MUSILINGUA: A MODEL FOR THINKING AND COMMUNICATION BASED ON THE IMAGING OF ACOUSTICALLY CONSTITUTED TWO AND THREE-DIMENSIONAL STATIC AND MOBILE CONFIGURATIONS

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ABSTRACT

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The notion propounded in this thesis is that sound-based modes of thinking and communication which are not language related are possible, and may enable hitherto unknown states of consciousness to be attained.

To test this hypothesis, a Musilingual code was devised, and researched with the help of the Vice-Director and students at the Royal College of Music. Preliminary Electroencephalographic investigations appear to indicate that Musilingual thinking may occur in a part of the brain different to that used for linguistic, mathematical, pictorial, three-dimensional or musical thinking, and that it is probably a higher intellectual activity.

The theory of Musilingua, which has as its basis the relationship between sound and spatial configuration is expounded, and avenues for further research in areas such as Musilingua and thinking, Musilingua and music, and Musilingua and the study of the brain are opened up. More specifically, questions are raised about the outcomes Musilingual thinking will engender, the effects of Musilingual fluency upon musical skills and musicianship, and the possible role of Musilingua in cases of brain disorders such as aphasia and amnesia.

Finally, based upon the results obtained in the present research, a proposal is made for the incorporation of a course in Musilingua into the aural training syllabus of music students as an initial step prior to its possible subsequent incorporation as a new subject in the music syllabus of the National Curriculum.

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"For when there are no words (accompanying music) it is very difficult to recognize the meaning of the harmony and rhythm, or to see that any worthy object is imitated by them"

-Plato. Laws. Book II

INTRODUCTION

Language is undoubtedly a magnificent tool for thinking and communication, yet it is not without its limitations. It is proposed here to examine some of these limitations and to explore as systematically as possible a different mode of experiencing the world through sound and space. We shall argue that even though at the moment language appears to hold pride of place in our thinking processes, conceptualisation is not exclusively in language and could feasibly take place predominantly through other means - thus causing a shift in the balance between the senses which will result in a different kind of perception of the world.

Language is closely intertwined with our physiology, and much of the work which has been done on the relationship between muscular and cerebral activity demonstrates this. For example, as early as 1921, Golla found that the strength of forearm tonicity was related to the difficulty of problems to be solved, and concluded (1929) that muscle activity may not be merely a manifestation of cerebral activity but a necessary concomitant of it. More recently McGuigan (1978) has shown that nonoral behaviour can also serve linguistic functions. For example, gestures can be substituted for spoken words, the deaf can communicate with dactylic language, the blind can read Braille, and the cutaneous senses can process linguistic input. However, McGuigan states that

> The great versatility of verbal symbolism has led us to recognize a priority for linguistic thought involving principally the speech musculature and the linguistic regions of the brain. (1978, p.85)

He also demonstrated that, even if linguistic thinking is not involved at all, musculature is still brought into play.

> A subject was instructed initially to sing up and down an octave and then to imagine the same activity. Phasic changes in the front neck musculature (hence laryngeal movements associated with thyroid cartilage movement) were measured by a system of tambours and an optical lever. Sample records showed that muscle activity during imagination was of lesser amplitude but in the same pattern as that observed during actual performance of singing. (1978, p.50)

In 1920, Watson, having observed small contractions in the vocal cords while thinking was in progress, equated these with speaking. He states that

> ....one's total organization is brought into the process of thinking. It shows clearly that manual and visceral organization are operative in thinking even when no verbal processes are present - <u>it shows that we could still think in some sort of way if we had no words!</u> We thus think and plan with the whole body. But since...word organization is, when present, probably usually dominant over visceral and manual organization, we can say that 'thinking' is largely subvocal talking - provided we hasten to explain that it can occur without words. (1930, p.267-268)

Watson clearly believed that nonoral as well as oral responses are associated with thought, and his findings indicated to him that thinking is largely but not exclusively subvocal.

Whorf (1936) takes up this theme, pointing out that the importance of Watson's work lay in recognizing the linguistic element in silent thinking. He cautions against overlooking the fact that the linguistic aspect of thinking is a cultural organization or a particular language rather than 'speech' or 'language' in general. He emphasizes the difference between words and morphemes, and the factors of linkage between them, and points out that

> It is not words mumbled, but RAPPORT between words which enables them to work together at all to any semantic result. It is this rapport that constitutes the real essence of thought in so far as it is linguistic, and that in the last resort renders the mumbling laryngeal quiverings, etc., semantically de trop. (p.67)

Whorf's insight makes it possible to see Watson's work in true perspective, and it is further confirmation of the central role of language in thinking, for, without words, there can be no factors of linkage between them, leading to 'a language' which enables thinking to take place.

Edward Sapir (1921) is emphatic that thinking is impossible without language.

> The writer, for one, is strongly of the opinion that the feeling entertained by so many that they can think, or even reason, without language is an illusion. (p.15)

Nevertheless, Sapir concedes that

> The symbolic expression of thought may in some cases run along outside the fringe of the conscious mind, so that the feeling of a free, non-linguistic stream of thought is for minds of a certain type a relatively, but only a relatively justified one. (p.16)

Later, Sapir expresses the situation as he sees it in language which transcends prose and is nothing short of pure poetry. '...thought riding lightly on the submerged crests of speech, instead of jogging along with it, hand in hand.' (p.16)

But perhaps the nub of the matter is not whether it is possible to think without language, but rather how effective a tool language is for certain kinds of thinking. In order to answer this question a distinction must be made between different levels of thinking, for a tool which may be perfectly adequate for one task, may not be so for another. Indeed, there are no universal tools. Language may be an admirable tool for concretizing thought and making it precise on one level, but for certain levels of feeling its limitations become manifest and it appears that its very strength in precision risks limiting its effectiveness in expressing de-contexualized thought. Sapir's position is modified somewhat.

> Language is at one and the same time helping and retarding us in our exploration of experience, and the details of these processes of help and hindrance are deposited in the subtler meanings of different cultures. (Sapir 1949, p.8)

But we are never totally free from the fetters of language, even when we are not required to produce it, but merely to receive and understand it.

> The point is, that no matter how sophisticated our modes of interpretation become, we never really get beyond the projection and continuous transfer of relations suggested by the forms of our speech. (Sapir 1949, p.8)

The implication of Sapir's position is that the very nature of a specific language limits thought development beyond a certain ceiling level, even though the mind may be capable, given the right tools, of functioning on levels far beyond the ceiling which is determined by that language. It is as though there is, ready at all times, a blank matrix capable of receiving any input for processing. Its power lies not in its ability to record and store information, but rather in its ability to integrate the information it has in a process of movement and balance which is the essence of what is called the process of thinking. The ultimate outcome of the process may well depend on the nature of the information which is fed into the matrix, and 'thus, one of the important steps for Western knowledge is a re-examination of the linguistic backgrounds of its thinking, and for that matter of all thinking.' (Whorf 1942, p.247)

Whorf introduces a drastic idea.

> It is the view that a noumenal world - a world of hyperspace, of higher dimensions - awaits discovery by all the sciences, which it will unite and unify, awaits discovery under its first aspect of a realm of PATTERNED RELATIONS, inconceivably manifold and yet bearing a recognizable affinity to the rich and systematic organization of language, including au fond mathematics and music, which are ultimately of the same kindred as language. (Whorf 1942, p.247)

Whorf later adds force to the idea by contrasting what he calls 'premonition in language' with the physical world of which we form a part.

> All I have to say on the subject that may be new is of the PREMONITION IN LANGUAGE of the unknown, vaster world - that world of which the physical is but a surface or skin, and yet which we ARE IN, and BELONG TO. (Whorf 1942, p.248)

Bearing in mind the foregoing it is therefore far from idle speculation to wonder what the end result would be if concepts were not constituted from consonants and vowels and produced vocally as words, but rather were expressed as pure pitch contours so that their production was totally divorced from existing vocal apparatus. If pitch alone were used to represent the letters of the alphabet, it may be that the pitch contours or 'neums' formed from the addition of pitch patterns for each letter will enable thinking in 'engrams' with no redundant language, and eventually the relationship of the neum to and its origin from existing words will be forgotten.

McLuhan (1962, 1967) has proposed that people adapt to their environment with a certain balance among their senses. If, for some reason, the intensity of one sense is stepped up, the other senses will change their intensity in an attempt to regain a balance. McLuhan argues that a major technology can cause changes in the balance of the senses, and that the development of the printing press had such an effect. He cites pre-Gutenberg man as having a tribal balance in which hearing was the dominant sense. Information was gleaned mainly from word of mouth statements, and this necessitated physical proximity. Since this was the only means of getting information, people had to believe each other, and this made them interdependent. This interdependency and close physical proximity made them more emotional. McLuhan argues that the spoken word, as well as conveying meaning, carries more emotion than the written word, and since intonation can convey emotions such as panic, sorrow, anger, and so on, tribal man's reaction to information was more emotional than is literary man's. In McLuhan's view the arrival of the printing press brought about a radical change in that the visual sense became dominant as more and more informationwas gleaned by seeing it.

McLuhan gives us a clue to his own feelings when he states that 'the interiorization of the technology of the phonetic alphabet translates man from the magical world of the ear to the natural visual world.' (1962, p.18). In the context of the present research it is important to remember that McLuhan's thinking was concerned with the balance between 'the world of the ear', and the 'technology of the phonetic alphabet', and that both the foregoing are rooted in language. 'The literate man is slowed down by the way he tries to convert the sounds to print in his mind and takes the words one by one, categorizing them and translating them in a plodding sequence.' (Wolfe 1967, in McLuhan 1967, p.23)

McLuhan's insight is particularly interesting because it helps to clarify the position regarding the 'quantifying' of emotion relatively between aurally and visually received information. It also illustrates that the balance between the senses can be altered with a resulting difference in the effectiveness of communication, and this in a remarkably short time when one considers that the cortex has been evolving for some 200 million years. McLuhan believes that the channel of hearing is 'hotter' than that of sight. In so far as sight is concerned, McLuhan points out that, due to the nature of the alphabet which is 'a construct of fragmented bits and parts which have no semantic meaning in themselves; and which must be strung together in a line, bead-like, and in a prescribed order......rationality and logic came to depend on the presentation of connected and sequential facts or concepts.' (1967, pp44,45). McLuhan senses that the real world is not of a linear nature and points to the artificiality of 'linear thinking', which he himself tried to avoid and objected to strongly.

If we accept McLuhan's position and substitute 'pure pitch contours' for 'aural language', we can expect there to be some change in the balance of the senses if pitch contours were to form the basis of incoming information.

There is no doubt that music can achieve meaning through mood and that language can achieve mood through meaning. However, in the former case the meaning is limited, and in the latter the mood may not be totally evoked. A model for accurate communication in which music has structure related to meaning enabling the formation of sememes or engrams, and embodying the potential for the creation of an unlimited number of new 'words' from a limited pool of basic 'bricks' which are pitch contours unrelated to the sound of speech or to the physiological movements that create it, appears to be without precedent. 'Music is a quasilanguage based entirely on patternment, without having developed lexation.' (Whorf 1942, p.261)

There are surrogate languages such as whistle speech and drum languages which are substitutive systems firmly rooted in language, and there are acoustic signals independent of language but translatable into it. In the case of surrogate languages, if meaning is to be accurately understood, their vocabulary must of necessity be limited, and it is often only possible to gain full understanding if, for example, there is a contexual background. In the case of acoustic signals the limitation is even more severe, the links between one signal and another being extremely tenuous, and any additions can only be made in a random fashion. In the Morse code, where dots and dashes are the signans and the letters of the alphabet are the signata there is no pitch variation, and owing to the fact that the transmission of information results from the addition of long sequences of rhythmic alternatives which can not all be kept in mind in one instant, the format of the message precludes successful independent conceptual thinking.

Since a preliminary review of the literature has revealed no model of thinking and communication in human languages in which 'tonal letters' produce 'tonal words' or meaningful pitch contours which are unrelated to the prosodic features of language, I shall refer to such a model as the 'neum-engram model'.

Expressing thoughts in words involves discipline, and it is possibly the very habit of discipline that is a factor which restricts thinking on the higher levels for, even if thinking is in concepts only, there is a constant tendency to regress to 'safe' bases which, ultimately, are words. This may be the case because language is so tightly intertwined with our physical being and sense of identity, and it may cease to be so if we could think with a tool which is independent of our body and requires no manifest physiological action on our part, yet over which we have total control in the sense that thinking would still be 'first hand' and not 'second hand' as would be the case with computers fed with programs. Thinking in pure sound appears to fit the bill, for, at speed, it is not possible to imitate or initiate sound progressions with any part of the body, though the mind does appear to be capable of functioning in such a domain.

In order to test the theory that music which has patternment combined with lexation can replace vocal language as a tool for communication and thinking, I devised a random Tonal Alphabet (see Chapter 2) with the initially limited objective of discovering whether, using this alphabet, effective communication could take place. If the early results of experimentation proved promising, the next stages would be to discover whether it would be possible to progress beyond simple understanding, whether there would be any observable and measurable changes in the thinking process, and whether creative thinking in a new dimension would be possible.

In devising the Tonal Alphabet I deliberately ignored the possibility of relating the sounds to intrinsic meaning e.g. rising sound representing a threat, or to the spatial configuration of matter where sound would relate to three-dimensional space. The necessity of investigating this area would only arise if the initial results warranted further research.

Having devised the random Tonal Alphabet I used myself as the subject, and spent about three months learning to think in language based on the Tonal Alphabet. The intention at this stage was simply to learn the letters and to acquire facility and fluency in constructing and understanding words. To practise, I used an electric organ with the facility for speeding up melodic lines, and a tape recorder to 'speak' to me after a lapse of time. There was a rapid improvement in my ability to grasp 'tonal words' at ever greater speeds and to formulate them in my mind. The following passage was written towards the end of the three month period and is reproduced verbatim.

> What I am about to explain is based on subjective feelings and has to be taken on trust. If I ask you to think of a word e.g. man, you can not help associating that word with all the complex mechanisms involved in saying the word, even if you were not required to say it. The mere fact that you can not stop yourself from getting ready to say it is a restriction of total thought freedom. In the Tonal Alphabet, if you ask me to think of a word (at the moment only short words with which I am familiar) the process happens at what seems to be incredible speed. I have no image either of the shape of the object or of its printed form, and I am completely relaxed physically because I am not getting ready to say the word. The comparative feelings; in the first case you are tethered down and are making your cumbersome way to saying the word using a lot of energy in the process. In the second case the word is floating in space and you 'receive' or 'catch' it, and there appears to be no effort involved. Also there seems to be a sense of permanence and security. I feel safe and certain that the word will always be there, because, as it were, it is detached from my body. (This is presumably because it is pure sound and I do not need my own physical being to produce it). What is also interesting is that when listening or imagining in the Tonal Alphabet I find words such as the definite article, please, and prepositions irritating because they appear to be superfluous. I am much happier to think in 'ideas' with the 'words' acting as prods to shape the idea. It feels like a release from the burden of letters and words and sentences and grammar, the imagery associated with words, and the physical process and energy involved in saying words. It has given me an insight into what it must be like to be on a higher plane, and it

> is a wonderful sensation. 'You know without knowing how you know' is the nearest I can get to explaining this sensation. And at the same time you are very certain of your knowledge. It is almost as though you can dispense with your physical body, have all the knowledge you want, and have a feeling of great calmness and security, and a feeling of great permanence is also present. This sensation has made language seem by comparison terribly primitive. This includes speaking (the physical process of saying consonants and vowels) and the structure of language itself. We are entrapped in space. We occupy it and are ourselves occupied by it, and we move through it, our consciousness of it depending on our ever-present consciousness of our physical existence. Similarly we are 'occupied' by language which permeates us to such an extent that we can not free ourselves from its entanglement and so our view of the outer world is largely a mirror of our inner world which, partly because of language, is primitive.

I have since made a deliberate effort to 'forget' the Tonal Alphabet, since a major part of the work in this thesis will be concerned with discovering an 'ideal' Tonal Alphabet, and this is likely to be very different from the original.

The outcome of this admittedly very limited and subjective experience nevertheless appears to warrant further research. In the absence of a neum-engram model it is proposed in the first chapter to study speech surrogates in the form of instrumental and whistle systems, as well as various forms of acoustic signals.

CHAPTER 1

FORMS OF COMMUNICATION

1.1. THE SOUND CHANNEL

As much of the universe that we are able to perceive, we perceive through our senses. As far as we know, the sum total of our perception may be limited to a minute fraction of what is extant. We are equipped to function in a world of space, time, matter and energy, and our survival in the temporary volume of space we occupy depends upon the efficient functioning of our senses, each of which is highly specialized and adapted to the investigation of a specific aspect of the environment.

However, of the five sense modalities attributed to man, hearing is unique, because audition is concerned with a result of the expenditure of kinetic energy rather than, as is the case with the other senses, with the inherent or spatial attributes of matter. Audible sound, which is produced by the vibration of the source, has a temporal existence related to the nature of its origin, and to the amount and duration of energy expended at the source, and this renders it 'once removed' from matter, making it impossible to have continuous contact with sound patterns - only renewed contact through repetition where this is possible.

The German philosopher Schelling, sensing the link between the relative permanence of the three-dimensional world of matter and the temporal nature of sound wrote

> Was also in dem Gebiet des Schematismus liegt, ist der arithmetischen Bestimmung unterworfen in der Natur und Kunst, die Architektur, als die Musik der Plastik, folgt also nothwendig arithmetischen Verhaltnissen, da sie aber die Musik im Raume, gleichsam die erstarrte Musik ist, so sind diese Verhaltnisse zugleich geometrische Verhaltnisse. (1802, p.576)

From the philosopher's point of view there is undoubtedly an affinity between architecture and music, the former being fashioned and balanced matter with a rationale behind its existence which is accessible to all the senses but one and existing through time, and the latter complementing and balancing it in the non-tactile invisible world of sound and existing in time only so long as energy infuses life into it thus completing the whole. In retrospect it may be seen that, though at first sight Schelling's idea must have appeared to be quite startling, no aspect of it was really new. However the word 'erstarrte' is translated, be it as 'frozen' or 'solidified' or 'transfixed' or 'crystallized' or 'held immobile', the fact remains that ideas of transmutation and the belief in the magic and power of the invisible were common in ancient times. In Greek mythology, Medusa the Gorgon transformed to stone living matter that gazed upon her. The Greek gods could bestow the power to become invisible. In the book of Genesis of the Old Testament, Lot's wife was transformed into a pillar of salt. The fact that in these examples animate visible forms became solidified or vanished, and in Schelling's paradigm inanimate ordered matter is apparently conjured forth from invisible space is immaterial. In all cases man's preoccupation with the power of the invisible is the paramount consideration, and this has dominated much of his spiritual thinking - which is hardly surprising since, as Ouspensky (1931) said, 'The enigma of death is connected with the enigma of birth, the enigma of disappearance with the enigma of appearance'. (p.514) The very idea of 'faith' in primitive religion arises from the fear of the unknown and is related to the curiosity-fear continuum in which very great fear causes the condition of 'freezing', at which stage 'trust' and complete surrender to fate is the only course left open. In the Judaic religions, even though the face of god can change from a god of vengeance to a god of love, the greatest power is invisible; the Jehovah of the Jews, the Allah of the Muslims and the Father of the Christians represents the ultimate power, for only such an all powerful invisible god can create matter from nothing, or bring forth a world from nowhere. Ouspensky (1931) wrote, In this way invisible worlds, the religious, the philosophical, and the scientific, are, after all, more closely related to one another than they would at first appear. And these invisible worlds of different categories possess identical properties common to all. These properties are, first; incomprehensibility for us, that is, incomprehensibility from the ordinary point of view, or for ordinary means of cognition; and, second, the fact that they contain the causes of the phenomena of the visible world. (p.69)

Thus Schelling, perhaps unknowingly, attributed very great powers to music, and it is little wonder that his idea caught the imagination of no less a thinker than Goethe. In Goethe's Gespräche (1910) Eckermann reports Goethe as saying on March 23rd 1829 in Weimar,

Ich habe unter meinen Papieren ein Blatt gefunden, sagte Goethe heute, wo ich die Baukunst eine erstarrte Musik nenne*. Und wirklich, es hat etwas; die Stimmung, die von der Baukunst ausgeht kommt den Effekt der Musik Nahe.
*Goethe zitierte dies als ein Wort Schellings. (p.79)

In his Maximen und Reflexionen, (in Goethe's Werke 1978, p.474) Goethe develops this theme further.

Ein edler Philosoph sprach von der Baukunst als einer erstarrten Musik und mußte dagegen manches Kopfschütteln gewahr werden. Wir glauben diesen schönen Gedanken nicht besser nochmals einzuführen, als wenn wir die Architektur eine verstummte Tonkunst nennen.

Man denke sich den Orpheus, der, als ihm ein großer wüster Bauplatz angewiesen war, sich weislich an dem schicklichsten Ort neidersetzte und durch die belebenden Töne seiner Leier den geräumigen Marktplatz um sich her bildete. Die von kräftig gebietenden, freundlich lockenden Tönen schnell ergriffenen, aus ihrer massenhaften Ganzheit gerissenen Felssteine mußten, indem sie sich enthusiastisch herbeibewegten, sich kunst-und handwerkgemäß gestalten, um sich sodann in rhythmischen Schichten und Wänden gebührend hinzuordnen. Und so mag sich Straße zu Straßen anfügen! An wohlschützenden Mauern wird's auch nicht fehlen.

Die Töne verhallen, aber die Harmonie bleibt. Die Bürger einer solchen Stadt wandlen und weben zwischen ewigen Melodien; der Geist kann nicht sinken, die Tätigkeit nicht einschlafen, das Auge übernimmt Funktion, Gebühr und Pflicht des Ohres, und die Bürger am gemeinsten Tagefühlen sich in einem ideellen Zustand: ohne Reflexion, ohne nach dem Ursprung zu fragen, werden sie des höchsten sittlichen und religiosen Genusses teilhaftig. Man gewöhne sich, in Sankt Peter auf und ab zu gehen, und man wird ein Analogon desjenigen empfinden, was wir auszusprechen gewagt.

Der Bürger dagegen in einer schlecht gebauten Stadt, wo der Zufall mit leidigem Besen die Häuser zusammenkehrte, lebt unbewußt in der Wüste eines düstern Zustandes; dem fremden Eintretenden jedoch ist es zumute, als wenn er Dudelsack, Pfeifen und Schellentrommeln hörte und sich bereiten müßte, Bärentänzen und Affensprüngen beiwohnen zu müssen.

As Goethe said, Schelling's is a beautiful thought, and Goethe's own imaginative comments add greatly to its beauty, yet the fact remains that it is not in keeping with the real world. Had Schelling used the word 'matter' instead of 'architecture', and 'energy' instead of 'music', thus stating that matter is 'frozen' or 'condensed' energy, he would have been nearer the mark, for this approximates Einstein's equation ($E=MC^2$) in reverse. And so Schelling the philosopher and Goethe the poet, though reaching an intuitive understanding that there is a relationship between sound and matter, have attributed to sound impossible qualities. The underlying and all important consideration is that sound is the product of matter in movement, and even the most brilliant imagination, or profound intellect, or powerful 3-dimensional phantasy cannot manipulate matter in such a way as even to remotely focus form from sound, or extract or create audible sound from static matter. Could music guide the pen of the architect? Could music guide the hand of the sculptor? Could music form matter?

We must be grateful to Schelling for his vibrant thought which opens up imaginary vistas depicting a dreamlike universe in which sound cushions matter instead of the force of gravity, in which there are magnificent edifices cushioned by sound floating in space, and in which sound is the voice of static matter and the product of its spatial relationships with a multitude of its own uniquely formed volumes, all in turn cradled by sound.

So much for imagination. Now to the reality, as we believe we understand it in our environment. The process of perception involves the reception of information from a form or pattern of energy and, through a series of coding operations, translating it into another. Thus, sound energy will stimulate hair cells in the cochlea of the ear which originate impulses which will eventually arrive in the temporal lobe of the cortex after having travelled along the auditory nerve. The result is the experience of sound, and within this modality a wide range of differences can be detected, such as pitch, duration and loudness. However, the mere experience of sound, cocooned, isolated and detached from its origin in the physical world, is on a level far removed from that on which an incoming stimulus interacts with a memory trace and is categorized.

A great deal has been written about the nature of categories, and there has been much discussion as to whether they are innate or not. Piaget (1951) implies that primitive capacities to categorize depend upon even more primitive ones, and this statement is based on the acceptance that categories such as motion, time and space have some counterpart in the neonate. He finds support for this belief in Hebb's work (1949) in which he asserts that certain primitive identities within perception are innate and not learned.

However, both Hebb's and Piaget's views lead to the conclusion that the only true innate capacity is the anatomical/physiological potential to react to and to form memory traces from incoming stimuli and then to relate new incoming stimuli to extant memory traces so forming categories which enable perceptual experience to occur. What is proposed is that, assuming man was born into a notional world in which space and matter and energy did not exist but rather some unimaginable other quantities, he would, given the identical capacities he is blessed with, be able to cope with the new environment. It is as though he had universal basic equipment capable of dealing with any input of which it has no knowledge until it actually arrives. A very crude example to illustrate this point would be to imagine a power unit which is capable of powering either a car, or boat, or plane, but which is totally useless unless its potential is realized through its attachment to one entity or another.

It is the inborn capacity to memorize and to learn and to manipulate information and to deduce and predict that is at the root of the ability to categorize, and in audition particularly memory plays a vital role, for the incoming stimuli are transient and often of very short duration. Bruner (1957) states that

> Perception involves an act of categorization. Put in terms of the antecedent and subsequent conditions from which we make our inferences, we stimulate an organism with some appropriate input and he responds by referring the input to some class of things or events. (p.123)

Bruner goes on to suggest seven propositions about the general properties of perception.

> 1. That it is a decision process... 2. that the decision process involves the utilization of discriminary cues... 3. that the utilization process involves the operation of inference... 4. that a category may be regarded as a set of specifications regarding what events will be grouped as equivalent... 5. categories vary in terms of their accessibility... 6. veridical perception... consists of the coding of stimulus inputs in appropriate categories such that we may go from cue to categorial identification, and thence to the correct inference or prediction of other properties of the object so categorized. Thus, veridical perception requires the learning of categories and category systems appropriate to the events and objects with which the person has commerce in the physical world. When we speak of the representative function of perception, we speak of the adequacy of

> the categorizing system of the individual in permitting him to infer the nature of events and to go beyond them to the correct prediction of other events. 7. under less than optimal conditions, perception will be veridical in the degree to which the accessibility of categorizing systems reflects the likelihood of occurence of the events that the person will encounter. Where accessibility of categories reflects environmental probabilities, the organism is in the position of requiring less stimulus input, less redundancy of cues for the appropriate categorization of objects. (pp. 132, 133)

The channel of entry into the consciousness is of paramount importance, for any outcome is dependent upon the processes it instigates. The sensitivity of the ear is quite remarkable. The ear drum is capable of vibrating at one billionth of a centimetre, and the inner ear membrane at amplitudes 100 times smaller. (Von Bekesy, 1957). If the hearing threshold were slightly lower, we would be able to hear the collision of air molecules in random Brownian movement. The ear is capable of perceiving upward of 2000 gradations in pitch, though a tone must persist for 10 to 15 msec before it can be assigned a pitch, and for more than 100 msec if it is of low frequency. The minimum perceptible difference in intensity is of the order of 1 db. The average limits of the lowest and highest audible frequencies are between 20 and 20,000 c/s.

Stimuli entering via the acoustic channel may enable vibration in sympathy with the external source, and this may explain why rhythm so readily prompts physical movement - in particular since the body has its own internal rhythmic patterns - and why mood may so readily be influenced by music. Furthermore, rhythm plays a role in language and its associated imagery. The spoken word reigns supreme as a method of communication, and the rhythm of language undoubtedly plays a role in comprehension, the link between rhythm and imagery enabling rhythm-coding which, in conjunction with pitch-coding and superimposed factors such as timbre and loudness leads to a pinnacle of understanding, and, just as the brain is able to cope in this highly sophisticated way with the code of language, so it is able to cope with the world of pure sound, but instead of making sense associated with the physical world as is the case with language, sense is made of the origin and balance of sound, as is the case with music. Were it possible to mould language and music into one entity, the pooled power may produce astonishing results, for there would be no separate reaction to rhythm and to words or to pitch and words, and so the world of matter and the energy of sound would be fused to become a cohesive unity. Whorf (1956) talks of synesthesia and 'a linguistic metaphorical system that refers to non spatial experiences by terms for spatial ones.' (p.155) Whorf argues that non spatial experience has only one well-organized sense, namely hearing, and that

> Nonspatial consciousness is a realm chiefly of thought, feeling and SOUND. Spatial consciousness is a realm of light, color, sight, and touch, and presents shapes and dimensions. Our metaphorical system, by naming nonspatial experiences after spatial ones, imputes to sounds, smells, tastes, emotions, and thoughts qualities like the colors, luminosities, shapes, angles, textures, and motions of spatial experience. And to some extent the reverse transference occurs; for, after much talking about tones as high, low, sharp, dull, heavy, brilliant, slow, the talker finds it easy to think of some factors in spatial experience as like factors of tone. Thus we speak of "tones" of color, a gray "monotone," a "loud" necktie, a "taste" in dress; all spatial metaphor in reverse. Now European art is distinctive in the way it seeks deliberately to play with synesthesia. Music tries to suggest scenes, color, movement geometric design; painting and sculpture are often consciously guided by the analogies of music's rhythm; colors are conjoined with feeling for the analogy to concords and discords. The European theater and opera seek a synthesis of many arts. It may be that in this way our metaphorical language that is in some sense a confusion of thought is producing, through art, a result of far-reaching value- a deeper esthetic sense leading toward a more direct apprehension of underlying unity behind the phenomena so variously reported by our sense channels. (pp.155,156)

The astonishing reality is that, throughout history, music has been deprived of its potential to convey meaning and to achieve total integration with what Whorf calls 'spatial consciousness'. Perhaps the reason for this is that the human anatomy enables the production of a staggering number of distinguishable sounds capable of being easily joined, and that the animal, having only its body to use as an instrument, inevitably accepted the status quo which has undoubtedly served its needs adequately enough. However, as technology has advanced and it has become possible to use a 'surrogate voice' in the form of synthesizers powered by computer brains, the situation can be viewed from a new vantage point. Even though the production of 'new sound' may not be achievable by the human body, the knowledge of its potential existence and possible contact with it may lead to a more insightful understanding of the universe and the inner world.

There is an analogy in the visual world, where the surrealists, in their concern with the images of the unconscious, asserted that the reality of the dream world of the unconscious is superior to the world of the senses, and that the two should be integrated to form a super-reality. Unfortunately, this aim, as outlined by Andre Breton in his surrealist manifesto of 1924 has been frequently misunderstood by some artists whose attitude has been flippant in the extreme, and some consider that it has given the movement a bad name. However, Whorf's contention that, through art, a deeper aesthetic sense will result from 'a more direct apprehension of underlying unity' holds true, and the achievement of such a state is one of the great challenges for mankind for the future, for it represents progress within man rather than by man vis-a-vis the universe, and it is high time that man began to fulfil his own true potential in this way. As Ouspensky (1931) puts it: 'Unless he attains inner unity, man can have no "I", can have no will.' (p.132) Oddly, when considering the world of sound, man has had to wait for technological progress before his ambitions for growth within his psyche could be formulated.

Now to turn to the animal kingdom, in which sound is a major contributory factor to survival. Sounds provide receiver animals with information about past, present or future events which modifies their behaviour and determines their immediate and more delayed course of action. Received sounds are associated with an object or activity, and, once analyzed and categorized, are designated as signifying danger, or being harmless or useful, whereupon decisions can be made regarding an appropriate response. In some circumstances, failing to hear or misinterpreting auditory information may have dire consequences. Struhsaker (1967c) revealed that Cercopithecus aethiops (the Vervet monkey) has three distinct alarm calls. The 'r-raup' sound warns of the approach of an aerial predator, 'chuttering' warns of snakes, and a 'chirp' of ground-living predators. The monkey who fails to hear the 'r-raup' sound or misinterprets it believing it to be the 'chirp', finding himself at the top of the tree will fall easy prey to the swooping bird.

Yet it is not only the hearing of sounds but their production which represents an important part of animal activity and plays a role in survival. A timely alarm call may save the life of the sender as well as benefit several receivers. Indeed, it may well be that, in so far as evolution is concerned, the receiver is less important than the sender, and that a communication only evolves if it proves beneficial to the sender. However, senders do not always broadcast with the express intention of conveying information or communicating, some calls or noises arising from extrinsic or intrinsic motivational factors over which there is no voluntary control. Moreover, even in cases where the call is of immediate benefit to the sender, its very temporal existence, however brief, may also spell danger to its originator. It follows, therefore, that in certain circumstances the sender may expose himself to danger by reason of his broadcast call regardless of the cause for its origin, which could fall into one of several categories.

There are attracting, courtship and competition calls in sexual relationships; there are calls to enable identification of individuals and for communication within family groups; there are calls relating to group activities such as alarm and food behaviour; and there are sound-ranging calls such as echolocation.

The acoustic channel in air or water fulfils animal needs admirably. Sound can carry over long distances, travel round corners and around obstacles and penetrate dense undergrowth or muddy water. It requires no light or direct receiver contact with the source, which is locatable even if it is concealed. Unlike chemical signals, sound does not linger and changes are instantaneous, and unlike vision, it is not necessary to direct the gaze at a given area in which case there is a single restricted field of vision for some time - whereas several sounds coming from different sources can be simultaneously heard without the need to move physically or, conversely, whilst on the move. Since codification is possible, a great deal of information can be compressed into a given unit of time.

1.2 SIGNS, SIGNALS, GESTURES AND SYMBOLS

For the human foetus, one of the earliest and most powerful of all signals is auditory. It is the rhythmic pumping sound of the mother's heartbeat. The world of sound and rhythm is familiar to the foetus long before sight, taste and smell play a significant role, and a strong association is created in the womb between the enveloping feeling of warmth and the regular comforting sound pulses, this combination engendering a sense of security which remains valid throughout life and may explain why sound, and in particular music and rhythm in whatever form seem to fulfil a need in later life.

The first great shock is the shock of birth, and the neonate's breathing is its very first signal emitted in the world, and later crying is an important means of attracting its mother's attention. Its cry is a signal, and a sign to the mother.

This seems clear enough. However, there appears to be some confusion in the terminology used in the literature on the subject of signals, signs and symbols, so much so that these terms are sometimes used interchangeably. There appear to be two main sources of confusion. The first arises from different authors' understanding of the words themselves, and the second and more serious is bound up with the first. The terminology is itself a major obstacle to the creation of a map on a scale large enough to enable the displaying of the relative positions of clearly defined elements and the pin-pointing of each thereon with great accuracy.

De Saussure (1970) came up against this problem of terminology when he wrote

> Our definition of the linguistic sign poses an important question of terminology. I call the combination of the concept and a sound-image a sign, but in current usage the term generally designates only a sound-image, a word, for example (arbor, etc.) One tends to forget that arbor is called a sign only because it carries the concept 'tree', with the result that the idea of the sensory part implies the idea of the whole. (p.45)

Accordingly, if 'arbor' did not carry the concept 'tree', it would not be called a sign. But this would only be true if applied to a given target population to whom it would be meaningless. However, it may be meaningful to another target population. Therefore, it might seem to be necessary to conceive of the word 'sign' as having a possible existence independent of any receiver and to call it a 'potential sign' if it has no effect because it is not understood, and a 'sign' if it is meaningful to some receiver. De Saussure continues

> Ambiguity would disappear if the three notions involved here were designated by three names, each suggesting and opposing the others. I propose to retain the word sign (signe) to designate the whole and to replace concept and sound-image respectively by signified (signifie) and signifier (signifiant); the last two terms have the advantage of indicating the opposition that separates them from each other and from the whole of which they are parts. As regards sign, if I am satisfied with it, this is simply because I do not know of any word to replace it, the ordinary language suggesting no other. (ibid p.45)

The matter can now be taken further, for it is evident that the key to do Saussure's sign is the signifier. The existence of a signifier leads to the presumption that there is a signified and hence 'the linguistic sign, as defined, has two primordial characteristics'. (ibid, p.45). De Saussure talks of the signifier as being auditory, yet there may be other signifiers such as, for example, visual signifiers. It is now necessary to make the following distinctions.

1. There can be 'potential signifiers'.
2. Signs can have an existence independent of any receiver.
3. In order to distinguish a sign as above from a 'linguistic sign' as defined by de Saussure, the latter's 'sign' should be called a 'meaningful sign'.

A 'potential sign', therefore, would become an impossible term, but a 'sign' could be a 'potential signifier', or a 'signifier' if it forms part of a 'meaningful sign'. The need to make finer distinctions was sensed by de Saussure when he wrote about the arbitrary nature of the sign.

> One remark in passing; when semiology becomes organized as a science, the question will arise whether or not it properly includes modes of expression based on completely natural signs, such as pantomime. Supposing that the new science welcomes them, its main concern will still be the whole group of systems grounded in the arbitrariness of the sign. (ibid, p.45)

Prophetic words indeed. Implicit in this statement is the realization that it is necessary to find a means of including visual signs and gestures in the grand scheme, for

> In fact, every means of expression used in society is based, in principle, on collective behaviour or - what amounts to the same thing - on convention. (ibid, pp45 and 46)

Thus, a visual sign or gesture may be a potential signifier and hence may form the signifier portion of a meaningful sign. At this stage, then, it becomes necessary to make a distinction between a visual sign and a gesture, the latter having some affinity with the auditory signifier which may have a linear nature.

