a two-cell indent is better in braille. Whole line-breaks would be mostly used for big separation - different codes etc. - or in music between whole score systems in Open Score.

The use of the Capital Sign, dot 6 preceding, makes spaces more difficult - the wider they get beyond the finger-pad size, the harder they are to fine-judge. One also loses the sense of line, and is 'misguided' by the fact that they draw one further away from the central meaning-carrying part of the cell, which as noted, is in the top left. In other words they align one to the 'wrong place'. Really good readers do not notice this; perhaps

211
their speed carries them smoothly without any loss of linearity: but for average and poorer readers, it is very tedious.

This is made worse by the practical thing that so many titles have the word 'a' in them — and dot 6 1 is one of the very sparse signs, where internal and external space is least clear — when you fear you may be reading the bottom dots of one line and the top dots of the line below by accident. It is also one of the totally reversible patterns, so you also are not sure if you have the sheet the right way up yet! Such things do intrude on one's efficiency and patience. It would be much kinder to cut the capital signs, and have the heading compactly: it may then fit all in one line. The fewest times we have to search out a new line beginning, the quicker we will be. A line-break being a meaning-break is good.

Codeworks 5, right side modifying other signs: These always seem amazingly clear tactually, perhaps because this short-forming is so empowering to reading, the whole meaning in a couple of cells. They all feel very stable signs somehow, nicely compact with clear spaces around them. And some feel rather pretty, like the diamond of 'one'.

Codeworks 6 & 8: Numeral and Poetry signs are very clear and distinct to feel: as are dots 6 3 (music) 4 6 1 3 end of music. Strictly, perhaps Poetry is a format indicator rather than a code-changer, as also are the pair for 'music line' or 'text line' used in some vocal music setting-out: 6 3 = braille music code line, 5 6 2 3 = text line, usually in a foreign language, as if not, it would not need to be so marked. These, being mirror signs, belong to no. 8.

Codeworks 7, and 9 - 21: Obviously rules do not have a haptic component, although some may have a haptic reason. Anything specifically haptic in Braille Music Code is in the discussion for that point.

Codeworks 22, Style and setting-out, deserves attention from the haptic point of view.

* * *

STYLE AND SETTING-OUT

These issues may not be seen as strictly codicological: but they are crucial to the readability of a text, reflecting directly on code function and efficiency — so I believe them worthy of comment. Perhaps they could be termed 'Meta-code matters'.

Louis Braille said we must condense our thoughts into as few signs as possible: [Bickel 1988:80-81] and the most economical ways are certainly those which work best under the fingers. Anything spread-out is a major intellectual re-assembly job: so it is much more congenial to have the intellectual activity 'first', in the approach to the tactile signals, rather than derived from them after lengthy searching.
Space or information external to the finger-pad is always more doubtful and hazardous, both for the possibility of missing bits altogether, and for difficulties relocating previously-read parts as meaning is established. So anything that must be spread out, takes more practice, and is more stressful to use, even by the skilled.

From 1994 we will all be able to become more skilled however: as electronic scanners are becoming much more available, and make very fine 'picture braille' through a dot embosser. Deducing the meaning from a visual-type picture raised into dots is still not always effective: but at least the images themselves done thus in dots, are very clear to feel.

In the early 1980's I had discussions with various engineers and project people from Royal Melbourne Institute of Technology, to see whether a mechanical machine could be built, which would emboss dots wherever they were wanted on a horizontal and vertical axis the size of a braille page. Now, ten years later, this can be had electronically through computers. The electronic method is still very fiddly to use, and cannot be done by a blind person yet – as there is no way to display it – but it is nice to know that something desired then has somewhat become available.

The most empowering things of all are those which we can use ourselves, so as to experiment directly, and produce what we want when we want it. Braille has done this for us, offered us this empowerment: it is a priceless gift.
Chapter 9

CODING STRATEGIES 1

SUMMARY OF POINTS APPARENT

IN LITERARY BRAILLE

This chapter provides a quick list of all the coding strategies discussed so far. It extracts material from the previous three chapters, often from the summaries to a numbered point. Without their context they could seem a little bald and simplistic: please refer to the original discussion for all the ramifications. For enrichment, new braille examples are usually offered, but they illustrate the same content.

The unbound Braille System Statement card is provided to assist understanding of the points being made.

* * *

"CODE WORKS"

1. Braille works structurally from the top-left:

This was discovered by experience, then verified from the Statement. It is a vital coding principle.

The vast majority (48) of signs contain a high dot, dots 1 or 4. And if they do not, there are rules built in to ensure that their proximity to a 'higher sign' is such that the finger can readily perceive this. Relationship to the top is basic to braille.

If the script goes from left to right, the reading finger/s will first meet the left-hand column of each new cell. So to work from the top and from the left co-operates with the faculty of tactile perception.

2. As two convergent 4's (Relation of rows 1 and 5):

This distinction can be very useful in practice: differentiating between letters and punctuation, numbers and fractions, compact forms of telephone numbers; (as pictured below) dates etc; or any binary series or accepted-order series demanding no more than 10 characters per set.

In music code, lower signs appear for nuances and ornaments, repeats etc. whereas the same shapes in the upper cell are note-names. In computer and some math codes, all numbers are placed in the lower cell. Picture: tel. 808-6422

TELEPHONE NUMBERS

215
3. As a potential four on top with modifiers below:
   (The relation of row 1 to 2, 3, and 4)

A glance at the Braille System Statement above shows this as its
most obvious structural feature. However, as a coding strategy
it is exploited far more fully in specialist sub-codes. From the
point of view of literary braille, it only provides the ordering
mechanism, the basic seriality, for the letters and signs.

In music code it is basic, by providing the expression of rhythm.
The potential upper 4 dots, from Row 1, give the note-name, and
the presence or absence of lower dots the rhythmic status.

So although this method is only lightly used as a coding device
in Literary braille, clearly its beautiful logic makes a
memorable ordering device for new codes. And cells with longer
columns, obviously particularly favour this way of coding.

4. As a 2-column set, with internal space recognizably
smaller tactually than the inter-cell space:

Two space increments are essential for the balance of readability
with space efficiency. They maintain the tactually recognizable
shape-integrity of signs — where one configuration ends and
another begins. It actually provides the 3 basic and 4
subsidiary spatial distinctions necessary. Recognition of these
different spaces convey these messages to the reader:

intracell space = these dots all go together, are part of the
   same symbol;
intercell space = now this is the next symbol / configuration;
full cell-space = this is the end of the word, or other
   similarly functioning group of signs.

The subsidiary spacings which occur incidentally are;

If a single left-column is followed by a double-column sign
within a word;
The reverse of this, when a right-hand column follows a
double-column sign within a word;
If a single column left-hand-side sign is followed within
the word by a right-hand-side sign;
The longer space that occurs by chance if the last sign before
   a cell-space is one-column;
The reverse of this, when the sign after a cell-space is a
   right-hand-side sign;
And the longest one when both of these last occur by chance.

A most significant use for the two-increment space system is for
the way it makes possible right hand side columns going forwards,
(see manner 5 below) and left-hand side single columns referring
backwards (see M1, M2 in the music section).

I consider it essential to maintain the two column set in any new
codes. The present spacing increments work well.

216
5. As double cells, with a fixed group modifying all other signs: as in the Statement, row 6 relating to all else.

In braille coding, row 6 signs have no independent meanings: they are used purely to modify following signs. e.g.
'Part one: name the right question.'

This is a brilliantly efficient use of this row, yielding a potential of 7 x 56, = 392 character-sets. Not all 392 are used: and this is an area that deserves development, as in BUOC.

6. Other signs as code changers: e.g. Numeral Sign, placed before letters a-j to make numbers 1-0.

123 5000 99

This is also a very efficient coding procedure if there is a need to save cells.

7. Principle of using strict rules as to order of signs, so the same shape-symbol may be used as an initial, medial, or terminal sign, with different meanings: e.g.

lower c = con- at beginning,
-cc- in the middle, and
: (colon) at the end of a word, or group of signs:

contact-time occurs:  ··tact·· it·occurs··

In Braille Music Code, many more signs are context-dependent: as music needs so many more signs and symbols to represent it, making doubling-up more necessary.

8. Mirror signs for matching meanings: e.g.

open and close quotation marks, lower h & j; ·· ·

This is used more in other codes such as Braille Music.

Ways in which braille is not coded, but that are possible in new codes, include:
   rotationally based patterns:
   long line (fixed column) with moving ratchet up one of its sides.
9. Principle of commonest letter-groups allotted a sign: e.g.
   AND FOR OF THE WITH,
   CH SH ST ING EN IN ER OU etc.

10. Principle of letters and other signs being used alone to
    stand for a whole common word beginning with that letter, or
    those letters, in the case of contractions: e.g.
        c = can; y = you; ST = still; m = more; p = people
    Can you still take more people?

11. Principle of needed words over-riding first-letter
    rule: e.g. x = it; lower j = was; lower g = were
    We were trying, but it was too hard.

12. Principle of abbreviation: letter-groups standing for
    a whole word. e.g. gd = good; lr = letter; ac = according.

13. Principle of common letter-groups occurring in
    particular contexts being given a context-dependent sign:
        e.g. the lower signs, punctuation
        BE- COM- DIS-/full stop; numeral sign/-BLE

14. Principle of initial wordsigns attaching to first letter/s:
    e.g. Mother is right here. Know your spirit world.

A Wordsign is one which uses a Row 6 right-hand-side sign to
precede another letter or sign — Codeworks 5.

15. Principle of terminal contractions attaching to the final
    letter: e.g. 45 t = -ment; 6 y = -ally
        excitement comment tally naturally

218
When there are paired endings, principle of
a) Alphabetic series, use 46 then 56
   -ance -ence; -less -ness; -sion -tion;
e.g. chance cadence timelessness vision option.
(If contractions were marked, as in braille textbooks:
   CH/ANCE cadENCE TIME/LESS/NESS viSION opTION)

b) Phonetic series, only one: -ound -ount, -46 d -46 t.
   I'm bound for the mountains.

16. Principle of logical sequencing when possible: e.g.
   a) comma, semicolon, colon, full stop
      — i.e. smallest to largest size of speech break
      use lower a b c d, the first 4 signs in Row 5:
   b) order of terminal contractions, as 15 above.
   c) general linguistic hierarchizing, for sign choice.

17. Principle of speech patterns allowing run-on (no
   word-break) in very selected cases;
   AND FOR OF THE WITH, prepositions TO and BY.
   By the light of the silvery moon ...
20. Principle of specialized vocabulary contractions or abbreviations - e.g.

Biblical words: hl = holy, gl = glory, 456 u = unto etc.
blind affairs words: bl = blind; brl = braille

It would be helpful if this were much further developed.

21. Principle of periodic update - to grow with the language. e.g.

old ? = EN spaced after the word, now lower h close-up;
w = work in old Bibles, now w = will:

This process is actually not moving nearly fast enough - those interested should study BUOC. [Maxwell, all entries.]

22. Style, format, and setting-out considerations:

Thought must be given to the most enabling tactile expression of information: just as thought has been given to the best presentation of text in a print book. It should be compact, comfortable, and if possible convenient for locating its different content.

Blank line, short centred braille line, indents are available for section marking.

Italic, quotation marks, double quotation marks, brackets, double brackets, are available for distinguishing text.

Placement of braille page numbers, and identifying print-page numbers must be user-friendly in context.
Chapter 10

CODING CONSTRUCTION IN BRAILLE MUSIC

Having found the coding strategies for literary braille as in Chapters 6-9, it was necessary to do a similar kind of study on Braille Music Code, to see what extra strategies it would yield. However, such a study is enormously complex and detailed, and too long to include; so it has been thought best to give just the simplest possible view of its operation — just sufficient for a reader to understand the coding strategies themselves, which are the subject of the next two chapters.

SHORT LIST OF CONCEPTS

Braille music works in its own ways, which are highly appropriate for blind people. These must be understood, and if unfamiliar, will take a little thought. That is, without a little thought, they may remain obscure, since the code is necessarily intricate. Bear in mind that meaning must be expressed in serial strings of characters, all of which are coded, not pictorial. Remember too that blind people are accustomed to codes, and to memorizing any music they wish to play.

Any braille code at all had to use the same 64 characters that are possible from the six-dot pattern which bears Braille's name. These patterns are used for all 'literary braille' meaning words, letters and numbers, as described in the 'Codewords' section; all music braille, described here; and all other braille codes, e.g. those for mathematics, chemistry etc. Any code that is, excepting those like my new ones, which use long cells.

Naturally almost any page of a braille copy has literary code on it as well as its specific technical code: for all the headings, naming and describing, identifying sources and sections, and for the page numberings.

FIRST PRINCIPLES:

Louis Braille's Music Code worked from first principles:

What messages must be transmitted about sound to make it recreatable by the reader from a written source? Which abstract characteristics are efficient and sufficient, to transmit the information? How shall this be effectively tactile-coded using the newly-available dot-patterns?