> The signifier, being auditory, is unfolded solely in time from which it gets the following characteristics: (a) it represents a span, and (b) the span is measurable in a single dimension; it is a line. (ibid, p.46)

However, a visual sign is present continuously in time and space. Its movement through space does not change its potential message, nor is its two or three dimensional existence altered thereby. Yet if it is movement through space which makes it into a potential signifier, it is distinguishable from a sign and becomes a gesture. A visual sign requires no instant memory to make it a potential signifier. A gesture does, for without memory its various components (i.e. successive positions in space) could not be conceived as a unity and hence it could not become a potential signifier. To make a distinction between the two, it is necessary to assign them to different 'zones'. A visual sign which is a potential signifier and requires no memory would belong in the lower zone, whereas a gesture, requiring memory to become a potential signifier, would belong in the upper zone. Thus, there is clearly an affinity between a gesture and a word because both require time to unfold, and each is made up of a series of distinct elements which follow each other and have only a temporary existence. Here it must be borne in mind that, whereas in the world of sound distinct sounds can only have a temporary existence, in the world of vision the position is different, for visual signs may have either a permanent or a temporary existence.

It is therefore necessary to distinguish between a visual sign which has a temporary existence and one which has a permanent existence. If the word 'signal' is used to signify a temporary existence in space or time, a distinction can be made between auditory and visual signals, and visual signs. Thus, a spoken word would be an upper zone potential signifier arising from auditory signals, and a gesture would be an upper zone potential signifier arising from visual signals. If we are considering only the distinct elements which make up the whole of the word or gesture we would find them on the lower zone as potential signifiers.

De Saussure makes these points when he writes

> In contrast to visual signifiers (nautical signals etc.) which can offer simultaneous groupings in several dimensions, auditory signifiers have at their command only the dimension of time. Their elements are presented in succession; they form a chain. This feature becomes readily apparent when they are represented in writing and the spatial line of graphic marks is substituted for succession in time. (ibid p.46)

De Saussure then talks about the word 'symbol', if only to dismiss its value in this context.

> The word symbol has been used to designate the linguistic sign, or, more specifically, what is here called the signifier. Principle I in particular weighs against the use of this term.* One characteristic of a symbol is that it is never wholly arbitrary; it is not empty, for there is the rudiment of a natural bond between the signifier and

> the signified. The symbol of justice, a pair of scales, could not be replaced by just any other symbol, such as a chariot.
> The word arbitrary calls for comment. The term should not imply that the choice of a signifier is left entirely to the speaker; I mean that it is unmotivated, i.e. arbitrary in that it actually has no natural connection with the signified. (ibid, p.46)
>
> *Principle I is the arbitrary nature of the sign.
> Principle II is the linear nature of the signifier.

Sapir (1970) writes that 'the essence of language consists of the assigning of conventional, voluntarily articulated, sounds, or their equivalents to the diverse elements of experience'. (p.11) He points out that

> The speech element "house" is the symbol, first and foremost, not of a simple perception, nor even of the notion of a particular object, but of a "concept", in other words, of a convenient capsule of thought that embraces thousands of distinct experiences and that is ready to take in thousands more. If the single significant elements of speech are the symbols of concepts, the actual flow of speech may be interpreted as a record of the setting of these concepts into mutual relations. (ibid, p.13)

Later he states that 'not until we own the symbol do we feel that we hold a key to the immediate knowledge or understanding of the concept'. (ibid, p.17) Thus there appears to be an equivalence between Sapir's 'symbol' and de Saussure's 'signifier', and Sapir's 'concept' and de Saussure's 'signified'. The term 'signifier' may be preferable to 'symbol' for it embraces a wider conceptual range and affords freedom within it to delineate a variety of points of departure which are themselves dependent upon several definitions (or 'symbols' as Sapir might term them) whose dynamic relationships give the final shape to the 'signifier'. We find support for this view from Sapir himself, who states that 'the word, as we know, is not only a key; it may also be a fetter'. (ibid, p.17)

The use of the word 'signifier' instead of 'symbol' enables us to make distinctions between such conceptual entities as auditory signals, visual signals or signs, and potential signifiers on the upper and lower zones. Where Sapir states that 'the letter of the telegraph code is then a symbol of a symbol of a symbol' (ibid, p.20) we are able to describe it either as an upper zone potential signifier arising from a sign of a sign of an auditory signal, or a signifier if it forms part of a meaningful sign. This is, of course, assuming that Sapir is talking about the dots and dashes on paper. If, however, it is the sound of the dots and dashes that we are describing, then a Morse Code letter would be either an upper zone potential signifier arising from an auditory signal of a sign of a sign of an auditory signal, (the last being the sound of the letter), or a signifier if it forms part of a meaningful sign. If, like Sapir, we used only the word 'symbol', the description would read 'a symbol of a symbol of a symbol of a symbol', and would indeed be most confusing.

To test the validity of our argument further, we can examine Roman Jacobson's writings who stated, in 1971, under the heading of 'Visual and Auditory Signs' that

> The spatial dimension takes priority for visual signs and the temporal one for auditory signs. A complex visual sign involves a series of simultaneous constituents, while a complex auditory sign consists, as a rule, of serial successive constituents. (p.336)

Does Jacobson equate the word 'sign' with de Saussure's 'sign' or with Sapir's 'symbol'? We get some enlightenment from the following passage.

> Primarily representational signs, which display a factual similarity or contiguity with their objects, prove to be mostly visual, in contradistinction to non representational signs, which are preponderantly auditory. The former deal foremost with space, the latter with time; simultaneity in the one case and successivity in the other is the principal structuring device. (ibid, p.337)

It would appear that Jacobson's 'sign' best fits with de Saussure's 'signifier'. However, in the model we have proposed there can be no 'auditory sign', only an 'auditory signal', and so, to fit our model, Jacobson's title would have to read not 'Visual and Auditory Signs' but 'Visual Signs and Signals and Auditory Signals'. Clearly the use of the proposed terminology is a great help since the descriptive word refers to the nature of the origin of some entity and to the entity itself without making any assumptions with reference to possible receivers, i.e. we can differentiate between a mere stimulus and a stimulus which functions as a signifier.

At this stage it becomes necessary to consider the receiver and hence to assign to signifiers different levels of importance, for it is impossible to define the value of a signifier save as relative to a given receiver. We shall thus be able to define firstly the entity independent of any receiver, which, even though it may no longer be extant, has a clear label, and secondly, the effect of the existence of this entity in terms of its value to a given receiver.

It is important here to bear in mind that a high value meaningful sign can originate from a low level and vice versa, and that there is no relationship between the 'complexity' of a signifier and its contribution to the ultimate value. Indeed, any signifier can act as a stimulus causing 'reciprocal climbing', thereby helping to determine the ultimate value. However, whereas one signifier could enter in the low level and remain there, not causing reciprocal climbing, another could enter in the high level, the point of entry being dependent upon the state extant at the moment of its arrival. What is important is that the signifier may act as a trigger to a possible chain of reactions. Sapir (1970) calls this event the 'setting of these concepts into mutual relations' (p.13), and Peirce (1932) believes that a sign can only be a sign if it is part of a sequential set of signs forming an infinite series, the meaning of the earlier ones being constituted by the later ones until a logical conclusion is reached. He describes this process as follows:

> To say, therefore, that thought cannot happen in an instant, but requires a time, is but another way of saying every thought must be interpreted in another, or that all thought is in signs. (Vol.V, p.161)

Peirce holds that in this process linguistic signs, or what he calls symbols, can have no connection with indexical signs connected to things, for linguistic signs are what he terms 'thirdness' whilst indexical signs are 'secondness'. Peirce holds that signs in the 'thirdness' category do not themselves refer to things, but have a tenuous connection with them through the intervention of 'secondness' in which the idea of dyadic opposition predominates, bringing us closer to the world of things. He states that

> ...this notion, of being such as other things make us, is such a prominent part of our life that we conceive other things also to exist in virtue of their reaction against each other. The idea of the other, of not, becomes a very pivot of thought. To this element I give the name of secondness. (ibid, Vol.I, p.162)

There is a relationship, however tenuous, between this notion and Osgood's Mediation Hypothesis (1953) in which he distinguishes between 'stimulus objects' which elicit sequences of behaviour without mediation, and signs, which are complexes of stimuli which elicit mediation processes. Notwithstanding the fact that Osgood's representational mediation response assumes that a reaction to a sign is some fraction of the total response sequence which would have been elicited by the object itself, bearing in mind Peirce's 'secondness' and its relation to his 'thirdness' and his view that no conclusion of reasoning is ever finally fixed because it may be modified by new signs, we are forced to the conclusion that, in so far as the ultimate value to a receiver is concerned, the power of the sign is not only potentially equal to but may be greater than an actual stimulus object. This last point is of particular concern to us, for we can not talk of a 'stimulus object' when considering sound, and the very fact that in this realm our initial contact with the world is through auditory signals which are once removed from matter and are rarely iconic could not only present us with a basis for an explanation as to why music has never developed lexation, but could be a strong argument in favour of sound-instigated meaningful signs being of potentially high value to receivers because different routes of entry into the consciousness may activate different 'triggers' leading to reaction sequences of different quality and power resulting in changed routes and destinations. In other words, it may be that the very first 'trigger' has a strong bearing upon the nature and direction and ultimate destination of the entire process which leads to 'value' for the receiver.

Morris (1938) laid stress on the relation of signs to their users or 'interpreters' and in this connection it may be well to note at this point that whereas to Peirce 'interpretant' meant another linguistic sign or set of signs, Morris uses the word as a 'personal user' or 'interpreter', which usage would not have been acceptable to Peirce since it infers that what interprets a given linguistic sign is dependent upon the individual interpreter. In order to avoid confusion, I have called Morris's 'interpreter' the 'receiver', thus allowing the final value of a meaningful sign to depend upon what Peirce called a process of sequential movement of signs to a final logical conclusion in which process signs are interpretants of other signs, and what I have called 'reciprocal climbing', in which there can be interchange between or among signifiers of different origins so that, for example, an auditory signal signifier could spark off another meaningful sign and so on, all of this leading to some conclusion which would represent the final value of the original signifier which could thus be regarded as an investment with an unknown potential except in cases where there is already an established pattern based on previous experience and no need for change. In this connection it should be noted that the word 'climbing' refers to the ultimate value and not to the course of the process, for in the latter there can be shifts from low to high levels and vice versa, the system being either 'closed' and operating only on information already available within it, or 'open' and receiving new information in the course of operation.

Now to return to Morris (1938) who distinguishes four components of signs. (i) The sign vehicle. (ii) That to which the sign refers. (iii) The effect on some interpreter. and (iv) The interpreter. Morris proposes three dimensions. 1. The semantic dimension in which signs designate and/or denote. 2. The syntactical dimension in which signs implicate. 3. The pragmatic dimension in which signs express. In the semantic dimension signs relate to one another, and in the pragmatic dimension signs relate to interpreters.

Morris's dimensions fit easily into our proposed model, but though his confining of these three dimensions to parameters certainly has its advantages for it enables recognition of the validity of each, it raises the danger that, for the very reason that these dimensions have been isolated, their separateness will weaken the links between them resulting in the destruction of the cohesiveness of the whole so that an integrated solution of the kind Peirce was trying to achieve becomes beyond reach.

We are now at the stage where we have reached not an impasse, but rather crossroads on high ground, and we can sum up and evaluate the various theories which have been proposed. In some aspects of each of the positions we have discussed there is inevitably a measure of conjecture bordering on the esoteric with little hope at present for total verification based on empirical experimentation, though in parts the theories are based on ingenious and careful experiments which have yielded incontrovertible results which are at the root of some quite extraordinary insights.

When assessing the merits of the S-R theories of the behaviourists or examining the position of the neo-behaviourists, or looking at the Cognitive and Gestalt theories, I must confess that, when all is said and done, I am left with some sense of mystery, and an instinctive hope that somewhere in the maze of possibilities lies the route which will lead to the promised land.

Yet from now on we shall be on much firmer ground, for we are going to deal with what is directly and easily verifiable. We shall first examine the different kinds of visual signs and signals, which, though of peripheral interest, will serve to locate the position of auditory signals central to our subject.

The following diagrammatic representation encapsulates the argument thus far, illustrates the position and relationship of the various terms of the proposed terminology, and will serve as a basis for further explication. It provides a framework which enables clear reference to be made to any aspect of the subject free from the danger of introducing ambiguity which stems from the use of some words which appear in the literature to be devoid of a clear universal meaning, bringing to mind the passage in Carroll's 'Through the looking glass'

> "When I use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean - neither more nor less." "The question is," said Alice, "whether you CAN make words mean so many different things." "The question is," said Humpty Dumpty, "which is to be master - that's all." (Ch. 6)

or the doctor's remark in Molière's 'Le médecin malgré lui' when he explains that the heart is on the right and no longer on the left side

> "Oui, cela était autrefois ainsi, mais nous avons changé tous cela, et nous faisons maintenant la médecine d'une methode toute nouvelle." (Act II, scene IV, 1667)

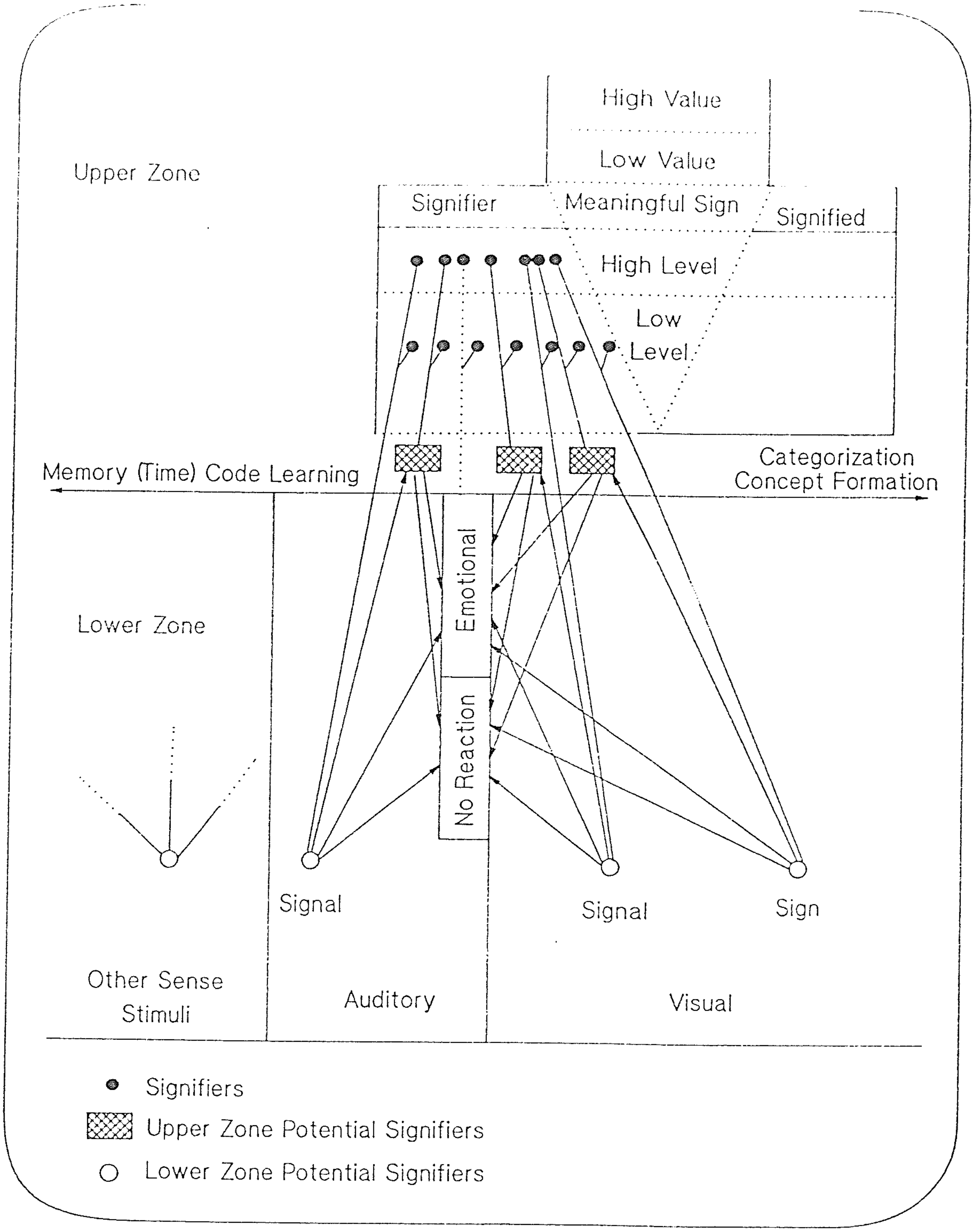

High Value
Low Value
Upper Zone
Signifier
Meaningful Sign
Signified
High Level
Low
Level
Memory (Time) Code Learning
Categorization
Concept Formation
Emotional
No Reaction
Lower Zone
Signal
Signal
Sign
Other Sense
Stimuli
Auditory
Visual
Signifiers
Upper Zone Potential Signifiers
Lower Zone Potential Signifiers

Table I

1.2.1 VISUAL SIGNS

Visual signs occupy two or three dimensional space and are permanently available to view. They are either upper or lower zone potential signifiers. There are not different kinds of signs, only hierarchies of signs. It is impossible to have partial or incomplete signs, or complex signs. (For example C is not an incomplete O, and O is not 'complex' because it is made up of a C and its mirror image joined together). The value of a sign signifier does not depend on its position in the hierarchy. As there are no complex signs, so there are no simple signs - there are only signs which stand alone, and signs which stand in combination with other signs as potential signifiers. Signs may not become signifiers until several signs are added together, exhibiting simultaneity on the lower zone, and successivity on the upper zone. If a sign signifier is made up from several signs, each constituent sign does not have to originate from the same position in the hierarchy. (For example, the word 'NO' next to a drawing of a cigarette, or a real cigarette lying on a red background). In the early part of the hierarchy signs are 'natural', and in the later part code weakens the links with the material world and symbols play an ever more important role. In this connection and bearing in mind the difference in understanding by different thinkers of the word 'symbol', it is interesting to note Oswald Wirth's view. He states that

> A symbol can always be studied from an infinite number of points of view; and each thinker has the right to discover in the symbol a new meaning corresponding to the logic of his own conceptions.
> As a matter of fact symbols are precisely intended to awaken ideas sleeping in our consciousness. They arouse a thought by means of suggestion and thus cause the truth which lies hidden in the depths of our spirit to reveal itself.
> In order that symbols could speak, it is essential that we should have in ourselves the germs of the ideas, the revelation of which constitutes the mission of the symbols. But no revelation whatever is possible if the mind is empty, sterile and inert.
> (In Ouspensky 1938, pp 217 and 218)

In a sign signifier (for example 'car') the spatial relationship of the constituent signs is a contributory factor to meaning. The spatial relationship (structure) is dependent upon such factors as the force of gravity and function. Peirce (1932) divided signs into indexes, icons and symbols. To the receiver there is a factual association between an index and its object, whereas there is a factual similarity in icons. There need be no existential connection between a symbol and the object it refers to.

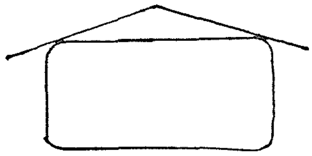
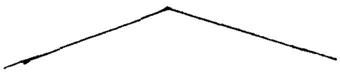
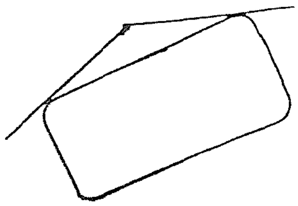
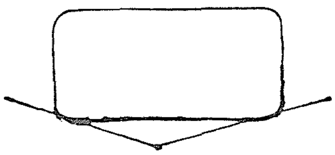
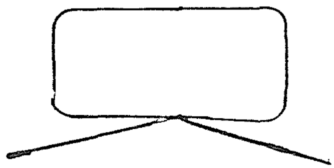
The following table illustrates the hierarchy of visual signs using the terms Peirce proposed, but it should be borne in mind that these terms should be used only in this connection, and that whatever the point of origin of the sign, it is a potential signifier in the first instance, and may become a signifier.

Direct	Reference, inference and association
A real cigarette <u>Index</u>	A piece of wood which looks like a cigarette (We tend to reify visual stimuli)
A drawing of a cigarette <u>Icon</u>	A drawing of smoke We infer that there is a cigarette
The word CIGARETTE <u>Symbol</u>	The word ASH We associate ash with a cigarette

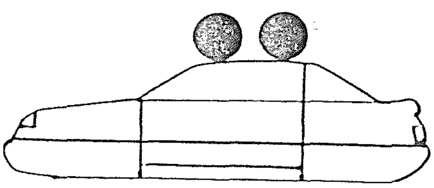
<u>Table II</u>

Depending on the entity, the meaning of some sign signifiers to receivers could depend on their constituent parts (i.e. the number of signs together) and the receiver's code. For example, a white line on a road could be a meaningful sign, as could a white line on a tennis court. A cross over a cigarette could be a meaningful sign, as could a cross between two digits. The colour red on a road sign could be a meaningful sign, as it could be on a flag. A circle on a road sign could be a meaningful sign, as could a circle on a speedometer.

Signs must relate to each other correctly and fit into our scheme of things, for if they do not, we become curious and anxious. The situational ambiguity can lead to frustration. The following examples will illustrate this position.

If this is a house  we are prepared to accept that this  is a roof. We are also prepared to accept that this house  for some reason is leaning at a precarious angle. We would also accept that this  is a house upside down. But are we prepared to accept that this  is a house?

We would much rather say it is a blackboard or a screen to fit our experience of the relations of signs to one another in the physical world. What do we make of this?



It is clear that, whatever the origin of a signifier, it must fit with our experience of reality, whereas we are surrounded by innumerable potential signifiers. Therefore, there is a correlation between the distinctive features of language and music and the distinctive features of the visual world, for, in the former, the ultimate component is the single note with all its characteristics, and in the latter it is the sign. Neither can it be argued that whereas music and language exhibit a hierarchical structure built ad hoc, there is no equivalent of this in nature, for there is a balance in music which corresponds to the balance of nature. A 'tune' which is constructed in a totally random fashion will have the same effect upon us as our last drawing. A tune has many constituent parts (notes), but each note is a note - not a simple or complex note. Of course, we can distinguish one note from another by its timbre and pitch in the first instance, and by its duration and loudness, but it is the relationship of the notes to one another (which may be ad hoc but still has to conform to laws of balance) which constitutes what we would call a tune.

Just as music exhibits successivity, so too can signs on the upper zone. We are constantly moving our eyes and adding signs to get a picture of the world around us. It is interesting to note in this connection why television or motion pictures may hold our interest, for the looking is done for us by the camera, and the physical world moves for us without the need for us to move physically, so that our environment, albeit artificial, is created and re-created constantly. Even though there is no control over what will be seen next, and perhaps because of this, curiosity and anticipation do operate - not only in so far as the visual field is concerned (what will I see next?) and immediate interest (what does she look like?) but also in so far as the dramatic action associated with the images is concerned (what will he do next? why did he do that? where is he going?).

1.2.2 VISUAL SIGNALS

Visual signals, unlike visual signs, may or may not occupy space and are temporary in space and/or time. They are available to view only temporarily. 'Now you see it, now you do not' or 'now it is here, now it is there' or 'now it is this shape, now it is that shape' are characteristics of visual signals. A grin is a visual signal because it can change to a frown from one second to the next. The red traffic light is a signal because it is only temporarily red. The Semaphore Alphabet is typical of signalling systems, as is the Morse Code transmitted by a light flashing on and off. Thus, movement is associated with visual signals, whereas this is not the case with signs. By movement in this case is meant not movement through space, but rather movement through time in the sense that the signal 'comes and goes' rather like a temporary visitor who appears and disappears at irregular intervals and for varying periods of time, but never stays for long. It is akin to the movement of rhythm in the world of sound, but not necessarily rhythmic movement, for it divides time into portions of varying durations.

Naturally, a visual signal signifier can originate either in the lower or upper zone, as is the case with signs. It is interesting to note in this context, the difference between a visual signal signifier and a sign signifier in relation to a given receiver. A policeman's hand up with the palm facing the viewer is a visual signal, though if it were drawn on a piece of paper, it would be an iconic sign. Naturally, the meaning and value to the receiver in both cases would depend upon the receiver's code. To most Western receivers, the signal means 'stop'. However, African visitors to England may rate policemen as the friendliest people because, in their code, the signal means 'Hello, and welcome'. Yet, whereas the iconic sign would mean the same as the signal to the Western receiver, to the African receiver the sign may represent a magic charm.

1.2.3 GESTURES

Unlike the visual signal which is temporary in one position in space, the gesture is made up of successive visual signals in movement through space, each signal being closely related to the preceding and succeeding ones in space and time. (Except the first and the last). Thus, gestures are associated with movement through space and time. Unlike a visual sign signifier, which can originae either in the lower or upper zone, a gesture signifier can originate only in the upper zone.

Desmond Morris (1977) distinguishes between Primary and Incidental gestures. The Primary gesture is deliberate and made specifically for the purpose of communication, whereas the incidental gesture is involuntary, for example, a sneeze. Morris proposes that the term 'gesture' should be used to mean 'an observed action'. (p.24) This fits well with our description. Morris distinguishes many kinds of gestures, such as expressive gestures, mimic gestures, schematic gestures, symbolic gestures, technical gestures, coded gestures, multimessage gestures, hybrid gestures, compound gestures and relic gestures, as well as gesture alternatives and gesture variants.

We are interested in gestures for two main reasons. The first is the equivalence between the gesture which we can define as a visual signal potential signifier of the upper zone, and the tune, which we can define as an auditory signal potential signifier of the upper zone, and the second is the relationship between the gesture as 'spatial shorthand' as opposed to words as 'sound shorthand' and the possibility of pure tone pitch variations fulfilling a similar function.

For clarity of reference we can distinguish between 'gesture language' (as opposed to sign language, which, according to our definition is a misnomer - signal language being the correct term) in which visual signals are the potential signifiers, 'spoken language', in which consonants and vowels are the potential signifiers, and 'musilingua', in which pitch and rhythm are the potential signifiers. In this connection it is important to remember that there is a difference between 'language' and 'speech', and it is the difference in 'language' which arises from the use of 'gesture language' as opposed to 'spoken language' which is of special interest, particularly since gesture language originates from visible movement and occupies no space. It is only to be expected that there will be differences between the two.

If we take American Sign Language as an example of a sign language, then 'the linguistic structure of ASL is sufficiently different from English that true simultaneous communication in ASL and spoken English is very difficult to accomplish'. (Wilbur 1979, p.203) It is clear that in ASL and English there are internal pressures arising from the very nature of the process of expression which force development along certain lines. Gesture languages, if not based on the spelling of letters of spoken language, concentrate more on syntactic structure and sense words, exhibit their own unique syntax and morphology, and may leave out function words altogether. Surprisingly, and possibly because they are partly iconic and a fair distance has to be covered through space to complete gestures, gesture languages have a more restricted vocabulary than sound languages. For example, in ASL, 'home' is a combination of 'eat' and 'sleep', and the physical effort required to complete the gesture is very considerably greater than that required to say the word, not to mention the time difference between the two. It is factors such as these which operate to denude the sentences of gesture languages of everything but the most essential elements which contribute to sense, and give credence to theories which propose that gestures may have been the origin of language, and that speech was a very late development. (Hewes, 1973)

If speech can be regarded as an 'advance' or 'improvement' on gesture language, it is yet another illustration in support in our earlier contention that we are equipped to deal with whatever sensory information is presented for processing, and, just as the transition from gesture to speech may have been a forward leap, so it may be possible to take what may be another forward leap which will have as its basis the abandonment of speech sounds and their replacement by pure tones. It is, of course, impossible to predict what the effects of such a change would be on the sentence, which is the major functional unit of speech, but if we assume that we shall continue to inhabit our present world and bear in mind tha we are concerned therein with describing animate and inanimate matter, its condition, and its position in space relative to other matter,we would not expect radical changes but possibly some measure of improvement because

> Underlying the finished sentence is a living sentence type, of fixed formal characteristics. These fixed types or actual sentence-groundworks may be freely overlaid by such additional matter as the speaker or writer cares to put on, but they are themselves as rigidly "given" by tradition as are the radical and grammatical elements abstracted from the finished word. (Sapir 1970, p.37)

Sapir further states that 'the habitual association of radical elements, words, and sentences with concepts or groups of concepts related into wholes is the fact itself of language'. (ibid p.37)

This position remains constant, regardless of the origin and means of production of the communicative element. What may change, however, is not only the efficacy of the communicative element, an improvement in which may result in a process of continuous propagation leading to the achievement of ever more sophisticated modes of thinking, but also the relationship between the latter and the inner feeling world, for we must not neglect what has been called the feeling-tone associated with words, and the notion that many linguistic elements originate from the domain of feeling. Sapir (1970) points out that

> The feeling-tones of words are of no use, strictly speaking, to science; the philosopher, if he desires to arrive at truth rather than merely to persuade, finds them his most insidious enemies. But man is rarely engaged in pure science, in solid thinking. Generally his mental activities are bathed in a warm current of feeling and he seizes upon the feeling-tones of words as gentle aids to the desired excitation. (pp 40,41)

This is of special interest to us, for gesture languages, displaying some degree of iconicity, have within them the potential to convey emotion better than spoken language. 'Emotion, indeed, is proverbially inclined to speechlessness'. (ibid, p.38) Clynes (1989) studied emotion in music related to gesture, and gesture related to sound. He categorized gestures, for example joy or anger, and the 'shape' of the gesture became the 'shape' of the sound in terms of pitch and amplitude. Gestures and sounds, to Clynes, are a universal language rooted in music. He believes that 'music lets you become free. Free of your own personal life'. (p.21, 1989) Is it possible that the freedom he refers to is the freedom from the web of language? Since music can stir the emotions so effectively, what will be the result of thinking conceptually with music and superimposing thereon the emotional element?

Finally, a cursory examination of a few psycholinguistic aspects of 'sign languages' will elucidate further some of the points raised earlier and enable comparisons to be made with spoken language. Although there are an astonishing number of sign languages, American Sign Language will serve admirably as a basis for illustration. Contrary to popular belief, ASL is not purely iconic and does not consist solely of drawing pictures in the air, the measure of iconicity inherent in its structure being of a low order since most non signers do not understand most signs without prior training, and so, as in spoken language, arbitrary representation plays an important role, the latter factor substantiating ASL's claim to being a true language. 'Signs' can operate by direct representation where a shape is presented in space without movement, for example a ball (this would be a visual signal in our terminology) or outlined in the air (this would be a gesture in our terminology) or the simultaneous presentation of both of the preceding, or a finger pointed at an object (this would be a visual signal in the hierarchy proposed in Table 2), or by indirect representation where part of an object or action is used to refer to the whole. (See Table 2)

Mandel (1977) distinguished between direct and nondirect representation (in which part of an object or action refers to the whole). He further distinguished between presentation and depiction. In presentation there is either what Mandel calls mime (which he sees as a type of sign and which we have called a gesture), or indexing, and depiction, which can be either substitutive or virtual. It is useful to note in this connection that what we have called a gesture can be imitative either of an action or of an object. We have made no allowance for the former eventuality in Table 2 since in spoken language actions do not lend themselves to be iconically represented as in sign language, verbs fulfilling this function admirably. However, the picture is now complete, and 'mime' can be easily slotted into the correct position in Table 2.

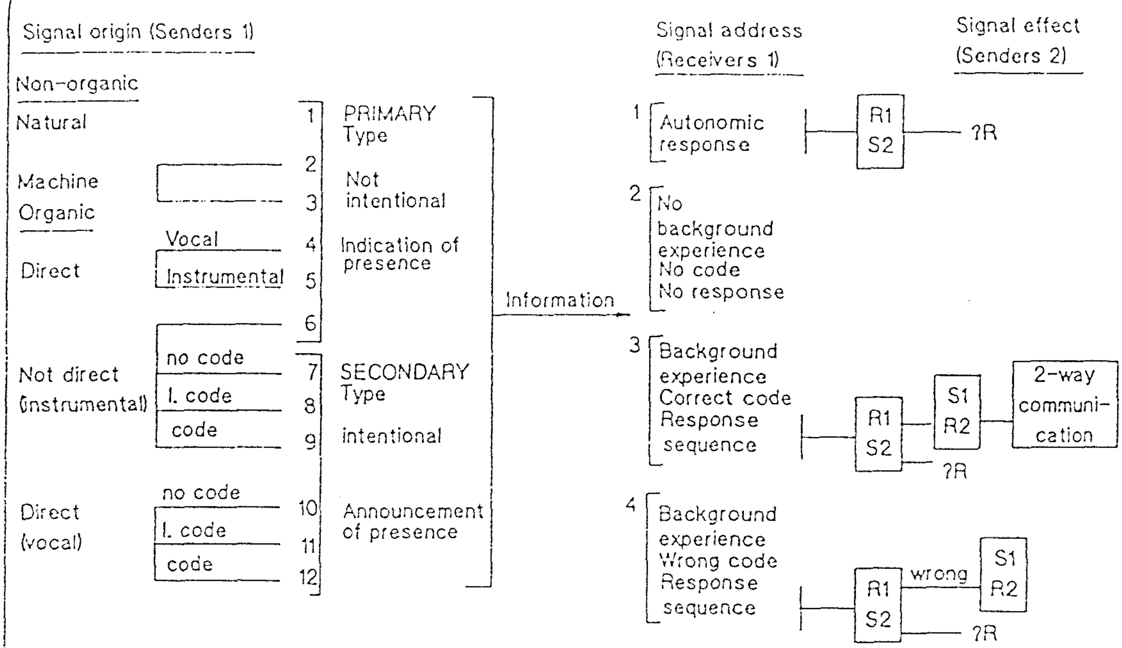
We can learn from the demonstrated affinities between 'sign' language and spoken language that where there is apparent diversity it is only apparent, and that there is in reality a universality in our understanding and processing of information regardless of the nature and mode of operation of the channel delivering the information to be entered into the processing machine. This augurs well for our future study, for, though there appears to be universality, there also appears to be a variation in quality in the very factors which appeared initially to be diverse but are nevertheless members of the same family merely exhibiting different characteristics. There is an overriding unity in nature which is the master-key which can unlock any room if we can but discover its existence, and it is comforting to know that there is very little risk of ever opening a Pandora's box.

1.2.4. AUDITORY SIGNALS

A child may ask where the fire goes when you can not see it. This question is not as simplistic as may at first appear, for we are indeed living in a world which is a potential inferno, and similarly we could be exposed to a cacophony of sounds emanating from innumerable sources in our environment. It would be sheer folly to attempt to locate and list all possible sound sources, but it is valuable at this stage to identify the main ones so as to enable categorization and reference to take place. We are not here concerned with the response to auditory signals by some receiver, or with spoken language, but only with the origin of sounds. Table 3 illustrates the position.

It is clear that all sounds can be defined as auditory signal potential signifiers on the lower or upper zones, but owing to the fact that music has no lexation, single notes or tunes are rather in the position of 'being all dressed up with nowhere to go', for they can not convey continuous clear meaning, and so, unlike speech, there is little likelihood that they will be elevated from potential signifiers to signifiers. Where they do become signifiers they can enter only in the low level or act as triggers to the process of reciprocal climbing, and herein lies their limited power, for there is no relationship between the 'trigger' and the final value. The outcome of this is that, though 'immediate memory' (Miller, 1956) operates for all potential signifiers on the upper zone, the result at the end of the process (i.e. the value) is likely to be very different and may depend on whether it stems from speech or music.

Auditory Signals – The Hierarchy



KEY

1. Thunder, waves, wind, and results thereof
2. Moved by animal power
3. Moved by fuel
4. Shock, coughing
5. Locomotory noises
6. Hammer, moving chair
7. Musical instruments
8. Intrinsic code. Not language-based e.g. happy or sad music (alphorn), some signals e.g. 'come to eat' bugle
9. Language-based e.g. drum signals, Morse code, Tonal Alphabet (T.A.)
10. No code, e.g. 'idle noises'
11. Intrinsic code, e.g. Comfort, fear noises, happy or sad singing
12. Threatening, sexual, warning (Vervet) Language-based– whistled speech, T.A.

NOTE

An auditory signal may result in

1. No response
2. An immediate response of action only
3. A delayed response of action only
4. An immediate vocal or instrumental response
5. A delayed vocal or instrumental response
6. An immediate response of combined action and vocal or instrumental
7. A delayed response of combined action and vocal or instrumental
8. An immediate vocal or instrumental and delayed action
9. An immediate action and delayed vocal or instrumental

Table III

1.3 INFORMATION, SENSE, MEANING AND UNDERSTANDING

The main problem facing us in this discussion in particular is that it is, of necessity, going to be language based. Though we need words as points of reference, these very words severely limit our horizons. We can only argue our case if we accept that our terminology is of paramount importance. Peirce (1903) is most concerned that his use of terms and notations may be understood. He states that

> a general agreement concerning the use of terms and notations - not too rigid, yet prevailing, with most of the co-workers in regard to most of the symbols, to such a degree that there shall be some small number of different systems of expression that have to be mastered - is indispensable. (p.10)

Peirce is concerned with the ethics of terminology, and it is the very fact of his concern with the subject which interests us most, for it is the outcome of a realization of the confusion that terminology can cause. This is of particular interest and importance coming from Peirce, for he believes that

> the woof and warp of all thought and science is symbols, and the life of thought and science is the life inherent in symbols; so that it is wrong to say that a good language is important to good thought, merely; for it is the essence of it. (1932, p.284)

Peirce does not comment on the limitations of even the 'best' language and consequently on the quality of the thoughts of which he believes it to be the essence, yet it is this point which is of particular interest to us.

Cherry(1957) commenting on words and meaning states:

> What should be said in a short space concerning meaning, a subject so controversial and upon which some of our greatest philosophers have spent so much energy? I can do little but make a naive sketch indicating the nature of some of the difficulties which surround the word meaning, lead the reader up to some of the literature, and leave him there. (p.11)

And later, under the heading 'Some different meanings of "meaning" Cherry states that 'meaning is a harlot among words; it is a temptress who can seduce the writer or speaker from the path of intellectual chastity.' (p.114) This neatly encapsulates the problem, and with this in mind it is possible to state our theory relating to information, sense, meaning and understanding with special reference to Musilingua.

Sense is derived from information, and meaning is derived from sense. Stated differently, information constitutes sense, and sense leads to meaning. Sense is the scalar depiction of the physical world in the mind, and meaning arises from a combinatory process using sense as its basis.

Sense is static, for it is the acceptance of the status quo in nature, and is based on recognition arising from the reception of information. Information is created at the very instant one of the sense modalities is triggered. The survival of information is dependent upon memory. Memory of information enables sense, and memory of sense enables meaning. The achievement of meaning involves the manipulation of sense and is therefore not a static process, but may be regarded as a vector in a vector field.

It is possible to come into close contact with information and sense for they form part of the physical world which is represented on a scale model in the mind, but meaning is less tangible because of its fluidity and further distance from information. Whereas sense is universal, being based on immutable information received from the environment, meaning is individual, being related to the data base and sense bank, and to the level of sophistication and quality of the individual's processing mechanism.

First information, and then sense are used as the basis for the creation of an internal blueprint which becomes progressively more sophisticated, this enabling ever more sophisticated thought processes to occur leading to the achievement of meaning on progressively higher levels. The higher levels of meaning arise from a combinatory process in which lower levels of meaning, possibly in combination with new information and/or sense spark off a chain reaction which terminates only when all available material has been used up in the process.

The meaning derived during and after the process together with any new information and sense which may be perceived as a result of it influences the structure of the blueprint and the future functioning of the processing mechanism.

Since all information arises from the physical environment, information and sense are based on matter and its movement through space, and meaning arises from an understanding of the events and relationships which occur in toto. Experience enables extrapolation which in turn enables further extrapolation without new information necessarily becoming available in the course of the process. On a very high level, this is inspiration. Extrapolation arises mainly from the availability of meaning, less so from the availability of sense, and still less from the availability of information. Reasoning is at the root of extrapolation and leads, through enlightenment, to freedom, for it enables control of the internal scalar model of the universe. A superior blueprint combined with superior processing capabilities enables the escape from the 'here and now' and the creation of an internal world which is not linked directly either to the physical world of matter or to the related world of time. The greater the distance of the internally created world from the physical environment, the greater the freedom. The greatest measure of freedom is achieved when the umbilical cord between the created world and the physical environment is totally severed. This freedom can be achieved in consciousness in life, or without consciousness, in death. Freedom is the release from the bondage of the physical world. It is the passport to the independent world of the mind. When it is created by the individual, it is the spark of God in man.

Freedom in consciousness is only possible based on the blueprint learned from the environment. Since we can not understand freedom which is not based on consciousness, our progress will be based on the study of the internal blueprint and its development, and the processing mechanisms associated with its existence and functioning.

The structuring of a cognitive blueprint may begin even before birth and certainly continues throughout life, never reaching a final form but rather being forever in a state of flux ready to accommodate any changes perceived in the first instance through the senses and entering from the outer world, and later resulting from the manipulation of extant stored information and knowledge. The blueprint is at the basis of the ability to get sense from information, meaning from sense, and understanding from meaning. Whereas sense is an acceptance of facts and inter-related facts, and meaning arises from a grasp of the significance of sense and inter-related sense, understanding may involve a leap to new knowledge arising from the action of reasoning on meaning. Peirce (1932, p.4) stated:

> We all have a natural instinct for right reasoning, which, within the special business of each of us, has received a severe training by its conclusions being constantly brought into comparison with experiential results. Nay, we not only have a reasoning instinct, but...we have an instinctive THEORY of reasoning, which gets corrected in the course of our experience.

The following is a diagrammatic representation of the preceding.

Reasoning

Information → Sense → Meaning → Understanding

Knowledge

Reasoning is the motive power without which understanding can not be achieved from the manipulation of static information and sense initially, and meaning subsequently. Knowledge embraces information on the lower level, and the product of the action of reasoning on meaning on the higher level. Memory is at the root of the whole process. If there is experience, sense fulfils expectations. Surprise is when expectations are not fulfilled, or when new information is presented unexpectedly. Reasoning acts to redress the balance where surprise has caused anxiety. Kant (1923, p.86) stresses the prominence of reasoning in this model.

> Now man really finds in himself a faculty by which he distinguishes himself from everything else, even from himself as affected by objects, and that is Reason. This being pure spontaneity is even elevated above the understanding. For although the latter is a spontaneity and does not, like sense, merely contain intuitions that arise when we are affected by things (and are therefore passive), yet it cannot produce from its activity any other conceptions than those which merely serve to bring the intuitions of sense under rules (86), and thereby to unite them in one consciousness, and without this use of the sensibility it could not think at all, whereas, on the contrary, Reason shows so pure a spontaneity in the case of what I call Ideas [Ideal Conceptions] that it thereby far transcends everything that the sensibility can give it, and exhibits its most important function in distinguishing the world of sense from that of understanding, and thereby prescribing the limits of the understanding itself.

What is of major concern here is whether, when reasoning acts, the level of understanding ultimately achieved is dependent upon the nature of information (i.e. aural, visual, tactile). Although it is not anticipated that this question will be answered fully, asking the question will hopefully enable clues to be found which may in turn enable the thinking to be taken further.

1.3.1. INFORMATION

Cherry (1957, p.63) states that

> The stimuli received from nature - the sights and sounds - are not pictures of reality but are the evidence from which we build our personal models, or impressions, of reality.

The reality of the physical world is perceivable through the senses. Information is perceived reality. It is not true to say that the entire universe within our reach is perceivable. We are in all probability surrounded by entities of which we are totally unaware because our sense mechanisms are not equipped to perceive them, or because we do not possess the necessary sensory equipment. What is perceivable to us, therefore, is only a fraction of the perceivable. It would thus be wrong to say that information is perceivable reality. Rather it is perceived reality. The act of perception is an act of recognition of existence. It is not an act of recognition. Therefore the existence of perceived information is not tantamount to meaningfulness. Information may be regarded as 'external', but its 'value' or 'meaning' is internal. A book can not be said to contain information until such time as someone is able to 'use' it. Only then does it yield up its 'information'. But the book can certainly be perceived as paper and ink, and the preception of its existence is also information.

Peirce (1932, p.29) states that

> It may be that knowledge cannot be realized without somebody's thinking something corresponding to it, in the same sense in which colour cannot be realized unless somebody sees it.

Wittgenstein (1938, 432, p.128) states that

> Every sign <u>by itself</u> seems dead. <u>What</u> gives it life? - In <u>use it is alive</u>. Is life <u>breathed</u> into it there? - Or is the <u>use</u> its life?

As for the word 'information', it has been related to communication, noise, meaning, cultural boundaries, knowledge, order, mathematics and signals. Such titles as 'The Mathematical Theory of Communication' (Shannon and Weaver, 1949), 'Thermodynamics and Information Theory' (Brillouin, 1950), and 'Information Transmission' (Edwards, 1964) abound. But our main concern is not with the measurement of information, or with the speed of its transmission, or with such factors as channel capacity or redundancy, for information theory has an essentially statistical character. Our interest is going to be restricted to how sound information is processed once it has been perceived. The information we shall be concerned with will arise from pure sound, timbre, duration and loudness. We shall be concerned with senses other than hearing only in so far as they can help to illuminate the area of our main interest.

Clearly, not all the senses have equal 'depth' in that the 'value' of information conveyed in a given time about the perceived universe varies from one sense to another. It can be argued that, compared with sight, hearing is a very shallow sense; music as we know it, or indeed sound, conveying considerably less information than sight. We have to go through the medium of language to enable the internalization and animation of the three-dimensional universe, whereas sound is only the result of friction relating to matter and has no relationship to the latter's physical configuration except in so far as such factors as timbre and loudness are concerned. Matter does not describe itself through sound or music, and sight enables only the viewing of a restricted external surface area of matter from one angle only and can not enable the seeing through it or seeing it from behind.

In the universe we are dealing with animate and inanimate objects. An inanimate object can be seen from different angles and hence present different configurations to the observer. But it does not change its shape - though it does change its position in space-that is - its static position - in the sense that it does not travel from one position to another but stays on the same spot relative to the observer. An animate object, however, does change its shape or configuration while remaining on one spot. (e.g. a frog breathing, a blade of grass blown by the wind). In this case, the animate object can a) change its shape, b) move through space, c) be seen from different angles. Either way, the object is a distinct entity, unpierceable by sight.

If sound information could be used to enable matter to 'describe itself' the balance between the senses would be altered drastically, for it would then become possible through sound 'to see' the entire surface as well as the internal structure of matter at the same instant. In other words, it would enable us to 'see with ears', reversing Shakespeare's example of synesthesia; 'To hear with eyes belongs to love's fine art'. Hence, thinking with auditory information would be on a different level than with visual information, especially since, once captured in the mind, images would lend themselves to manipulation of the kind that would be quite impossible with visually acquired information only. This may enable thought processes to occur on a level unimaginable at present. Further, sound-created three-dimensional configurations enable the mind to fuse with matter and sense it through being integral with it, whereas sight merely enables the appreciation of matter as a disconnected entity observed clinically from afar.

With sight, the relationships between matter are observed as events, whereas in sound-created images (Musilingua) they are sensed as reality. Because Musilingua is 'internal' to matter, it is dynamic, and enables a 'sharing' of the inherent energy of all matter. Musilingua is not a new way of looking at the world. It is a way of sensing it from within itself, and being moved with it and not by it. Whereas music influences the psyche and enables it to express itself, Musilingua integrates the psyche with the universe.

1.3.2. SENSE

In attempting to define information we have made a distinction between the theoretically possible, the realistically achievable, and the actually achieved. If we were to take the range from G below middle C to G three octaves above, in terms of frequency, the range is in the order of 200 to 1600 cycles per second, and within this range the number of notes of different pitch may be considered to be VIRTUALLY infinite. However, the power of auditory resolution is not perfect, and on the assumption that a listener can only distinguish clearly between notes which are one semitone apart, only 37 notes could be distinguished. Thus, the theoretically possible would be the VIRTUALLY infinite number of notes in the three octave range, the realistically achievable would be 37 notes, and the actually achieved would be whatever number the listener actually captured. Although the rates of transmission of information as related to the amount captured is of peripheral interest, our main concern is with the actually achieved, for that is the only information which can play a role in the internal processes which follow its 'capture'.

It is now necessary to examine what can happen to 'captured' information, for its fate will be influended by a plethora of factors, and in most cases it will form the basis of an ongoing dynamic process of indefinite length and complexity. Table IV will serve to illustrate the possible internal routes information may take, some of which may lead to sense and beyond.

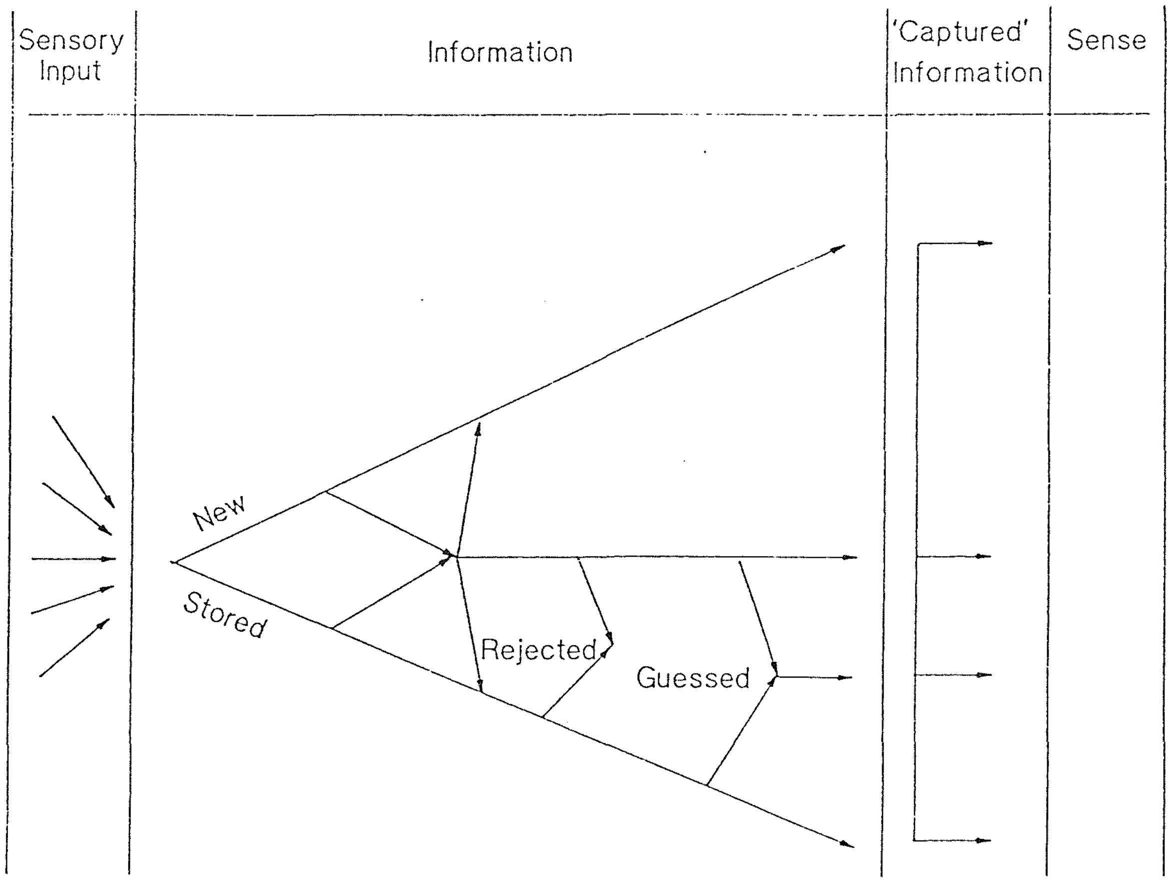


Table IV

As new information enters the system, it is first compared with stored information. If there is a match, it can be either used or rejected. If there is no match, it can be used or stored or rejected, or used and stored or rejected. Incoming information may prompt the search for stored information to be used in conjunction with it, and from this combination there may be certainty or guessing may result, or there may be rejection. The matching, adding, and combining of information which is not rejected and which is held in the mind as a cluster of 'bits' which relate to the known universe or to a possible or feasible universe, leads to sense.

To make sense information must fit with the environment or with an environment which appears possible and acceptable. For example, the word 'chair' is information, and if the code is available, that is if English is known, it fits with the environment and so 'chair' makes sense. If the information 'chair' does not make sense, it can not lead to meaning, though it can be stored as information. If, for the sake of argument we were to equate information with fact, then having the fact does not mean having the meaning. The word 'chair' may make sense, but it has no meaning until it is put into some context, for example, a chair next to a table may mean that someone can sit on the chair in order to eat. But a chair floating in a swimming pool is another matter. The meaning of the situation will have to be searched for and any number of guesses could be made. We can not understand why a chair should be floating in a swimming pool.

It must be borne in mind that sense can be progressively 'condensed' as more and more relevant information becomes available either from external or from internal sources without it necessarily leading to meaning. Sense 'modules' of various 'sizes' can exist independently of meaning even though they may contain within themselves weak 'potential' meaning ready to fuse with other sense modules to produce meaning.

It is becoming clear that from information to understanding is a dynamic process, and that sense is a milestone which has to be passed along the route to understanding. Sense leads to meaning, and meaning is an outgrowth of sense.

1.3.3. MEANING

What is the connection between riding a horse and going to the cinema? 'Riding a horse' and 'going to the cinema' make sense separately in that each phrase fits our expectations from the environment. (The actual sound of each of the words is the information). But, there is no meaning until some connection can be made to unite the two phrases into one thought-entity. Without meaning, there can be no understanding.

If we were to postulate that someone lives in the country and the only way they can reach the cinema in the next town is by riding their horse, we have meaning, and we can then understand that they wish to see a film but can only do so by riding their horse to get there, since they have no viewing facilities at their home because of its isolation, lack of electricity, and so on. Alternatively, we can postulate that on going to the cinema to see a Western a man in the film will be riding a horse. Or, on the way to the cinema we shall see a policeman on his horse. Or, that sitting in the cinema is more enjoyable than riding a horse or vice versa. Or, that while riding our horse we meet a friend who is going to the cinema. The possibilities are endless.

Countless words have been written on the subject of meaning by a great variety of thinkers of different intellectual backgrounds. It is not proposed here to review all the literature on the subject, for it will be a pointless exercise. It will lead to nothing but the confusion of the issue, and it is vital that we do not lose sight of our singular goal - to understand 'meaning' as it applies to Musilingua. Cherry (1957, p.115) states:

> In brief, the word "meaning" has many meanings, and such have been the fruitless philosophic speculation, the misunderstanding, and scientific error set up by this word that we should almost blush to use it.

We shall now return to our argument. Information builds sense. Sense leads to meaning. Meaning enables understanding. The process may be regarded as lying along a continuum. Understanding is reached through thought or reasoning, which is the power that bonds information to give sense, and sense to give meaning, and meaning to give understanding, which alone enables prediction.

In Musilingua information is the note. Sense is the combination of notes enabling the location of a position in space and the further combination of a number of spatial locations to produce a structured configuration. Meaning is the change in the configuration of a spatially 'static' entity or the manipulation of a number of configurations relative to each other be they of a static or mobile nature or both, and static or mobile through space and in constant or changing relationships through time. Understanding is prediction based on the whole dynamic process.

It is clear that there will be less redundancy in Musilingua than there is in language, and hence the flow of information from source relative to the ability to absorb it will be very different in Musilingua than in language. However, it should be borne in mind that we are more concerned with the <u>result</u> of the processing of incoming information and the effect of this upon thinking than we are with the speed of processing or even with the quantity of information available for processing at any given instant.

In the universe it is a foregone conclusion that we shall find information, sense and meaning. We may or may not have understanding. However, in language the position is different. In language the stored information is the vocabulary and grammar, and new information is related to and matched with stored information in order to decide whether it makes sense i.e. whether it fits in with the real world or can be made to do so. Randomness in language arises from the divorce of sound from matter. Words are 'flat' labels for three-dimensional entities and events.

In Musilingua matter has its own 'sound signature' which is dictated by its spatial configuration, sound also indicating precise movement through space - only the original code being randomly determined. In the realm of 'matter speaking' (describing itself and its movement through space) the process of thinking, being tied directly with the outer universe, is on a new plane. The 'sense' of the universe is an integral part of thought, and thought becomes four-dimensional. In Musilingua it is not necessary to say 'the dogs jumps', for 'the dog jumping' is seen as an action - the dog and the jumping are seen happening simultaneously. This is the fourth dimension which is superimposed upon and becomes integral with true three-dimensional thought. Musilingua describes what happens <u>now</u>, and there is no need to wait for the verb - in this case 'jumps'. This Musilingua has in common with sight, except that, as stated earlier, in sight the true third dimension is missing. In language, having said 'the dog', anything can follow. It can jump or run or lie or bark. This is impossible in Musilingua - for the entity and its movement are inseparable.

In Musilingua the stored information is the code, and the new information the notes. The notes prompt meaning <u>directly</u> because it is impossible that something will not make sense unless a contrived impossible configuration is received. Musilingua may thus be regarded as having a 'direct line' to the universe.

1.3.4. UNDERSTANDING

We must attempt to allow the sheer power of understanding to pierce the shield of language in which we are cocooned, so that the universality of understanding totally overrides the specificity of the detail words describe. However, we must at the same time bear in mind that the power of understanding derives its life-energy from the particles which sustain its existence. The existence of understanding through time is only possible if its energy is able to relate to the particles through time. Thus, the disappearance of the particles from the 'reality' of memory will eradicate understanding.

Understanding may be regarded as an all-devouring force swallowing up meaning which has life breathed into it through sense based on information. Understanding is like a spark from the sparking plug of an engine which alone enables the whole engine to come to life. The same spark can serve a tiny or a huge engine. Like the spark, understanding is universal and all important. It can act as an 'umbrella' for a very small or a very large 'quantity' of meaning. As higher levels of understanding are reached, details, though enabling them, become progressively more insignificant. On such high levels it is possible to communicate with 'understanding' as through the transmission of 'sparks' each of which represent the all embracing power of the whole, rather than through the transmission of details, which is the case when we communicate using language with words forming its basis.

Although the 'spark' itself if capable of being defined, the machinery it sets in motion is not, for the latter is the extant totality of experience and 'set' of an individual which itself can be influenced by events still occuring at the very instant of observation. It is this which defies definition. Thus, though the spark remains constant throughout, as understanding 'grows', the spark controls more and more powerful machinery.

It is understanding which infuses life into ideas. Ideas are only extant for us so long as the energy of thought nurtures their cohesiveness, whereas matter is extant so long as the energy content within it is at a certain level. Whereas matter is not 'improved' by an addition of energy but rather it is changed, the power of an idea may be so improved, bearing in mind that all judgements in this sphere are value judgements and subjective evaluations, as opposed to the state of matter in nature, which is testable across a wide range of possibilities. If there could be a fusion between ideas and matter, matter could be regarded as the container which would enable ideas to be continuously available to our senses, bearing in mind that the ideas would be captured at one point in time in their existence and held rigid, whereas in idea form, there is constant change brought about by the energy of time.

Power is rooted in movement, and movement requires energy through time. The power of thought can mould the universe ceaselessly into countless shapes and configurations, and though these are not physical reality we are more closely affected by them than we are by matter which is physical reality but whose existence is not directly relevant to us. The mind has the power to create 'matter' which is extant only in itself, but which is more relevant than some matter in the outside world, particularly if it was created as the result of the transference of an idea. On a primitive level, a sculpture can be regarded as the embodiment in matter of an idea. However, a moving sculpture moves at random, each new configuration influencing the idea, yet if the sculptor's hand through his mind were to control the changes, it would be in a different category, for it would be one stage more advanced than a static sculpture with finite dimensions. The power lies in the removal of randomness and the introduction of control. It lies in the ability to create continuously something where previously there was nothing.

There is an affinity between an idea and sound, for both are temporarily available to us, being dependent for their existence upon a source of energy other than that contained within matter. Yet there is a connection between temporary (to us) sound, and permanent (to us) matter. The permanence of matter to us is so because it is continuously available to our senses, and matter can hold within itself sound just as it can an idea, which in pure energy form is not continuously available to our senses. Matter is therefore the key to the permanent appreciation of sound, and on a high level the changing shape of matter will dictate the changing sound patterns, whereas when matter remains rigid, so will the sound patterns. In the process of creation it is the sound patterns which dictate the shape of matter in the first place and later control any changes it undergoes. In the process of communication in pure sound, therefore, notwithstanding the fact that a code is needed, matter may be regarded as the intermediary which enables stabilization through time.

The creation of an internal physical reality in which sound plays a fundamental part has as its basis a mode of thinking vastly different to that based on language which uses totally random sound labels linked directly to extant matter of finite dimensions or describing its movement or change of shape with further similarly based sound labels which have no relationship whatsoever to three-dimensional space. Since matter in space through time is the currency of thought in the new mode of thinking, the result of irritability for the organism represents a high level of sophistication in the internal world of thought.

In such thinking there is an approximation and finally a bonding and unification between what Plato called the phenomena of the world and a transcendent world of archetypal forms. The world is sensed rather than known, as is the case when language is the currency of thought, for sound is fused inextricably with the matter and energy of the universe resulting in perfect harmony and permanence. Sound does not 'imitate a worthy object'. It is integral with it. Mozart travelled some distance towards such a position when he compared holding an entire work in mind at one instant with taking in a scene at a glance.

Mozart (Mozart, in Ghiselin, 1952, p.45) wrote:

> The whole, though it be long, stands almost complete and finished in my mind so that I can survey it, like a fine picture or a beautiful statue, at a

> glance. Nor do I hear in my imagination the parts successively, but I hear them, as it were, all at once (gleich alles zusammen). What a delight this is I cannot tell! All this inventing, this producing, takes place in a pleasing, lively dream.

However, Mozart thought of music as having themes and harmony, but not conveying meaning - rather emotion - and therefore there was nothing to understand or think about. There was only the sheer excitement and pleasure of creation. Only in combination with language can higher levels be approached (opera), and that on a most primitive level.

It is evident then, that Mozart got as far as information and sense only, but his experience removes the speculation from the first part of our research and gives us the confidence to expect a different outcome if music is linked to meaning and understanding.

If we relate Mozart's experience to language it becomes clear that, as words are strung together and meaning takes shape, and becomes coherent, individual words pale into insignificance as coherent meaning becomes prominent. All the words can not be held in mind at the same instant for meaning now has an existence beyond individual words. It is an edifice which can be sustained once the words are obliterated, as Bartlett's (1932) work on memory makes clear. Once created, the edifice may be perpetuated independently of words or restructured with different words.

Miller (1971) in the course of his rejection of McLuhan's assertion that there is an exclusive linearity about script, points out that speech is just as linear as script. However, he does concede that

> to be fair, there is a sense in which it is true to assert that speech is 'simultaneous'. It is this. In order to understand the meaning of a sentence it is necessary for the listener to hold in his memory at least a temporary record of all the the words that have just been uttered, so that each new word can then take its place in a context which gives it significance. (p.113)

The key words in this statement are 'meaning' and 'temporary'.

The position is different if pure sound is at the root of the edifice.

The ability of an image to participate in the thought process depends on how it was created in the first place. A conventional word is tied to a random sound, and this weighs it down and makes it clumsy and unwieldly. Thought is on a low, cumbersome level. But if the image (i.e. the configuration) is created through Musilingua, since the image is integral with the sound, and the sound is not of physical origin, the image is 'free' and becomes integral with its sound 'shell' as soon as it has been created. Therefore, images are able to dart about in the mind at incredible speeds like molecules in a confined space. The mind's ability to do what the computer can do with images (i.e. turn them around, enlarge etc.) leads to enhanced thinking, whereas in the computer it leads to nothing more than it actually does. Thus, the original mode of creation of the image will influence the ultimate nature of thought. If two identical images are created, but each is created originally in a different mode, there would be different potential in each.

Einstein (in Hadamard 1945, p.142) wrote:

> (A) The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be "voluntarily" reproduced and combined.
>
> There is, of course, a certain connection between those elements and relevant logical concepts. It is also clear that the desire to arrive finally at logically connected concepts is the emotional basis of this rather vague play with the above mentioned elements. But taken from a psychological viewpoint, this combinatory play seems to be the essential feature in productive thought - before there is any connection with logical construction in words or other kinds of signs which can be communicated to others.
>
> (B) The above mentioned elements are, in my case, of visual and some of muscular type. Conventional words or other signs have to be sought for laboriously only in a secondary stage, when the mentioned associative play is sufficiently established and can be reproduced at will.

> (C) According to what has been said, the play with the mentioned elements is aimed to be analogous to certain logical connections one is searching for.
>
> (D) Visual and motor. In a stage when words intervene at all, they are, in my case, purely auditive, but they interfere only in a secondary stage as already mentioned.
>
> (E) It seems to me that what you call full consciousness is a limit case which can never be fully accomplished. This seems to me connected with the fact called the narrowness of consciousness (Enge des Bewusstseins).

The creation of meaning takes time in conventional language. A word has to follow a word. This time could be reduced through the use of harmony.

St. Augustine (1957, p.62) states:

> For what we speak also, by the same sense of the flesh thou hearest; yet wouldest not thou have the syllables stay, but fly away, that others may come, and thou hear the whole. And so ever, where any one thing is made up of many, all of which do not exist together, all collectively would please more than they do severally, could all be perceived collectively.

In Musilingua the creation of meaning can become as independent of the notes as in language it can be independent of the words, but the quality of meaning would be on a higher level, higher even than that enabled through vision which is concerned with the instantaneous appreciation of matter and movement through space, for all true three-dimensional elements can be held in mind simultaneously and not sequentially and thus form part of a further process of thinking. In this connection it is well to bear in mind that in vision true three dimensions are not seen and that binocular vision only enables the brain to compute an invisible dimension based on the differentials between two images.

Our consciousness is, in the first place, private to our species, and in the second, to ourselves. We accept the world as it appears through it because we have no alternative. Because we are thus entrapped, we can not imagine what it would be like to have a different consciousness and perceive the world through that. The mere knowledge of the possible existence of a different consciousness is a very different matter to experience of its quality. However, at present we can not even be certain of the former premise, let alone achieve the latter.

It may be that it is the delimitation of our senses which is also a major contributory factor to the restricted levels of consciousness we have been able to achieve up to this stage in our evolution. The states of consciousness of a supreme being may be based on the possession of innumerable senses and perfect synesthesia. It is reasonable to expect that, even with the sense mechanisms we do possess, had our thinking and 'language' developed differently, our perception of the world would have been different. It is interesting to speculate on what the nature of the states of consciousness which could be attained would be were they to be based on musilingual thinking, but there can be little doubt that our perception of the world would be most exciting.

1.4 ACOUSTIC SURROGATE LANGUAGES

In an examination of the non-verbal acoustic transmission of meaning, distinctions must be made between language related imitative rhythms, language-related imitative pitch, a combination of the foregoing, and non-language related rhythm and pitch with a randomly associated meaning.

To cover the range of possibilities it is necessary to examine both instrumental and physical means of generating the sound which will ultimately lead through the creation of information to the formation of meaning.

The necessity for the non-verbal transmission of meaning arose mainly from the need to transmit sound over long distances - a feat even the loudest voice is incapable of achieving - not only because of limitations of volume but also because

> what makes speech unintelligible at a distance is the loss of the weak harmonics and transients (of the complex speech waves)...A whistled signal, whose meaning does not depend on timbre but is determined solely by pitch, will be understood perfectly so long as it is heard at all. (Classe, 1957 p.117)

As well as the fact that pure sound shrouds language in a measure of secrecy, non-verbal acoustic communication is particularly useful in emergencies when warnings and signals have to be transmitted rapidly, although naturally it has its uses for ordinary long distance communication where the terrain makes visual communication and travel difficult or impossible.

In the world of communication it might be claimed that the first drum beat which signalled danger was as great a leap forward as the telegraph, and it was probably the need to transmit more complex messages which prompted the link with language. Cercopithecus Aethiops (the Vervet monkey), having no sophisticated language, progressed no further than the first stage, typically having three different alarm calls transmitted by physical means.

In a true acoustic surrogate language, sound which is propagated by means other than vocal must have a verbal basis. Sounds are interpreted in terms of speech rather than music so that arbitrarily selected sound sequences which act as signals but do not refer to the spoken language can not be said to be true surrogate languages. This being the case, since language is inextricably bound up with culture, the interpretation of non-vocal verbal substitutes in the form of pitch and rhythm depends not only on linguistic but also on cultural factors. Indeed, it must be borne in mind that surrogate languages generally serve more for community use rather than one-to-one communication, and play a role in guiding social action and behaviour.

Since in surrogate languages rhythmic and tonal patterns correspond to units of grammatical structure, and since the instrumental representation of the spoken word is an elaborate and lengthy process, there is a tendency to concentrate on the use of a limited number of familiar patterns which have outstanding and clearly distinguishable features. This means that not onlyis restricted vocabulary used, but that available sophistication in language, notably the use of tenses, is not fully utilized. It follows that any departure from a limited stock of understood and familiar messages may lead to confusion, since vowel and consonant phonemes can frequently not be precisely reproduced. This leaves the syllable as the finest distinguishable feature either on its own or in combination with others. A syllable can be represented as a single note of short or long duration, stressed or unstressed, of low or high pitch, and can be combined with other syllables at different tempi with pauses of varying lengths intervening. Which of these distinct features play a prominent role in the whole pattern depends on the nature of the language upon which they are based, so that in a tonal language a multi-tone system of transmission is a prerequisite, but even at best, where each feature is used to maximum effect and in perfect combination with others, there is poor agreement between speech tones and instrumental tones and thus the accuracy of the spoken language is not reproduced and clear meaning only arises if the contexual background is known or is at least familiar. This introduces an element of redundancy in order to achieve clarity.

The fact that tonal and rhythmic configurations are not crystal clear in the first place, and that identical configurations may be shared by several words and word groups imposes severe limitations on surrogate languages' ability to communicate intelligence accurately, making surrogate languages only imperfect substitutes for speech and limiting their role to special areas of social life.

Had it not been for this inherent weakness, the principles upon which acoustic surrogate languages are based could have made them superior to language as a means for thinking and communication, for 'the mere sounds of speech are not the essential fact of language, which lies rather in the classification, in the formal patterning, and in the relating of concepts' (Sapir 1921, p.19). There is clearly a link between the nature of the seminal information and the level of language achievable based thereon.

It is now proposed to overview several surrogate languages and the various means used to propagate sound, bearing in mind the distinctions which can be made between phonemic abridgement, in which there is a significant resemblance between the transmitted sign and the base message, and encoding, in which there is no physical similarity between the sign and the base message. (Stern 1957). It is also of interest to examine semiotic systems in which meaning is transmitted acoustically but non-verbally and in which the sign is arbitrary and does not refer directly to the prosodic features of spoken language.

Owing to the central role which tone plays in language, and in surrogate languages in particular, and owing to the fact that the nature of a language to some extent determines the types of instruments that can be used in conjunction with it, it might be politic at this point to discuss briefly tone languages in general before proceeding to the examination of some specific surrogate languages.

1.4.1. TONE LANGUAGES

It could be argued that all languages are tone languages on the basis of their intonation. (Beach, 1924) At the one end of the scale, the same word 'sung' differently might signify a different shade of meaning, whereas at the other it might signify a totally different meaning.

The word 'well' in English is a good example of how 'music' can affect shades of meaning. 'Well' can express surprise, challenge, hesitation, relief, decision, qualified approval, resignation or sarcasm. (Low 1985, p.179) Even though the difference between 'tunes' may be very slight, it is nevertheless sufficient to differentiate between one idea and another. However, pitch is utilized only to differentiate between shades of meaning, but not to distinguish meanings of words. Pitch is thus significant but not lexical, and English can therefore not be called a tone language. Pike (1948 p.3) defines a tone language as 'having lexically significant, contrastive, but relative pitch on each syllable', rendering tone an integral part of a word, unlike the case in English, where pitch systems are superimposed upon words of which they are not basically parts, and therefore contribute only to establishing shades of meaning. Only if this point is grasped can surrogate languages which are based on tone languages be properly understood. For someone whose mother tongue is not a tone language it is extremely difficult not to confuse tone with intonation and to accept that tone is lexically significant however fine the differences between one tone and another may be.

If a speaker of English superimposes his mother tongue's intonation when speaking a tone language total confusion may result because the tone language speaker will interpret intonation contours as lexical pitches which are basic to the words in which they occur. Yet, owing to the special features of the speaker's own language, he may be unable even to recognize the nature of the lexical pitches of the tone language because they do not fit into any part of his own familiar acoustic framework. Not hearing, or misinterpreting what is heard may lead not only to confusion, misunderstanding and loss of information but, since what is not heard can not be repeated, to total breakdown in communication, unlike the case where speakers of a non-tone language learn another and at worst are unable to deal effectively with new consonants, vowels and diphthongs, and the rhythm and music of the language, resulting in nothing worse than a foreign accent.

Tone languages are of special interest in this study because tonemic analysis serves to illustrate the outstanding ability of human beings to detect the finest tone changes and relate them to the meaning of words and to fine grammatical nuances. A thinker in a tone language utilizes pitch as an integral part of his thinking far more than a thinker in a non-tone language, for tone can obliterate certain prosodic features of language leaving the meaning clear, whereas this can not be the case in non-tone languages where tone is merely a superimposition but not an integral part of words. This ability to think partly in pure tones is a tiny step in the direction of musilingual thinking and serves as adequate evidence that such thinking is not only possible, but that, were there to be total severance from language, it could be developed much further and might lead to advanced modes of thinking. Indeed, the EEG results obtained in this study from musilingually trained subjects give every reason to believe that surrogate languages have remained primitive because they are inexorably tied to language, and that human capabilities in the area of independent tonal thinking remain very largely unexploited and unexplored.

With this in mind, following a brief examination of types of tone languages and their basic characteristics, several surrogate tone languages will be studied, albeit on a superficial level which will nevertheless suffice to make the point in so far as this study is concerned.