So the first necessary information units concerned which pitch sound, and how long it must endure: point 1. Point 2 contains more on pitch register, and interpolations: point 3 the various ways of expressing simultaneity. 4-6 deal with other common necessary signs, 7 with setting-out, 8 with instrument-specific signs. A quick overview of the 63 signs with their braille music meanings, and discussion of sign use, completes this chapter.
The New International Manual of Braille Music Code will be at least 200 print pages, so it is to be understood that what you find here is indeed brief.

* * *

1. Pitch and rhythm:

(a) The French names for the notes were, and still are:—

    Do or Ut, Re, Mi, Fa, Sol, La, Si

and it is likely that in being taught singing with these, they seemed the logical place to start. So Braille took letter d for 'Do', and the six following letters for the rest.

d e f g h i j (d)

(b) These are obviously all in row one, so can be used in manner 3 of Codeworks to express rhythm; by the taking of a dot 6 to be designated a crotchet, dot 3 to be a minim, dots 3 & 6 to be a semibreve — with the original letters standing for quavers. Thus the following rows express in order, quavers, crotchets, minim, semibreves:

\[
\begin{align*}
\cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot \\
\cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot \\
\cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot \\
\cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot \\
\cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot & \ \cdot \\
\end{align*}
\]

Of course there are only four rhythmic distinctions this way: so the series is re-used: dots 3-6 for semiquaver, minim for demisemiquaver, crotchet for hemidemisemiquaver (64th), quaver for 128th. The music Louis Braille envisaged normally used bar-lines, and regular rhythmic groups, so the same sign for different meanings was not too serious a problem; users just work it out mathematically to determine which values will fit.

Signs exist in the code for 'greater value', 'smaller value', 'unmeasured' etc. so extra rhythmic distinctions can be made; but they are rarely used. Obviously they must be included when there is no way to tell which value is intended, as in the Andante (variations in C) of Beethoven's Sonata in G, Op. 14 no. 2; here there is an anacrusis semiquaver in a signature of cut-common time. But most often one must just calculate.

There is a special braille convention for groups of smaller values, semiquaver and below: viz. writing the first note of the
group at its proper value, and the other notes as quavers. This feels good when the groups are regular, but can make for a lot of working out when they are not, and creates even more context-dependence. It is not used if the note following the group is a quaver. An example where it works conveniently: right hand of the Czerny study Op. 299, No. 5: see Appendix 1 page 262.

\[\text{[Staff notation of musical examples appears in Appendix 1.]}\]

A semiquaver rest can also operate the convention, Op. 299 No.4:

\[\text{[Staff notation of musical examples appears in Appendix 1.]}\]

In the last movement of Bach's Brandenburg Concerto No. 3, main theme bar 1, the first and last group can be 'abbreviated', but not the second, because of the quavers of beat 3:

\[\text{[Staff notation of musical examples appears in Appendix 1.]}\]

It is tiring to hand-write rows of semiquavers, the most notes with the most dots as above; and quite cluttered to read as well, more obstructive to recognition than mixed depth cells. So there are good haptic and practical reasons for the idea.

* * *

(c) By the 1820's, when this code was being evolved, an octave was the notional unit, or set, in Western music pitch, as the hexachord was in medieval and renaissance times. So a set of octave signs beginning on the lowest 'C-Do' on the piano, seemed a practical solution to identification of register. Each octave is deemed to run from C up to the B above it, and the sign-set used was the right-hand column preceding, i.e. Codeworks 5.

Here are the seven octave signs, each preceding a C crotchet.

- 'Cello C' (4th string open) is thus second octave C
- 'middle C' is fourth octave C

The last character is the extra C, highest note on an 88-note piano keyboard.

\[\text{[Staff notation of musical examples appears in Appendix 1.]}\]

So the code itself works from note identification by fixed sign, to rhythm by lower dots, to pitch-register identity by the extra sign preceding.

All other musical information, in addition to notes and their octave-signs, must be placed in the line of cells either before
or after the note, or other most-relevant symbol. The rules for position must be quite rigorous both to optimize sign use, as in Codeworks 7, and to make clear whether they pertain to the previous or following note. See the Overview of signs to corroborate this need for re-use and re-combining of cell-shapes. (It follows point no. 8 of this discussion, page 233.)

* * * * *

Pitch is understood in a conceptual grid, or an aural grid of sounds in recurring octaves — rather than a pictorial grid, the sort of y-axis of the visual stave. And rhythm must be totally intellectual in braille, whereas there is a sort of informal horizontal x-axis for time durations in staff notation. That is, in print notation it would be rare for there to be no more space left after a semibreve than after a quaver in the same composition; there is normally some proportional spacing. In braille notes must simply occur in the next cell, irrespective of their length.

Of course this x-axis for duration in print is more context-dependent, more unpredictable, than the y-axis for pitch — the 5-line rigid grid. Perhaps this accounts for the fact that most people sight read rhythm with more difficulty than pitch: though just as exact codicologically, it is less exact pictorially. Actually, the limited rhythmic designations of Western notation are not all that effective or accurate in expressing the fine differences we expect to hear: but then the infinite varieties do pose a problem to express.

Said another way, we seem to tolerate and even prefer pitch regularizations from the infinite possible number; but not to tolerate the same regularization of rhythm, we actually use more of its tiny increments ‘automatically’ in performance. These are then called ‘good taste’, or ‘sense of style’.

Or perhaps it is just lazy habits of thought which limit our pitch options, or lack of experience and training that makes most of us unequal to rows of quarter-tones, much less smaller microtones. Such matters will need to be addressed by those preparing braille codes for the musics in the world that do use much finer distinctions, or have a greater number of designated pitches or rhythms than ‘we’ do. Long cells may provide an excellent option for such codes.

2. In musical context: the next essentials

that is, after pitch and rhythm have been expressed:

Once music is flowing, the normal necessary braille coding arrangements described above give rise to the next level of code features, which include octave sign rules, interpolations, and interval signs, amongst other things. The last is complex, so has its own number, 3.
(a) Octave Sign Rules:

Whereas the visual stave sets up the whole grid for every pitch, in braille music code, octave signs are only marked as needed. This saves bulk and tedium, but requires concentration to use, since information is only sometimes provided. Things must be read in their context. The usual logic and economy is evident in the following rules, which apply for melodic intervals:

If a note is a 6th or further from the previous note, it will always need a new octave sign:
If a 4th or 5th, it will need a new octave sign only if it jumps into another octave (crosses over a C), and must not have one if it does not;
If a note is a 3rd or nearer, it needs no new octave sign, unless there has been an interruption of some sort, such as an expression mark or line-break.

Nothing must come between an octave sign and its note, because these Row 6 signs are used as modifiers for all other signs in principle, and a great many in practice: as described in Codeworks 5; e.g. nuances, see M 4 page 243.

(b) Interpolations

These include: expression, slurs and ties, fingering, phrasing, nuances, ornaments, etc.

Expression letters, and instructions of any kind are prefixed by AR: thus using method 6 of Codeworks. So ARf = the 'forte' f; ARpp = pp; ARc = the beginning of the hairpin (diverging lines) crescendo, AR-lower-c means the end of hairpin for crescendo; ARd and AR-lower-d give the beginning and end of the 'diminuendo' hairpin. The ends of these hairpin signs are not always marked, only if it is considered necessary.

This AR sign could be called a literary prefix, in that what follows it, is words or letters, not notes. A dot 3 follows such letters if there is need to terminate tidily and revert to music. The common short expressions do not bother with the dot three code-breaker if an octave sign or other right-hand-only sign comes next, since the sign itself is short, so minimally interruptive, there is enough tactual gap, and expectation is sufficient.

3. Simultaneity:

(a) Interval Signs

Chords are conceived and expressed as Interval Signs following a significant note: thus making temporal distinction conveniently in a single line. This is expressed by an x or y axis in print, simultaneity on the y, next temporal happening on the x, thus being written further across the page. In braille music, the significant note is usually the bass note in low
parts, so the intervals read upwards from it; but the topmost line in high parts, so the intervals read downwards. Practice concerning direction has varied in different times and places, however: so it is more helpful to state direction clearly than have doubt for parts such as viola, which are not clearly bass or top.

So in intervals, the chord of G across a bass clef, would read '2nd-octave g [with its] 3rd 5th 8th' — not 'gbdg'. If 'gbdg' were written, the notes would be sequential, not a chord.

(a) The Interval signs are, for

2nd, 3rd, 4th, 5th, 6th, 7th, 8th interval:
ST ING BLE IN WAS CON COM

and they apply for notes sounded together.

When notes are to occur other than simultaneously, there are two possible representational methods: Moving Part Signs, and that called In-Accord: see below, part (c).

(b) Moving Part Sign:

Where an obvious rhythmic division occurs in the intervals with respect to their note — e.g. two crotchets with one minim, or three crotchets with a dotted minim — then the Moving Part Sign (dot 6) marks the interval(s) that the faster part moves to.

Similarly for the Double Moving Part Sign; all the intervals that sound with the note follow it as usual, then 56 before the set of intervals that they all move to, and again if needed. Until now, these could only be used if the division was in the direction of travel, the way the intervals would read, for the part: so in a right-hand part, the longer value had to be in the top to use this method. The 1993 Draft gives an extra AR onto a hand-sign as a reversal of interval direction: this will make for flexibility in a number of situations.

46 AR AR = right hand when intervals are to read upwards
456 AR AR = left hand when intervals are to read downwards.

Intervals wider than an octave can use the next octave-sign preceding the theoretical interval number, meaning the interval as it would appear if that note-name were within the octave. If in a series, this may not be considered necessary: 2nd octave C with 5th and 3rd interval signs following it, would be understood as cello C, with the G above it, and the E above that; all in the direction of travel for that part.

'Vertical Score' works on this principle, a series of intervals reading up from the bass. Only where parts cross will an octave sign be needed for the out-of-sequence interval. Vertical score
is a very quick convenient way of notating hymn-tunes, harmony exercises, etc. See Setting Out discussion page 231. In Vertical Score dots 123 can be used for a unison; and also for choral vocal parts which come together.

Here follow some Interval examples: the first of a piano jazz bass using tenths; the second of Moving Part sign, used in the well-known hymn-tune 'Wilton' by S. Stanley, (often sung to the Charles Wesley words 'O thou who camest from above') soprano & alto line [see page 262]

```
\[ \text{c} \] \text{IN-ACCORD:}
```

When the music is more complex than plain chords, as in contrapunatal writing, the 'in-accord' sign is needed — denoting that the parts either side of it should be read separately then added up. GH AR is a full bar in-accord. If some of the bar can be written more simply as chords, 46 \( k \) separates the regular part, and 52 separates the parts to be added up.

This is obviously a braille convention; since any rhythms can be combined visually on a stave by spacings, stems, and verticality. Here are examples from Bach's 'Bist du bei mir': bars 1-2, then bar 34: features are noted below.

```
\[ \text{c} \] \text{Bist du bei mir:}
```

Notice the bar-numbers out to the left, since it is Bar Over Bar format: \( a = 1 \) for the first example, \( cd = 34 \) of the second. Bar 1 r.h. has full bar in-accord, whereas bar 2 takes moving part for the changing intervals. Bar 1 l.h. uses a minim stem on the first c (see below); also tracker dots to keep the finger on the line.
In 34 r.h. bar-section follows the first 2 quavers and crotchet cbc, which are written simply, and part-bar in-accord applies for the last beat only. Here is an example of the smaller values, dotted quaver and 2 demisemiquavers, same sign as minimis, see l.h. bar 2 above, minim crotchet.

Double stems — the unison-to-chord effect when a note is held as well as part of a faster moving group — are expressed by Stem Signs. These use the Left hand side series prefixed by 456, and are placed after the note-shape, which carries the smaller value. Stem Signs are value-specific, not context-dependent like other rhythm. See left hand part of bar 1 above: C is written as a crotchet and followed by a minim Stem sign.

When stems-only are used in print because pitch is not relevant, it is often easier to read in braille if an arbitrary pitch (or pitches) be chosen: then the rhythm can be expressed in one cell rather than two, for each unit; and with easy signs, not hard ones - codicologically much simpler. For students in class, there is much more hope of keeping up with the activity if each unit is one cell. User-friendly accessibility often requires some adjustment to the way of presenting material in braille.

* * *

4. Other basic common signs

Dot after a note, dot 3; double dot, 3 3

Rest signs are m u v x — whole, half, quarter, eighth; and re-use for smaller values;

m = semiquaver rest, u = demisemiquaver rest etc.

Space denotes barline, GH k double-bar

Double-bar with dots to the left, GH lower b; with dots to the right, GH lower g. Pause GH 1.

Sharp, Flat, Natural use the English contractions SH GH CH:

2 SH's = double-sharp, 2 GH's double-flat

Staccato sign is lower-h preceding: tenuto, 456 lower-h; accent, 46 lower-h; staccatissimo, 6 lower-h;
martellato, 56 lower-h.
Slur is letter c between the slurred notes; 
4 c = tie, 46 c = tie for a whole chord; 
Other modifiers give accumulating arpeggio (45 c), slur from part to part etc.