1.4.2. TYPES OF TONE LANGUAGE AND THEIR BASIC CHARACTERISTICS

Pike, in his 1948 study of tone languages, delineated a comprehensive picture which will serve as a broad guide and point of reference for the tone languages presented in this paper.

A tone language may be defined as a language having lexically significant, contrastive, but relative pitch on each syllable.

1 Lexically significant pitch distinguishes the meaning of words.

2 Contrastive pitch entails one pitch being kept different from another in the immediate context.

3 Relative pitch concerns the pitch relationship of one specific syllable to another in the specific context of a particular utterance. The actual pitch or general level of pitch used is immaterial.

4 Syllable pitch means that each syllable has pitch as fully basic to the words in which it occurs.

<u>Level-pitch register systems</u>

A level toneme (in tonal analysis a toneme is the equivalent of the contrastive unit of sound - the phoneme) does not change pitch during its production. A gliding toneme does, and there may be a rise or fall in pitch or a combination of both.

<u>a) Number of registers</u>

Where there are pitch contrasts between level tonemes, they are called registers, and these seem to be limited to a maximum of four. In a two-register language, the high and low registers tend to be further apart than in a three or four-register language.

b) Where the movement from one register to another results in a glide, the glide is not a separate toneme but a compound of level tonemes with audible transitions between them, still leaving the language with two, three or four tonemes, the glides being two or more tonemes juxtaposed. Such glides may be considered nonsignificant.

c) Frequency of semantic distinctions

The number of words that are distinguished by tone alone differs greatly from one register-tone language to another, but tone plays an important role even where words do not depend entirely on it to distinguish meaning.

Gliding pitch contour systems

In a pure contour tone language each contrastive pitch unit is a glide and there are no level tonemes whatever. Therefore the beginning and end of the glide can not be equated with level tonemes in the same system, unlike the case in a register system where glides are interpreted phonemically in terms of their end points. It is the direction of movement rather than the precise points of the beginning and end of the glide which is important. 'Psychologically one gets sensations or intuitions of direction without necessary awareness of points of reference'. (Sapir, 1938, in a letter dated 14 July addressed to Kenneth L. Pike).

Register-tone languages with contour overlap

If glides develop in a register-tone language which have some characteristics of timing or placement that seem different from glides composed of juxtaposed tonemes, a contour overlap may be postulated.

Contour -tone languages with register overlap

The chief distinguishing characteristics in a register system are the relative heights of level tonemes, and in a contour system the direction of glides. If in a contour system two or more glides move in the same direction but are of different heights, a pertinent difference gives the impression of a register-tone overlap.

Surrogate languages, be the sound source drum, gong, wind instrument or whistling, appear to involve a mimicry of linguistic tonemes. As illustration of this, a good starting point for study would be the wide variety of drum languages.

1.5. DRUM LANGUAGES

We can do no better than to actually listen to W.H. Ford explaining the theory behind the sending of drum messages of the Lokele talking drums of Africa, with live illustrations. (Tape 1, side A, recording 2). It will therefore suffice here to complete the picture with a small number of illustrations of some other African drum languages. It should be borne in mind that drums can be used for signal drumming, speech drumming and dance drumming. Rattray (1922) has called drum-talking a tympanophonetic means of communication as opposed to drum-signalling, which he called tympanosemantic. Since true surrogate languages fall into the former category, the examples given relate only to tympanophonetic communication, and not to tympanosemantic communication where there is a pre-arranged code. The overriding purpose is to demonstrate the synergic relationship which exists between spoken and surrogate language.

1.5.1. RUNYORO BANTU DIALECT

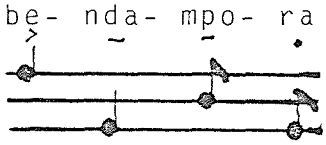
(Mbabi-Katana, 1984)

> = strong accent   – = half strong accent

• = weak accent

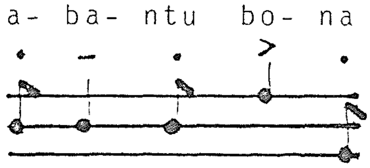
Go slowly = be - nda - mpo - ra   benda mpora

be- nda- mpo- ra



All people = a -ba- ntu - bo - na   abantu bona

a- ba- ntu bo- na



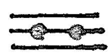
1.5.2. TUMBA DRUMS (Clarke, 1934)

Tones are about a third part. 'Do' = D 'Mi' = M

M = High tone on right side m = High tone on left side
D = Low tone on right side d = Low tone on left side
Here is a typical assembly call: ESOMBE LANGANGALA DmMmMm
'The shaman is in full regalia'.

1.5.3. YORUBA DRUMS (Ulli Beier, 1954)

The Lia-ilu 'mother of the drums' is a dundun drum shaped like an hourglass with a range of about an octave, and varying pitch is obtained by the drummer's left hand tightening or relaxing leather strings attached to the two membranes, only one of which is beaten. Thus the Dundun drum can produce not only tones but also glides, and is perfectly suited to the Yoruba language in which many words are distinguished only by their tones, their vowels and consonants being exactly the same.

ỌKỌ  husband

 hoe

 spear

 canoe

Words can be understood by their tones alone and the talking drums do not use any kind of code such as the Morse code.

1.6. IDIOPHONES

At the root of surrogate languages lies the ability to produce pure sounds of different pitch and duration which represent the essential tones of linguistic elements, but the nature of the sound-producing instrument is not at all crucial. There is accordingly a great variety of instruments ranging from drums and idiophones to wind and stringed instruments. Though there is little value in examining here further individual languages in relation to specific instruments, it is nevertheless of interest to mention a few instruments by way of illustration.

Izikowitz (1935), in his study of instruments of the South American Indians, distinguishes between drums, which need a stretched membrane to produce sound, and idiophones, which produce sound through the stiffness or elasticity of their construction. Idiophones are classified according to whether they are made to vibrate using strokes, friction, or sudden release after bending.

Percussion idiophones are of particular interest here because of their affinity to drums, and their ability to transmit sound over long distances. They can be caused to vibrate a) by striking the instrument with a non-sounding implement such as a stick, as would be the case with gongs (hollow log drums), (Carrington 1953 and 1957, Wilson 1963, Thiesen 1969, Burridge 1959), and iron gongs (Simmons 1955) such as used by the Efic of Calabar Province in Nigeria, or by pounding sonorous tubes against the ground, these forms of sound-generating instruments being termed stroke idiophones, b) by striking two sounding parts together, (clappers), c) by allowing a number of loose parts to strike against each other. In this group are included rattles and notched or rasping sticks. These instruments may be conveniently classified as follows:

a) Clappers
b) Stroke idiophones
c) Rattling idiophones
d) Stamping tubes
e) Notched sticks

The Amahuaca Indians in Peru even signal by removing the bark of the in-situ flat root of the Alatea tree and striking it with a log or club.

Geiser (1978) has produced a comprehensive list of instruments used by the Swiss in folk music, and the section on idiophones lists no less than 25 instruments, their ingenuity extending to a broom which is held over the shoulder and beaten with a brush in front of and behind the player's head in time to the music.

Arbeitsgeräte als Aufschlagidiophone

Dreschen

Rhythmisch geregeltes Dreschen als Lärmbrauch in der Neujahrsnacht; Ende des letzten Jahrhunderts erstmals in der Schweiz bezeugt und noch heute in Hallwil üblich.

Fyraabe-Topple (Zimmermannsstreich)

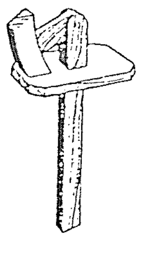
Rhythmisches Schlagen mit Hämmern oder Äxten auf den Firstbalken eines von den Zimmerleuten errichteten Hauses. 1835 für den Kt. Bern belegt und dort noch heute bekannt.

Chüferstreich (Küferstreich)

Schlagen mit Setz- und Schlaghammer auf Faß und Reifen in bestimmten Rhythmen durch den Küfer oder Kellermeister. In der Schweiz 1511 erstmals gen..nnt. Heute noch an Vereinsanlässen der «Confréreric du Guillon».

Bäsne (Besenspiel)

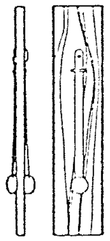
Zum Besenspiel wird ein geschulterter Besen, seltener eine Sense, mit einer Mehlbürste oder einem Scheit vor und hinter dem Kopf des Spielers im Takt zur Ländlermusik geschlagen. In der Innerschweiz verbreitetes Rhythmusinstrument der Bauernkapelle.



Aufschlagplatten

Chlöpfer [LU], *Täggi* [VS], *tapolet, tablèch* [TI], *tabela* [GR] (Klapperbrett)

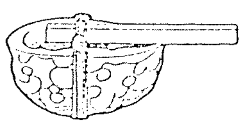
Rechteckige, seltener ovale Bretter mit einem Handgriff und angelenkten Hämmern oder in Ösen drehbaren Eisengriffen ersetzten in der katholischen Kirche vom Gründonnerstag bis Karsamstag die Altarglocke. «Tabulas percursoras» wurden in Zürich 1346 genannt. Volksliturgisches Lärminstrument in Kippel und Faido.



Gläppere [BS], *Chläppere* [BL] (Brettklapper)

Etwa 10 cm langes, 3 cm breites Brettchen mit je einem Stahlbändchen und einer Bleikugel auf beiden Seiten. Diese Klapper schüttelten jene Buben als Trommel-Ersatz, die die zweiteiligen Plattenklappern (Chlefeli) nicht handhaben konnten.
Vor allem in der Stadt Basel verbreitetes gekauftes, seltener vom Spieler selber gebasteltes Bubeninstrument.

Aufschlaggefäße



Chlöpperli [LU] (Nußklapper)

Eine halbe mit Faden umwickelte Baumnußschale. In den Windungen steckt ein Zündholz so, daß das eine Ende in der Schale ruht, während das andere über die Nuß ragt. Durch Zupfen des freien Zündholzendes prallt das Hölzchen an die Schalenwand. Früher überall in der Schweiz, wo Nußbäume gedeihen, verbreitetes Kinderinstrument.

67

From the seemingly endless variety of instruments used for long distance communication, we shall move on to examine non-vocal means of propagating sound for use in conjunction with language. Whistle speech is the most widely used in this context and deserves the most attention.

1.7. WHISTLE SPEECH

Instrumental sound production may be regarded as further removed from speech than whistling, and even though wind instruments can be considered nearer to speech than stringed or percussive instruments, the necesity for an external sound-producing apparatus which is not part of the body puts all instruments into the same category. Whistling is, however, in a class of its own. It can be produced in a variety of ways, and is much louder than the loudest shout. The range of notes that can be produced is wide, and glides of every description are possible. In addition, crescendos and diminuendos can be produced, and loudness and timbre can be controlled. Of course, another means of producing pitch variations using the mouth only is by clicking, but click languages do not have the power, clarity or flexibility of whistling, as is further evidenced by the Jews'-harp, which is an instrument of limited versatility. Whistling may thus be regarded not merely as an intermediate step to sound production by instruments, (tone-language drummers frequently superimpose the whistle upon the words as an aid to drumming), but as a superb means of sound propagation in its own right. A good whistler can even produce vibrato and trills with different intervals.

The purpose now is three-fold. In the first place it is to give an overview of whistle speech. In the second place it is to demonstrate the human capability of perceiving and utilizing very fine differences in whistled pitch and nuance within the framework of language, and in the third place it is to demonstrate the relationship between whistling and language, be it a tone language or not. Neither of the latter objectives can be satisfactorily achieved in the absence of oral examples, and tape 1, side A, recordings 3, 4 and 5 presents recordings made in the field by George M. Cowan, of Mazateco, Tepehua and Amuzgo examples. (Appendix 1)

When George M. Cowan was asked to enumerate peoples who use whistle speech (1971), he replied that he had personally worked with six informants who whistled different languages, and he named no less than a further 22 peoples throughout the world who use whistle speech. Such widespread use of whistling suggests that humans share an inner need for expression in ways other than speech, which is a complex anatomical and physiological manoevre. That whistling is related to language is not surprising, for breathing involves the flow of air through the mouth just as whistling does. Indeed, in the same way that breathing and making vocal sounds are pleasurable, so whistling gives satisfaction to the whistler, who, through his whistle, communicates with the exterior world and expresses himself. The fundamental nature of whistling in so far as the individual is concerned is evidenced by the fact that magical ideas have long been associated with whistling. Pan used his syrinx to terrify travellers in the dark forest, and his flute to enchant King Midas. He was even prepared to pit his flute against Apollo's lyre and challenged him to a musical contest. Flutes which have power over demons appear in the legends of many cultures.

An ecological survey confirms the view that whistling appears to be a universal human activity arising from an inner need, for there is no evidence to indicate that there is a relationship between different populations using whistled languages, however far-flung they may be. However, we must expect to find certain conditions, common to all, which lead to the use of whistling as a form of communication rather than self-expression, and, indeed, this is so.

Busnel and Classe (1976) examine the local conditions in which several different populations who use whistle speech live in an attempt to discover what factors they have in common. They mention first the village of Aas in the Pyrenese range of mountains, then Kusköy, which is in the mountainous region north east of Turkey, then La Gomera, on a Canary island which has difficult mountainous country, then Oaxaca in Mexico, which is very hilly country with fairly dense vegetation.

There is clearly a common thread running through all these regions. They are all mountainous regions in which physical movement is difficult and may be dangerous. People take the line of least resistance. Since shouting is inadequate and whistling is not, and since meaning has to be transmitted, the usual vehicle of communication, speech, is naturally used as the basis for whistled communication. Clearly, the nature of the whistle language depends on the nature of the spoken language. In tone languages articulatory features are dispensed with, the whistle being an imitation of the melodic line of the spoken word, whereas in non-tone languages some articulation of ordinary speech is retained.

In their conclusion Busnel and Classe (1976) pose a question which is of very real interest in this study.

> ...one may be tempted to wonder why a form of communication that is so economical as to the number of physical parameters involved should not have been universally developed by man instead of the system of signals we call speech ...(p.109)

They then answer their own question.

> The physical basis of speech involves little conscious effort and is there all the time to build on. Whistling is another matter...It is not a natural activity, proves difficult for many, impossible for some, so that it is in fact beyond the reach of a good many people. (p.109)

This answer is in conformity with reality. Whistle speech is based on speech, which utilizes 'a complex combination of movements by a large number of organs which have to be coordinated with the utmost precision'. (Busnel and Classe 1976, p.109). It is only to be expected that the whistled patterns produced as a result will retain within them some of the complexity and weaknesses of the original model and will therefore be difficult to produce. But if pitch had originally been related directly to the universe of sense - not through speech - some form of pure whistle 'speech' might indeed have developed. It is the randomness inherent in human speech universally which is at the root of its subsequent development and is one of the factors which has played a major role in casting language in a primitive mould, and it is the intervention of speech between whistled speech and the universe of sense which leaves whistled speech in a weak position vis-a-vis speech. This may be represented diagramatically as follows:

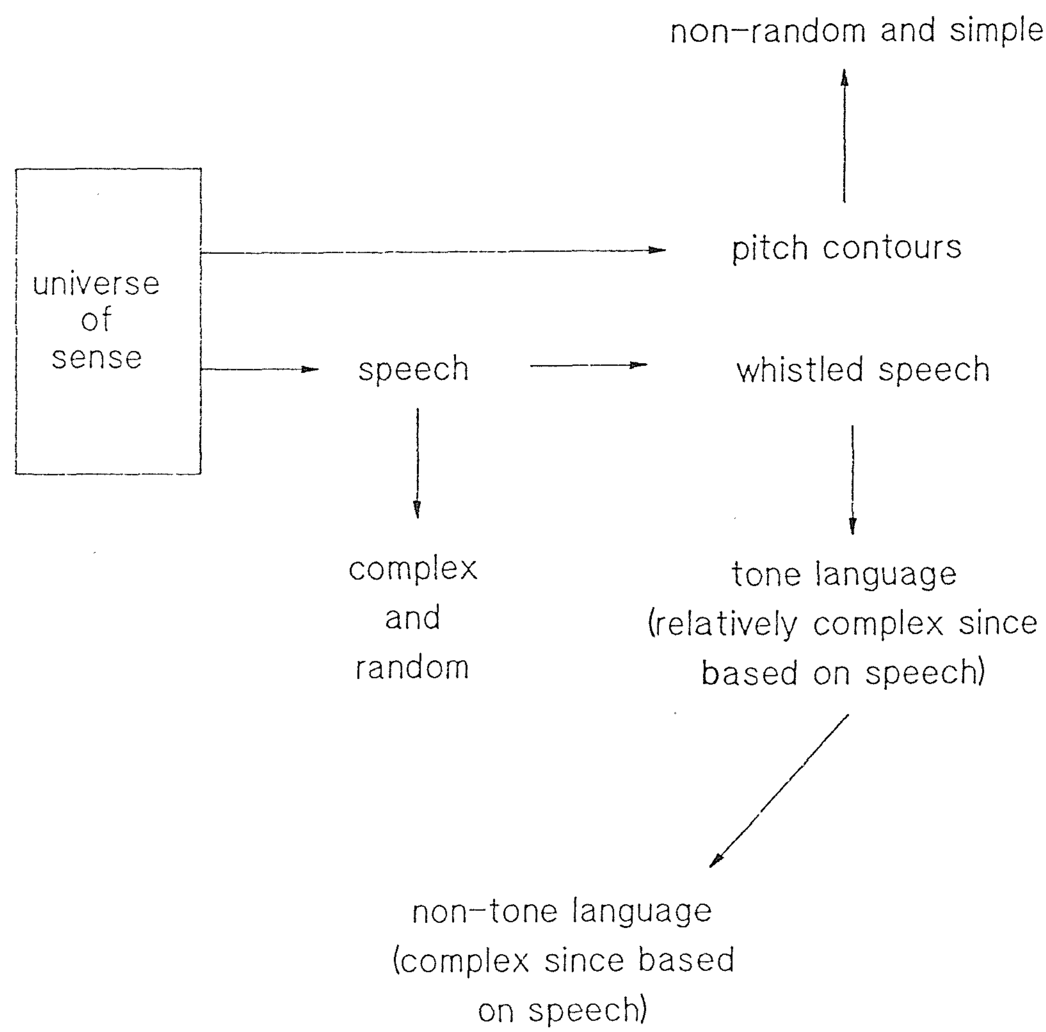


Table V

The diagram illustrates that whistled speech based on tone language is closer to pitch contours whilst whistle speech based on non-tone language is closer to speech. Indeed, Busnel and Classe (op. cit.) have proposed that since this is the case there is an argument for not calling whistled languages surrogates, but rather adjuncts, since whistle speech is not a substitute for normal speech, but rather it complements it. This closeness between whistle speech and spoken language results in certain circumstances in whistle speech being superior to drum languages which have to rely on a measure of redundancy to be intelligible.

Pitch contours in direct relation to the universe of sense occupy a unique position. For evidence that the skill of whistling as the basis for meaningful communication can be satisfactorily acquired by humans, we need look no further than little Daniel, aged two and a half at the time of writing, who for the past year has been singing and whistling happily. His mother reports that no one ever taught him to whistle and she believes that he picked it up because since babyhood she trained him to drink with a straw. (Tape 1, Side A, recording 1).

As illustration of all the foregoing some features of several whistle languages will be examined, and this should be read in conjunction with recordings 3, 4 and 5 on Tape 1, side A, which alone can serve to exemplify the reality of the nature of pitch contours in whistle speech.

1.7.1. MAZATEC WHISTLE SPEECH

Cowan (1948) writes that whistling for communication is common among the Mazatec tribe of the state of Oaxaca in Mexico. Whistling is used mainly by males, especially when they need to converse over long distances, the whistled conversation corresponding to spoken conversations very closely, though whistled conversations are generally shorter than spoken conversations. Any utterance that can be spoken can be whistled, though ambiguities may arise when words and phrases have identical tonal patterns, but this is rare because whistling is done within a known context.

> The whistle is obviously based upon spoken language. It follows the same tonal system with regard both to registers and to lexically, morphologically, and syntactically significant glides. (Cowan 1948, p.284).

Tape 1, side A, recording 3 presents examples of Mazatec whistle speech and should be listened to in conjunction with the text (appendix 1). (Note: At the beginning of the tape Cowan gives explanations referring to the text which I have omitted, the examples given sufficing to demonstrate that the whistle is based on the prosodic features of the language).

1.7.2. TEPEHUA WHISTLE SPEECH

Unlike Mazatec, Tepehua is not a tonal language, but the whistle articulates the segmental features of the language so that, as well as stress and intonation, vowel and consonant articulations are important. It is as though the whistler would start speaking but whistles instead. Tepehua is thus close to normal speech, and its relative position can readily be identified on the diagram given previously. Of special interest here and well illustrated on the examples on the tape are a) the redundancy inherent in the language and copied by the whistle, and b) the minute pitch variations of the glides leading into and out of consonant positions. Both these points are of significance in this thesis because a) musilingua may be said to have no redundancy, and b) musilingua depends upon small pitch differences (semitones) for the creation of information leading to meaning. Tape 1, side A, recording 4 presents examples of Tepehua whistle speech and should be listened to in conjunction with the text. (Appendix 1) (Cowan 1971)

1.7.3. AMUZGO WHISTLE SPEECH

> Tone is not written on the transcription but the language is tonal and there are many tonal pairs, some occuring in the drills. The whistle following each spoken utterance helps identify the tonal contours and pitches of the spoken. Tonal contrasts may also occur on nasal consonants.
>
> George M. Cowan (From notes to accompany "Examples of Amuzgo whistled speech" cassette recording).

Only a few examples are given on tape 1, side A, recording 5 to illustrate the nature of the whistle speech, which is based on a tone language.

1.7.4 KICKAPOO WHISTLE SPEECH

In Kickapoo the whistle represents pitch and length of vowels or vowel clusters, but not vowel quality or consonants. However, it is not a tone language. There are two pitches (high and low) and a falling pitch, and notes are of one, two or three morae (one mora is the shortest note). Pitches and morae are combined in different ways, for example, one mora with high pitch, two morae with high pitch and so on, so that a sentence is made up of a sequence of high and low notes of various lengths. (Voorhis 1971) Kickapoo is of interest because it is a non-tone language displaying some features of a tone language.

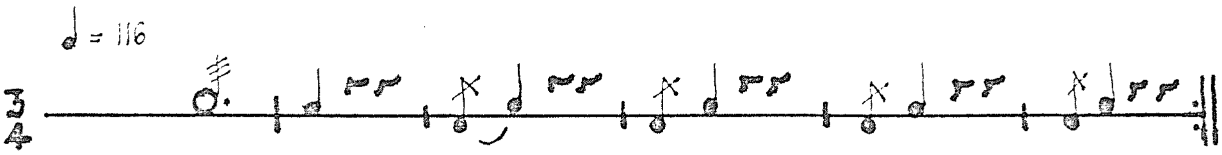
1.7.5. THE WHISTLED LANGUAGE OF GOMERA

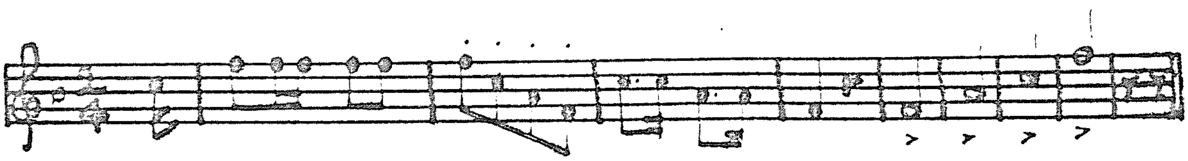
The silbo is an adaptation of Spanish for use in long-distance communication, made necessary by the nature of the terrain on the island of La Gomera. The main features of the Silbo are pitch and duration based on articulatory but not prosodic features. It is not a tone language. Lip-whistles do not appear to be used because they are not loud enough, whistlers rather using a groove in the tongue blade or thrusting fingers or knuckles into the mouth to produce a whistle whilst attempting to articulate as in speech. (Classe 1957). It is not necessary to elaborate any further, since the point has been made that pitch and duration based on language are the information-creating elements.

1.8. IDEOGRAPHS

The ideograph symbolizes the concept, shortcircuiting the phonemic structure of language. It conveys a complete message, but the relation between the ideograph and the message meaning is arbitrary and must be known for meaning to arise.

For the purpose of this paper, the best examples are encoded sound sequences such as are used by the military. (Bundesamt für Infanterie, 1985). The range of signals is extensive, and in view of the rarity of the material, several examples have been included in the appendix. (Appendix 2). Of special interest is the 1917 tambour-ordonnanz which uses only two tones and is reminiscent of African drum languages. The more sophisticated trumpet signals, though musically more interesting, perform precisely the same function as the drums, there being great redundancy in both, though this may be deliberate in order to give listeners time to wake up to the fact that there is a relevant message being broadcast and to absorb its content. This point can be illustrated by comparing the drum and trumpet signals for 'officers out'.





Since words may not tell what it means to outsoar the human, let the example satisfy him for whom grace hath fuller proof in store.

Dante

CHAPTER 2

TONAL ALPHABETS

2.1. THE PITCH-DIMENSION LINK

The idea for a tonal alphabet came in a most unlikely way. While devising a typewriting course, I noticed that students were most reluctant to look away from the paper because they needed confirmation that they had typed the correct letters. I looked for a way to develop in students the habit of not looking either at the keyboard or at what had just been typed, and yet giving them the confidence that they had typed correctly. I reasoned that if a distinct sound could be linked to each letter, since the position of the keys is known by feel, the eyes would not be needed for confirmation during the process of typing. (Except when copy typing). In any case, since typing is a 'silent' activity (discounting audio-typing or the sounds produced by the machine), the introduction of sound as an integral part of the typing process appeared to be quite an interesting idea.

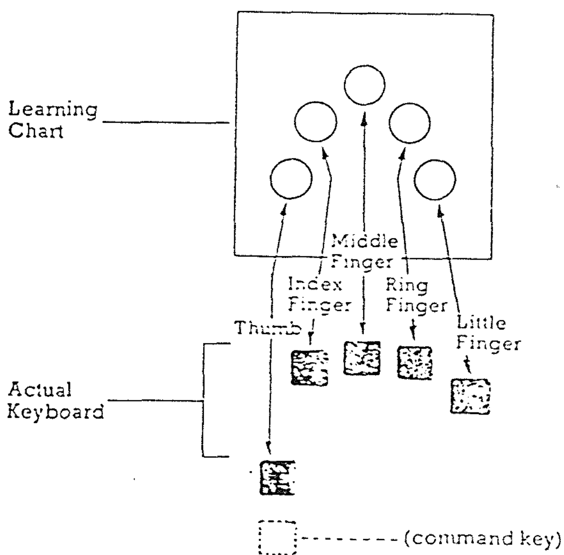
In order to enable students to know what they had typed by getting auditory information only, I looked at voice synthesizers, but found them to be slow and monotonous, not always clear, and above all, they gave no instantly recognizable sound patterns - so I tried music. It was in this way that the idea for a tonal alphabet came into being.

In a tonal alphabet each letter of the conventional alphabet has its own distinct musical equivalent consisting of two notes, this enabling words to be based on pure pitch contours rather than allophones. If two notes were to sound every time a typewriter key were pressed, the typist would have instant auditory feedback. It soon became clear that, since typing is a rapid process, the quick succession of notes would lead to recognizable auditory patterns for words, each word having its own 'tune' which, if typing speeds were great enough, might occupy less time than saying the word. This gave rise to the seminal idea that words could be thought of as pitch contours totally detached from the sounds of speech.

(The idea of pressing a key to produce sound is not new, and calculators that sound notes related to digits are available, as is the case also with some telephones and cash registers). Since in the tonal alphabet two notes represent one letter, it became evident that the number of keys on the typewriter could be greatly reduced and the keyboard accordingly simplified. This was not a new idea either. The Microwriter is available on the commercial market, and uses a five-finger keyboard. (Microwriter 1982). It is of interest here because in order to form some letters, two keys are pressed together, the imaginary line formed between them relating in some way to the shape of a letter.

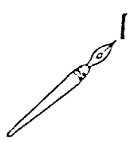
HOW TO WRITE THE ALPHABET:

It's all based on this chart:



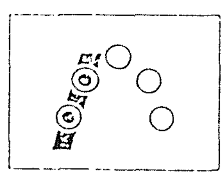
. . . and the SHAPES of the letters.

Example:



This is how you handwrite the letter "I".

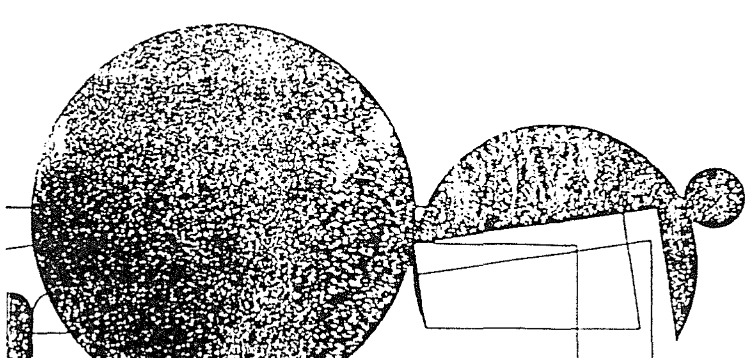
You MICROWRITE the letter "I" like this, creating the shapes with your finger tips Memorise how its SHAPE relates to the keys.



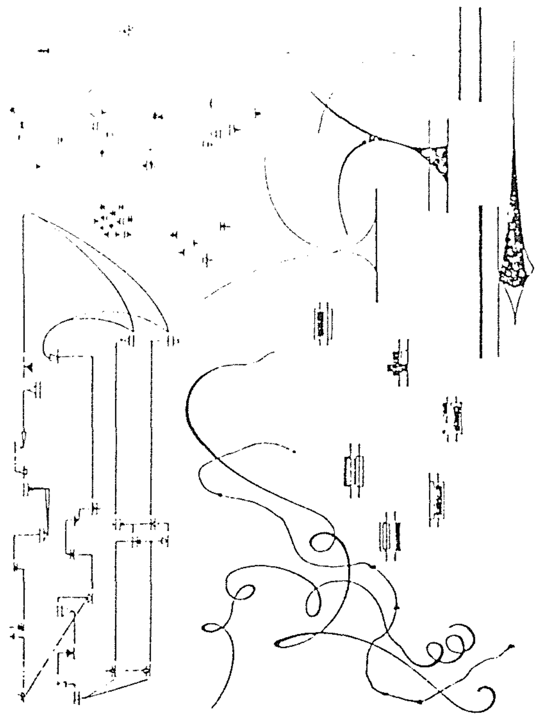
This idea is a departure from the conventional typewriter in which the letters are pre-formed and simply struck. We are not here concerned with the memory or printing capabilities of the Microwriter, but only with the idea of the dyadic relationship of the keys to a two-dimensional configuration- in this case the shape of the letters in the English language. The idea of copying by pressing keys the stroke of a pen outlining a letter is novel, but it contains no new concept, whereas the idea of associating meaningful sound patterns with two dimensional configurations showed promise. As will be illustrated later, the latter idea is fundamental to the development of tonal alphabets. The key word here is 'meaningful', since the association of sound with spatial dimension is age-old. 'High' and 'low' notes have always been graphically represented, the musical stave being an example of this. However, there appears to be some powerful and elemental force initiating the drive to combine pitch with spatial configuration - probably based on the intuitive feeling that music and matter are monadic.

Nowhere is the striving to unravel the mystery of the sound-matter relationship better illustrated than in eye music. (Arts Council, 1986). Eye music or, 'the graphic art of new musical notation' is a serious attempt to give music 'physical shape', but it falls far short of the ultimate goal because 'meaning' is not an integral part of the picture, so that the shapes created are meaningless in the same way as the music that created them is meaningless. The following examples will serve to illustrate this point.

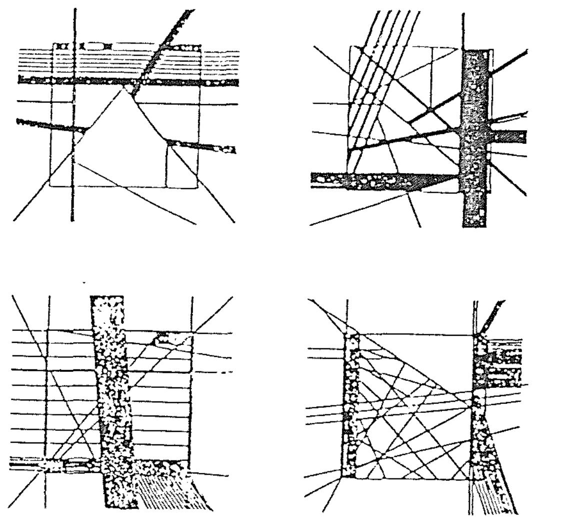
10 · EYE MUSIC



• Cornelius Cardew *Treatise* 1967
GALLERY UPSTAIRS PRESS



• Anestis Logothetis *Koordination* 1960.
EDITION MODERN



• Painter. Tom Phillips *Four Pieces for John Tilbury* 1966.

In developing the tonal alphabet consideration was given neither to the relationship between pitch contours and spatial configuration nor to the idea that pure pitch contours could represent spoken words, and the developments which followed based on these ideas were truly serendipitous.

The main problem, curiously enough, was to devise a suitable code, and the main consideration here was what the smallest interval between two notes should be, this helping to determine the largest interval to be used. I decided to use the semitone as the smallest interval, and thus the perfect fifth would be the largest needed. The next step was to allocate each letter two notes, and this was done by emulating Morse's example and allocating the easiest intervals to the most frequently used letters, at the same time bearing in mind that in English certain clusters of letters recurred fairly frequently. The allocation of notes to letters was thus not totally random, but this point is, in any case, not central to the argument. In view of the fact that only eight notes were needed, I called the tonal alphabet 'The Octatone Alphabet'.

2.2. THE OCTATONE ALPHABET

The octatone alphabet uses a distinct pitch pattern of two notes within the range of a fifth to represent each letter of the alphabet, each number from 1 to 10, all punctuation marks and other necessary signs. The total number of notes used is eight.

The advantages of the octatone alphabet are:-

1. A conventional typewriter keyboard is not required. All that is needed is an arrangement such as is found on the piano of one fifth only. (e.g. eight keys of which five are white and three are black). Keys do not have to be marked, and only one hand is needed to type in information.

2. Each letter can be heard and therefore

   a) There is an auditory check on what is being typed.
   b) Words can be constructed from the auditory pitch patterns.

3. There are no vowels or consonants to be said or heard, and the message is therefore crystal clear. Very high or low pitch notes can be chosen for people who are hard of hearing in certain ranges and have difficulty in hearing normal speech.

4. The octatone alphabet and keyboard can be linked to a computer used by blind people obviating the necessity for the computer to learn to simulate human vowels and consonants or produce some form of mechanical stimulation for tactile appreciation.

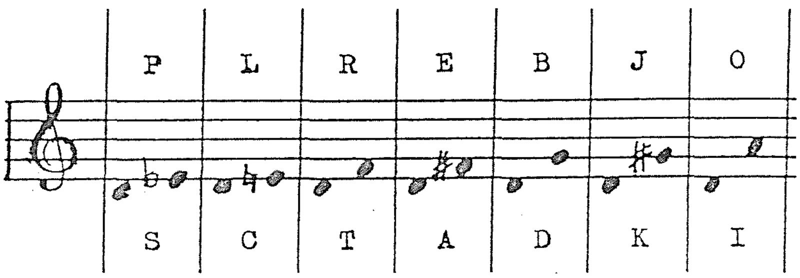
5. Since only pitch is involved the alphabet can be transmitted with great speed and accuracy.

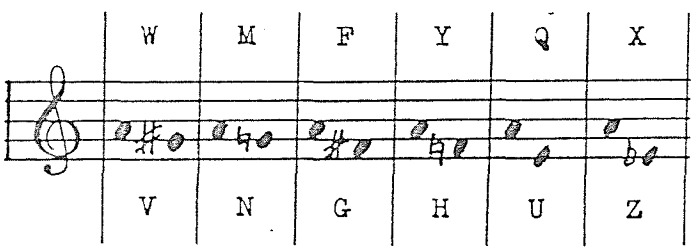
6. A suitable harmonic and rhythmic background can be added for musical interest and variety, and as an aid to memory and learning.

7. Pitch patterns of letters can be changed if it is desired to produce a different musical 'atmosphere'.

THE OCTATONE ALPHABET

(Music for bottom letters is read in the normal way. For top letters music is read from right to left).





Numbers and punctuation marks correspond to letters. A mode change from letters to numbers is indicated by e.g. VV for entry and WW for exit. Some punctuation marks have time values or are repeated notes.

The above arrangement represents only one possibility for the construction of a Tonal Alphabet. Possible variations are limitless.

A pertinent and obvious point which emerged at this stage was that the Octatone Alphabet could be of value to some deaf and blind people. I decided to concentrate in the first instance on blind people and accordingly I contacted the RNIB whose director of Music expressed interest in the idea and put me in touch with a blind music teacher. After extensive discussions and acting upon the latter's suggestion, I prepared a tape explaining the Octatone Alphabet (Tape 1, side A, recording 6) the text of which follows.