A phrase can be shown as a long slur with the Doubling Convention cc after the first note, c before the last – or as a Phrase, open and close, the mirror signs 56 12, 45 23.

Here is 'The Ash Grove' melody, with syllable slurs and phrases:

\[
\text{\textit{The Ash Grove}}
\]

Fingering: a b l , k = 1 2 3 4 5 after a note or interval, or after its prolongation dot.

The next example shows a right-hand piano fragment: first the one # 3/4, then right-hand part, octave sign, note and finger:

\[
\text{\textit{Ornaments code-base on to lower-f (preceding) for trills and mordents, lower-d for turns. Lower-e (= EN) = small-note sign.}}
\]

5. Before the main music

(a) Key and Time Signatures are placed together, i.e. unspaced, somewhere between the title and where the actual Braille Music Code starts: see braille examples above. The number of sharps or flats comes first, numeral sign, then the numbers written like fractions (Codeworks 2). Row 6 signs before C give Common and Cut-common time (Codeworks 5).

one sharp 4/4, 2 flats 6/8, 5 flats cut-common.

These follow Italian instructions at the beginning of pieces, so it depends on the amount of instruction where they will be found. The Dvorak Slavonic Dance 16 that I have just been reading had

229
'Lento grazioso, quasi tempo di valse.' so that all took two braille lines. Here follows: Allegro con brio. ### 2/4

**ALLEGRO CON B tro. ***

Metronome markings appear between the Italian words and the key and time. They use a code-mix, by taking C note with a value from braille music code, lower g for the old 'equal sign' from English mathematics code, and numeral sign with numbers as in literary braille; all written unspaced.

Andante. crotchet equals 66 4 sharps 4/4:

**ANDANTE: D76C VGB7D**

* * *

6. Repeats

Repeats have a variety of braille conventions, in addition to the usual print ones. Lower g means repeat bar as its first meaning, but if not spaced, means repeat beat, or repeat half-bar; one works out which applies by the counting-out of the bar, whatever fits. Nuances like staccato are expected to be implicit in a repeat, but ties and expression must be added separately.

In older braille copies chunks of repeat which were just flowing on in print, were marked by segnos in braille. These were begun by an ING and concluded by a CH, and repeated where dot 5 precedes the ING. If there are different repeatable chunks, they will be labelled ING 1, ING 2 etc., written without numeral sign, as INGa INGb.

In modern scores, where bar numbering is a strong feature of the braille setting-out, bar numbers in the lower, meaning 'Repeat those exact bars' are commoner.

In older copies numeral '2' (spaced) meant 'repeat the 2 bars you just had' whereas 'numeral 4 numeral 3' meant 'go back four bars, repeat three of them'. These, to my surprise, are still listed in the 1993 International Draft Manual; so must still be used in some countries. They are quite efficient in some contexts.

None of the above come from print setting-out, they are purely braille conventions for convenience and space-saving. As above, the signs corresponding to the print repeat, double bar with dots to right and left are GH lower-g and GH lower b: and word instructions or abbreviations like 'DC' are written as words would be with AR, or bracketed: in future (1994 meeting) AR...AR

*DC* ***DAL SEGNOR ***DAL SEGNOR

230
7. Setting-out

This has a major bearing on what is read — since music 'looks' just like words, to the finger as well as the eye. It uses all identical symbols. Only by thinking and expectation can it be known which code is being used. I think examples are the quickest way to make this plain: see those above, and below.

(a) Here follows part of a 'Words and Voice' setting-out of the spiritual 'Nobody knows the trouble I've seen': words line is at the margin, music line indented two cells.

```plaintext
Nobody knows the trouble I've seen
Nobody knows the trouble I've seen
Nobody knows the trouble I've seen
Nobody knows the trouble I've seen
Nobody knows the trouble I've seen
Nobody knows the trouble I've seen
GLORY HALLELUJAH!

(b) 'Bar Over Bar' applies chiefly to piano and organ music: it uses right and left-hand signs in a vertical arrangement with bar-numbers down the left (without numeral sign) before each right-hand sign. Bar-beginnings are aligned, or their note-beginnings after expression. Here is Bach's Minuet in G:

```
 Allegretto.
```

231
(c) Open score can be used for orchestral scores and chamber music, but also complex keyboard polyphony if desired. Here is the first bar of the Haydn piano trio in G minor, Hob. XV:1 no. 9: for 'Violine, Violoncello, Klavier'.

'ARvn' 'ARvlc' and hand signs 46 AR and 456 AR therefore prefix the lines. The bar number usually appears above in an open score, such as here, the a = 1 under 'moderato'.

MODERATO. BB.MC

8. There are instrument-specific signs, such as the following:

keyboard hand-signs: 46 AR right, 456 AR left: also dot 5 AR for solo line, 45 AR for organ pedal line etc.
piano pedalling: chiefly GH c and CH c for down-pedal and up-pedal, dot 5 GH c for half-pedalling
organ pedalling: a b l, for left toe, left heel, right toe, right heel
breath marks: dot 6 ST full breath, AR comma half-breath - the latter a much more sensible sign, since often on the print, the sign is only a little comma above the stave - why make a mystery out of a comma?
swell, a crescendo and diminuendo on one note: CH 3

signs relating to matching words with their melody, e.g. Italian texts with different numbers of vowels on one note
bowing signs: GH b and GH dot 3 for down-bow and up-bow; also used for plectrum direction in plucked strings music; also direction of bellows in accordion playing.
string numbers: SH followed by row 6 but in the left-hand-side for strings 1-7 - most commonly needed in guitar music, 1-6.
barré: now officially, full barré 456 AR, half 45 AR - but some of this will need more thought yet.
position signs (violin etc): AR plus interval signs for positions 2-8; AR AR for 1st; AR AR CH for half-position; AR bottom c plus interval sign series again, for anything higher

232
OVERVIEW of the 63 SIGNS:

Looking at the whole statement, clearly if the d-j, n-t, y-WITH, and TH-w are all gone for first hierarchy note-signs, remaining, one has the first three signs of these rows, plus rows 5, 6, and 7 for everything else.

Row 6 is the modifiers, so it has 'gone'.

Its corresponding left-hand column uses a b l, k for fingering, lower-b for triplet (before the affected notes), and dot 3 for a dot after a note:
i.e. first two signs of rows 1,2,5 and 5th of row 7 are gone.

Letter c is a slur, modified by row 6 for a tie etc.
This finishes off row 1.

m u v x are rests, also first hierarchy;
i.e. third in row 2 and first 3 of row 3 — so rows 2 & 3 are now all used.

Natural flat and sharp use the first three signs of row 4:
also first hierarchy.
That fills row 4.

In row 5 the first 2 are already accounted for, used in the left-column, first meaning fingerings:

lower d is the base for turns, modified by row 6 and accidentals: also end 'dim. hairpin' after AR:
lower e for Small note of any kind — can be cues, or unmeasured, or acciaccaturas.
(Also modified for large notes.)
lower f is the base for trills and mordents, modified by row 6:
lower g used as (braille) repeat marker:
lower h is staccato and the base for nuances, modified by row 6, all as described above.

So three remain from Row 5, lower c, i, j.

From row 7: AR has gone as code-changer for words;
dot three for dot after a note, and other separating meanings:
— so the four remaining signs (ST ING BLE COM) can be combined with the remaining signs from row 5 to be used for the 7 intervals, 2-8:
ST ING BLE lower i, j, c, COM

This fills Row 5, and 7: and Row 6 has been used for modifiers.

So all 63 signs have now been used.

* * *

233
Just with the above meanings, the whole 63 characters are gone: so it is clear that much duplication must occur. We have hardly started on the more obscure or specialist signs. The above is quite simplified; all those signs have a great many other meanings as well, which in context are usually quite comfortable.

There have had to be additions to the original set – e.g. Louis Braille did not cater at all for koto players. We have all had to adapt sometimes to fit circumstances, and have done our best, using different solutions in different places for a similar thing: therefore automatically, as the code is so full, using signs to mean totally different things. International conferences get called when this process seems to have got out of hand. Fingering for guitar music, especially right hand, was such a case; there were (are) several quite different sign-sets being used in different countries.

The accretions have been variable, some very effective and some quite poorly-functioning, needing more thought. All of Louis Braille's original is strong, well-functioning, holistic: the more one studies it, the more striking is the efficacy of his solutions. But it is naturally very hard to add anything to so carefully integrated a code, without being clumsy.

The worst thing about this continued accrual, as well as ambiguity with meanings, is getting too many signs. There is obviously a law of diminishing returns from added complexity rarely needed – or needing explanation anyway, in which case signs can be chosen and listed, applying just to that situation. My inclination would be to drop as much as possible of the accretion, keep the code as near as possible to its integrated original: to regard most new needed special signs as temporary, therefore being listed somewhere sensible in the copy, rather than being put into concrete as part of the main corpus of official Braille Music Code.

Most of the new signs needed are to do with educational apparatus and fashions of presentation, not with expression of the music itself. Of course learner materials are important, but many of their signs are temporary, once the person becomes skilled, the signs will not be needed: and different learner materials choose different special signs for their temporary, non-standard indicators.

Concerning dropping signs

Consultation with a great many violinists has shown that they universally believe that Position Signs are not shown on copies of real music: that fingering and other cues show you how to play something difficult. Though usually unable to remember, they believe there could have been position signs used in their studies and learner materials. This does not mean that position signs never occur, since it is quite normal for users to ignore superfluous information; but it says to me that we could drop the incredibly complex and poorly-functioning set of Position Signs from the concrete central code, interpolating the
occasional sign in words or as Roman figures, in whichever way it is shown in the source copy, when it does occur — thus cleaning up our code, and freeing signs. Doubtless at some point there was a fashion and a perceived need for these signs, but perhaps it has passed?

Every wise person recognizes the necessity of respecting the code and not meddling: however, it is worth occasionally asking: Do we still need this sign?

The needs of users — clarity, comfort, and accuracy — must remain priority number one; why else would one be brailling the music? And odd little things come up all the time which necessitate a deviation or addition, or a conceptually extended meaning of a sign temporarily, to express what is on the published copy. Life resists regularization. Or perhaps more truly, small deviations can easily be shown in print without confusion to the central idea: this is much more troublesome in braille, when there are no free signs left without inbuilt meanings of their own, to express such extension.

The acute conservatism in blind politics does not aid growth either. As in all language, some words and expressions just peacefully die out of use, and others come to be used, as found more suited to the climate of thought at the time — in our case this usually reflects music publishing conventions. I see no reason why this normal healthy process cannot take place in our codes as well. We must be willing to drop as well as accrue.

* * *

DIGRESSION ABOUT NEW CODES:

None of my new codes, Chapters 1-5, supersede or in any way interfere with the Braille Music Code as accepted world-wide, and described here. The new codes open up complete islands of musicology previously inaccessible because of the non-availability of manuscript/source information.

Naturally my chief wish is to make known the new specialist early notation codes, since they open up quite clear areas of study for blind students, and offer no conflict with existing code. This must be understood as meaning — they offer no more 'between-code conflict' than any other set of alternative codes currently in use. It was not possible or codicologically sound, to use only signs with long cell components, thereby totally avoiding all known signs. People will doubtless continue to argue about the suitability of particular signs in any existing code.

But it should be clear from the above why new codes were needed — purpose-built, with specific sign selection, so as not to buy into all these other accumulated meanings. The conditions of life for blind students, the future users of codes, in most Western countries — no blind schools, scattered through the country's regular school system, often without competent help for even quite simple braille, let alone braille music — makes it certain
that complexity and intricacy can scarcely survive. Our systems among small numbers, are quite fragile already.

But they are so necessary for the prosperity of music as a career for the musical blind — and these are usually quite many — it is worth considerable effort to hold the expertise, insist on teaching being available, preferably by other touch-readers, and keep abreast of needed study areas by providing new codes to represent them.

* * * * *

IMPLICATIONS OF THIS CONSTRUCTION

Many of the coding decisions were probably made as much from the point of view of the person writing down the music from dictation, as from that of the reader. It must be remembered that the crucial and revolutionary thing about the whole braille system, was that it enabled a blind person to write for the first time. Strong linearity would certainly be one of these features, made necessary by the original method of writing.

For an excellent description of writing, see Louis Braille's original 1829 method, Procédé, translated in Appendix 2 page 263. Also see page 23, and the pictures in the Appendix 4.

Copies had to be done a dot-at-a-time by hand, and with their shapes in reverse, since the dots had to be pressed downwards into the frame and paper, in order to be turned over and read as upward bumps. It was certainly not convenient to have to keep stopping and taking the paper out to see what had been written.

The writing process sounds slightly more alarming than it is; one might compare it to reversing a car; but it certainly made alignment totally impractical. And lest that be thought to be from the Dark Ages, it was on a similar hand-frame that I took my university notes in the 1960's, it was perfectly efficient, if a little tiring.

Concurrent lines are scarcely practical in braille reading either. Vertical alignment is not as much help as it is visually. In most circumstances works must be memorized, so all the information has to be internalized quite separately from the activity of performance. Much of the point of alignment in print is to enable things to be played as immediately as they are seen.

From a reading efficiency point of view, the finger gains most from passing along the single line, smoothly collecting the knowledge without gaps and scraps, or any necessity to relocate. Relocating is mostly a considerable obstruction to touch-reading efficiency.

It is still the case that any professional musician must do a lot of their own transcription, with friends dictating. Now that this is usually done on an upward-writing machine, alignments are quite possible; though still usually wasteful of space, and
inconvenient — requiring the writer to disconnect from the writing keys, and bring at least one hand up and down to check cell positions all the time.

Perhaps it is a weakness that most braillers use three dot-keys for each hand, one presses down together as many as are needed up to the full six: so writing is basically a two-handed operation. (See the pictures.) Naturally some machines have had to be modified to be usable by one hand, but usually this means embossing each cell in two stages.

Most of the ways the code works reflect the most co-operative tactile systems for a linear method. Linearity was no particular constraint in ordinary writing, which is linear anyway: but in a simultaneous-events system like music, there had to be specific code design to represent its concurrency as nearly immediately as it sounds. This is variously, or sometimes not, possible.

There was so much gladness about the possibilities of representing knowledge of all kinds in the little dot-patterns, that having to re-use them all for each new knowledge area probably seemed to the original braillists a very small price to pay for such wonderful access. For us, both the re-use, and the totally-coded nature of the music signs is inclined to be perceived as difficult: and in many ways, if compared to print music, it is. It is certainly an entirely different kind of code.

For instance, with almost any visual display, space is used meaningfully for the separation and binding of information units. In Braille use of space is quite a different matter, cells are confined to their lines, and all boundaries must be inherent in the coding. Sign ordering therefore becomes quite an issue. A single space, being normally used for a barline in melodies, is not available to demonstrate the boundaries of other information clusters within a bar/measure. All cells follow on equidistantly from each other until the end of the bar.

Louis Braille made most left-hand column signs refer back, since they are closer to the previous sign. See chapter 11 Musi-Codeworks M 1 for fuller discussion from this point of view. All right-hand side columns relate forwards, as in Codeworks 5; this is one of the underlying structures of his literary coding method. But for any two-column sign, there is nothing in the spacing to tell you whether it is a completely new sign, or refers to the symbol that has just occurred, giving you more information about that symbol, or is a warning for the symbol to come, an extension of its meaning.

The same is true for double-cell signs: their direction of application usually has to be known by the user, as well as their meaning, since context may or may not help. Sometimes it is possible that it is not a double-cell sign at all, but two single signs with their own independent meanings that one does not happen to recognize. For any music reader, if one does not know the meaning of a sign, it may or may not be possible to guess it:
but the small sign-bank, similarity and totally-coded nature of braille signs makes for even fewer clues to a reader. This is another reason for insisting on the importance of teaching being available to blind students, since learning braille music casually or by chance is scarcely possible.

It is complex: but it is tactually and intellectually efficient. Compactness is a great advantage for finger-reading, and it is very compact. It is much our best option.
Chapter 11
"MUSI-CODEWORKS"

After exhaustive analytical study of Braille Music Code, the following points constitute coherent deliberate strategies, which may therefore be usable in the construction of other codes. These are additional to those already documented as 'Codeworks' for Literary Braille: they take an M-prefix.

Since there is not room in this work to present the whole study of the Braille Music Code itself, this chapter discusses just the extra strategies that emerged. It does not go into the ways in which music code uses those strategies already elaborated upon in Codeworks. Chapter 12 then gives the quick list for reference, the companion to Chapter 9.

If the points are long, summaries are indented, and precede the primary discussion, as for 'Codeworks'.

M-1. Signs modified by a left hand side column following them: e.g. fingering, stem signs, dot after note

Patterns using only dots 1-2-3 are just part of the letter-set in literary braille: but in music code they are deliberately left as a set for things such as fingering, when they follow notes or interval signs, string numbers, when they follow an SH sign, or for other modifications, such as

\[ m = \text{semibreve rest}, \ mk = \text{breve rest:} \]
the lowering of turns & mordents uses a following l.

* * *

There are 7 positive characters from the 3-dot column set, and they follow the same order as for Row 6 in the Statement, but in the left hand side. So in the primary hierarchy, the commonest signs needed, we have:

\[
\begin{align*}
& \bullet : : : : : \\
& \text{fingering uses the first 5: a b l, k = 1 2 3 4 5} \\
& \text{no. 6, dots 23 = triplet} \\
& \text{no. 7, dot 3 = the prolongation dot of a note or rest}
\end{align*}
\]

Instruments such as violin that use only four fingers, use k = open string, or natural harmonic.

All refer back to the preceding sign, except the triplet marker. It precedes the affected notes, possibly because it is a help to know in advance about triplets, so as to conceptualize the rhythm correctly. However, haptically this sign can seem to be shadowed
under the previous one, and not be noticed, even by good readers: so it seems possible that there is a real psychological expectation of 'referring backwards' for left hand side signs.

They are also used for these specialized signs —
organ pedalling:  a b 1,
= left toe, left heel, right toe, right heel
In solo vocal music, b & 1
= 2 or 3 vowels to be sung on a single note

The string signs mentioned above all follow SH

They are also part of compound signs as below, for pause and double-bar, bowing, greater and lesser value for rhythmic distinction, beam break etc.

There is no purpose in listing all the contexts in which these dots appear. The aim is just to give a notion of how they are used in a coding sense. They are easily felt after a 2-column sign like a note, a little less easily when say a thumb (dot 1) follows a dotted note, and they must follow it. See the discussion on density of signs in Chapter 8.

Some signs go into their doubling mode by repeating only their 2nd half, which may be a left hand side sign:

 e.g. repetition tremolos in a series

Others go into a 'logical opposite' mode,
e.g. ARk = ripple / arpeggiation in the 'normal' direction,
i.e. upwards;
AR k k = arpeggiation downwards:
with a dot 5 preceding, = arpeggiation across two staves

* * *

M 2. Using double-column signs as a centre, so as to be modifiable on either side by single columns; right hand side preceding, left hand side following, or both, achieving the cluster effect of print notation: e.g.

note with fingering and preceding octave sign;
various needed trill and turn modifications
ferrata and double-bar variations
bowing signs
The 2-column signs in braille music code include:
notes, intervals, rests, accidentals, staccato/nuances, and
ornaments.
There are obviously only 14 signs which are not double column in
the original 63 patterns: the 7 possibilities of three dots in
each column.

Third octave c, [semibreve/semiquaver] finger 5

Pictured below: fermata, then fermata on a barline;
turn, then inverted turn;
trill, then (lower) mordent;
down-bow, then down-bow at the frog.

This notion is the only clustering braille can do: whereas print
music uses a great deal of clustering. Perhaps its most extreme
form is found in print guitar music, where information of many
different sorts is all clustered around the notes — left-hand
finger, slide marks, right-hand fingering, string numbers, barré
information, in addition to ordinary musical things like
staccatos and expression.

Nothing in Braille Music Code is immutable, but the only other
thing that note-shapes and rests can be is words: whereas non-
note-signs are extensively re-used. GH for instance is part of
an enormous number of compounds; for repeats, value signs,
bowing, pedalling, beam interruption, pause, in-according — none
of which have any connection to its first hierarchy meaning of
Flat.

The validity of this point can also be demonstrated from a
negative perspective —

M 2 a. The deliberate avoidance of 2-column signs. This
is a useful distinction. Where not more than 7 discriminations
are needed, single columns can be used, one right hand side to
show which category, and the next left hand side to give the
internal distinctions within the category. e.g.

Stem signs use prefix 456, which will be followed by 3 k
a b l , to denote all the values from a semibreve 'stem' to
a 32nd-note stem. The longer value is expressed by the
stem sign: hence no need for signs beyond a 32nd. See the
end of 3 (c) Chapter 10 for an explanation of stem signs.

Rapid repetition (beam-lines crossed through a note's stem
e tc.) uses 45 in front of a b l , k 3 for the values from
crotchet down to 128ths. This sign follows its note or
chord.
Tremolo alternation uses 46 before all the different values, b 1 , a 3 mean quaver down to 128th. This will appear between the notes to be alternated, as in print.

All of these have to use slightly broken sets, because of other commoner signs already in use: e.g. 46 k is the bar division needed with partial in-accords, see section 3 (c) in chapter 10; so alternating tremolos in 64ths cannot use 46 k in its expected sequence; so 'a' is used, on the premise that alternation of values larger than a quaver would not be needed, as they do not use this abbreviating convention.

* * *

M 3. A fixed set being modified by all other signs. In a way that is the overall concept of Braille Music Code: with the notes as the fixed set. All code decisions work around the neatest way to give all necessary information around these basic sound-symbol units. The next-nearest essentials are carried by single columns against them; and further meanings by moving outwards, using all the methods and strategies described.

There is always a balance to be struck between using different fixed signs for different meanings, and using the one sign modified, whether by height, or columns before or after, or some other way. With fixed signs you save a cell — all intervals take only one cell whereas nuances except for staccato all take 2 cells — but you tie up more of the precious characters.

The interval sign series, for instance, appears at first to be a rather odd, random set, containing both high and low signs. However, from the overview of signs in chapter 10, it seems as if the reason may only have been the shortage of signs — these were the only ones left. But codicologically they could have been a comparable instance to nuances: i.e. there might have been a case for using an interval-indicator plus number.

Louis Braille did not choose that option: whether for reasons of frequency, therefore efficiency, or from a concept of intervals still being notes / sounds, and therefore on first hierarchy level, deserving separate immutable signs, and in double-column like notes, may never be known. He was probably thinking particularly of piano and pipe organ music, where there is expectation of much chording, often several intervals to follow a note. Otherwise, whether chords are commoner than nuances probably depends upon which literatures are under consideration.

* * * * *
M 4. Other agreed signs being modifiable by a one-column set for small variations: e.g. a right hand side example:

staccato uses lower \( h \) preceding its note: \( :: \).

dots 456 lower-\( h \) = tenuto;
dots 46 lower-\( h \) = accent;
dot 6 lower-\( h \) = staccatissimo;
dot 5 lower-\( h \) = mezzo-staccato;
dot 56 lower-\( h \) = martellato-type marks.

\( :: \)  \( :: \)  \( :: \)  \( :: \)  \( :: \)

Thus on this one sign all the common nuances are carried: and two possibilities remain for unusual signs, which would be asterisked and explained: 4-lower-\( h \) and 45-lower \( h \). It is not that these have never been used, but only in highly specialized situations, clear of these they could be used:

dots 45 lower-\( h \) has been used for left-hand pizzicato in string music, and may be followed by a finger.
dot 4 and lower-\( h \)'s for the number of dots can = 'bebung'

In the 1993 Draft Manual, dot 4 lower-\( h \) is included as 'reversed accent sign' ("v" pointing left). One wonders about the reality of this sign, whether it is really a baby crescendo mark? in what contexts does it occur — woodwind, accordion?: and whether its frequency justifies tying up a precious sign. If there are no signs at all left to express an unusual nuance, we make our lives rigid to what already exists. It would be much better for this sign to be left free, and asterisked and described when it is needed for a reverse accent, or for anything else.

A left hand side example: The first hierarchy meaning for SH is sharp. Thus SH alone, or when preceding a note means sharp: an octave sign may intervene between it and its note, but nothing else. (Nothing may separate an octave sign from its note, as those right hand side signs are the chief modifying set for all cells, as in Codeworks no. 5, and as in the example above, nuances.) This means that SH followed by left-side-only characters can be the set for String Signs, for plucked or bowed instruments. They are in the same order as Row 6 of the Statement, but in the left: so the 6 strings of guitar are

\( :: \)  \( :: \)  \( :: \)  \( :: \)  \( :: \)  \( :: \)

Naturally only the first 4 will be needed for violins, cellos, mandolins etc., and pianists may never meet with them at all.

\* \* \* \* \*
M 5. Strict sequencing rules, in order to make clear which note or character a sign applies to.

From the examples above, it may already be clear that these must be quite stringent in braille music: indeed, sign ordering is one of the complexities of the system. Accepted print order such as accidentals preceding, prolongation dots following, is similar in braille music; and the order is logical whenever there is a logic available: e.g.

piano pedalling is in the left hand line, before the bass note (for down) and after the note of releasing (for up);

expression marks and string bowing precede:

open and close phrase occur before and after the phrase, as one would expect, surrounding it.

But some signs just have to be arbitrary; e.g. ornaments and nuances are not more logical written before than after, but in braille the rule is that they precede their note or chord: whereas tremolos follow it. Even the common turn, which is actually written after the note in print, to happen between the two notes, precedes the first note in braille.

The strict rules point above in Codeworks 7 is for a different purpose — viz. getting more mileage out of the precious signs, maximizing sign use by limiting context. Thus it distinguishes initial, medial and terminal positions. This strategy is used in braille music as well: e.g. marking of a segno

CH = natural, and of course must precede a note; so it can do duty as a terminal sign to mean 'end segno'; it would not be mistaken for a natural sign with no note following.

ING being third interval when following a note, can mean 'begin segno' since it obviously cannot be confused with an interval sign if not attached to any note.

But M 5 is a different point. Order cannot be quite as much used in music because of the lack of boundary spaces such as occur between all words — notes flow on — so that what is 'after' for one will be 'before' for the next. Put another way, technically almost all signs must be regarded as medial in music: as probably or potentially surrounded by other signs. Therefore their meaning relationship to affected pitches is fixed; they precede, or they follow, and position as well as sign must be learned.

Sign ordering is one of the context dependencies of the code which has almost defied computer translation of music into braille.

* * *

244
Sign Ordering

We are often asked why braille music could not be more like print, raised up, but spread on a stave. There are two main reasons: the first to do with effective touch perception, the second to enable us to write down our music. If signs did not stay in their lines, how would we write them? And when reading, the fingers might miss them altogether. A 'perceptual window' the size of one or two finger pads needing to cover an open area, is not tactually efficient for the collection of essential data detail. Even those who normally use two hands to read, may use only one for certain music tasks, e.g. read with one and play with the other when learning piano music. So the information-receiving 'window' is often only one finger-pad.

Orientation is crucial to shape recognition in planar tactile perception tasks in general, and braille coding in particular: degradation of both speed and accuracy was reported by Foulke when dissimilar. [Foulke 1973:40ff] So secure line structure is our most empowering arrangement. And once you have linearity, ordering naturally becomes very important.

Recently a young country student came in for a special program at our school, and announced that there were mistakes in his braille music: his teacher had marked them with pencil. Of course there are occasional mistakes, however hard we try, so no one made any contradiction. But they all turned out to be context-dependent re-uses of signs: like 46 c means the C for Common time when in a key signature, but is a tie-for-a-chord sign when it is in amongst notes. There were no mistakes, all just context.

Accustomed users almost forget how complex context really is: all is well once you know, then you never give it a thought. Because it has great haptic logic, if learned contextually, it does not often present user-problems. The country student above has had no problems since. Once one has met with and knows the meanings intended, it is an almost surprisingly fluent code.

* * *

M 6. A lower sign modifying higher signs: Since all notes include top dots, it is natural to choose lower signs as one way to modify them. Thus nuances, ornaments and graces, and print-size do this; e.g.

lower-e (EN) = Small note, printed smaller for any reason, cues, variants, but commonly, = acciaccatura, EN prefixed by dot 5 = appoggiatura;
56 EN = larger note, e.g. Chopin Ab Study, Op. 25 No.1
lower-f = trill, also variously modified
lower-d = turn

Not all lower signs modify: i j c are used as intervals 5 6 7, and lower-g as repeat beat and repeat bar: these are independent sign-units.
This is different from Codeworks 2 and 3, which is the use of height (lower signs) as a contra-distinction device, not as modifiers: codicologically this has quite different uses. There is no relation between Rows 1 and 5 in braille music, except that their tactile discriminability makes them ideal for entirely different meaning allocations. In literary code there is a degree of correspondence - BE CON- DIS- EN = lower b c d e etc., and the numbers as part of literary code often use strong correspondences.

M 7. Doubling as plurality: staccatos, intervals, slurs etc. can all be doubled, saving space, time and effort. Here is a row of staccato 6ths: the double staccato precedes, the double interval follows the first note c; staccato ends before the last of the quavers, the 6th not till after the last crotchet.

 There is also a word-text doubling convention, IN, lower i, before and after the repeated words; IN IN appears before if they are twice repeated, numeral IN before if many times. Here is "Rejoice Greatly' from Handel's Messiah: before this example, imagine the two flats, common time, and 8 bars rest which precede the vocal entry.

In the first example 'rejoice' (rjc) must be sung 3 times, thus IN IN before and IN after. The last time '-joice' is across 5 notes - so the slur, c, is doubled after the first, and restated before the last, natural e. In the second example '-joice' takes 13 notes: so the slur is doubled after 5th octave F semiquaver, and terminated after the 4 semiquavers in bar 2. Another slur occurs for 'dau-' and 'Zi-' since they are sung through two pitches.

Notice that the semiquaver grouping convention is used in the first 2 sets of 4, 2nd example, but not the third because a quaver follows the group. This is 'Words and Voice' setting out with words at the margin, melody indented 2 cells.
The one great drawback is that the ending signal of such a series is the single sign again—so if one has not read the whole thing, there will be bits missing, and it will be picked up only as a single sign, not recognizable as the end of a doubling.

Braille music usage demands thoroughness in many ways, so this is less of a problem than it would be in music where users are likely to just dip into it, which is extremely unlikely in braille. But I still consider it a code weakness, and best modified in any new codes. That is, the doubling is fine for plurality, as long as its ending is somehow distinguished from the single-event marker for the same meaning.

* * *

M 8. Principle of omission: this is really an extreme, and best not used in more than one context in any new codes. It is used in PASCO in the same manner as in Braille Music Code, to indicate line-placements; these have no deep dot in the sign, whereas space-placements will have a deep dot in the sign.

The place where it is well-known is in Octave Sign Rules, where 4ths and 5ths are to be understood and distinguished by presence or absence of a new octave sign. If they jump into another octave there will be a sign, if not, there will not. So their presence or absence carries equal weight in the establishment of melodic direction.

For practical reasons many things are actually routinely omitted in braille, which sighted users would expect to have, whether they use them or not. Hairpin crescendo and diminuendo signs may not have their ends marked if the musical meaning seems obvious enough. Extras like chord symbols in piano music, or sol-fa syllables in vocal music are often completely omitted in a braille copy. Key and time is typically stated once at the beginning of the piece, and not again. Doublings require the user to supply the fill-in information between its beginning and ending statements.

This is not to do with any principle of omission, only with practical considerations. Some things are omitted because they are more trouble to show than their significance warrants.

* * *

M 9. Pictorial patterns:

These are not terribly significant, but braille music does contain more of them than literary braille. See the balancing signs for text and music, 56 23 versus 6 3, pictured in their context in M-9, Chapter 12. The following pictures are:

(line 1) old bar-line 1, dots 123;
slur & double slur; open and close phrase 'phrasing slur';
(line 2) full bar in-accord, bar section and part-bar in-accord sign;
(line 3) asterisk in amongst music, then as it appears in
the left for literary explanation. According to the
1993 manual, AR may now be used in both situations —
regrettable from a coding logic point of view;
full cell to give height orientation,
bracket above the stave, bracket below the stave.

Is the old sign 123 for barline a 'line for a line'? Slightly:
when one gets into a depth of four dots, a whole column is very
strongly perceived as a line, but in three it is perhaps only
suggestive. It does feel like a clear divider.

Part bar in-accord 5 2 is very easy to locate tactually, for
checking back in complex polyphony. One could wish it were the
standard sign always, rather than the more cluttered and
therefore less easily found GH AR. It was the only in-accord
sign in Bar By Bar format: 46 k, the 'stop sign' only appearing
if part of the bar was not divided, it separated off the non-
divided part.

Asterisk sign, EN IN has a sort of shape that acts as a warning;
that is somehow subliminally a good sign. AR must precede it in
amongst music code of course, as EN and IN both have other music-
code meanings. It may or may not take AR before its explanation
line, which can be more music or literary text.