2.2.1. TONAL ALPHABETS

This tape explains the concept of a tonal alphabet, using the octatone alphabet, which is one example of a tonal alphabet, for the purpose of demonstration. The tape is in 7 parts. In part 1 the concept of a tonal alphabet is explained. In part 2 the octatone alphabet is explained and a key to the letters is given. In part 3 similar short words are given. In part 4 long words are given. In part 5 a short simple passage is given. In part 6 a short difficult passage is given. In part 7 one possible use for a tonal alphabet is suggested.

Part 1. What is a tonal alphabet?
Listening to music gives pleasure. It can be listened to on an emotional or intellectual level. On one level even rhythm alone can stir the senses. On another level, when rhythm is combined with melody, harmony, form, and the timbre of different instruments we have a sophisticated kind of music which can set mood, calm, or excite.

When words are combined with music, as in songs for example, the pitch and rhythm of words are varied as they are said, and the sung words are frequently supported by harmony. In this case it is the words as well as the music which evoke emotion. But in all songs the words used in everyday language remain unchanged, the special effects being obtained by singing the words.

Now, let us suppose that, instead of singing a word, we were to use notes of different pitch to spell it, so the word could be known without a single consonant or vowel being spoken. This would create a very direct link between musical pitch and the alphabet, and text could be understood by listening to pitch patterns.

This is the idea underlying the tonal alphabet. Listening to music in this way requires some adjustment, because, whereas at present we get meaning either by listening to words or by reading print, the user of a tonal alphabet would have to listen for meaning. Not in the sense of following a story line as in a song or opera, but rather by building words from letters and getting meaning from sentences, all information coming through the ear only. This process might be called 'aural reading' as opposed to visual reading, and linguistic communication becomes possible by using musical notes only.

A tonal alphabet therefore makes it possible to understand words by listening to musical notes. Very simply, in a tonal alphabet every letter has its own distinctive tune which can be sung or played on any instrument. For example, the letter A could sound like this....the letter N could sound like this....and the letter D could sound like this. When the tunes for all the letters in a word are played together, a melody is produced, and so the word can be understood by listening to its melody. Here is the melody for the word AND....

PART 2. WHAT IS AN OCTATONE ALPHABET?

The octatone alphabet is one example of a tonal alphabet. In the octatone alphabet only 8 notes are used in different combinations to give tunes to all the letters of the alphabet, as well as to the numbers from 0-9, punctuation marks and other signs. Here are the 8 notes....

What follows is a key to the octatone alphabet. First a letter will be spoken and then its tune will be played. Every letter consists of 2 notes only.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

PART 3 Similar short words. Two words will be spoken and then their melodies will be played. BELL - TELL BAKE - MAKE SING - RING HAND - BAND GIVE - LIVE SEND - MEND HAND - STAND

PART 4 Long unrelated words. The word will be said and then its tune played. EDUCATION DEVELOPMENT DESIRABILITY FUTURISTIC

PART 5 A short simple passage will be played first, and then the text will be read. TOM LOOKED AT MARY AND WAITED. SHE SAID NOTHING. THE ONLY SOUND THAT COULD BE HEARD WAS THE STEADY TICKING OF THE OLD GRANDFATHER CLOCK.

PART 6 A short difficult passage will be played first and then the text will be read. IN A DEMOCRACY, THE MINORITY MUST ABIDE BY THE DECISIONS OF THE MAJORITY. ONE OF THE STRENGTHS OF THE DEMOCRATIC IDEA IS THAT HOPE IS ALWAYS KEPT ALIVE BECAUSE THE MINORITY MAY BE SO ONLY TEMPORARILY.

PART 7 Because the octatone alphabet uses 8 notes it is possible to construct a keyboard such as a typewriter keyboard which has 8 keys and which do not have to be labelled in any way since the letters would produce sounds as they were typed. In fact, the keyboard would resemble a fifth on a piano and would have say 5 white and 3 black keys. Typing could be done using one hand only with a sure knowledge of where the keys are, and of course, there would be clear aural confirmation of what is being typed.

Such a keyboard could come under the heading of technical aids for the disabled.

The teacher gave his comments, which can be heard on tape 1, side B, recording 7. The following pertinent points are extracted from his comments.

1. The compass of the notes and their chromatic relationship is too limited and is therefore tiring to the ear.
2. It is difficult to distinguish between two similar letters.
3. The ear becomes tonic-orientated and this may lead to careless listening.
4. It takes a long time to get through a long word, and this means that one has to remember long sequences before one can get meaning.
5. The predominance of recurring intervals leads to aural monotony.
6. The speeds of presentation may be too great for information to be taken in.

   He makes the following suggestions:

1. Each letter ought to be very markedly different from any other.
2. Disabled people should use standard products which are already on the market.

In his conclusion he states that, since the tonal alphabet enables one to verify what one has done, it increases motivation.

His insightful comments undoubtedly form the basis for further development. I had already considered several of the points he mentioned before I had sent him the tape. However, in view of the direction the research was taking, this stage proved to be a milestone and a turning point, and there was no going back.

By now it was becoming increasingly clear that, though the Octatone Alphabet was very far from perfect, the principles underlying it might enable a new system of writing letters to be developed which would be simpler than Braille and have the added advantage that letters could be 'set to sound'. Since attempts had been made to enable the blind to read print by 'listening' to it, and since the subject of prosthesis of one lost sense by another was of great interest in this regard, this seemed to be a fruitful area for further research.

Wiener (1975) points to one of the difficulties encountered in 'designing an apparatus to enable the blind to read the printed page by ear'. (p.22)

> The production of variable tones by type through the agency of a photocell is an old story, and can be effected by any number of methods; the difficult point is to make the pattern of the sound substantially the same when the pattern of the letters is given, whatever the size. This is a definite analogue of the problem of perception of form, of Gestalt, which allows us to recognize a square as a square through a large number of changes of size and orientation. (p.22)

Later Wiener states that

> We thus find that the eye receives its most intense impression at boundaries, and that every visual image in fact has something of the nature of a line drawing. (op. cit. p.136)

and

> We center our images around the focus of attention and reduce them more or less to outlines. We have now to compare them with one another, or at any rate with a standard impression stored in memory, such as "circle" or "square". (op. cit. p.136)

and

> There now ensues the problem of determining the shapes of the individual letters as the scanning apparatus passes over them in sequence. It has been suggested that this be done by the use of several photoelectric cells placed in a vertical sequence, each attached to a sound-making apparatus of a different pitch. This can be done with the black of

> the letters registering either as silence or as sound. (op. cit. p.139)

Wiener sees no problem with interpretation.

> With the ordinary help given by our ability to interpret, it should not be too difficult to read such an auditory code, not more difficult than to read Braille, for instance. (op. cit. p.140)

However, Wiener does encounter a problem of another nature.

> However, all this depends on one thing; the proper relation of the photocells to the vertical height of the letters. Even with standardized type faces, there are still great variations in the size of the type. Thus it is desirable for us to be able to pull the vertical scale of the scanning up or down, in order to reduce the impression of a given letter to a standard. We must at least have at our disposal, manually or automatically, some of the transformations of the vertical dilation group. (op. cit. p.140).

The really important words in the statement are 'to reduce the impression of a given letter to a standard'. Wiener continues by suggesting several ways in which this might be done, but they are of no concern here. What is of great importance is his statement that

> A blinded man, as distinguished perhaps from one congenitally blind, not only retains visual memories earlier in date than his accident but is even able to store tactile and auditory impressions in a visual form. He may feel his way around a room, and yet have an image of how it ought to look. (op. cit. p.142)

Even more important and crucial to this thesis, Wiener states that

> It is necessary to equip him not only with artificial visual receptors but with an artificial visual cortex, which will translate the light impressions on his new receptors into a form so related to the normal output of his visual cortex that objects which ordinarily look alike will now sound alike. (op. cit. p.142)

He continues

> Thus the criterion of the possibility of such a replacement of sight by hearing is at least in part a comparison between the number of recognizably different auditory patterns at the cortical level. This is a comparison of amounts of information. In view of the somewhat similar organization of the different parts of the sensory cortex, it will probably not differ very much from a comparison between the areas of the two parts of the cortex. (op. ct. p.142)

Finally, Wiener states that

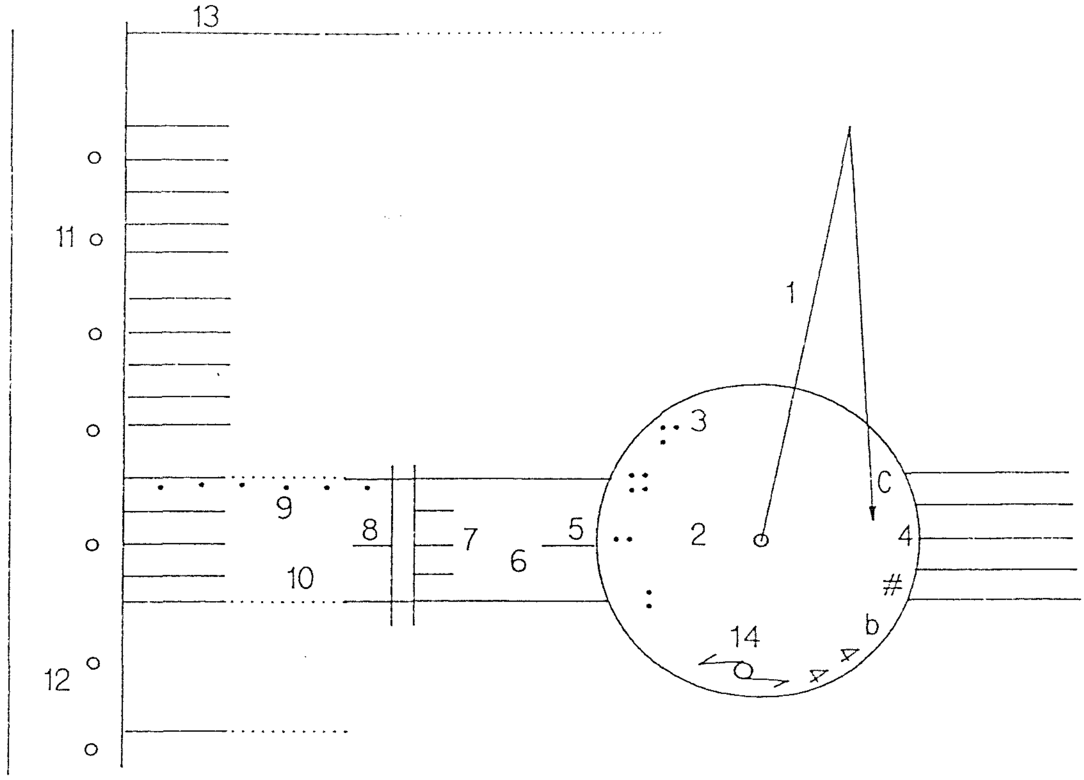
> The eye can detect all the nuances of the ear with the use of only 1 per cent of its facilities, and still leave a vision of about 95/100 which is substantially perfect. Thus the problem of sensory prosthesis is an extremely hopeful field of work. (op. cit. p.143)

It seems that the necessity to read the outlines of conventional letters before they could be transformed into sound presented some technical problems, but these were by no means insurmountable. The advent of computer power and its harnessing in this area has totally changed the picture in recent years. Speech synthesizers are commonly found even in toys, and 'letters of the alphabet are spoken as they are Brailled (Perkins Brailler) or touched (concept keyboard) and words and phrases are read back'. (Information technology and the visually handicapped, Department of Trade and Industry information pamphlet).

Notwithstanding the foregoing, the fact remains that Braille is the system still in use, and since it consists of raised dot-patterns to indicate letters, it is essentially complex and therefore difficult if not impossible to produce accurately by hand, though this can of course be done by using a tool of greater or lesser sophistication.

With this in mind I decided, partly out of sheer curiosity, to attempt to use the Octatone Alphabet as a basis for developing an alternative system to Braille, which would be simpler and would therefore enable writing without a special machine which would make reading easier, and which could at the same time form the basis for a letter-sound system. I realized the value of such a system after I had tried, at the request of the blind music teacher, to produce a tool which would enable blind people to write conventional musical notation. The complexity of the problem encouraged me to pursue the tonal alphabet system further.

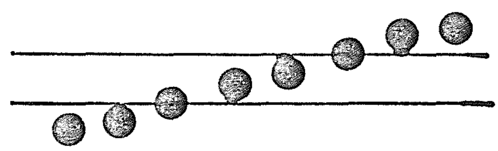
Music Notation Writer



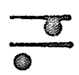
1 Pen Holder (pen is always over 4)
2 Stencil disc (revolves on 6)
3 Braille equivalent of cut-out in stencil (one letter e.g. N for 'note' S for sharp) (matches up with 5)
4 Cut-outs in stencil
5 Indicator for cut-out positions (matches up with 3)
6 Stencil disc holder (can move up and down on 10)
7 Raised stave lines
8 Stave position indicator (matches up with 7)
9 Successive note indicator
10 Horizontal arm
11 Stave indicator
12 Vertical frame arm
13 Horizontal line markers (can move up and down on 12)
14 Note stencil (enables writing breves, semi-breves, crotchets, quavers etc.)

2.4. A NEW ALPHABET

As a first step I decided to have two raised horizontal lines upon which raised dots would be placed in different positions. The thinking behind this was that, unlike in Braille where each dot pattern remains a distinct entity, these lines would form a link between one letter and another, and would enable dot patterns representing several letters to be formed which could be recognized as a single unit. This would be the equivalent of the process a good reader follows who recognizes an entire word with a single fixation, rather than adding one letter to another until the word is complete. Since there are only eight notes in the Octatone Alphabet, this is the system I envisaged, which should be read in conjunction with the code I proposed earlier.

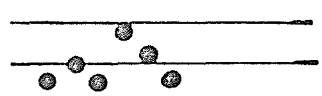


The actual pitch of these notes is immaterial. What is important is that the relative positions of the dots to the lines are easily determinable, and that there are no letter shapes to be considered. Using this system, the letter C would look like this 

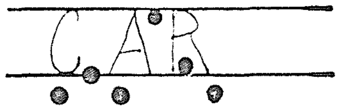
A would look like this  and

R would look like this 

Combined to form the word CAR, the following pattern would be produced.

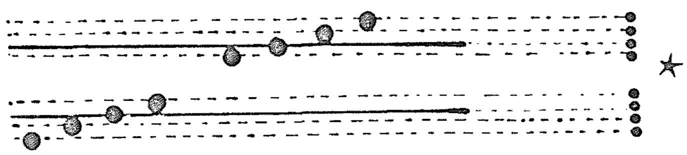


It will be noted that the same number of dots as are used to make up a single Braille letter have here produced a complete word (albeit a short one) which has its own distinct dot-pattern. Furthermore, the lines and dots could be used in conjunction with conventional print, being raised by using thermal ink, or some other suitable embossing system.



This idea opens up possibilities for the development of a three-dimensional system of dots in special spatial relationships to each other (as the planets in the universe) but conveying meaning - in fact, a form of three-dimensional writing and reading. This point will become relevant and of great importance later on. But let us now return to the question of the tonal alphabet in relation to sound.

The matter can be taken a stage further if it is required to convert the dots into sound. A simple instrument could be constructed consisting of eight wires, which, when touched, would emit a note of a certain pitch. By running a finger over the dots, the notes would sound in the right order, and the word could be 'read' aurally.



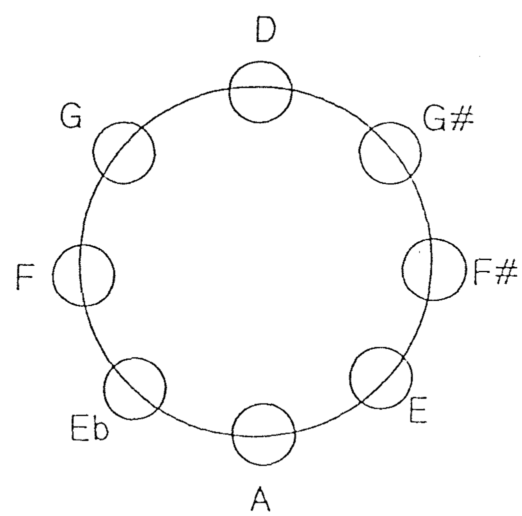
*Relevant note sounds when a dot makes contact with the wire due to finger pressure.

The 'sounding board' could be put under the letters, over the letters, or it could be in the form of a hand-held instrument with eight contact points which could be pulled along the lines, and every time a raised point came into contact with one of the contact points on the instrument, the relevant sound would be emitted.

Writing using this system could be done by feeling for the raised lines with (say) the index finger of the left hand, and making indentations with a pointed object with the right hand. To make this process effective, some experimentation with various materials would be necessary, but I proved the viability of the system using silver paper placed on cardboard and using a blunt pencil for making the indentations.

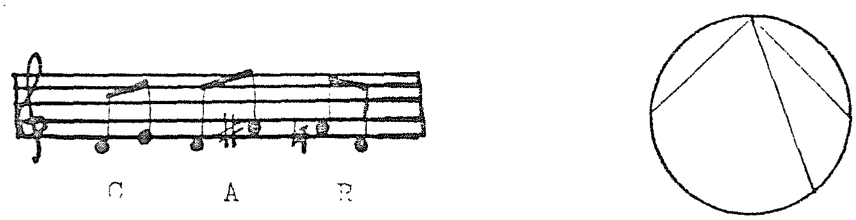
I decided not to persevere with this 'tramline' system because, in the course of its development, I was led to investigate a new possibility using a circular arrangement. The basic idea was to remove the linearity of the system, which followed the printed words, and to condense the eight notes into a confined space so as to obviate the need for horizontal movement and enable the more precise location of relative points in space. A circle may be thought of as being a straight line condensed in space, and it is easier to feel a circle as an entity in one instant than it is a line, whose extremities it is difficult to determine if it cannot be seen.

I therefore decided to use the circle as the basis for an arrangement for sounding the notes of the Octatone Alphabet. The arrangement I chose is as follows:

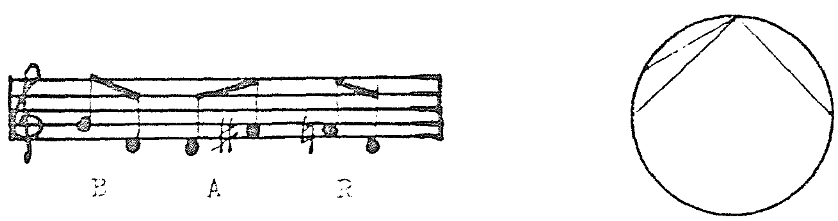


Arranged on a suitable instrument which would enable each note to sound when touched, all the letters could be given sounds using the simplest of keyboards which would have one outstanding advantage over the conventional arrangement of the piano keyboard. If a line were to be drawn to join together two notes on the piano keyboard, it would be a straight line drawn horizontally or, if one of the keys were white and the other black, the line would be slightly inclined.

However, in the case of a circular keyboard, a whole array of differently angled lines would result from the joining of several points and a distinct configuration would become associated with a given order of letters. For example, the word CAR would look like this



and the word BAR would look like this



However long the word, it would have a unique two-dimensional configuration peculiar to itself.

At this point I arrived at an appreciation of the real importance of the relationship between pitch and spatial dimension. What struck me above all, was that the configurations created by different words, though pretty to behold, endlessly fascinating and reminiscent of Kaleidoscopic effects, were quite meaningless, in the same way that the sound of a word is meaningless unless the code is known. At this juncture the question had to be asked:

Assuming that matter is encapsulated in a lattice of sound into which vision can not penetrate, only sound could search the heart of matter. Is sound the voice of the cohesive energy cradling matter, and can sound concretise matter?

This was the breakthrough point at which the realization came that the next step could only be taken if tonal alphabets and the speech and language upon which they are based were to be obliterated. Another means would have to be found to give voice to the universe, and I would have to deal with stationary and mobile three-dimensional configurations. The enormous and exciting possibilities this opened up led to my decision not to pursue further research on tonal alphabets, and to concentrate on Musilingua.

THE SECRET OF MUSIC

In the mystery of time, the complexity of sounds,
Exploring new paths in the dense gardens of pleasure,
Is transformed, a link in an endless monstrous chain,
And wanders, a mirage, through a weary, lifeless brain.

Sounds that were conceived decades ago,
Will vibrate with inexhaustible fury in days yet unborn,
And will clash in fantastic harmony and rhythm,
In the skies of a world tormented and forlorn.

The crooked finger of human curiosity,
Like a charmed snake unwinds its coils,
When the magic notes hypnotize its spirit,
And seeks to understand the lands of infinity.

With efforts supreme the snake uncoils,
Winding and feeling the heights aspiring yet to rise,
Then full length it stands vertical, agonized,
And in a flash 'tis down in the dust and dies.

B.G. Bardi The Philologian, 1953

CHAPTER 3

MUSILINGUA

3.1. THE 'EYE' OF MUSIC

In the quest for perfection there is an element of the quest to assuage curiosity. The fascination of perfection is bound up with its mystery and with the unknown, and as more of the enigma is revealed, perfection eternally recedes, leaving the position as it was in the beginning. But the continuous striving for perfection yields knowledge, and since knowledge is gratifying, we continue to explore.

Perfection, the ever receding goal, has ever been pursued in every field of human endeavour, and music has been no exception. The mystery of music, as is that of life and death, is unfathomable. The primum mobile is the question - what is perfection in music? Or even the less ambitious question - what is good music? Or, what is a good tune?

We may regard a tune as having a 'centre of attraction' which is in constant motion as the tune unfolds in time, and which serves to 'balance' the tune - the situation being rather akin to a storm moving along with the 'eye of the storm' being its focal point. This cohesiveness, or 'tonal balance' corresponds to the balance of the natural world. Although it must be admitted that 'what is a good tune' is a very subjective judgement based on such factors as cultural background and personality, there is nevertheless convincing evidence that the concept of a good tune relates to universally constant factors. (Voss 1977)

Balance is the bedrock from which one has to rise to get even the first glimmerings of understanding. As time has the universe of matter trapped in its web, so it has the universe of sound forcibly expanded within it. As the notes unfold to our hearing in an ever forward movement, the 'eye' of the music is balanced by the entire universe of notes in harmonic and rhythmic consonance and dissonance in apparent chaos but in reality in perfect balance. If this were not so, and there was no balance resulting from constant energy and movement, there could be no 'eye' of the music. The universe is in perfect balance, and the sound of the universe is perfect music.

The 'eye' of the music, sustained as it is by the universe of notes, has a permanent existence and is infinitely versatile, but it exists for the individual only temporarily in states of consciousness based on his subjective value judgements. The 'eye' is an aural mirage - a 'ghost' entity. It is thought to be sensed as reality, but its existence is only sustained for as long as conditions which are not part of itself are sustained. It is a purely subjective and temporary contact with the inner universe of sound; temporary, because we do not possess a sense modality powerful enough to make it permanent.

Deutsch (1989) designed experiments in confusion. If each ear is fed with a distinct tune, the two tunes being different, the brain may synthesise a third tune which is not actually played. The 'ghost' tune is nevertheless crystal clear.

The 'eye' of music may be likened in a simplistic way to the centre of gravity of a mass. Simplistic, because the mass is a rigid structure of finite dimensions whereas the universe of sound is unformed, offering a myriad possibilities for the creation of the 'sonic cradle' which is the sustainer of life needed to enable the 'eye' to appear. Since it is sound which gives form to the cradle and sound is bound up in time, the cradle is in a constant state of flux, and accordingly the 'eye' is never still or of fixed dimensions, being infinitely flexible. It is as though the universe were packed with a dense array of 'pitch points' giving off sound when not occupied by matter but being silenced by the occupancy of matter. The presence of matter would thus create a 'sound vacuum', sound acting as the cradle of matter, and matter could be appreciated by what is <u>not</u> heard.

> It may be that knowledge cannot be realized without somebody's thinking something corresponding to it, in the same sense in which colour cannot be realized unless somebody sees it. (Peirce 1932, p.29)

The totality of the universe of sound may be defined as 1 minus X, X being the 'eye' of the music; an indefinable quantity - a 'ghost' sound - both in terms of magnitude and position in space. This is somewhat akin to the position of an electron in an orbit around a nucleus. It is not possible to see it and to locate its precise position in space at any given instant. It is only possible to predict that it is somewhere along the orbit. This has to be taken on faith, just as we take on faith that what we are not actually looking at at any given instant, does nevertheless exist. It is the difference between the reality of existence, and the reality of the belief of existence.

Good music may be that in which the 'eye' fits most closely with the perfect balance of nature, or that part of nature which is accessible to our perception - the world of matter- and that part of nature which we can not perceive but which is just as vital to sustain our existence - space - for space is energy.

Martin Rees, a theoretical astronomer, believes that Wimps (Weakly Interactive Massive Particles) make up 90 per cent of the universe. These Wimps are invisible though we are in close proximity to them, and their combined weight is greater than everything else in the universe. Rees believes that there could be 100,000 Wimps in a cubic metre. This astounding claim means that space is filled with energy, but only ten per cent is visible in the form of matter. (1988)

Alexander Vilenkin believes that 'cosmic strings' - infinitely thin snake-like structures - attracted galaxies towards them during the early history of the universe. An inch of such string could weigh ten million billion tons. (1988).

Richard Voss (1977) used a mathematical approach in an attempt to discover the difference between good music and bad. He based his research on the theory that good music imitates a subconscious need to observe the process of change, and to be 'good' there must be a balance between the elements of predictability and surprise. As a basis for his work Voss uses the mathematical notions of spectral density and time correlations. There is a relationship between white noise and brown noise. In white noise 'the autocorrelation function, which measures how its fluctuations at any moment are related to previous fluctuations, is zero'. (Gardner 1978, p.16). To the listener it sounds colourless and boring, like a hiss, and there is no correlation between one note and another. In brown noise (a term derived from Brownian motion) there is an underlying ordered structure in that there is a correlation between note sequences.

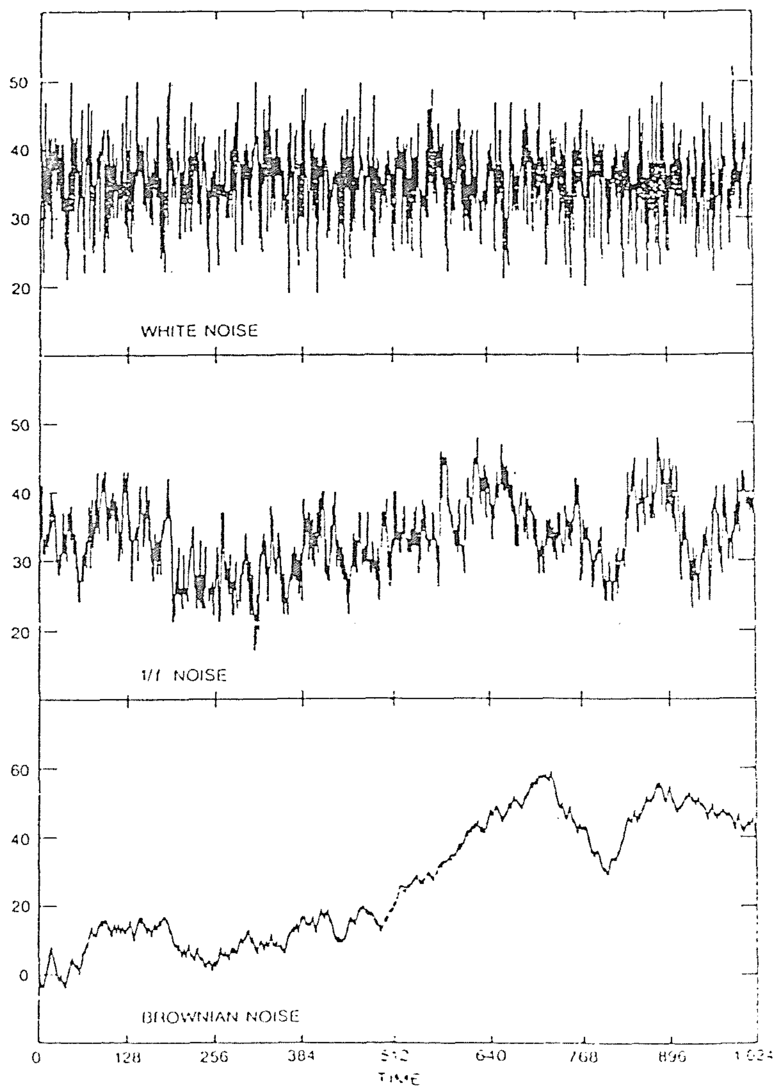
In the past, composers of stochastic music tried to select each note on the basis of the previous three or four. If a certain composer's work was studied, rules based on a statistical analysis of his work were enforced when composing in order to avoid the introduction of any note sequences which the composer himself never used. The results of this approach were that over a few bars the music sounded similar to the composer's own, but when considering the composition as a whole, it was boring and sounded like white noise.

Voss suggested a compromise between total randomness (white noise) which is meaningless, and close co-relation (brown noise) which is predictable, both the preceding being boring in their pure form. He proposed a mathematical formula which would express the balance between predictability and surprise not just for a few bars, but for a complete composition. His formula is 'one over f'. (1/f noise) The spectral density of white noise is $1/f^0$, of brown noise $1/f^2$ and in 1/f noise the exponent of f is very close to 1.

He states that

> The observations on music suggest that 1/f noise is a good choice for stochastic composition. Compositions in which the frequency and duration of each note were determined by 1/f noise sources sounded pleasing. Those generated by white noise sources sounded too random, while those generated by 1/f noise sounded too correlated. (1977 p.258)

Voss' work provides a mathematical basis for my contention that there is an 'eye' of music - a balance which exists within music as it does within the universe - and the relationship between music, mathematics and spatial dimension is clearly demonstrated. The following diagrams illustrate this triangular bond.



Typical patterns of white, 1/f and Brownian noise

From Scientific American April 1978 p. 21 (Gardner, Mathematical Games)

Yet stochastic music, however sophisticated, can not even begin to compete with 'humanly' composed music. Could this be because computers are programmed in ignorance of the 'eye' of the music factor of which humans are instinctively aware and which forms an integral part of their thinking and intellectual life? We must not overlook, in this context, that Voss' results were based on feedback from people's value judgements as to what 'sounded good'.

Gardner states that 'you will never come on anything in nature that sounds like a symphony'. (1977 p.31). He is right in that nature or any part of it does not sound like a symphony. But nature does sound, if we but had the ears to hear it. As we travel through time, the 'eye' of nature's music is with us like the presistent moon on a journey at night. Normally we take it for granted and are only vaguely aware of its presence, until it disappears and it is then that we become affected by its absence. Herein lies the power of music therapy to restore the balance, to reinstate the lost 'eye' of music, and to create harmony between mind and universe.

3.2. UNIVERSAL LANGUAGE

It is notoriously difficult to communicate meaning without language or a language surrogate of some sort. In fact, it is probably impossible. Telepathy excepted, visual imagery can not be transmitted directly from mind to mind through space, but sound can. Language, using the stratagem of random sonic encoding and subsequent decoding of spatial configurations and their state is used universally for the transmission of meaning. But music has ever been meaningless, except in so far as it affects the emotions. In language there is no emotional tie between the sound label (the word) and the entity it describes, because the sound is totally random. But if the sound were to be closely tied to an object - form an integral part of it- it would be entirely possible to feel emotion about an object, since the beauty of its occupancy of three-dimensional space could be 'felt' directly.

This fusion between sound and object is nowhere to be found in human language, onomatopoeia being a separate consideration, for it is no more than an imitation and is not integral with the configuration of matter.

Whorf (1973) states that

> Modern thinkers have long since pointed out that the so-called mechanistic way of thinking has come to an impasse before the great frontier problems of science. To rid ourselves of this way of thinking is exceedingly difficult when we have no linguistic experience of any other and when even our most advanced logicians and mathematicians do not provide any other - and obviously they cannot without the linguistic experience. For the mechanistic way of thinking is perhaps just a type of syntax natural to Mr. Everyman's daily use of the western Indo-European languages, rigidified and intensified by Aristotle and the latter's medieval and modern followers. (p.238)

and

> Moreover, the tremendous importance of language cannot, in my opinion be taken to mean necessarily that nothing is back of it of the nature of what has traditionally been called "mind". My own studies suggest, to me, that language, for all its kingly role, is in some sense a superficial embroidery upon deeper processes of consciousness, which are necessary before any communication, signaling, or symbolism whatsoever can occur, and which also can, at a pinch, effect communication (though not true AGREEMENT) without language's and without symbolism's aid. I mean "superficial" in the sense that all processes of chemistry, for example, can be said to be superficial upon the deeper layer of physical existence, which we know variously as intra atomic, electronic, or subelectronic. No one would take this statement to mean that chemistry is UNIMPORTANT - indeed the whole point is that the more superficial can mean the more important, in a definite operative sense. It may even be in the cards that there is no such thing as "Language" (with a capital L) at all! The statement that "thinking is a matter of LANGUAGE" is an incorrect generalization of the more nearly correct idea that "thinking is a matter of different tongues". The different tongues are the real phenomena and may generalize down not to any such universal as "Language", but to something better - called "sub-linguistic" or "superlinguistic" - and NOT ALTOGETHER unlike, even if much unlike, what we now call "mental". This generalization would not

> diminish, but would rather increase, the importance of intertongue study for investigation of this realm of truth. (1973 p.239)

Whorf plumbs the depths beyond surface meaning. It is not merely a question of understanding through the use of what he calls 'Mr. Everyman's daily use of the western Indo-European languages'. He is concerned with a universal, a direct link with what he terms the 'mental' and 'the deeper layer of physical existence'. And such a link can not be forged so long as we are constrained to remain imprisoned within the boundaries of any language. Whorf, with his linguistic-relativity hypothesis which proposes that thought is relative to the language in which it is conducted has opened the floodgates, and he has himself been carried some considerable distance by the rushing waters. In his search for a universal direct link with the deeper universe Whorf is stopped short because no linguistic experience other than language can be provided by 'even our most advanced logicians and mathematicians'.

Nor is Whorf's insight an isolated example of such thinking. Hesse (1977) also seeks a universal link between mind and the inner universe, and links music with mathematics with spatial dimension. He states that

> Men like Abelard, Leibniz, and Hegel unquestionably were familiar with the dream of capturing the universe of the intellect in concentric systems, and pairing the living beauty of thought and art with the magical expressiveness of the exact sciences. (p.10)

Hesse is concerned with the need for uniformity in expression and highlights the need for an as yet non-existent new means of expression. He points to the yearning based upon this strongly sensed need.

> There was a passionate craving among all the intellectuals of his age for a means to express their new concepts. They longed for philosophy, for synthesis. The erstwhile happiness of pure withdrawal each into his own discipline was now felt to be inadequate. Here and there a scholar broke through the barriers of his speciality and tried to advance into the terrain of universality. Some

> dreamed of a new alphabet, a new language of symbols through which they could formulate and exchange their new intellectual experiences. (p.36)

The Joculator Basiliensis

> invented for the Glass Bead Game the principles of a new language, a language of symbols and formulas, in which mathematics and music played an equal part, so that it became possible to combine astronomical and musical formulas, to reduce mathematics and music to a common denominator, as it were. (p.37)

And commenting on the quest for reaching ever deeper into the universe, Hesse writes the words

> I suddenly realized that in the language, or at any rate in the spirit of the Glass Bead Game, everything actually was all-meaningful, that every symbol and combination of symbols led not hither and yon, not to single examples, experiments and proofs, but into the centre, the mystery and innermost heart of the world, into primal knowledge. (p.119)

Again the link between universality and the power to reach ever deeper into the universe is stressed.

> These rules, the sign language and grammar of the game, constitute a kind of highly developed secret language drawing upon several sciences and arts, but especially mathematics and music (and/or musicology), and capable of expressing and establishing interrelationships between the content and conclusions of nearly all scholarly disciplines. The Glass Bead Game is thus a mode of playing with the total contents and values of our culture; it plays with them as, say, in the great age of the arts a painter might have played with the colours on his palette. All the insights, noble thoughts, and works of art that the human race has produced in its creative eras, all that subsequent periods of scholarly study have reduced to concepts and converted into intellectual property - on all this immense body of intellectual values the Glass Bead Game player plays like the organist on an organ. And this organ has attained an almost unimaginable perfection; its manuals and pedals range over the entire intellectual cosmos; its stops are almost beyond number. Theoretically this instrument is capable of reproducing in the Game the entire intellectual content of the universe. (p.15)

The 'organ' bears some similarity to the 'points of pitch' mentioned earlier.

> Within the complicated mechanism of this giant organ, a whole universe of possibilities and combinations is available to the individual player. (op. cit. p.15)

The 'universe of possibilities' may be the equivalent of what I have termed the 'eye' of the music, the configuration which silences a part of the total sound universe and can be 'heard' because of its silence, for, as there is energy in space, so there is power in silence.

Having arrived at this point we can stand back and look for some further confirmation that language is not the key to universality, before taking another tentative step towards our goal. We can learn a great deal from studies in Artificial Intelligence.

Brittain (1987) poses the question

> Computers still cannot understand natural language as well as young children can. Why is it so hard? (p.31)

At first sight the answer to the question seems obvious. The underlying assumption is that 'natural language' is the only intelligence extant, and therefore AI is only an attempt to mimic it with a different kind of brain. Even on the assumption that the artificial brain equals, nay, surpasses the capabilities of the natural brain, the fact remains that everything is based only on the existence of the assumed intelligence, and however well it is copied or improved upon, its basic weakness will radiate through the entire system and impose severe limitations upon its development.