The above- and below-stave brackets are new signs in the 1993
Draft Manual, also 5 3, 6 2 for vertical brackets surrounding a
special feature. These will all be very useful in didactic
works, and may save a deal of troublesome specific coding. The
vertical brackets are somewhat like a tactile open asterisk, so
will be almost like an example of this same point M 9. When an
alerting line above or below the stave has an ending that is
unclear or insignificant, the closing sign is abbreviated: these
are conceptually pictorial. The first pair is the vertical
bracket: the next two pairs are aligned. Full cells are here
substituting for meaningful signs.
M 10 - 14. Use of space:

M-10 Spatial Conventions to express meaning:

Conventions are always two-edged swords - really helpful if you know them, and really troublesome to work out if you don't. 'Words and Voice' is a case in point. We try to make sure everyone knows it, because it is the most practical way of presenting vocal parts for quick learning: but nothing other than the setting-out - the use of space - tells you what is words in literary code, and what is melody in music code. Words are placed against the left margin, whereas melody is indented two cells. See 'Rejoice Greatly' in M 7 above.

No such problem exists in print, because music notes have their distinct symbology, and do not have to re-use letter-shapes. Also the size of both symbologies can be varied, and information matched up vertically.

Similarly for Bar Over Bar: users must get used to the conventions of what to expect, so it is not too difficult to work out where the actual music code begins. From the reader's point of view there is no knowing what, or how much or how little, will be written at the top of a music copy. Many of the words in titles, composer's names for example, are not at first familiar, so as to be recognized linguistically, especially by younger users. It 'could be anything' until one expects appropriately, and start working it out according to the code it really is written in. Minim D minim C also spell 'on', consecutive signs often make sense in more than one code.

Knowing to hunt for the bar numbers down the left, then going up a line from the number nought or 1, where the key and time should also be found, gives a sense of stability, even if the title words do not at first make any sense, or if one is searching in the middle of a page for the beginning of a piece. The numbers actually look just like letters, there is no numeral sign preceding them, another convention: nought appears if there is an anacrusis, 1 is used for the first complete bar.

Louis Braille used quite different conventions, because he had to write down all his music by hand from dictation, and the means of writing was a hand-frame which precluded 'seeing what you were doing' as you went. See his own description of the 'planchette' handframe in the Procédé page 263 of Appendix 2. For piano music he used 'm.d.' followed by a paragraph of right hand music, some convenient number of bars, then 'm.g.' for the same number of left hand bars: another m.d. followed by its m.g. and so on. This is still used for some publications, especially organ music, and called 'Continental format'. If the purpose of the copy is to memorize a work, it is still the best method of all.

But if you are teaching, and do not know the work from memory yourself, and would like to know what the left hand does at the same moment as the right hand, clearly this information is not available from such a setting-out. See also M-13.

249
Vertical Score convention uses the bass note and all the rest of the parts in interval-signs reading upwards. For homophonic music such as hymn-tunes, with predictable part/hand arrangement, bass and tenor for left hand, alto and soprano for right, this is very convenient. But if you need to quickly remind yourself of the tune only, or a single part only, it is not particularly convenient. For that, open score, or one's own part would be better.

Short Form Scoring was used by those musicians who made their living arranging, and playing for receptions and dances during the 1930's, '40's and '50's. Being somewhat informal, practice doubtless differed between countries. In the local dialect that I know, by courtesy of eminent tuner and teacher Dick Sutcliffe, it consisted of the melody in regular braille music on one side of the half-size sheet, followed by 'Chords' i.e. the chord information as it usually appears in print copies above the main staves, on the other side of the sheet in this 'short' form. This appeared as: the braille music note-name giving length, preceded by an accidental if applicable, followed by a dot if applicable: this was followed by indications such as 'mIN', aug, dim, numeral 7 sharp 5, maj 7 etc. as needed. Codicologically it is a slightly odd mix of notes, letters and numbers, with mixed direction of applicability: but ingenious, and perfectly user-friendly. Again, it had to be written on a hand-frame.

Each kind of setting-out convention has its own good use, and contrary situations where it is less useful and convenient. The music code is bound closely to the everyday needs of practising blind musicians, and most of the setting out and format changes have occurred in response to social changes in their livelihood, or different availability of machinery, in particular, the advent of upward writers.

* * *

M-11 Strategies used instead of stave verticality:

Most of these demand intellectual effort and memory to use — one works it out. For example:

Octave signs preceding notes to indicate pitch register; to be followed by intellectual assumptions about the register of subsequent pitches, according to the rules. So the octave sign system actually projects quite far forwards. This is probably a strategy in itself — not listed — it is very efficient.

Interval signs directly following a note for the expression of chords.

In-accord to express concurrent rhythms & pitches within a bar, which are not able to be expressed as chords or moving parts.

'Words and Voice' setting-out: again, sequential presentation rather than simultaneity being expressed, but in
short spurts which are convenient to put the conceptual simultaneity back. Some other examples are given in the List.

'Bar by Bar' setting out for piano and organ has the verticality somewhat taken care of — but the constant interruption of musical sense by the barlines makes for its own memorizing difficulties.

* * *

Looking at this from the other side

Where verticality is attempted, as in Bar Over Bar piano music, the punishment is the enormously inefficient use of space. For instance if one hand only takes 2 cells and the other 20, 18 are wasted. Also the need to use right- and left-hand prefixes for every parallel takes between 4 and 6 cells out of each 40-cell line before you start writing any actual music: quite a serious on-going wastage. However, users need the security of having the prefixes there: since there are not enough other reliable cues to make clear which part one's hand is on.

There is no extra spacing gap between the systems as in print, all braille lines are equidistant. Features like interval direction are determined by the operative hand-sign, so one would deduce quite different music if the wrong hand was imagined. And in some systems there is always an octave sign at bar beginnings, but in others not: and it is random when an octave sign will next occur, depending on the vagaries of a melody, so there may be no helps of the pitch probability kind to suggest which hand is being read.

* * *

M-12. Compensation for other 'no-frame' aspects of braille compared with a print score:

Extra slurs may be needed in the music line to show the braille user where words come — whereas the new syllables may simply be aligned with their note in print, no slurs provided.

'Manufactured rests', dot 5 preceding regular rests, may need inserting, where piano music etc. displays time pictorially.

Tracker dots may be needed to guide the finger across gaps produced by vertical alignment of bar-beginnings, used in open score and Bar Over Bar.

Quoting bar numbers far more extensively is one way to keep a track on the music conceptually.

Beaming of smaller values needs to be marked, if 'irregular' to convey a musical message. Braille music does not contain beaming information, only value — which is deduced from context. If the notes are grouped as expected, all is well, the same assumptions
are being made with or without the beams. Irregularity is often shown with GH 2, but this sign is really too non-specific, a general sort of grouping break.

One day the issue of beaming will have to be more carefully addressed, as in much 18th century music especially, the beaming is meaning-carrying. Scarlatti often has beamings of 4 plus 2 semiquavers in particular bars of 3/8 time, and one automatically articulates this to suit. In Mozart, if four semiquavers are beamed two and two, we think of them, and consequently play them, subtly differently from how we would if they were beamed in a four. In Balkan and Slavic rhythms of 5 and 7, beams declare whether 3 + 2 or 2 + 3 is desired by the composer. This researcher has begun trialling CH b as 'begin beam', with perhaps CH 2 as matching sign for 'end beam' in the less common case of that being the important one to mark. CH b can be followed by the number in the lower of however many notes are beamed, then dot 3: in that case there would normally be no need for an end of beam signal. This is fairly neat, and accurate in a way that using GH 2 is not.

* * *

Concurrency:

Sometimes a format makes no attempt to display concurrency, therefore depending entirely on the intellect of the user to make all the right matchings: For instance:

Section by Section, 'Continental Format', 'Short Form Scoring' etc. spread parts into paragraphs as needed, so it is usually only efficient to locate them by skipping to indents for the first, then reading the whole thing.

In-accord just proceeds horizontally; for the reader there is no knowing where the part will end, to locate its matching notes, it may be only a few cells away, or a whole line in a complex polyphonic bar; but at least it is only one bar.

Words & Voice selects chunks contingently to circumstances; usually a line of poetry for a simple song where most notes take the next syllable; but maybe as few as one syllable for a very melismatic part.

LUTAB does not match rhythm if using the separate rhythm-line way, but does if inserting the rhythmic value into the tablature just before the fret-columns it applies to.

Sometimes there is a partial attempt: instances include

chamber scores where the same number of bars are given for each part, but they are not each aligned, score chunks;
Bar Over Bar, orchestral scores, and FIGBY align the first symbol — but obviously after that there is no guaranteed matching.

Of course single-line music does not need to be matched up to anything, and is therefore very much easier to read.

* * *

M-13. Bridging signs: such as the various long slur between staves etc.: 456 c is one such.

Ties may be restated at the beginning of a new line, to be user-friendly.

Bar hyphens may be needed at the end of a braille line, as not as much will usually fit as on a print-line, if there are expression words and long bars. The contrary is sometimes true, if only notes, braille may fit into a smaller space than print. As mentioned elsewhere, braille cells are a fixed size, and cannot be squashed up to fit more on to a line. The incomplete measure of its continuing will have a dot 3 after the bar number, if the bar number is quoted. Sometimes the overflow is merely further indented, not numbered.

Setting up again by plain description, so the carry-over is properly identified — sometimes it is more appropriate to write something out in plain literary braille than have coded signs.

In FIGBY code it was necessary to have both a joining and a separating sign, to make certain situations absolutely clear. Then one is not totally dependent on intellect or space.

* * *

M-14. Integrity of amount: co-operating with intelligence and purpose in the preparation of transcripts.

In order to make braille work, judgements have to be made by transcribers about the size of passages to be sequenced etc., how many words to give, for easy sense: where to divide things, and how to present them in the most flowing, unobstructive manner. Choice of format is the first part of this, but within formats there is still a deal of choosing to do. A lot depends on the use to which the copy will be put, which strategies are the most suitable.

For example, if 8 bars of something like a Mozart Minuet and Trio movement can be fitted onto one braille line in an open score, a student is immensely helped, both to read fast enough to keep up with the performance as it is played in class, and to understand the form easily.

If it is not fitted into one braille line, relocating time will make it virtually impossible for the reader to keep up: to stay on the theme, or to find the subsequent sections quickly enough
as they occur. If all detail is in, it will almost certainly not fit: but with a few slurs or staccatos less, it may. For this kind of purpose, it is worth that sacrifice in detail.

Obviously if the student were playing the first violin part, it would be quite unsuitable to leave out the slurs and staccatos from their braille part.

A lot of trouble goes into presentation of visual materials, in order to facilitate their use: so it is not surprising that the same care is needed for tactile display as well, but using the different criteria which facilitate touch. For this reason, braille produced through computer translation is often horrible to read, and completely inadequate for presentation of special codes such as music. At the moment, only the discerning human intelligence can really present it well. It is always best to have good braille readers in the production team, to assure quality control.

This completes the ways in which six-dot braille has been coded, as far as I can find them in the two codes examined. It is possible that there may be others buried in the maths and science codes, but the foregoing would certainly account for almost all possible strategies.
Chapter 12

CODING STRATEGIES 2

ADD BRAILLE MUSIC CODE

The first 22 points, 'Codeworks' would be sufficient to describe the way literary braille is coded: the following must be added to account for Braille Music Code. They are briefly stated here for quick reference, as M 1 - M 14, following on their fuller discussion in Chapter 11.

M-1. Signs modified by a left hand side column following: e.g. fingering, stem signs, dot after a note

Here each double-column sign is a note, and each is followed by a fingering mark. The final note is dotted; and the first is followed by a stem sign, making it a crotchet as well as the written value of semiquaver. The special convention for semiquavers is used; as described in Chapter 10, 1 (b).

M-2. Using Sign sets which are double-column so as to be modifiable on either side by single column, right hand side before, left hand side after, or both: i.e. the cluster effect of print notation:

 e.g. note with fingering and preceding octave sign;
      trill and turn signs
      fermata/double-bar
      bowing signs

2-column signs include: notes, intervals, rests, accidentals, staccato, ornaments. Picture examples:

(line 1) Third octave c, finger 5; Fermata, fermata on a barline;
(line 2) Turn, inverted turn;
Trill, (lower) mordent;
(line 3) Down-bow, down-bow at the frog

255
M-3. An agreed set, the notes, being modifiable by all else in the whole character-set: other than words - which are part of a hierarchy above any music signs, and follow the code-changer sign AR. Notes and rests have no other meanings in braille music.

M-4. Other agreed signs being modified by any of the 7 characters of a one-column set for small variations.

Signs which precede their note usually take modifiers before them, therefore in the right hand side of the preceding cell. Signs which follow, take them afterwards, therefore in the left hand side of the next cell.

e.g. nuances, ornaments, tremolo

M-5. Strict sequencing rules - what must be next to what - to retain a meaning: especially since with many signs it is arbitrary whether they precede or follow. In print they would be conveniently near the note-head in such a way as to make clear where they apply. Or they may be an added part of the note as with tremolos and alternations, where the stem takes the slashes corresponding to smaller values intended to be heard, or long values take short value beams. It is not possible to add-on in braille. In the examples below:

If C# is both staccato and accented, and for other reasons needs its fifth octave mark, this must be the order, staccato preceding, as 2 lower h's together would mean doubling of the staccato.

Tremolo follows, so the first two crotchetts are single, last two broken into semiquavers.

This is somewhat similar to Codeworks 7; but applying more to character-sets than to single characters.

M-6. Lower sign modifying the following higher signs:

e.g. small note (i.e. size of printing)

These quavers C and D written small, precede E dotted minim.

256
M-7. Principle of doubling signs, as an expression of plurality, as many languages do. The rule is to double the sign at its first natural occurrence, then use a single sign to stop the series. This will occur at its normal place in relation to the last affected note or sign, preceding or following, and in its proper place if in a series of other modifying signs.

Doubling can be a real help to fast learning, but can also be a nuisance that there is nothing to distinguish a single occurrence sign from a series ending sign. In any new codes, the doubling idea should be retained, but a distinction should be made for the closing sign. Here is the beginning of opening theme of the slow movement of Haydn's 'Surprise' symphony: doubled staccato.

```
...APRA HPAR HUGS HUGS HUGS WR
```

* * *

M-8. Principle of omission — it means something definite that it isn't there — in a defined binary system, of course:

e.g. melodic progression of 4ths and 5ths in the octave sign rules; no sign has the same 'weight of content' as the sign, only they convey different directional information. e.g.

'Old MacDonald' in F and C: F to the C below, a fourth, same octave, so no sign needed: C to G below, a fourth, and jumps into the lower octave, so needs an octave sign. Otherwise the reader would go to the G a fifth above.

```
...ALGK ADK
```

'Pease Porridge Hot' in F and D: F to C above it, a fifth, into a new octave, so sign needed. But D to A above it, a fifth, and same octave, so the no-sign specifically identifies that A as the one above — in the same octave.

```
...LIF
```

M-9. Picture-pattern signs & relationships:
e.g. letter 1 = barline in some formats:
part in-accord 5 2 in relation to 'stop-sign' 46 13;
words prefix 56 23 in relation to music prefix 6 3;
Here is a bar of 'Eine Lindenbaum' illustrating words and music prefix, and partial in-accord patterns.

Mirror or balancing sets:
  e.g. open & close phrase 56 12 ... 45 23;
  full bar in-accord GH AR:
  music asterisk AR EN IN 3

Here the same music is used as the above example, this time using phrase marks and full bar in-accord.

* * *

M 10-14 Use of Space: Expectation:

M-10. Spatial conventions: different meaning of spaces:

For selection of code-type – e.g. whether words or notes, in 'Words & Voice'

Spatial arrangement with bar and hand-sign pattern down the left denoting Bar Over Bar: the placing of instructions, key and time etc. just above the first line that carries a bar number, which is where music code begins. One space will mean barline in the busier part, extra spaces in the other are non-significant, except as they provide new-bar alignment.

Matching information in open scores, less possible in braille – i.e. only the first cell can be matched.

m.d. and m.g. 'Continental format' look for the other hand in the next (or previous) paragraph: space means barline

* * *

M-11. Compensations for lack of verticality:
These include:
  Octave sign strategies
  Interval signs for chord expression;
  In-accord
  Words and Voice
  Bar by Bar

* * *
M-12. Compensation for no-frame of print score:

Extra slurs may be needed to show where words come — where new syllables may simply be aligned with their note in print;
Manufactured rests, where piano music displays time pictorially;
Beaming & breaks may need to be marked, if 'irregular' to convey a musical message
Space-fillers: tracker dots to guide the finger to the next information unit, (otherwise it could be missed altogether), and for assistance with matching up parts.
Quoting bar numbers very often

* * *

M-13. Bridging signs: various long slur between staves etc.
Special joining and separating signs in FIGBY code.

M-14. Integrity of amount: meaningful musical section on one braille line in scores etc. to make the presentation spatially intelligible.

= = = = = = =
Appendix 1

STAFF NOTATION OF THE BRAILLE MUSIC EXAMPLES

Chapter 1 p. 53

The Ash Grove

Austria

Chapter 4. LUTAB, point 516, page 124: last two bars.
Jazz bass

Bach 'Bist du bei mir' bars 1-2 & bar 34

Fingering: p. 229
Nobody Knows

Nobody knows the trouble I've seen, Nobody knows but Jesus.

Nobody knows the trouble I've seen, Glory hallelujah.

Bach Minuet in G

Haydn Trio p.232

9.

TRIO in g
Chapter 11: M7 p.246

Chapter 12:

p.255

p.255

p.256

p.256

p.257

M8 p.257

Old McDonald

M8 Pease Porridge Hot

p.250

M9 Eine Lindenbaum
PROCEDE
pour écrire les Paroles, la Musique et le Main-chant au moyen de points, à l'usage des aveugles et dissaisi pour eux, à Paris.
L. BRAIVE,
RÉPÉTITEUR À L'INSTITUTION ROYAL DE JEUNES AVEUGLES.
PARIS,
1829.
TRANSLATION OF
LOUIS BRAILLE'S 1829 "PROCÉDE"

PROCÉDE
pour
écrire les Paroles,
la Musique
et le Plain-chant
au moyen de points,
A L'USAGE DES AVEUGLES
ET DISPOSE POUR EUX
PAR
L. BRAILLE,
Répétiteur à l'Institution Royale
des Jeunes Aveugles.

PARIS
1829.

Translator's note:
Heartfelt thanks to Perkins School and Kenneth Stuckey for providing the photocopy of this work: it was a thrill to study it! Thanks also to Rebecca Maxwell and Wendy Cobcroft for translation help. Some signs it was not possible to see well enough to identify - if they can be identified from the original, I will be delighted to put them in.

Square brackets are used when Louis Braille's word is given; curly ones for a translator's addition; regular brackets are as in his text.
"PROCEDURE/METHOD FOR WRITING WORDS, MUSIC, AND PLAIN-CHANT BY MEANS OF DOTS, for the use of the blind, and set out for them by L. Braille, Répétiteur at the Royal Institution for Young Blind. Paris. 1829."

Foreword / Introduction

The ease with which one can learn and put into practice the ingenious method of writing by means of dots, invented by Mr. Barbier, especially for the blind, would have been a more than sufficient reason for us to dispense with publishing another method, if we had not felt the need of a system of writing in which the signs took up less space than those of that inventor, while still being numerous enough to represent all the characters used in ordinary writing, and being able to be applied to the writing of music and plain-chant.

In the Method explained in this work, we have tried to avoid the shortcomings indicated and to obtain the required advantages: two of our signs take up exactly the space of one of Mr. Barbier's: we have more signs than are necessary, to represent the letters (both) simple and accented, punctuation, numbers, and algebraic signs, and finally we have applied this method to the writing of music and plain-chant.

One will find at the end of this work a type [espèce] of stenographic system in which twenty signs suffice to write all the words in the French language.

Three of these signs take up exactly the same space as one of Mr. Barbier's.

If we have pointed out the advantages of our method over that of this inventor, we must say in fairness to him, that it is to his method that we owe the first idea for our own.
This method is based on the knowledge of ten signs which result from the combination of two columns of dots, each composed of one or of two dots set out parallel to each other, and placed vertically on the paper.

One means by the first column of dots that of the two columns which is placed on the left of the other, and by second column, that which is placed on the right of the first.

One calls the upper part [partie supérieure] of a column or of a sign the part of that column or sign the furthest from the writer or reader, and one calls the lower [inférieure] part that which is nearest {to the writer or reader}.

Each sign is essentially composed of two columns of dots, or of the space for the columns. If in the explanation that we are going to give of each sign, we speak sometimes of only one column or one part of a column, that is because that column or part of a column of which no mention is made, must remain empty.

Here is the formation / structure of the ten fundamental signs (*)

* See another explanation of the ten fundamental signs at the end of this work.

The first sign (•) is represented by a dot placed in the upper part of the first column, the second, (••) by a dot in each part of the first column; the third, (•••) by a dot in the higher position of each column; the fourth, (••••) by one dot in the higher part of the first column and one dot in each part of the second column; the fifth (•••••) by a dot in the higher part of the first column and another dot in the lower position in the second column; the sixth, (••••••) by a dot in each position in the first column and another dot in the higher position in the second column; the seventh (•••••••) by a dot in each position of the first and second column; the eighth (••••••••)
by a dot in each part of the first column and another dot in
the lower position in the second column; the ninth (••) by
a dot in the lower position in the first column and another dot
in the higher position in the second column; the tenth (•••) by
a dot in the lower position of the first column, and another
dot in each position in the second column. See the picture
below.

Footnote

1 2 3 4 5 6 7 8 9 10

By combining these signs, for which we have just given the
picture, with one dot, two dots, or a horizontal line, [un trait
horizontal] we obtain nine rows [neuf séries] of signs each
composed of the ten fundamental signs to each of which is added
one of the three things mentioned.

Here is the explanation of the nine rows.

The first row is composed of the ten fundamental signs; the
second is marked by a dot placed below the lower-dot position of
the first column of each sign; the third by a dot placed below
the lower position of each column; the fourth by a dot placed
below the lower position in the second column. {Since} the signs
of the fifth row each require particular explanation, we will
explain that row after the last four. The sixth row is marked
by a horizontal stroke placed below the lower position of each
sign; the seventh by a stroke placed above the higher position
of each sign. One will notice that at the first and third
fundamental sign which must come in to make up the first and
third sign of this series / row, and the following one, it is
necessary to substitute for the first a sign formed of a dot in
the lower {lowest} position of the first column, and for the
third a sign formed of the lower position dots in each column.
The eighth row is marked by the horizontal stroke between the two
positions of each sign; the ninth by a horizontal stroke placed
below each sign of the fifth row.

The signs of the fifth series rest on a different principle from
all the remainder of the method. Here is the formation of each
of the signs.

The first sign is represented by a stroke placed in the higher
position of each sign; {sic - according to the diagram on p. 16
it means across both columns in the one sign} the second by a
stroke in the higher part of the sign, and another stroke in the
lower position in the same sign; the third by a stroke in the
higher position of the sign and a dot in the lower position in
the first column; the fourth by a stroke in the higher position
of the sign and a dot in the lower position of each column; the
fifth with a stroke in the higher position of the sign and a dot in the lower position of the second column; the sixth by a dot in the higher position of the first column and a stroke in the lower position of the sign; the seventh by a dot in the higher position of each column and a stroke in the lower position in the sign; the eighth by a dot in the higher position in the second column and a stroke in the lower position of the sign; the ninth by a dot in the higher position of the second column; the tenth by a dot in each position of the second column. (*)

Footnote

(* ) See the other explanation {footnote continued on bottom of next page:}
of the signs in the fifth row at the end of the work.

Here is the explanation of six supplementary signs: the first of these signs is marked by a dot below the first column; the second by a dot below each column; the third by a dot in each position {i.e. the top two} of the second column and by a dot below the first column; the fourth by a dot placed in each position of the second column and another dot below in each column; the fifth by a stroke in the upper part of the sign and a dot below the second column; the sixth by a stroke in the higher part of the sign and a dot in each position of the second column.

The stroke which comes into the composition of the signs in the last five rows could present some difficulties for those who will study this method, {so} we are going to indicate another way of showing the signs in these rows.

The fourth supplementary sign {our Numeral Sign} has the property / characteristic of raising by four stages / degrees the row in which the sign it precedes is to be found; thus if the fourth supplementary sign occurs in front of the second {sign} of the third row, the second sign of this third row must no longer be considered like this because it must then be {regarded as} the second sign of the seventh row.

We are going to present the picture of the signs and the letters, in such a way that the name of each letter is below the sign which must represent it.

See the attached picture / table.
picture / table
of the signs of the nine rows
with the letters, the
numbers, the signs of
punctuation and the signs
algebraic which
correspond to them.

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{These next few rows are far too large in the only way I can work out to represent them.}
### Fifth Row

--- --- --- --- --- * * * * * * * * *
--- * * * * * * --- --- --- --- (*)

1 2 3 4 5 6 7 8 9 0

(* These look lower in the picture, but are described in the text as higher position second column.)

### Sixth Row

* * * * * * * * * * * * * * * * * * *
--- --- --- --- --- --- --- --- --- ---
? ; : . ? ! } " l {?} "

(The last three signs in the meaning-row are not certain ... not quite clear enough on the copy.)

### Continuation of the preceding table

#### Seventh Row

--- --- --- --- --- --- --- --- --- ---
* * * * * * * * * * * * * * * * * * *
+ - /= / = < > x |X| |v|

#### Eighth Row

--- --- --- --- --- --- --- --- --- ---
* * * * * * * * * * * * * * * * * * *
: 1 : - : 1 {?}

#### Ninth Row

--- --- --- --- --- --- --- --- --- ---
--- --- --- --- --- --- --- --- --- ---
We have also applied this method to the writing of music, by substituting for the letters and characters employed in the system used at the Institution, the signs which correspond to them in the first six rows of the preceding table.

We have only changed the manner of marking the values of notes, and accidentals.

The values, namely: the semibreve, the minim, the crotchet, the quaver, the semiquaver, the demi-semiquaver and the hemi-demi-semiquaver [la Ronde, la Blanche, la Noire, la Croche, la Double, la Triple, la Quadruple-croche], are represented by the first seven signs of the seventh row, that is to say, that the first sign in this series indicates the semibreve, the second the minim, and so on.

The Sharp is represented by the eighth sign in the seventh row; the Flat by the ninth sign in this row, the Natural by the tenth sign.

We have further simplified this method for the writing of music of little complexity, such as plain-chant.

The notes are represented by the ten signs of the first row of the preceding table, and by the ninth and tenth signs of the fifth row.

The values are marked in this way: ( * )

Footnote

( * ) Although in plain-chant the values do not have the same names as in ordinary music, and that in these two things they do not correspond exactly, we are nevertheless served by the terms used in music for these values; the values of plain-chant are: the Double square, which corresponds to the semibreve, the Square / breve to the minim

{ footnote cont. bottom p. 20 }

the Long, to the dotted minim, or to the dotted crotchet; the Breve without stem to the crotchet, and the Breve with stem to the quaver.

the semibreve is marked by a stroke placed above the sign which represents the note; the dotted minim by a stroke between the two parts of sign, (for the notes affected by one of these values, one makes the indicated substitution for the first and
third signs of the seventh and the eighth row; and in place of
the eleventh sign, one puts a dot {which is} placed in the lower
position of the second column.) The minim is represented by the
blank space found below the sign; the dotted minim, by a stroke
below the sign; the crotchet by a dot below in the first column;
the dotted crotchet by a dot below in each column; the quaver
by a dot below in the second column.

The Clefs in plain-chant are marked in the following way: the
Ut C clef by the fifth sign of the fifth row; the Fa F clef by
the sixth sign of that row; the Sol G clef by the seventh; the
La A clef {?} by the eighth of the same row.

The number of sharps or flats that belong to the clef is marked
by one of the signs of the fifth row followed by one of the
letters d or b depending on whether one wishes to indicate
sharps or flats.

One indicates the alteration of a note in the following manner:
the note to be accidentalled sharp is preceded by a sign formed
by a dot placed in the lower position of the second of the two
columns which form each sign; the note {to be} flattened is
preceded by a sign formed by a dot placed in the lower position
of each one of the two columns which form a sign; and the
naturalled note is preceded by a sign formed by a stroke placed
in the lower part of the sign.

The repeat double-bar {barré de reprise} is marked by the first
supplementary sign; and the star {étoile} {segno ?} by the
second supplementary sign.

One sees from all that we have said, that the same sign can
represent a letter, a character in music, or a note of
plain-chant; to avoid confusion which could result from triple
use of each sign one will precede words by the first sign of the
ninth row; music by the second sign, and plain-chant by the
third sign of the same row. It will be good also to put at the
beginning of each page the sign for those of the three things
which will be found there.

To read and to write according to the method we have just
indicated are two things which require two quite distinct
practices; because in marking the dots on the paper they
reappear on the opposite side, and if for example one writes two
signs such that one is at the right of the other, it is necessary
to reverse {turn over} the paper to see {sic !} what has been
written; the sign which in writing was at the right of the other
will then be found to the left, and the first column of each sign
which was found at the left of the second, will be found to the
right of it.

To read from left to right it will be necessary therefore to
write from right to left, and for the first column of each sign
to be found on the left of the second column in reading, it will
be necessary to place it to the right of it in writing.
The grooved / grid-like frame / board [planchette] with grille {?} that we use for writing differs from that of Mr. Barbier only in that his has six concave lines on the surface whereas ours has only three.

One places the hand-frame [planchette] in a horizontal direction in relation to the writer; one next introduces the {sheet of} paper between the planchette and the grille which will cover it again in such a way that if the paper exceeds the width [largeur] of the planchette, the excess is on the side of the writer.

The inside of each rectangle of the grille can encompass an entire sign; the first column of the sign is marked by making the stylus [stylet] slide against the right side of the rectangle, and the second is marked by sliding the stylus against the left side of the same rectangle. The first sign is made in the rectangle which is the furthest to {most on} the right of the frame, the second sign is made in the rectangle which is on the left of the first; the third, which is in the rectangle to the left of the second and so forth.

When the stylus has thus gone {passed} through all the rectangles of the grille, the first line is completed; the next thing one does is to slide the paper toward the upper part of the frame so that the line written is no longer between the frame and the grille, and one writes the second line like the first; and it is the same for all the others.

ANOTHER EXPLANATION
OF THE TEN
FUNDAMENTAL SIGNS

If we represent by <a> the dot in the higher part of the first column; by <b> the lower dot in the same column; by <c> the higher dot in the second column; and by <d> the lower dot in the same column: each sign will be formed as in the following table.

\[
\begin{array}{cccccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
a & ab & ac & acd & ad & abc & abcd & abd & bc & bcd \\
\end{array}
\] (over)
ANOTHER EXPLANATION
OF THE SIGNS IN THE
FIFTH ROW

If we represent each of the dots which form a sign by one of the
letters a, b, c, d, and if we indicate by f the stroke at the
higher part of the sign, and by g the stroke at the lower part
of the sign: each sign of the fifth row will be formed according
to the following table.