The very best computer can only deal with the programmes it is fed with as a basis for its thinking. And if the software is poor, the quality of its thinking will be equally poor. Language is undoubtedly a poor programme, but poor as it is, computer technology is not yet advanced enough to equal the ability of the human brain to deal with it. Even if the day arrives when AI will surpass natural intelligence, the enhanced thinking power will lead nowhere new, for it will be based on a weak premise which inevitably will pervade its structure leaving it limp and ineffective vis-a-vis the universe.

But Brittain does sense that lurking somewhere in the background is a 'universal language'.

> Natural language processing spans virtually every field of AI - knowledge representation, machine learning, perception, reasoning - and the ability to use language is required for all kinds of intelligent behaviour. Thus, solving the problems in natural language understanding is tantamount to solving all the problems in AI. (p.38)

In order to take a step forward, 'natural language' must go.

In the search for a 'universal language' some interesting lessons can be learnt from work done with severely handicapped children in which non-speech language was used initially in an attempt to develop linguistic ability and thinking. Carrier (1976) developed a programme called Non-Speech Language Initiation Program in which colour-coded masonite symbols are used in the early stages, and later related to sentences, sometimes leading on to vocalized speech. Again, Carrier's main concern was, understandibly, to distinguish

> between the classes of behaviour a child must learn to perform according to linguistic rules, that is, to recognize various words and to develop sentence structure from among various syntactical (grammatical) arrangements. (NIH Research Advances, 1976, p.55)

Carrier's work is tied to a specific language, yet what is of interest here is what happens in the earliest stages of the training.

> The training procedure requires first only that the child be able to discriminate among each of four different classes of stimuli: 1) set of six colours, 2) symbols cued to one strip of tape or two, 3) the shapes of masonite symbols, and 4) pictures of people and animals in various actions. (op. cit. p.55)

It is the initial phase of the training which demonstrates that the departure point, the very basis, is the ability to deal with shapes and symbols unrelated to language. Language is then forcibly superimposed upon and linked to these skills.

Carrier's work in the initial stages of his training programme demonstrates the possibilities in the realm of non-speech non-language related thinking. Indeed, the highest levels of thinking (see Einstein earlier) fit into this realm. Titchener (1926) states

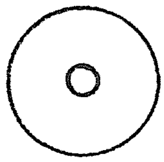
> I wish to be clear on this point; the visual pattern does not indifferently accompany, but is or equals my gross understanding of the matter in hand. (p.12)

3.3. PATTERN RECOGNITION AND THE SONIC STRUCTURING AND TRANSMISSION OF MENTAL THREE-DIMENSIONAL CONFIGURATIONS

A good reader can take in a large number of words in one fixation. If the number of individual letters involved were counted, it would indeed be a surprising figure. There is little doubt that this feat is only possible because the letter orders are familiar (words), and because words are in context (sentences), and that if the same letters were to be put together at random, the number of letters taken in would be very greatly reduced. But it is nevertheless remarkable that even a few letters can be taken in in one fixation.

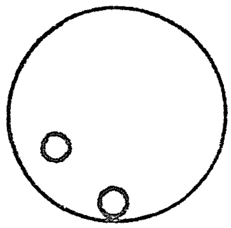
Let us take the letter B. Let us imagine that it is our purpose to instruct someone who cannot see us and who does not know what we are looking at to draw it, assuming that they have never seen it before. Notwithstanding the extremely clear image we have of it, indeed, we may actually be looking at it while speaking, we encounter considerable difficulty when trying to use words to describe its outline well enough to enable someone else to replicate it.

Now let us look at the following pattern.



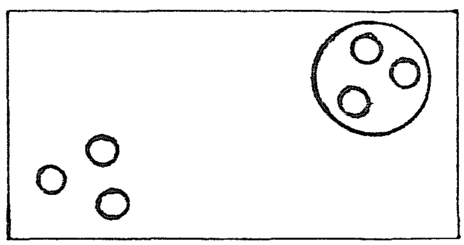
At first sight it appears to be simple. We would say it is a small circle in the centre of a big circle. But how small is the small circle? Is it a quarter of the size of the big circle, or an eighth?!

Now let us look at the following pattern.

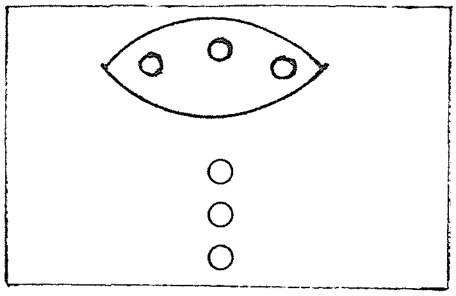


Again, to describe it would appear to be a relatively simple matter. Two small circles within a large one, one small circle fairly near the circumference of the larger one ...... and so on. But how small is the circle, how near the circumference is it, and what is its precise position within the circumference? Now for the description of the second circle ...... The point is that we must make a distinction between pattern recognition and memorization and pattern description or transference - the externalization of the internally held pattern - the exposing it in its precise form to external examination. In other words, pattern communication. Nor are we interested in this context to enable someone else to recognize a pattern we describe. We are interested in enabling someone else to replicate it from our description. Therein lies the crucial difference between pattern recognition and pattern transmission.

Let us consider one of Bongard's patterns. (Bongard 1970, from problem 49)



The complexity of describing it verbally with any degree of accuracy is immediately apparent, but if compared with another pattern,



one could be distinguished from the other following a verbal description. We are, however, not satisfied with saying 'this is not it' or 'this must be the one' or 'this is approximately what it looks like'. We are only interested in enabling an exact replica to be made based on transmitted information so that we can say 'this is it' without reference to anything else. The point is that the transmitter enables the receiver to construct the pattern accurately from scratch by following his instructions, rather than causing it to be copied or matched to existing knowledge. In this situation the receiver has nothing to begin with, the pattern being built up little by little until it is complete. The receiver has no inkling of what the pattern will be until he has constructed it, and no prediction is possible. He can not know what is going to happen until it happens. The fact that the transmitter may be copying either from reality or from mental imagery is irrelevant in so far as the receiver is concerned since the latter starts off with a complete blank. The only thing transmitter and receiver have in common is a code.

As we have seen, language is an unsuitable code for the transmission of patterns. It can not achieve precision even if a very wide vocabulary is shared between transmitter and receiver and a great deal of redundancy is built into the message. In order to transmit images using language, we have a situation of 'I have it, you have it, this is what it is'. (I have the image, you have the image, here is the sound label for it, so now you know what I am thinking of).

For example, I know what a chair is, and I know that you know what a chair is, and so when you hear the sound label 'chair' you will think of a chair. But if we do not speak the same language, even though we both know what a chair is, I can not make you think of it using language only.

Clearly such a code is useless for communicating visual patterns from one mind to another using sound only. It is necessary, for such an end to be achieved, to find a means other than language which will enable the transference of visual patterns directly from one mind to another with great precision. Such a code is musilingua.

In musilingua the situation is not 'I have it, you have it, this is what it is' but rather 'this is it'. (i.e. build up the image from what you hear, the only common ground being the code). The rules of language do not enter into the picture because there is no vocabulary. Nouns and verbs and prepositions function as a single unit in four-dimensional space. You do not say 'the cat is jumping off the wall'. You get a picture of it happening.

In the case of language, if I say 'chair', you get a picture of 'chairness', but not precisely the chair I am thinking of. We are exchanging more the concept than the specific within it. But using musilingua a precise three-dimensional configuration of a given chair can be transmitted, and in the case of animate entities in particular, the fourth dimension will also be a part of the total picture.

It is, of course, possible, that in musilingual shorthand 'chairness' may be transmitted, but the point is that the facility exists to transmit 'chair' if required. Furthermore, there remains the question of telepathic communication which needs investigation. Can sound be telepathically transmitted better than vision? Should the answer to this question turn out to be in the affirmative, the states of mind which could be attained using musilingua as the basis for telepathic communication boggle the imagination. This is, of course, wild conjecture at present - but it is more than a stab in the dark, for it is based on concrete evidence presented in this thesis - that people have the ability to think musilingually albeit at present on a most elementary level. However, today's possibility could be tomorrow's reality.

Still considering the chair, the picture we have of it is in three dimensions. If we were to slice a three dimensional entity into thin slices through any plane, we would end up with two-dimensional patterns. Looked at separately, the two-dimensional pattern may not give us any idea of the three-dimensional entity of which it forms a part. We may therefore regard a three-dimensional entity as being made up of multitudes of closely adhering two-dimensional patterns. We can take a disc as an example of the relationship between two and three dimensional entities. If we begin with a straight line, we may say that it is finite. It is incomplete, for it starts and stops suddenly. A circle may be thought of as a 'bent' straight line which fits into space, and so a circle may be said to be infinite. A disc can be thought of as having millions of straight lines of varying lengths lying in close proximity to one another in the same plane. A disc can be thought of as two-dimensional and finite. A sphere fits space and may be thought of as infinite. The space within the sphere may be thought of as being filled by millions of discs of varying circumferences lying in close proximity to each other. This model has the third dimension.

Our ability to visualize three-dimensional configurations is based on our ability to manipulate two-dimensional patterns relative to one another, building up the third dimension through this process. When the process of building up a solid has been completed, we can 'empty it', holding only the outer configuration in mind, its inside being only space. The ability to do this is important too, for, within the confines of the outer configuration, the inner space is available to hold further two or three-dimensional entities. It is a microcosm within a macrocosm which is capable of holding within it further static and mobile configurations, and so on ad infinitum.

Metzler and Shepard (1974) were interested in the mental rotation of three-dimensional objects. They presented subjects with perspective line drawings of abstract three-dimensional objects made up of cubical blocks attached to each other having three right-angle bends and two free ends. Subjects had to, after mentally rotating one of two objects, indicate whether they were the 'same' or 'different'. The variable of interest was the reaction time.

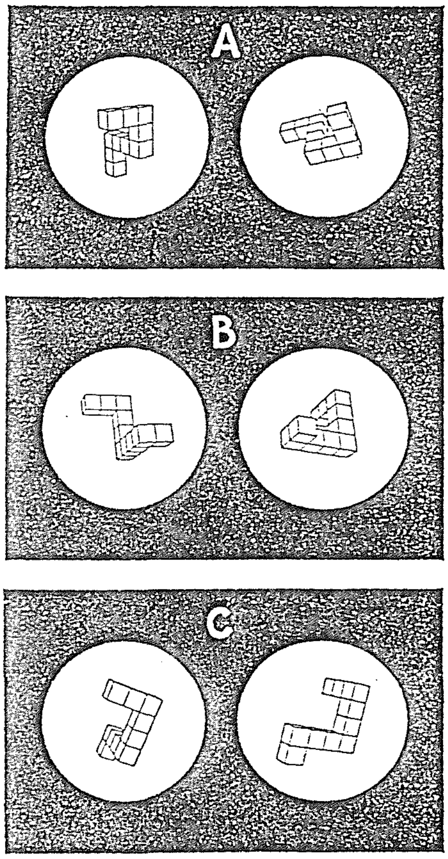


Fig. 1. Examples of pairs of perspective line drawings presented to the subjects. (A) A "same" pair, which differs by an 80° rotation in the picture plane; (B) a "same" pair, which differs by an 80° rotation in depth; and (C) a "different" pair, which cannot be brought into congruence by *any* rotation.

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From Science Vol. 171, p.702, 19 Feb. 1971

Reaction times to incoming information can vary considerably depending on the precise nature of the information. For example, the builders of the European Fighter Aircraft encountered a problem because pilots can become overloaded with cockpit information presented on banks of gauges.

> There isn't enough time. The human is not very good at taking several bits of information, making sense of them and flying an airplane, all at the same time. (Major Ron Small, at the United States Air Force (USAF) Wright Patterson Research and Development Centre, cited in Science and Technology article by Leon Clifford in the Daily Telegraph, June 12 1989).

In order to overcome this problem to some extent, future planes will have a few computer-generated pictorial displays instead of banks of gauges.

> You will have a cartoon of the engine and you will be able to see at a glance whether there is anything wrong because it will show up in red or yellow. (Small, op. cit.)

Because of the speed needed to control the plane, switches are of little use, and investigations are currently being carried out into voice-controlling computers, and indeed, thought - controlling them using super-conducting sensors which can monitor the brain's activity.

All this raises a vitally important question:- Could telepathy based on pitch operate more effectively than that based on spatial configuration? And what will be the case when, as in Musilingua, the two are inextricably woven together? It is highly likely that true three-dimensional visualization tied to pitch will enable information-processing and decision-making transactions to reach extraordinarily high levels. Such a prospect opens up vast new areas for further research.

Reaction times are only of marginal interest in this part of our study. What is of central interest here is how three-dimensional objects are internally represented.

> Of particular interest in this regard is the question of whether the internal representation is more akin to the two-dimensional projection of the object, which deforms in complex ways under rotation but which is at least directly available at the sensory surface, or whether it is more akin to the three-dimensional object itself, which is structurally invariant under rotation but has somehow to be indirectly constructed on the basis of the retinal projection. (Metzler and Shepard 1974, p.152)

In their conclusion Metzler and Shepard state

> These results seem to be consistent with the notion that....subjects were performing their mental operations upon internal representations that were more analogous to the three-dimensional objects portrayed in the two-dimensional pictures than to the two-dimensional pictures actually presented. The subjects themselves indicated that they interpreted the two-dimensional drawings as objects in three-dimensional space and, having done so, could as easily imagine the objects rotated about whichever axis was required. (op. cit. p.169)

And

> Clearly, then, the internal representation of an external object captures its three-dimensional structure - not as that structure exists in the object absolutely - but only as it appears relative to a particular angle of regard. Thus the internal representation shares properties with both the three dimensional object and its two dimensional perspective projection, without being wholly isomorphic to either. (op. cit. p.197)

Metzler and Shepard used two-dimensional drawings which depicted the third dimension through perspective, but a representation of the whole object had to appear in the drawing, and any 'invisible' parts of it had to be filled in by the viewer and had to fit the rigid structure presented. This method of presentation seems reasonable but it has its limitations. Presented musilingually it is possible initially to show only the front view of an object in two-dimensions so that at this stage the viewer has no idea what lies 'behind' it, and then, through the presentation of further information, enable the viewer to build up the complete three-dimensional configuration before enabling him to rotate it about an axis, enlarge it or reduce it, or move it in any direction at any speed whilst it is rotating and growing or diminishing in size and even changing its configuration all at the same time, the whole process being dictated by pitch and rhythm variations.

The point is that visual presentation in whatever form does not enable the true appreciation of the third dimension since the object is seen from one vantage point and sight cannot penetrate matter, whereas sonic presentation enables objects to be constructed mentally in true three dimensions. Further, in visual presentation there is a limit to the amount of information which can be given, whereas in sonic presentation great detail can be transmitted both to describe the external, and this is the important point, the internal three-dimensional structure, without resorting to the use of two-dimensional perspective drawings.

In the Metzler and Shepard experiments information had to be given to the subjects before anything could happen. Subjects could not be told 'think of a three-dimensional configuration, then describe it to me, then think of a different configuration or the same one seen from a different viewpoint and describe it to me and I'll tell you whether the two configurations you chose were identical or not'. Or, subjects could not be told 'listen to this, what is it?' This can be done in musilingua.

Musilingua, in one of its aspects, may be a new tool for the experimental study of mental images and related nonverbal processes. We have learnt from Einstein, riding his beam of light and coming up with the theory of relativity how important 'externalization' of mental images can be. In another of its aspects, musilingua may be a new tool for effective communication. But above all, it may form the basis for reaching states of consciousness unattainable without it.

3.4. THE MUSILINGUA CODE

When dealing with language, we have to consider the following points.

1. In order to communicate linguistically, a common vocabulary of many words is a basic necessity.

2. Words can not be continuously sounded.

3. One word can not be superimposed upon another.

4. There is no emotional aspect related to matter.

When dealing with musilingua

1. No vocabulary is needed.

2. Notes can be continuously sounded.

3. Sounds can be superimposed upon one another.

4. There is an emotional aspect related to matter.

When considering the relationship between music, language and musilingua it is important to remember that each has to be listened to with different 'ears'. In language what is remembered is not the succession of words, but the meaning. In music what is remembered is not the succession of notes, but the melody. In musilingua what is remembered is not the succession of notes, but three-dimensional structures operating over time.

If the wrong ear is used, no purpose is achieved. For example, listening to musilingua with a 'music ear' or listening to music with a 'musilingua ear' will result in total boredom.

In considering the code itself it must be stated at the outset that the need to devise a code at all in order to describe matter sonically is an admission of defeat. Somewhere within matter lurks its own voice, but we are not equipped with the sense modality to hear it, and so, if we are to make any progress at all, we have to create sound which is extraneous to matter in order to capture its physical existence mentally. A code is the best we can do.

> For what rational principle is there which will be perfectly determinative as to what terms and notations shall be used, and in what senses, and which at the same time posses the requisite power to influence all right-feeling and thoughtful men? (Peirce 1932, p.130)

Our aim is, through the use of a code based on pitch and rhythm variations to enable the description of two and three-dimensional configurations, their rotation about an axis, movement along an axis, movement along an orbit, movement along an irregular path, or any of the preceding in any combinations simultaneously, bearing in mind that configurations may not remain constant through time, simultaneity being achieved through the use of several contrasting timbres sounding concurrently, each concerned with one specific aspect of description.

3.4.1. THE RATIONALE

Once words have created meaning, they become superfluous. The meaning is retained but the words are not. In this sense, words may be regarded as tools rather than bricks. The following passage will illustrate how meaning can become totally independent of words. (It should be read quickly without stopping or regressing).

Mary was surprised his hand trembled to find the door open as he opened the envelope she knew she had locked it he stared unbelievingly at its contents and she knew that her mother could not be back yet he had won the pools.

A little reflection will show that two story lines were taken in at the same time, and this number could obviously be increased.

The same principle operates in music, but to an even greater extent since, because harmony and counterpoint are possible, more information can be condensed into a given time. In music, this is of no special significance, since no meaning is created. But in musilingua this is of vital importance.

For evidence of the relationship that exists between sound and spatial configuration and the ability of intelligence to compute and utilize it, we need look no further than the Barn Owl.

> The Barn Owl's facial ruffs of tightly pulled feathers funnel sound into its ears. One ear is lower than the other and angled differently. This helps the owl to pinpoint the slightest noise. It can locate the position of a sound better than any other creature. Its brain creates a sound map of the area in front of it. The owl uses this to memorize the position of the last sound it heard. Sound is the only guide as it orientates its claws. (Downer 1988)

Our problem is - how to pinpoint a position in space using pitch. Naturally a coordinate system has to be used, notes replacing linear measurement and relating to an agreed frame of reference. Having taken this first step, a code can be developed which will enable the description and manipulation of any configuration.

A sphere is infinite and it is therefore the ideal 'container' for holding two and three dimensional configurations. But in actually determining the code pitch has to be related to spatial location. The very centre of the sphere may be regarded as its point of balance. As things recede from us their sound lowers, and as they approach us their sound rises. Therefore, if we consider the centre of the sphere as the centre of the universe, the world of low sound lies along the outer surface of the sphere, sound getting higher the nearer one approaches the centre. The very centre itself has the highest pitch. If the centre is moved towards the outer surface of the sphere, the model will be out of balance.

In theory, the number of points within the volume of the sphere which can be precisely designated is infinite, but for practical purposes it must be limited in relation to a) what can be distinguished in space, and b) what can be distinguished in pitch. For a) the separation between points must be great enough to be readily recognized, and for b) the intervals between notes must be great enough to be readily perceived. These two factors operate to limit the number of positions which can be designated within the volume of a sphere.

To construct the code, a good starting point would be pitch. Although in theory an enharmonic system is possible, it would be impracticable, for the intervals would not be distinguishable at speed. I therefore decided to use the semitone as the smallest interval, and the octave as the largest.

Having reached this stage, it is necessary to decide which precise model should be used. There are three main possibilities.

1. A large sphere containing others.

2. A sphere containing discs.

3. A disc rotating about an axis within a sphere.

Each of these models will be discussed separately.

3.4.2. MODEL 1

This model is based on the idea of locating points on the outer surface of a sphere, and having five spheres of gradually diminishing size contained within the largest, rather like the layers of an onion but with space between each layer. On the surface area of each sphere there are eleven lines of latitude, each divided into twelve, and one line of longitude, also divided into twelve.

Line of longitude.

(Lowest notes are at poles).

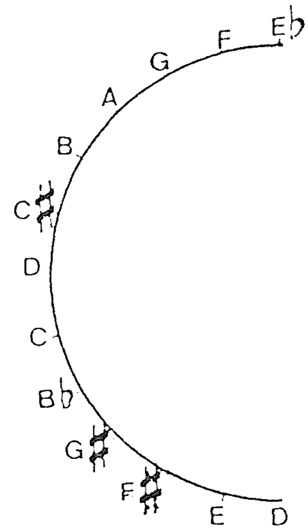
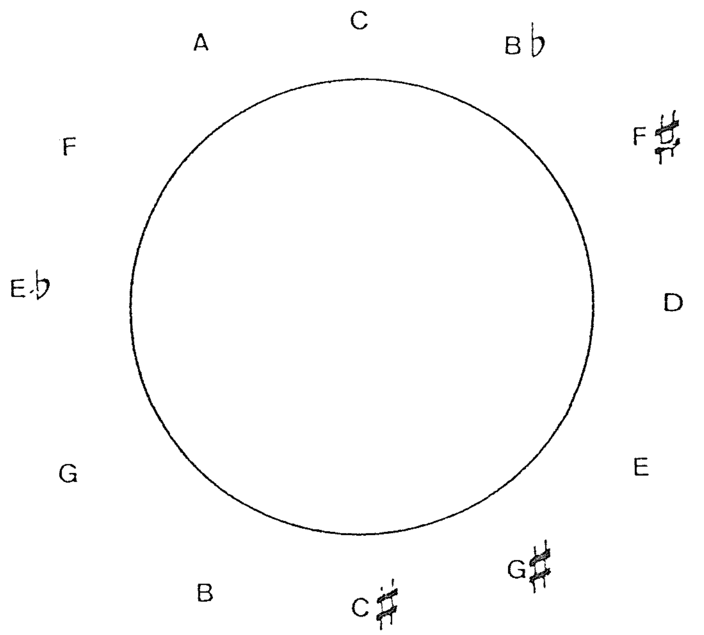


Fig. 1

Fig. 2

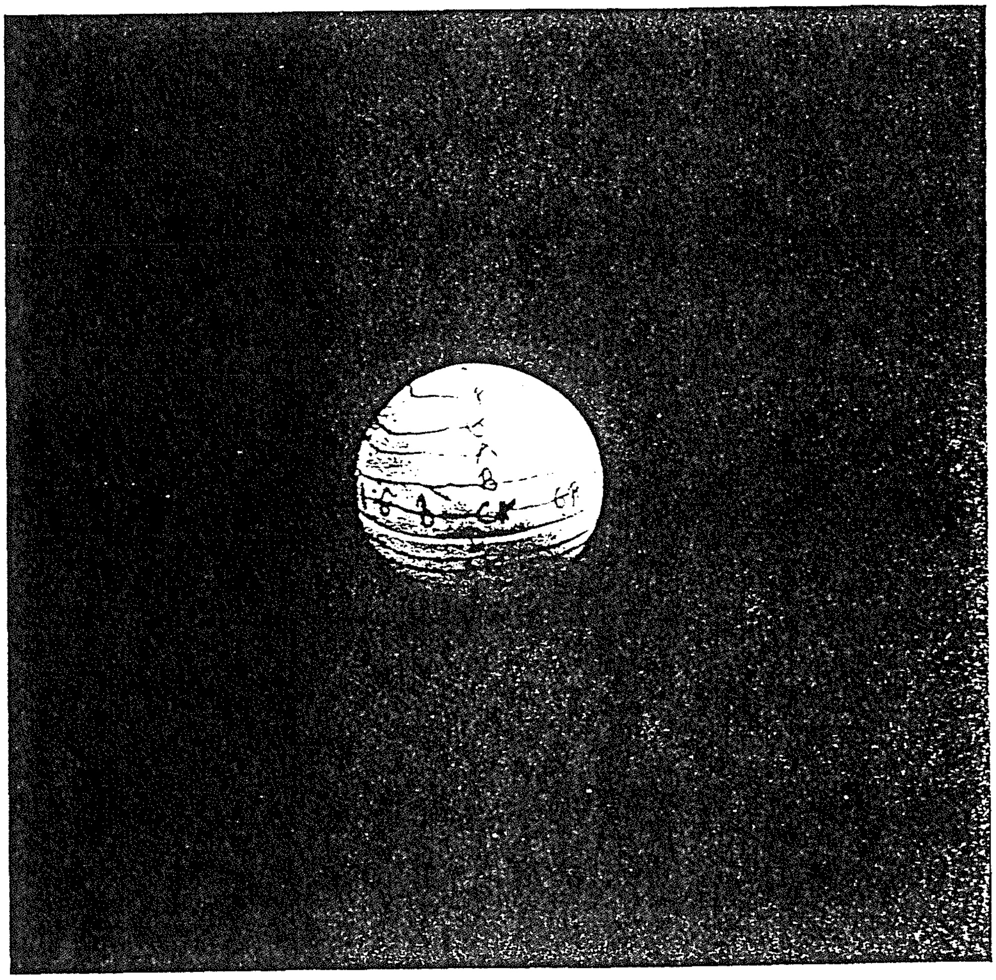


Lines of latitude.

To locate a point within the volume of the largest sphere three notes are sounded. The first note indicates which sphere is referred to. The largest sphere has the lowest note. The second note indicates a point on the line of longitude on the relevant sphere. The third note indicates the precise position on the circumference of the line of latitude referred to by the second note. The line of longitude always faces the describer, and low C is at a point furthest away from the describer.

Rather than illustrate the above with drawings, it is of greater value here to show photographs of the actual models which were used as aids to thinking and to the development of the code.

[illegible]



3.4.3. MODEL 2

In this model there is one sphere containing eleven equidistantally arranged discs with an axis running through their centres.

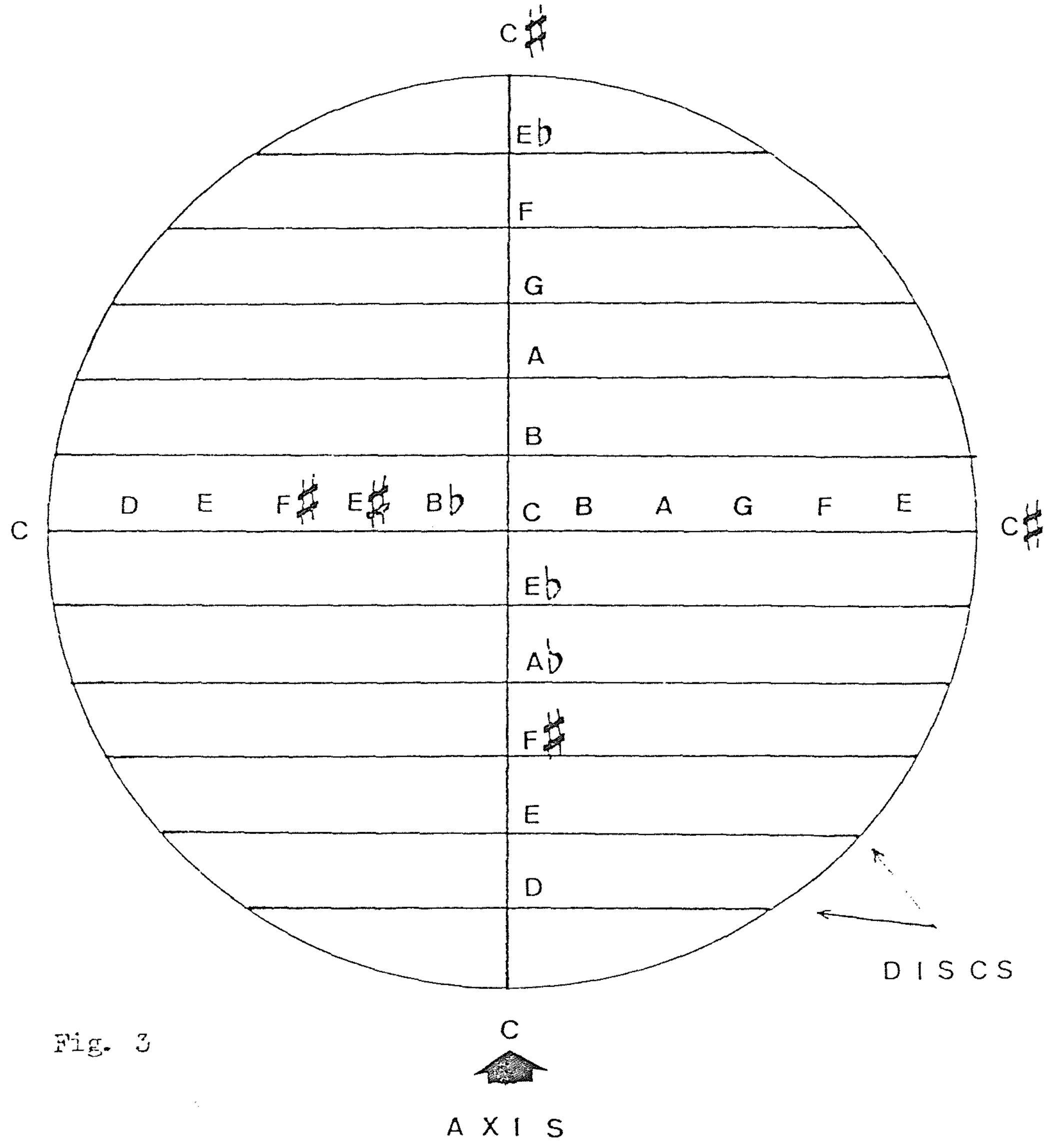
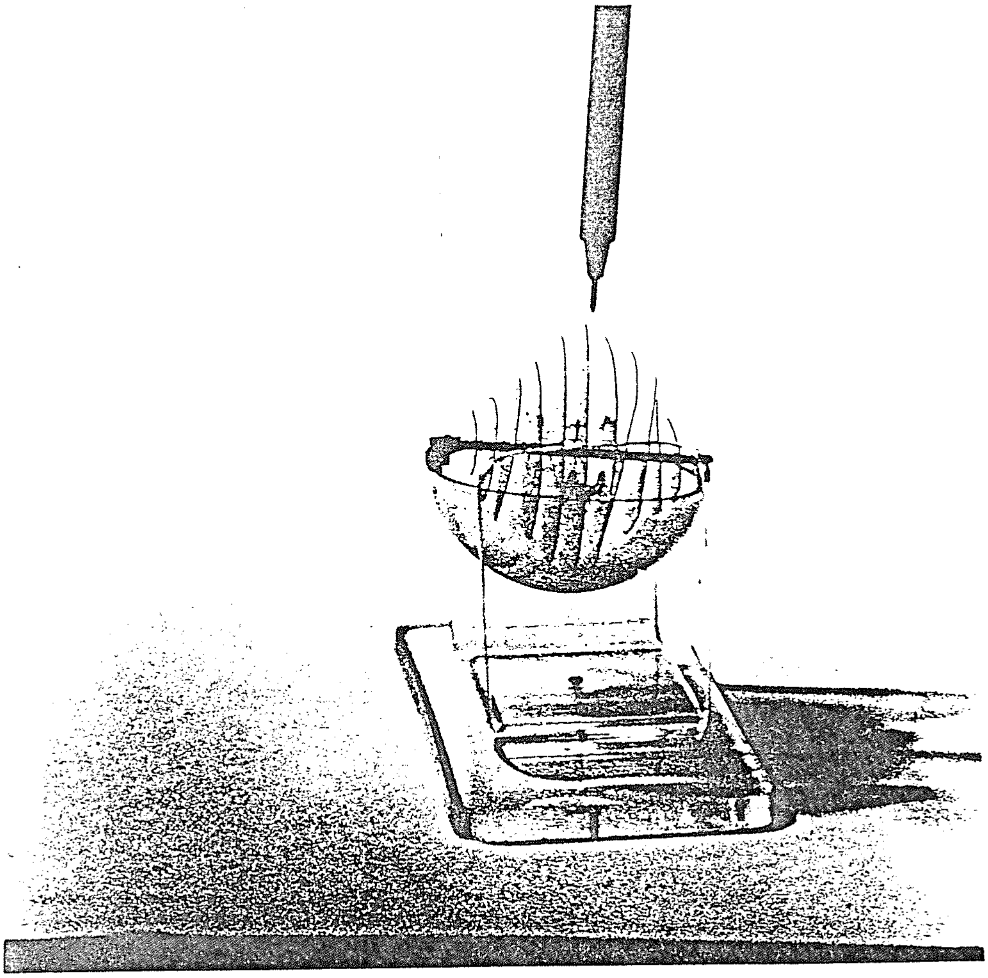


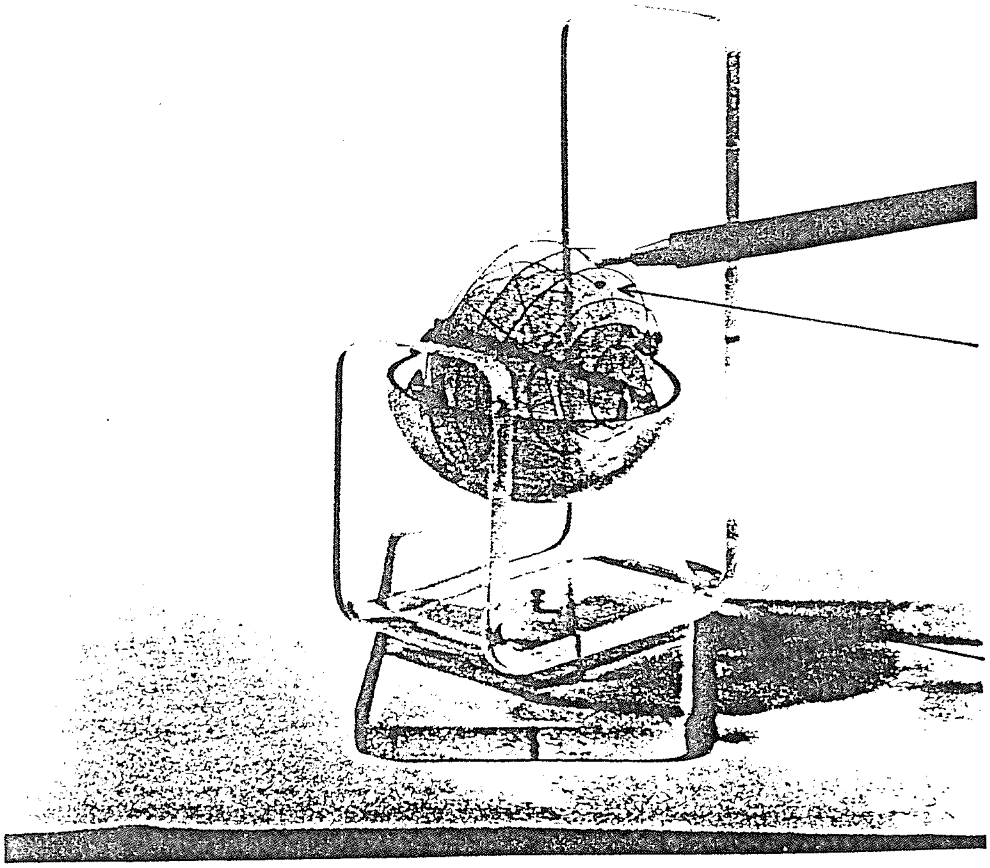
Fig. 3

To find a point within the volume of a sphere, the first note indicates which disc is referred to. The second note indicates which point along the circumference of the disc is referred to. (See figure 2, model 1). The third note indicates which point between the circumference and the centre of the disc is referred to. (See figure 3). In this model, a fourth note indicates the position of the axis on a horizontal plane (the discs being in a vertical plane at this juncture), and the fifth and last note indicates the position of the axis in a vertical plane (the discs being at some angle at this juncture).

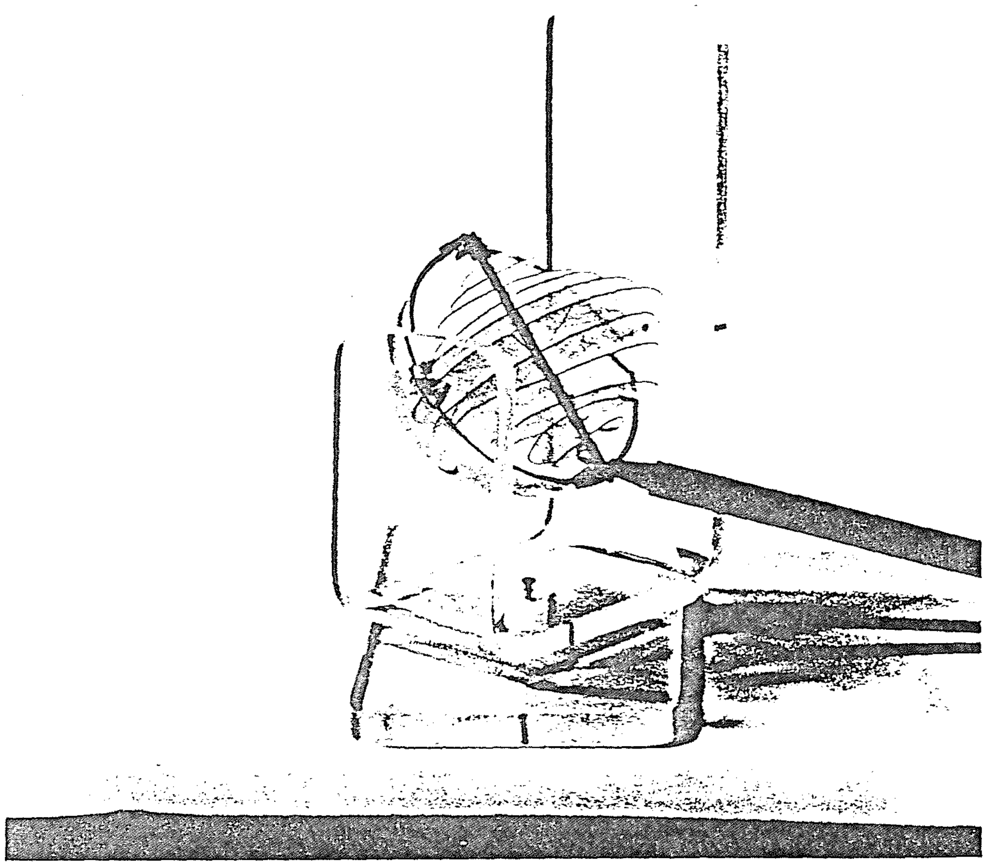
Photographs of the models will serve to illustrate the procedure.

MODEL 2





MODEL I (continued)



Fifth note

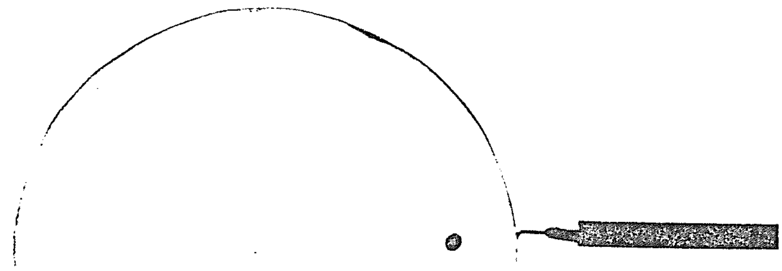
3.4.4. MODEL 3

Models 1 and 2 enabled the development of this model, which was used in the research. A description of the workings of this model is not given here because the text and tapes used to train subjects at the Royal College of Music are included in their entirety. The photographs show the actual models which were used in conjunction with the tapes.

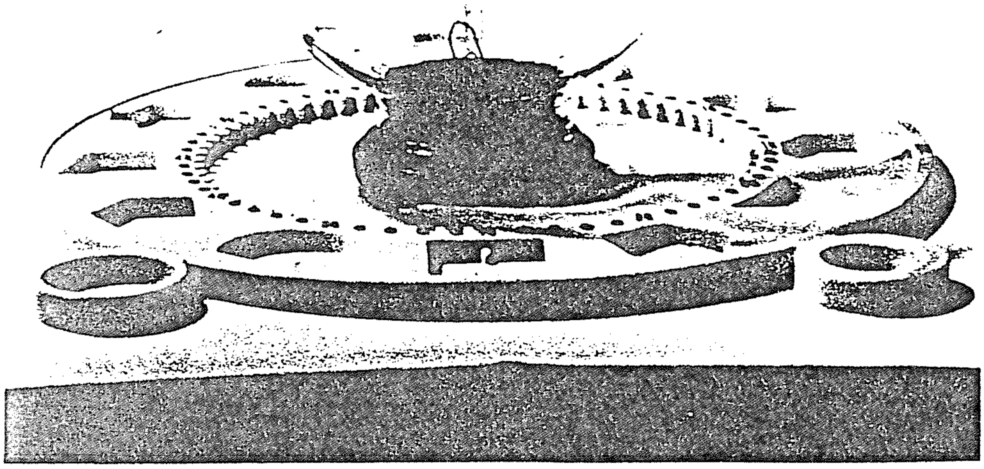
The previous models were abandoned because the spheres and discs used as a basis for description remained within the volume of the largest sphere after they had served their purpose, and this led to confusion in relating one point to another in the case of model 1, as well as to difficulty in devising a code for circles and arcs. Though model 2 enabled the description of circles and arcs, too many notes were needed to achieve this, and the process of rotation was too complex.

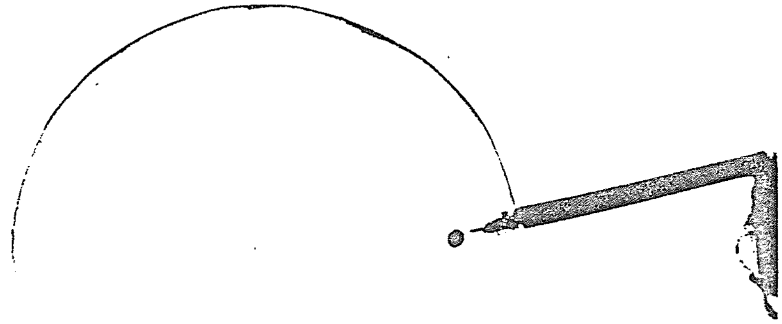
In model 3 the single rotating disc within the sphere 'disappears' after a point has been described, and it is therefore possible to visualise clearly three-dimensional configurations 'floating' in space unencumbered by other matter in their vicinity which even partially encroaches into their own volume of space.

MODEL 2



First
note





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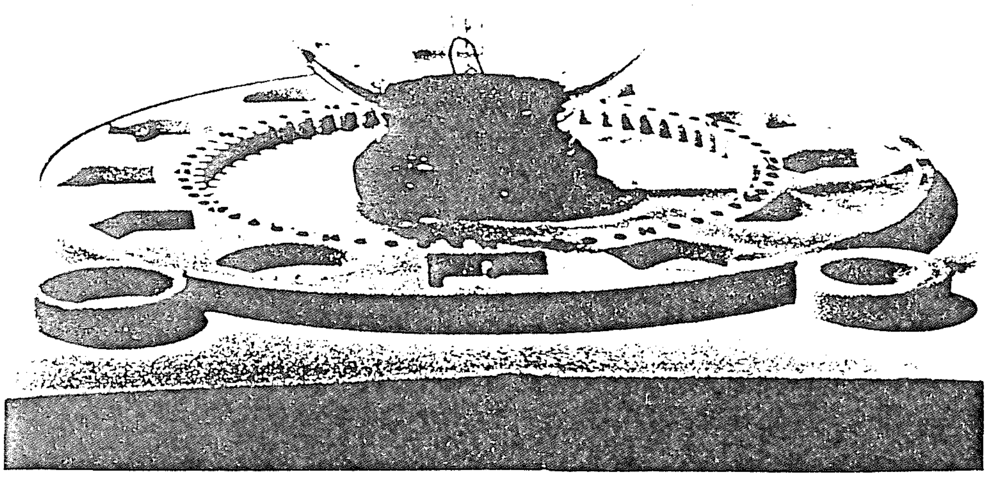
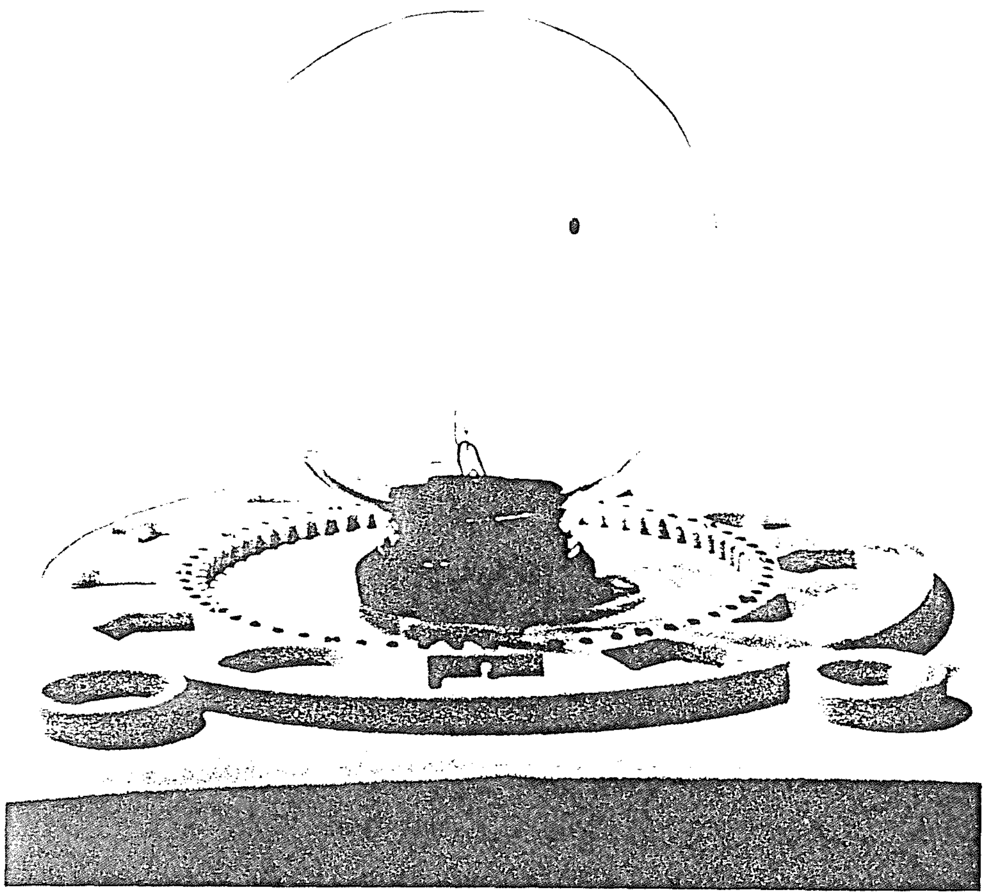
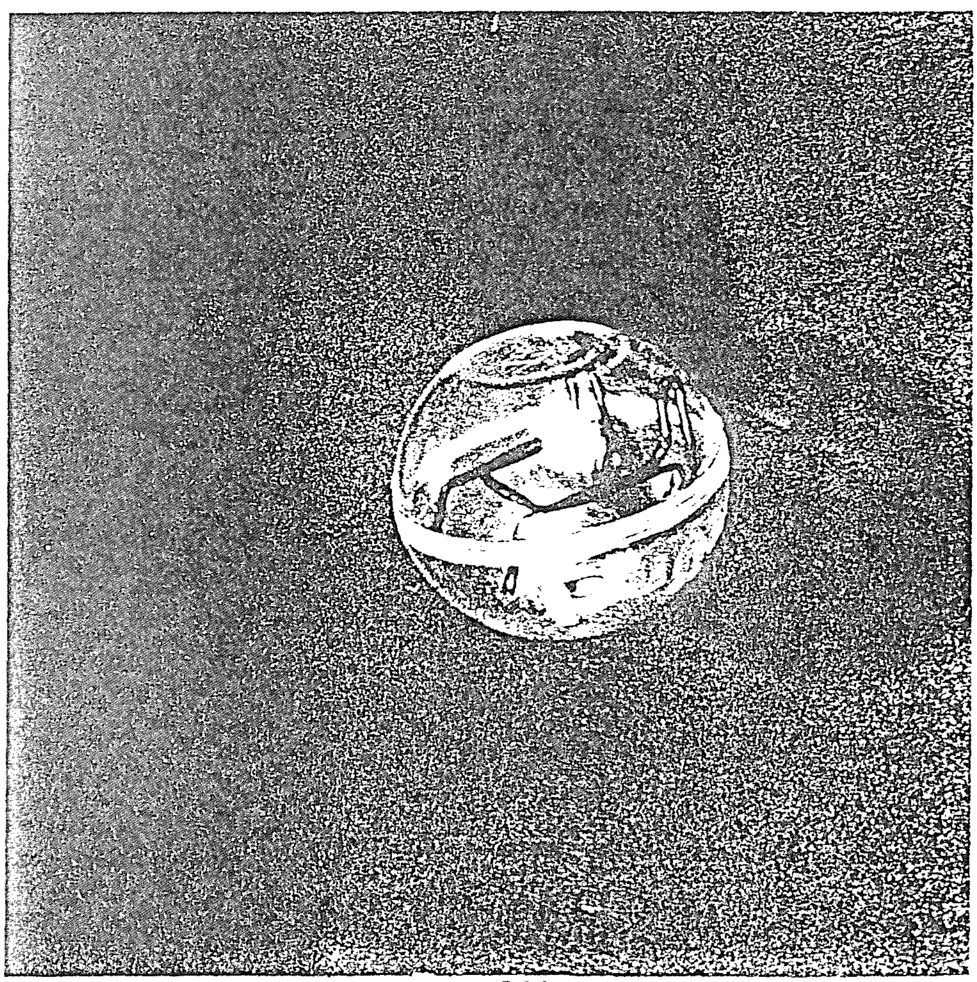
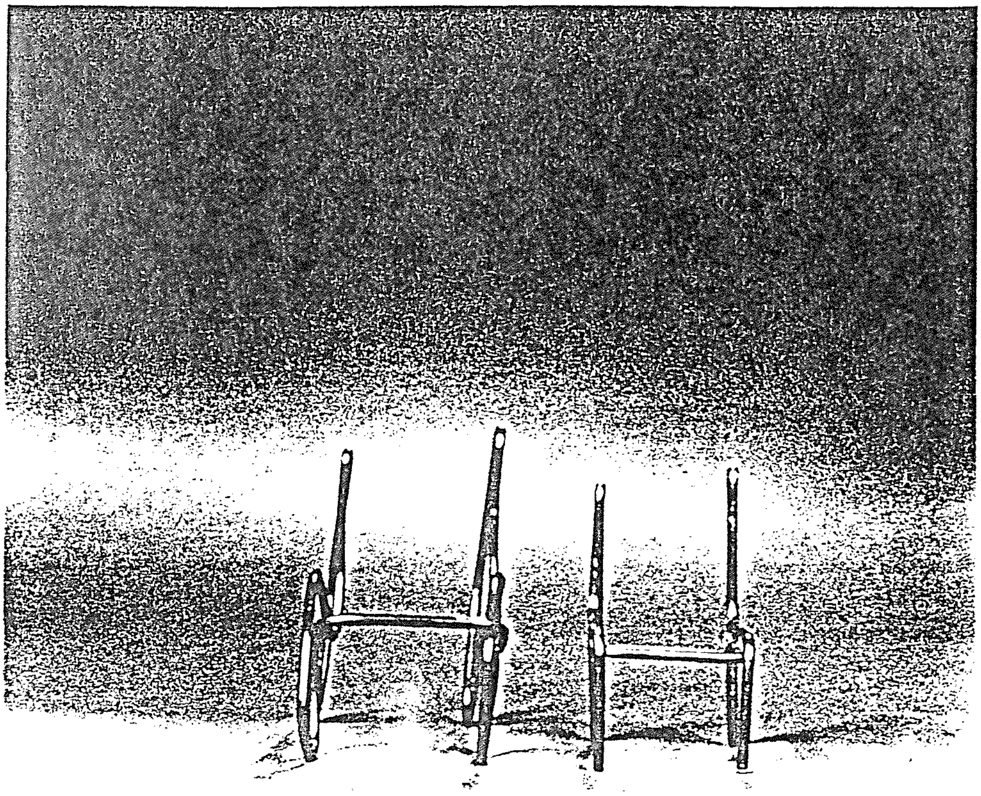


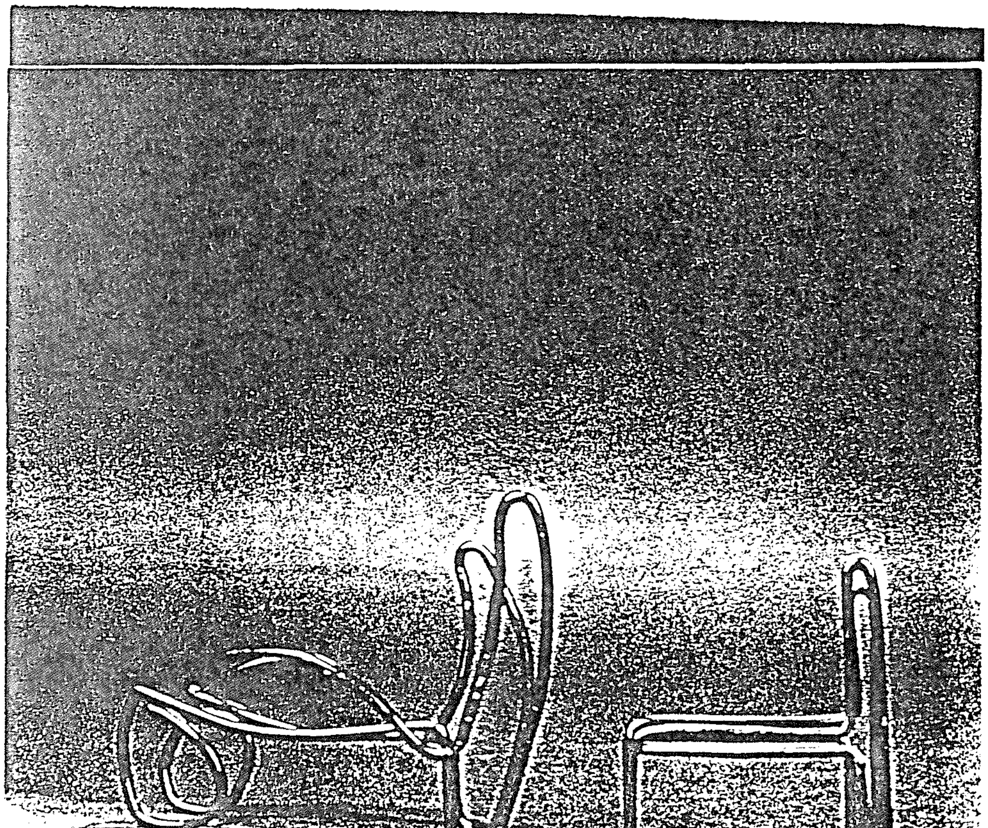


Third
note

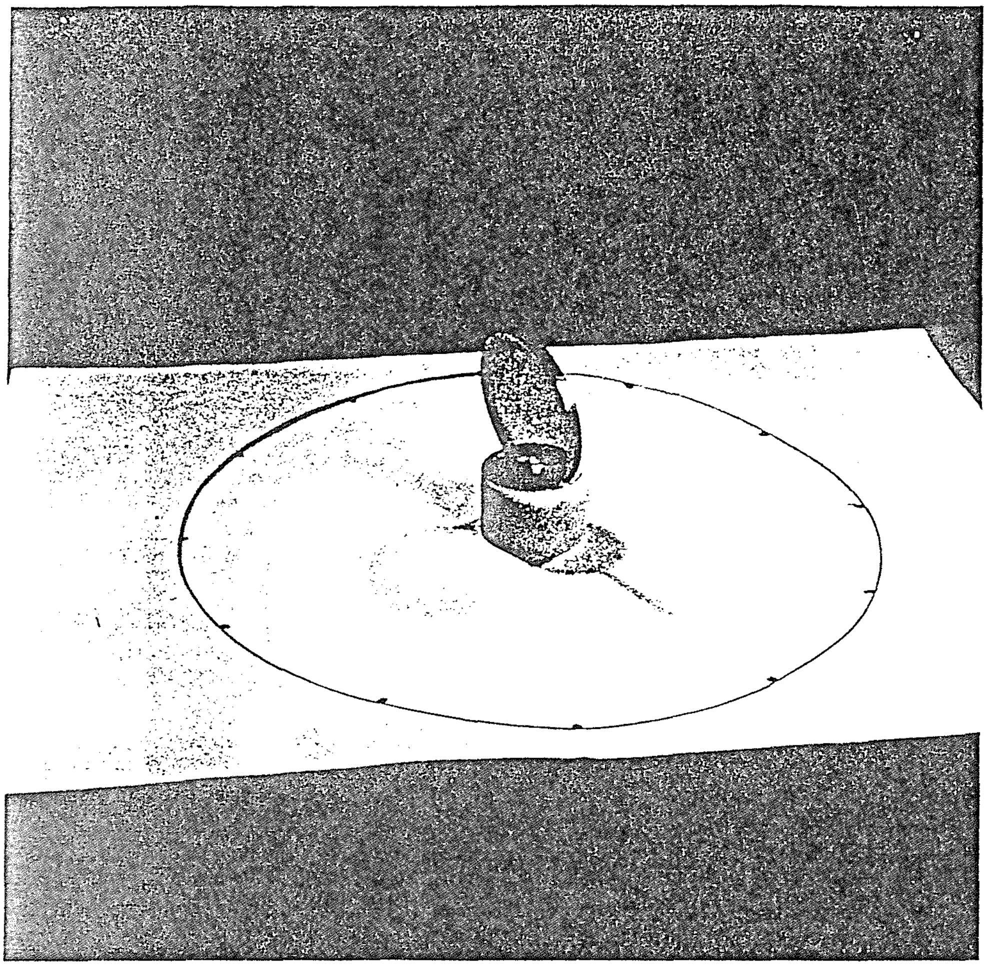
3.4.5. OTHER MODELS

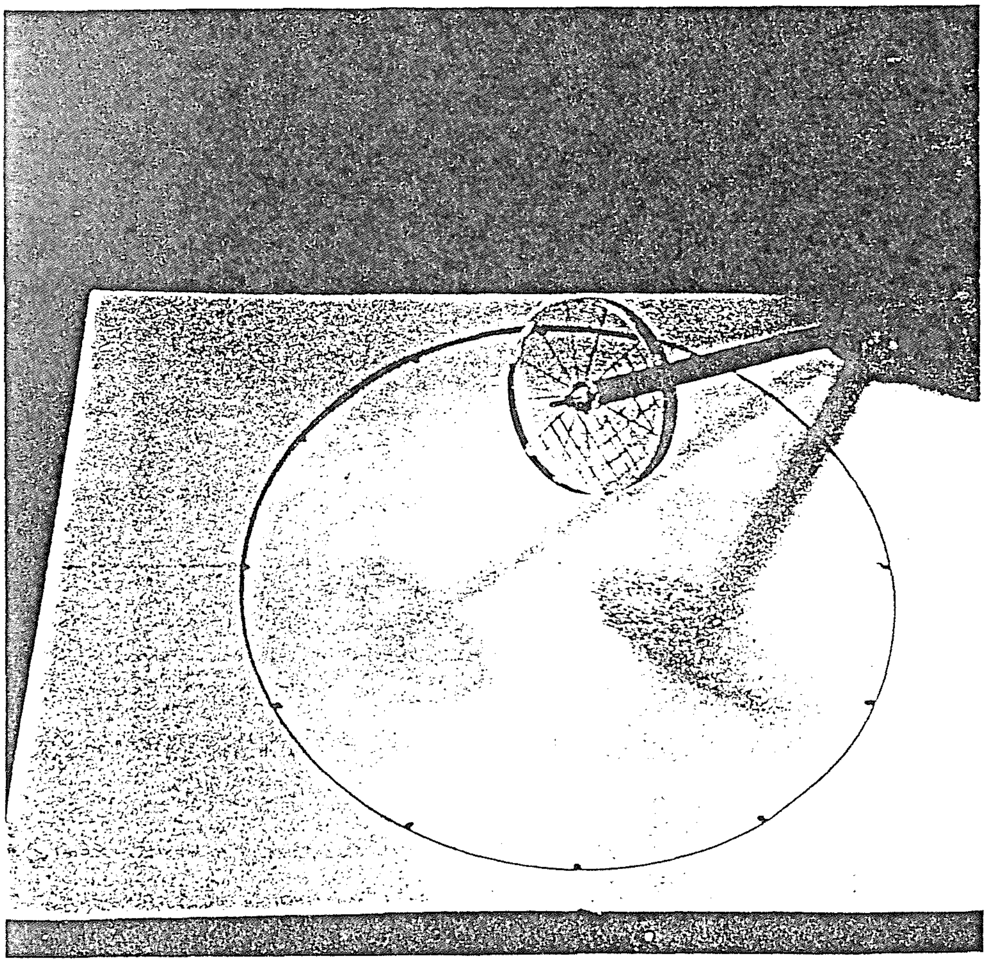






MODELS USED IN THE SECOND TERM

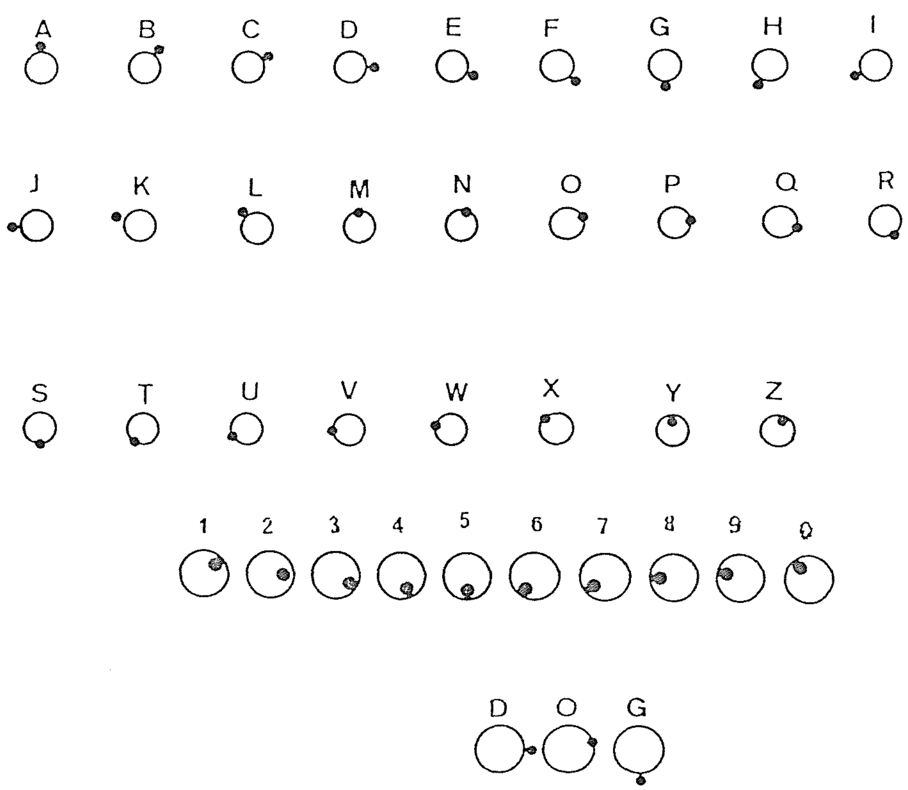




3.5. A NEW ALPHABET (CIRCULAR)

Before proceeding to an examination of the work carried out at the Royal College of Music, two ideas will be described which arose directly from the development of the models and which may be of value if developed further. It is not proposed to do so in this paper but they are included here for the sake of completeness.

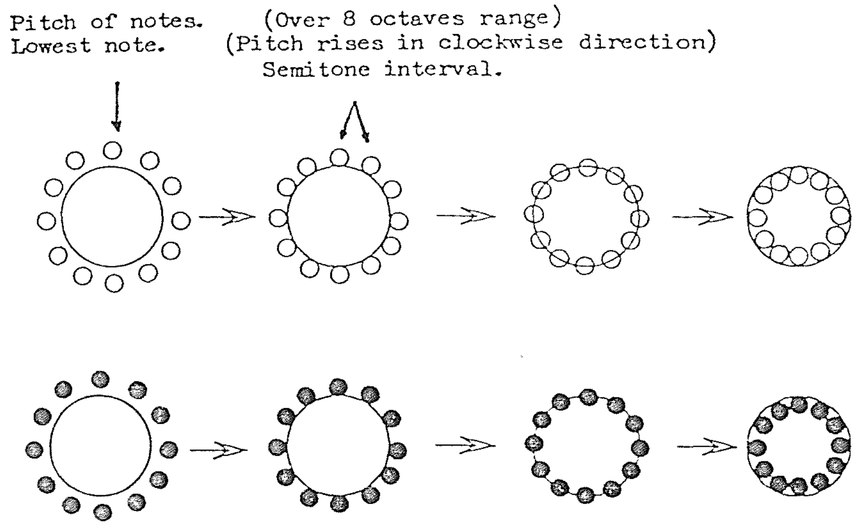
The Alphabet which was developed based on the tonal alphabet (see earlier) made it clear that the shapes of letters in conventional alphabets are the result of pure chance since there is no underlying principle in their design and no uniformity. It may well be that the randomness enables letter and word shapes to be grasped more readily by the eye than would otherwise be the case. A great deal of experimentation will have to be carried out in order to discover how sighted readers would react to the proposed alphabet in contrast to blind readers. Whereas the alphabet proposed earlier was based on a linear principle, the one proposed now is based on a circular principle demonstrating its origin in the musilingua code. It is self-explanatory.



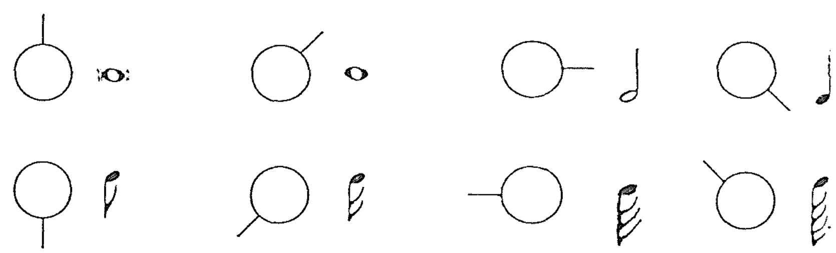
3.6. A NEW SYSTEM OF MUSICAL NOTATION

The present system of musical notation requires a stave of five lines to be available before writing can begin, and it requires key signatures (e.g. base or treble), and sharp ♯ or flat ♭ indicators.

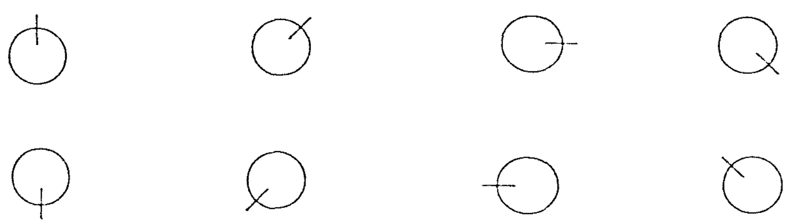
The system proposed here requires no stave and no key signatures, and notes are read like letters in a word in linear fashion. It is not proposed to develop the system any further in this paper, and it is given here only to demonstrate another outcome arising from the development of the musilingua code.



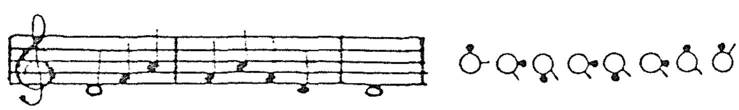
Value of notes



Value of rests



Example:



3.6.1. MUSICAL THINKING IN THE THIRD DIMENSION (The ebb and flow tube)

When the circular system of notation was devised, no more was expected of it than that it serve to obviate the need for a stave as a point of reference. For some time after it was proposed, nothing happened. Then, whilst listening to Mozart's 'Eine Kleine Nacht Musik' and trying to visualize the notes in the circular notation (as one normally does with conventional notation), the notes refused to arrange themselves in a linear fashion. Instead, every time a note was 'seen' (upon being heard) it receded into a tube and its place was taken by the next note, and so on, so that all the notes which were heard were being fed into this tube which stretched horizontally away from me and had its opening facing me. When the music had finished, I felt as though I could walk into the tube, surrounded by the notes I had heard, my presence making the notes around me sound.

The Mozart was followed by a concerto for three harpsichords by Bach. Again I tried to visualize the notes in the circular notation. I was not able to do so by seeing them next to each other, but this time, instead of receding into the tube they emerged from the tube and seemed to flow past me. When I tried to get into the tube I could not, because the flow of notes was too strong and they came cascading out. However, when I tried to feed the notes into the tube, I was able to do so, and I was able to enter the tube, albeit it seemed that I had to keep moving with the flow.

3.6.2. ELECTRONIC MUSICAL NOTATION

It is certain that I will never think of music in the same way as before. Notes will ebb and flow instead of moving from left to right. Finally, though I could reverse the direction, I was happier with Mozart receding and Bach approaching.

This experience suggests the possibility of using the circular notation system for the electronic presentation of notes, each note appearing in precisely the same spot, the only changes between one note and the next being the pitch, duration and pause indicators. This would be electronic musical notation as opposed to electronic music. A suitably programmed computer could simulate either the ebb or the flow in the tube described. This phenomenon illustrates how notation can shape and restrict thinking.

3.7. FIELD WORK

TERM 1. ROYAL COLLEGE OF MUSIC

In order to take part in the research participants would have to be musically literate, and accordingly music students were considered to be ideal subjects. The Royal College of Music, through the good offices of the present Vice-Director (then Assistant Director of Studies), arranged for a group of students to participate. Students were told that some research was to take place, and were given a general idea of the subject. 'It is to do with music having meaning'.

The participants were all volunteers, and there was no pressure put upon them to come to the first session or to attend later sessions. As it turned out, the participants were all advanced students and, fortunately for the research, the Vice-Director who came to the early sessions to monitor the interest of the participants, decided to participate in the research himself and became the key figure in the project.

One-hour sessions were held on Friday mornings at the College, and began with a very brief introduction but no discussion. Materials were prepared before students arrived. The tape was then played. At the end of each session there was a discussion based on points raised by the participants. Since the text for each session was prepared after the preceding one, minor alterations could be made during the course of the research, based on the results and the participants' comments. It was made clear to the participants at the outset that, should the results prove disappointing, the research would be stopped immediately.

In the record of the term's work presented, actual results are included because statistical analysis or description are not possible, but participants' comments and the subjects of the discussions will be described in detail. The order of presentation is as follows: 1. The text of the tape. (See list of tapes) 2. Results. 3. Participants' comments and discussion. 4. An evaluation of the session.

3.7.1. MUSILINGUA SESSION 1
(For recording number see list of recordings)

What is the difference between music and language? Language is good at conveying meaning, and music is good at conveying emotion. To date, music has never been used to convey meaning in the same way as language, and this may be due to our anatomical structure and the way we have evolved over hundreds of thousands of years. The question we are asking in this research is - can music convey meaning in the same way as language can?

I should like to begin by explaining in outline what the research is about, so that when we deal with the detail, you will see its relevance to the whole. First of all, I have a question which will require some thought before you answer it. Take as long as you wish before answering. When you decide to answer, underline either the word 'language' or 'music' at the top right hand corner of your sheet. Here is the question. Let us suppose that you had to make a choice between having only language or only music for the rest of your life, which would you choose? Remember that, whichever you choose, you could never have the other. I shall pause while you make your decision ......

The fact is that language can deal with the world we live in, but music can not. We live in a three dimensional world filled with matter and movement, and language is a tool which helps to describe and manipulate that world in our minds. Indeed, language creates meaning arising out of the sense we make of our environment through the use of our senses. Music, however, is unable to do this. It appeals to our more primitive instincts. We think in words and images when dealing with our environment. We do not think in music. The only connection between music and our environment is time, which may be regarded as the fourth dimension, and its relationship to movement. Whereas music may conjure up scenes and create atmosphere, we can not use it for communication and thought in the way we use words in language. Whereas it is partly through the direct link between heart rate, and rhythm and pitch that music affects the emotions, language does so by passing through the filter of meaning. Thus, some words can be more emotive than others.

However, we must not forget that language is also primitive, in the sense that words are randomly chosen labels, which when heard or seen in print, conjure up the image with which we associate them. The actual sound of the word, of course, will vary from one language to another. Language might thus be regarded as a crutch to help with the creation and transmission of images and their doings from the world in which we live. This is clearly not an entirely satisfactory state of affairs. But if we could transmit the image itself and its movement from mind to mind without resorting to the invention of random labels as an intermediary stage, we may find ourselves using a different mode of thinking which may be totally different from that based on conventional language. In other words, we would have a different consciousness. Can this be done, and if so, how?

This brings me to the point of the research. Musilingua is a code enabling two and three dimensional information to be transmitted from one mind to another using only pitch and rhythm. The randomness inherent in language is absent, for, when using this code, every object described will have its own unique sound signature, and every movement through space will be indicated with great precision.

Our objectives in this research are fairly limited.

1. We are going to learn the Musilingua code.

2. We are going to see whether we can communicate two and three dimensional configurations musilingually.

3. We are going to see how effectively Musilingua can communicate meaning.

4. We are going to see whether we are going to be able to think in Musilingua.

5. We are going to see whether Musilingua can combine the emotional effect of music with the effect of language through meaning.

In order to use Musilingua we need a simple skill. We have to be able to relate pitch to dimension. We do this, of course, quite naturally, when we look at notes on a stave. In this session our aim will be to see how accurately a line and a circle can be divided into 12 through musical instruction. Imagine a horizontal straight line. Now imagine that it is divided into 12 equal parts. Now imagine that each of these parts is represented by a semitone. Now imagine that middle C coincides with the beginning of the line on the left, and C an octave higher coincides with the end of the line on the right. What would be the note indicating the middle of the line? F sharp. What would be the note indicating the point halfway between middle C and F sharp? E flat. What would be the note indicating the point halfway between F sharp and the top C? A. We should now be able to guess the position of any semitone within our octave along the line if we relate it to these four positions.