```
1  2  3  4  5  6  7  8  9  10
f  fg  fb  fbd fd  ag  acg cg  c  cd
```

STENOGRAPHIC
SYSTEM

The sounds and the articulations {vowels and consonants} which
form the words of the French language can be represented by only
twenty signs, if one uses the same character to indicate sounds
{vowels} which are almost the same, such as u and ou and
articulations {consonants} which are little different like b and
p.

The letters which represent these vowels and consonants are
marked by the signs of the first and the fifth row.

See the following table.

TABLE

The signs of the first and fifth row with the letters to which
they correspond in our system of stenography:

(Row 1)
```
a  e'  i  o  u  an  in  on  en  oi
   e'  ou  un
```

(Row 5)
```
b  d  g  j  v  z  l  m  n  r
   p  t  q  ch  f  s  gn
```

==================================

277
Appendix 3

LONG CELLS

Extra Coding Strategies Available

X8-1 Divergent 4's (as well as convergent)
X8-2 3 convergent 4's - i.e. 3 distinctions - this has been found especially useful for ligatures
X8-3 4 divergent c's ... i.e. 4 single-row heights
X8-4 4's in the lower half, with upper projection - GH to long GH etc. v to long v ...
X8-5 15 patterns per single column
X8-6 6 with convergent 4:

This could be used to enhance present codes, for things like punctuation, to separate it from ordinary letters by deep dots: 12 of the 16 possibilities of 4 would work, in the lowest cell-position, i.e. avoiding only patterns of the 'convergent row' which already has meanings in the 6.

Apparent tactility of 8:

Signs with a long line are easy: also line with a with a 'twitch' (i.e. one dot transposed to the opposite column, like long GH or long s); or a square corner at top or bottom are all very clear. The middle two dots transposed are also easy, 1567 or 2348.

Signs that double-back or twist more than once are less easy, at least when unfamiliar.

Extra coding available with 10-dot

Ten is very much more pictorial to the fingers:

X10-1 4 convergent 4's (= 4 distinctions of 15 characters)
X10-2 31 single column possibilities
X10-3 divergent 6 with 4 - may be useful for leaving any code as it is now, but with a 'separate' sub-script in the bottom, with 15 positive characters available.

See the last 3 pages of this Appendix for Montpellier ms. in 8.
THE EXTENDED LAYOUT
FOR 8 & 10 DOTS:

Following Louis Braille's method: An 8-dot system uses up
rows 8-14 by adding dot 7 to the original 7 rows
rows 15-21 by adding dots 7 & 8
rows 22-28 by adding dot 8. See over.

Think of the ten as Louis Braille's 6 plus a 'lower square':
this square form includes Row 1 plus dot 4, 45, & 2, 25, 5,
whose homes are in Row 6 by virtue of their right-sidedness, or
Row 5 by virtue of their 'lower sign' character. This makes up
the 15 signs out of the theoretical 16 where one is a space.

Thus the extended Row series for ten dots, 2 columns, each 5
deep, would be as below. I recommend this arrangement.

<table>
<thead>
<tr>
<th>Rows</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-35</td>
<td>original 7 rows plus dot 9</td>
</tr>
<tr>
<td>36-42</td>
<td>originals plus dots 9 10</td>
</tr>
<tr>
<td>43-49</td>
<td>originals plus dot 10</td>
</tr>
<tr>
<td>50-56</td>
<td>rows 8-14 plus dot 9 (thus with 7)</td>
</tr>
<tr>
<td>57-63</td>
<td>rows 8-14 plus dots 9 10</td>
</tr>
<tr>
<td>64-70</td>
<td>rows 8-14 plus dot 10</td>
</tr>
<tr>
<td>71-77</td>
<td>rows 15-21 plus dot 9 (thus with 7S)</td>
</tr>
<tr>
<td>78-84</td>
<td>rows 15-21 plus dot 10</td>
</tr>
<tr>
<td>85-91</td>
<td>rows 15-21 plus dot 10</td>
</tr>
<tr>
<td>92-98</td>
<td>rows 22-28 plus dot 9 (thus with 8)</td>
</tr>
<tr>
<td>99-105</td>
<td>rows 22-28 plus dot 9</td>
</tr>
<tr>
<td>106-112</td>
<td>rows 22-28 plus dot 10</td>
</tr>
</tbody>
</table>

Then there will be the 15 characters of the 'lowest square'
without the original 63: shall we call this 'Row 113'?

This will comprise: row 1 in the lowest, as dots 7, 8, 9, 10,
plus dots 8, 8 10, and dots 9, 9 10, 10.

From braille thinking:

- b h e give the resulting formations from dot 7 additions
- f g d give the dot 7-8 additions
- i j 45 give the dot 8 additions.

That is, 16 complete sets of the original 63 positive patterns:
this yields 1008 characters (16 x 63). Add to this the 15
lowest-only, = 1023 - thus matching the theoretical possibility
1024 minus the space. (QED!)

Clearly these are more theoretical than practical - not totally
memorable; but at least are constructed according to Louis
Braille's way, so can be reliably reconstructed in the head at
need. Context largely defines tactility quotient.

280
Rows 8 to 14: Adding Dot 7

8

9

10

11

12

13

14
Rows 15 to 21: Adding Dots 7 and 8
Rows 29 to 35: Adding Dot 9
Rows 36 to 42: Adding Dots 9 and 10
Rows 43 to 49: Adding Dot 10
Rows 50 to 56: Adding Dots 7 and 9
Rows 57 to 63: Adding Dots 7 9 and 10
Rows 64 to 70: Adding Dots 7 and 10

64

65

66

67

68

69

70
Rows 78 to 84: Adding Dots 7 8 9 and 10
Rows 85 to 91: Adding Dots 7 8 and 10
Rows 92 to 98: Adding Dots 8 and 9
Rows 99 to 105: Adding Dots 8, 9 and 10
Rows 106 to 112: Adding Dots 8 and 10

Row 113: Dots 7 8 9 and 10 only.
Montpellier Codex, folio 1. [F-Mo H 196]

For dot-pictures of this folio, see the end of Appendix 3: also some of the photographs in the Equipment Appendix, 4.
Montpellier Codex, f.l: line 1

DEUS IN ADIUTORIO

SINTENDI
Equipment Appendix, Pictures:

3 Handframes: regular one in the middle. The writing sheet, light card, is clamped at the top. One places the guide in the topmost holes of the backboard, writes the two lines, moves the guide down to the next pair of holes, writes etc. until the page-end. Then the paper is turned, fitting in a little lower; so the lines of p.2 come out between those of p.1 - producing 'interlined' braille.

The dot-making part of these 3 hand-frames: the guides, closed, no paper between. 6-dot (top), 16, 8.

Guides have either a left-hand hinge, so the top 'arm' lifts perpendicular to the backboard; or a loose swivel-knob, so the top arm rotates out of the way when inserting paper, or feeling underneath to read what has been written.

On the machine-made guide, every 5th cell-wall dips slightly; thus marking regular 'tabs' for the user, and making tiny 'legs' to keep the guide from leaning right down on the dots.
Upper 'arm' of guides:

Both with the left hand finger tips, and through the stylus held in the right hand (usually), one can feel the little teeth on the cell-edges. These direct the stylus-point accurately into each dot-well, which is beneath the paper when the guide is closed and in use.

Since writing must be done from right to left, the left hand usually leads, locating the next desired 'cell-frame'. The right hand then comes up to it, and presses in the dots which will make the desired letter-shape within it.

Lower 'arm' containing the dot-wells.

The wider inter-cell spacing can be clearly seen on the 6-dot regular frame (top).

Each well must be a smooth shallow saucer-dent, so as not to exceed the elasticity of the paper - whose fibres must remain intact to make a good legible dot.

Original French frames had 3 horizontal grooves, not separate craters: since each had to be made by hand, by Louis Braille and the other students, in the woodwork room of the Institute for Young Blind in Paris.
The manuscript enlargement of Montpellier Codex, folio 1; with part of the braille transcript in HEXIMUS code; and the 16-dot handframe upon which it was written. This was made, painstakingly, by my father in his home workshop, the guide out of an old piece of iron.

Below: a close-up of the above.
Continuous 8-dot frame, and its braille cells, with the manuscript 'Constantes Estote / Gloria Patri' (LoD). It looks very nice and regular because of the lack of an intercell 'relating space' - but is quite inefficient tactually.

Compare this with the picture below: where the 2 spatial increments make clear how signs relate to each other: the placement signs refer forwards to their note etc.
The Perkins Brailler

The six dot-embossing keys, one key for each dot-location of the braille cell, can be seen in the lower front. A space-bar is in the middle between them. Pressing down all six dot-keys at once gives the full cell: left index finger gives dot 1, middle finger dot 2, ring finger dot 3; right hand index dot 4, middle dot 5, ring dot 6. The braillist on the right is embossing, on the left is reading back.

A back-space key on the right and new-line key on the left are not unlike any typewriter of the time. The clean paper, inserted from the back, winds around inside the machine; then as it is embossed upon, unwinds in line-depth stages, emerging out the back again, covered in braille. See the next page for a closer view of this.

It is mostly metal and weighs about 10 pounds, so is quite heavy for students to lug around in addition to their braille books. But it makes up for this by being extremely sturdy and reliable, and comfortable to use, even for long periods.
As the dot-keys or space-bar are pressed, the embossing head (one cell), moves left to right along its notched bar, on top of, and parallel with, the roller. There are a maximum of 42 cells brailleable from the bar, i.e. one braille line. The number of lines depends upon how much paper one has wound in; it is designed to take from about 3-13 inches; but most commonly the paper size 11 x 11.5 inches gives 25 or 26 lines to a page.

The sloping lever above the dot-keys is joined to the embossing-head, and thus moves along with it. It can be seen near the beginning of a line in the previous picture, here near the end of a line. Pressing it flat disconnects the head from the notches, so it can be moved freely to any cell-position in the line. When released it springs back onto the notched bar.

All actual embossing happens in a fixed set of locations width-wise. Releasing the two side-grips on top will make the paper flow in or out freely by using the roller: but once embossing is needed, it is almost always done in the proper controlled line-depths from the new-line key or the roller. There are margin-setting controls, a bell, and a carrying handle.

Its great boon is that it is upward-writing. One simply reaches up over the frame and roller to check one's work. It is not wonderfully comfortable for reading, and quite a stretch for small children; but is still greatly easier and more immediate for a blind person than other methods of producing braille.
Some of the modern electronic equipment does use the dot-key format, sometimes as optional to a Qwerty keyboard.

The Mountbatten (green and gold) is the only 'brailler': it is upward-writing, naturally, and built with the capability for 8-dot-cell entry and reproduction. It can also be used silently, storing input without simultaneous embossing, either for embossing later, or for transfer to another device. It can also act as a cheap embosser for other computer-generated material. It is a pity that in its embossing mode it is extremely noisy.

The other two pictured here, 'Eureka' (black with white keys) and 'Braille 'n Speak' (small, white with black keys) take input from braille, but have only speech as immediate output. (This is obviously quite limiting for all the other codes of braille, such as music code.) These machines will also print out word text when attached to a regular printer, or braille text if attached to an embosser; but this is usually non-immediate.
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As well as notes and translations, the record box contains a facsimile page, from the original in the Hessischen Landesbibliothek, Wiesbaden.
Extra Explanations suggested by Dr. Kathleen Nelson

p.8 Thanks also to colleagues Sue Bray, Ranée Mischlewnski, and friends Ruth Dixon, Fay Pasky and Jane Crowe.

p.21 'Codicological' is used throughout this study as it relates etymologically to 'code' - that is, referring to the elements, symbols and their relationships within a particular code, in this case Braille Code or one of my new codes.

It is not used here with its other specialist meaning, from the word 'codicology' deriving etymologically from 'codex' and thus referring to the study of codices.

p.79 This was supposed to be what happened, and what we were always told. Unfortunately it was found not to work with 8-dot material, since other computers do not have the corresponding software to receive the 8-dot shapes. Please see p.24 paragraph 3.

p.109 This was told to me casually in 1985 by an American musicologist; it is included here hoping someone else will know the precise source, which I have not been able to find.

p.111 Spanish publications from the late 15th century also use this numbering method. It is to do with the cutting and collation of quires, and was apparently a widely-accepted printers' practice.

* * *

Errata

p.8 The paragraph after the bass-course examples should read:

Course 7 can still use 25, 7th interval, at any time. But course 8 may be better not as 8th interval, dots 36, if 36 is needed for other meanings. For instance lower-h may be possible if 36 is being used for the slur in certain manuscripts.

It is regretted that a typing error led to a content error in this paragraph: 46 ST a = 9th course fret 1.

p.191 2nd last line of braille: extra r in 'gathered'.

* * *
long-cell symbols

(See also pages 296-299)

Some ligature examples:

Full list of space notes p 96

Spaces 1 - 4

5th, and above 1st & 2nd ledger

7th (below) and below 1st & 2nd ledger
THE BRAILLE SYSTEM STATEMENT:

LOUIS BRAILLE'S 6 - DOT SYSTEM

● ●
● ●

Dots 1, 2, 3 down the left, dots 4, 5, 6 down the right.

THE SEVEN ROWS

Row 1: Using only the top four dots:

a b c d e f g h i j

Row 2: Add dot three to Row 1:

k l m n o p q r s t

Row 3: Adding dots three and six to Row 1:

u v x y z AND FOR OF THE WITH

Row 4: Adding dot six to Row 1:

CH GH SH TH WH ED ER OU OW w

Row 5: Row 1 in the lower cell:

, ; : . EN ! ( ) ? IN "

Row 6: All possible Right-hand-side patterns:

Row 7: Any patterns left over:

ST ING # AR - '

● ● ● ● ● ●