Now please look at the large circle on your sheet of paper. We shall first of all deal with the line which runs from the 12 o'clock position to the centre of the circle. Please put a little x precisely in its middle. You have just indicated the note F sharp. Middle C is always along the circumference of the circle, and the C an octave higher is the centre of the circle. Now please look at the line which runs from the one o'clock position to the centre of the circle. Put a little x to indicate the note E flat. Remember that middle C is on the circumference of the circle. Your x should be a quarter of the way along the line nearer the circumference. Now please look at the two o'clock line. Put an x to indicate the note A. Your x should be three quarters of the way along the line away from the circumference. Now look at the three o'clock line. Listen to the note I shall play, and then put an x where you think it belongs. I shall first play middle C which is on the circumference, and then the note. Here is middle C. Now put an x on the line where you think this note belongs. D. Now look at the four o'clock line. Listen to the note and put your x on the line where you think it belongs. First, here is middle C again. Now here is the note. B. Now look at the five o'clock line. Here is middle C. Put an x where this note belongs. G. Now look at the 6 o'clock line. Here is middle C. Put an x where this note belongs. G sharp.

Look at the seven o'clock line. Here is middle C. Indicate the position of this note. F. Look at the 8 o'clock line. Indicate the position of this note. B flat. Look at the 9 o'clock line. Indicate the position of this note. E. Now look at the 10 o'clock line. Indicate the position of this note. C sharp. Now look a the eleven o'clock line. Indicate the position of this note. C.

Let us now look at the 12 circles at the bottom of our sheet of paper. We shall now try to divide a circle into 12 equal parts, again, each part being represented by a semitone. Imagine a clock face. Imagine that 12 o'clock is represented by middle C. 3 o'clock would be represented by E flat, 6 o'clock by F sharp, and 9 o'clock by A. Now I shall play a note, and please put a little x along the circumference of circle No. 1 where you think it belongs. First of all, here is middle C, which is at the 12 o'clock position. Now, here is the note. F sharp. Your x should be on the six o'clock position. Now look at circle No. 2. Here is another note. E flat. Your x should be on the 3 o'clock position. Now look at circle No. 3. Here is another note. A. Your x should be on the 9 o'clock position. Now look at circle No. 4. Now listen to this note. Middle C. Place your x where you think it belongs on the circumference.

Look at circle 5. Listen to the note and place your x where it belongs. D.

Look at circle 6. Listen to the note and place your x where it belongs. B.

Look at circle 7. Listen to the note and place your x where it belongs. F.

Look at circle 8. Listen to the note and place your x where it belongs. B flat.

Look at circle 9. Listen to the note and place your x where it belongs. E.

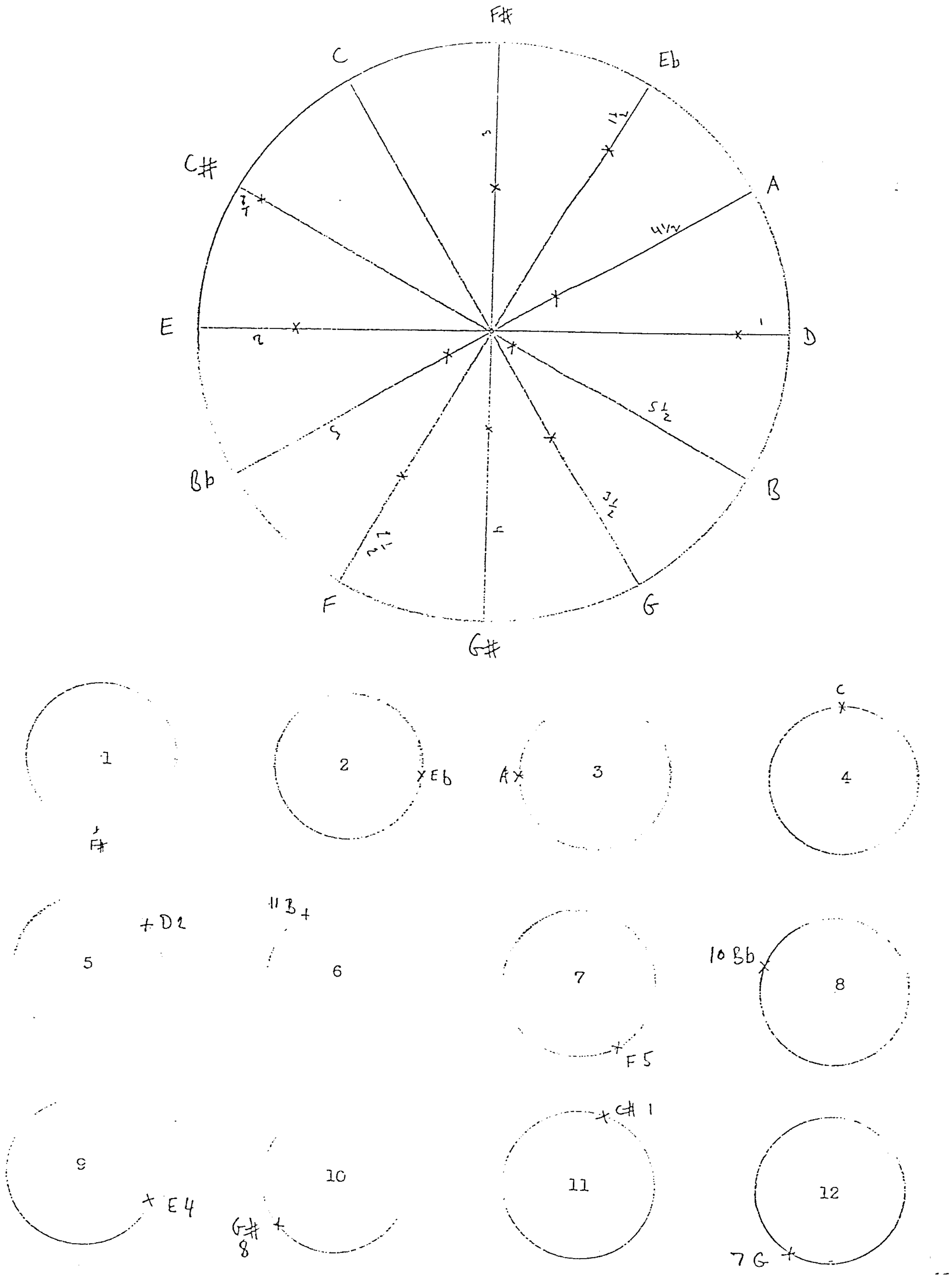
Look at circle 10. Listen to the note and place your x where it belongs. G sharp.

Look at circle 11. Listen to the note and place your x where it belongs. C sharp.

Look at circle 12. Listen to the note and place your x where it belongs. G.

This is the end of the first session. Thank you very much for your cooperation. In the next session we shall use our knowledge to indicate musilingually any point within the circumference of a circle. Till then, it might be interesting to practise the skills we have learnt today. In other words, practise becoming proficient at dividing lines and circles accurately into 12, and relating position on paper to pitch within an octave.

Name ....KEY.................... Language Music



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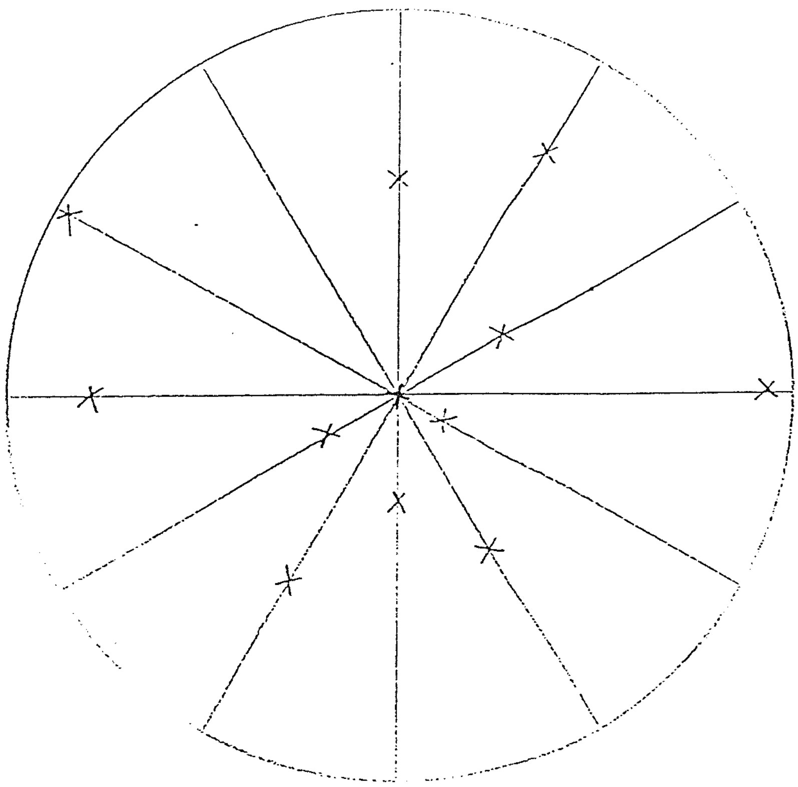
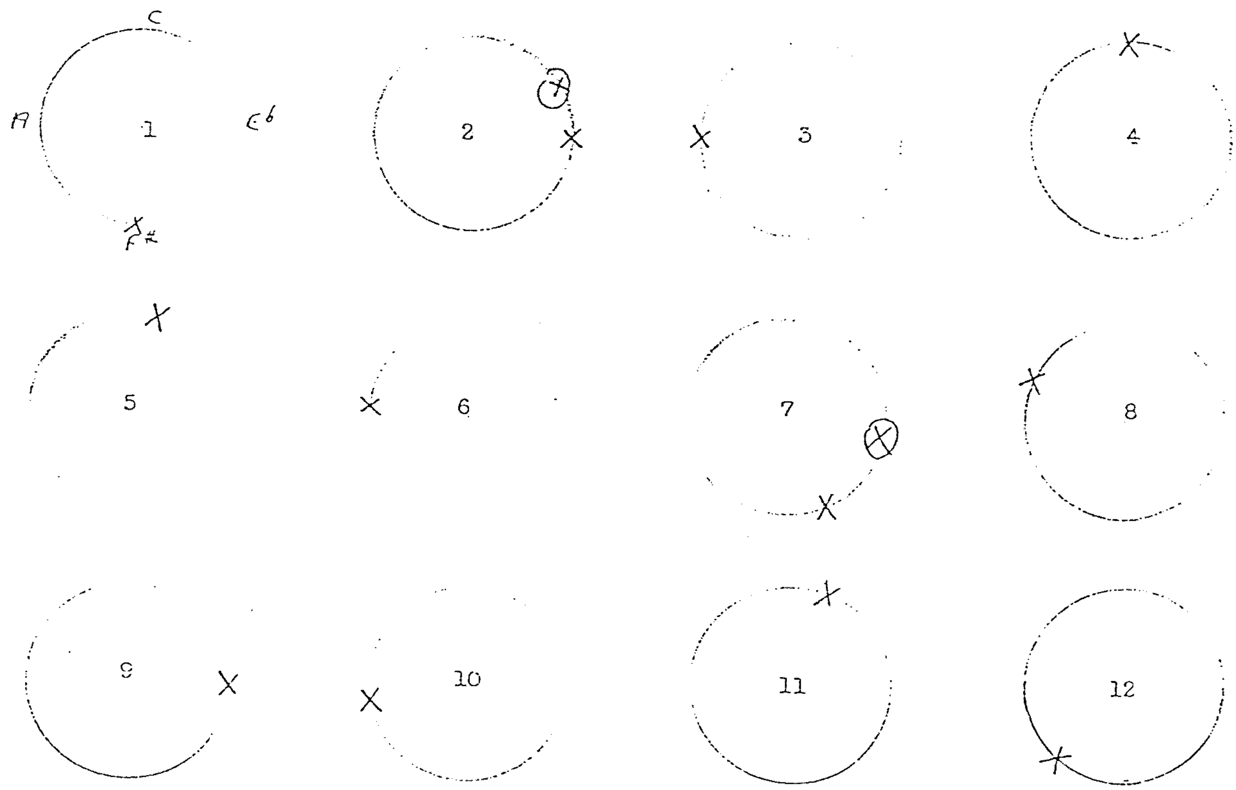
Name . Language Music





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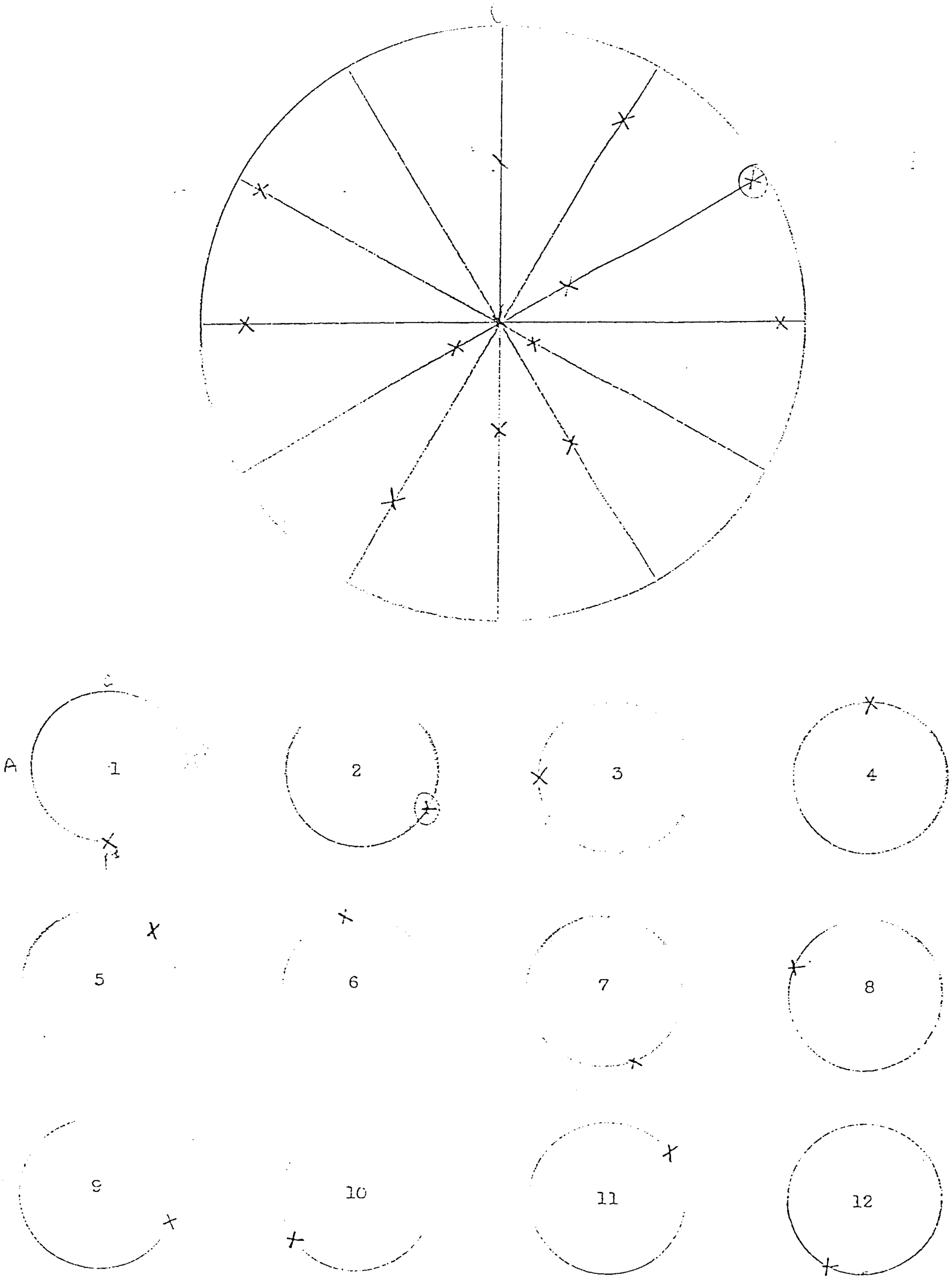
Name Language Music



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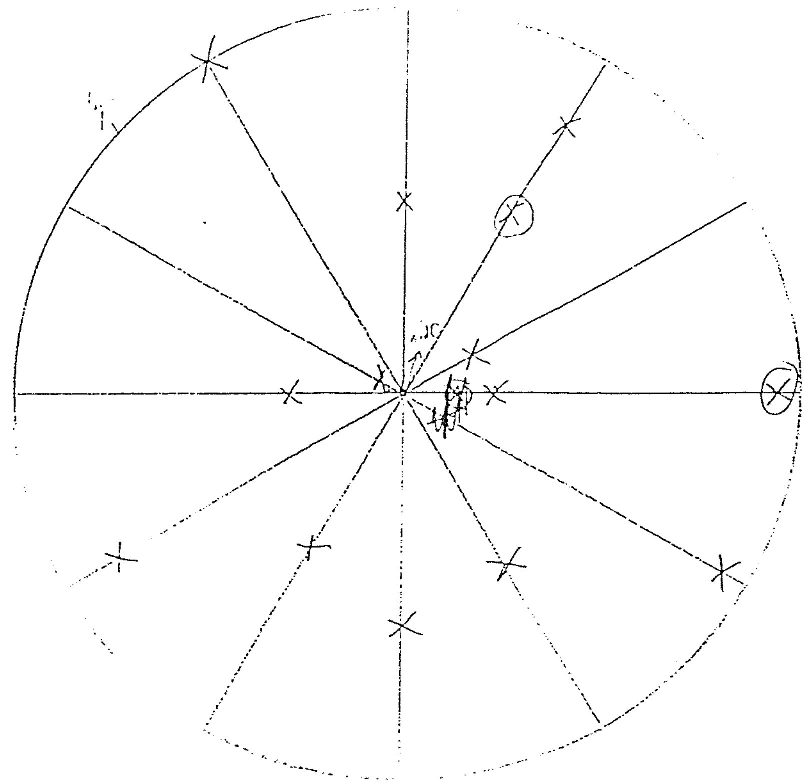

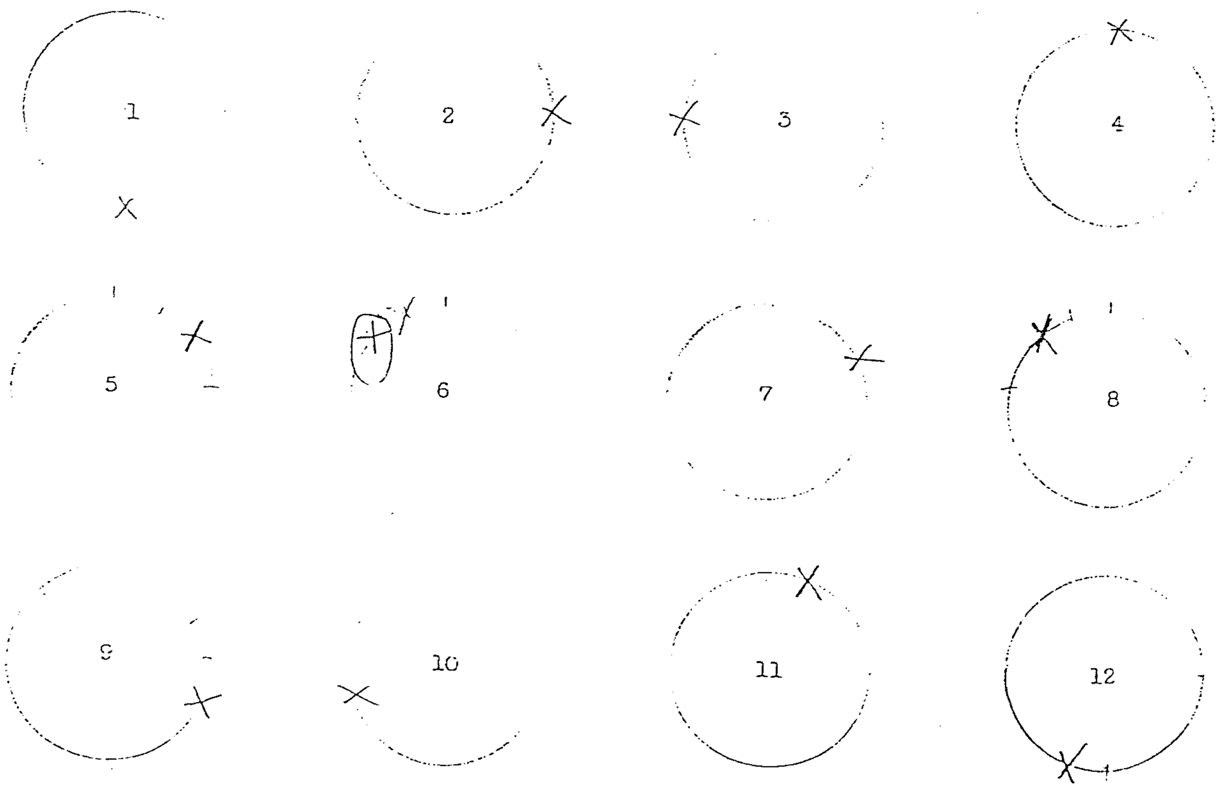

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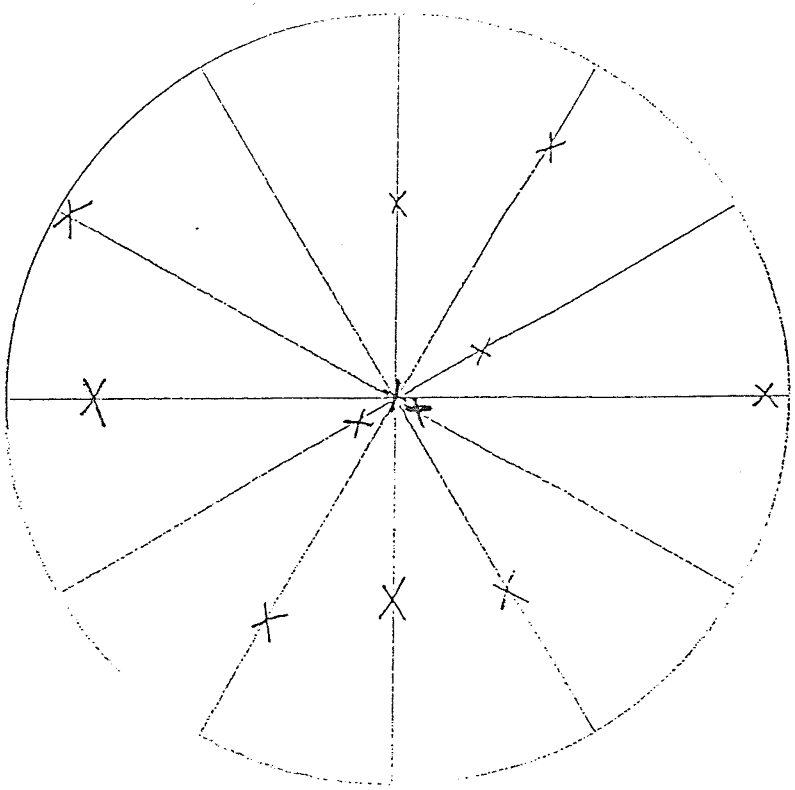

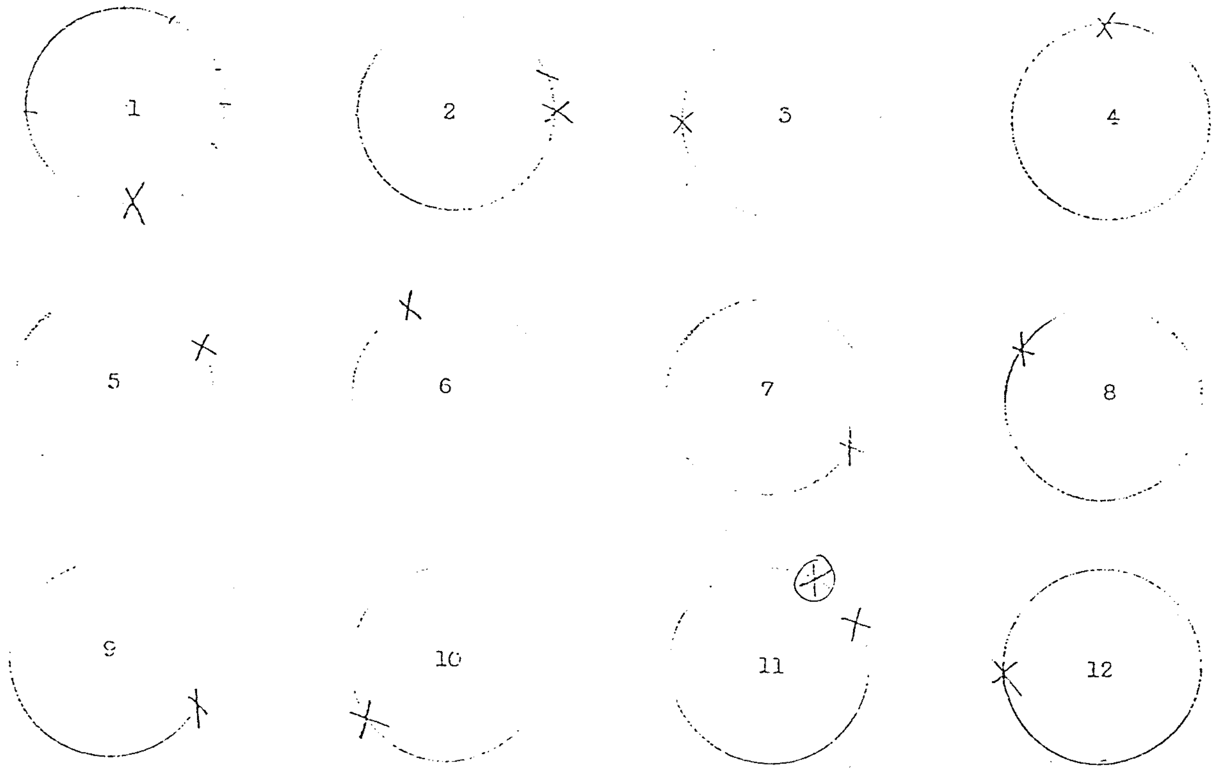

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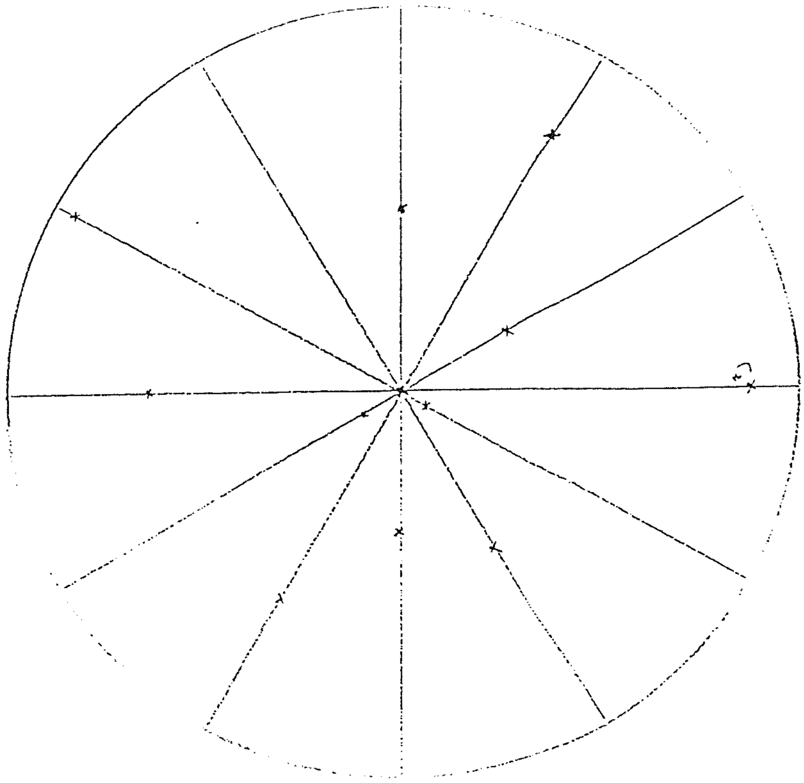

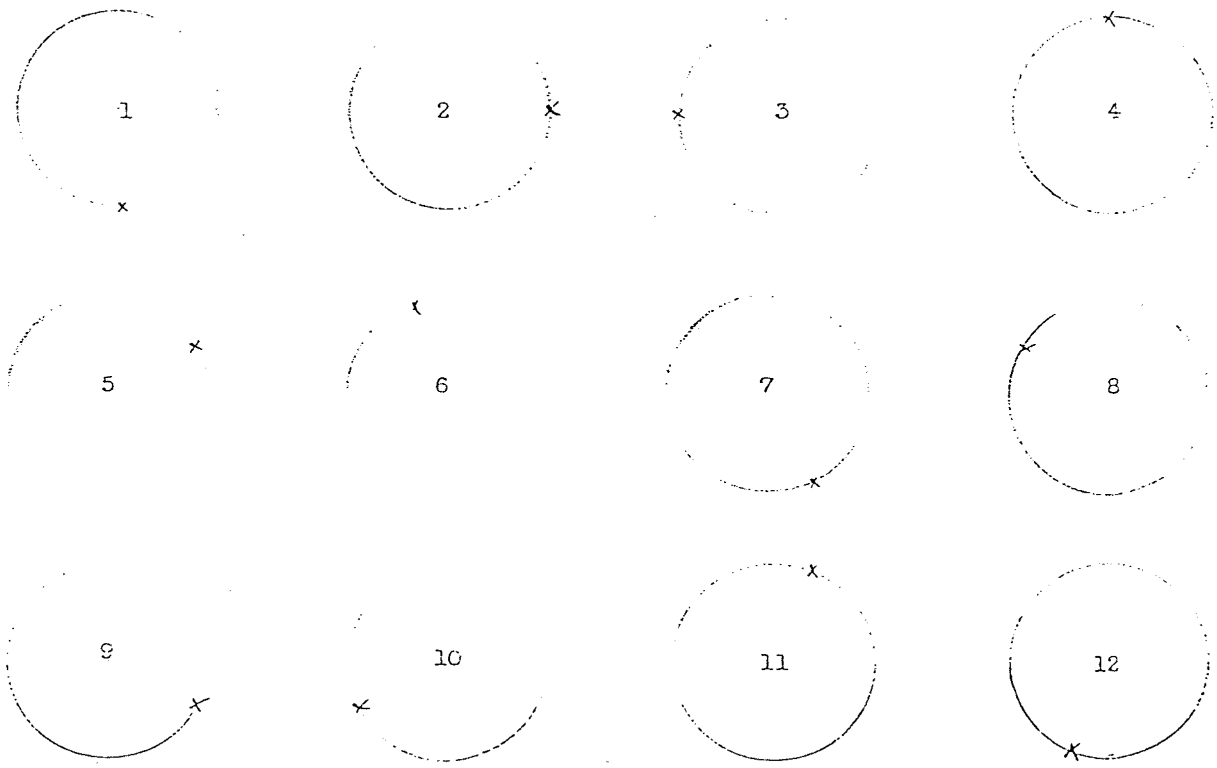

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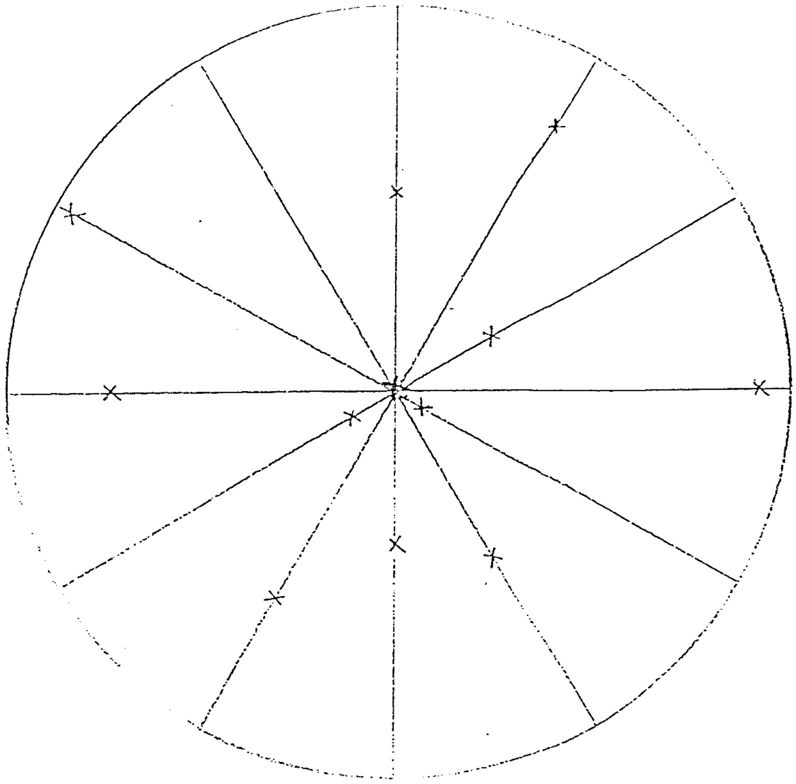
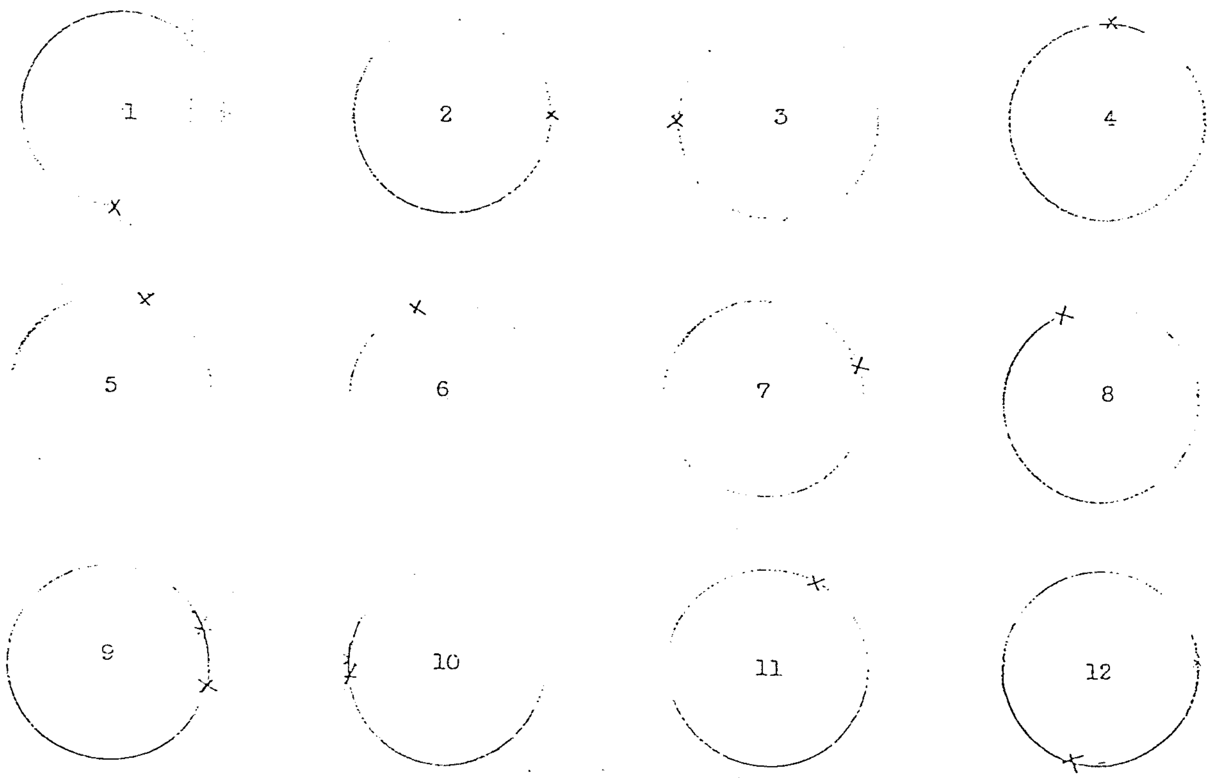




Results

The average margin of error in locating points from musical dictation was less than 5%.

Participants' comments and discussion

Question: 'In musilingua, how can I tell the difference between an oboe and a clarinet?'

The discussion which followed this question was mainly about how much detail is required before something can be recognized. The clarinet has certain features which are absent in the oboe, and in the course of the discussion it became clear that participants were, perhaps for the first time in their lives, considering carefully the shape of the instruments being discussed. There was general agreement that, provided just enough information was available to enable recognition of an object, any detail beyond that would be superfluous.

Question: 'After I learn musilingua, will Beethoven have meaning?'

It was made clear that, since Beethoven did not compose in musilingua, his work could never convey meaning. The discussion centred around the question of whether music could convey meaning, and whether it was desirable that it should. The connection between musilingua and how the meaning is arrived at was pointed out. When the relationship between sound and spatial dimension became clearer, there was general agreement that it would be interesting to pursue this subject further, and participants realized that music and musilingua were not of the same genus.

Question: 'Why use musilingua if it is shorter to use a word?'

It was made clear that musilingua can create a strong link between sound and spatial configuration whereas a word is only an arbitrarily chosen sound-label. The ability to think in sound-constructed configurations rather than in words might raise the level of thinking. There may not be a direct connection between the speed of absorbtion of information and the level of thinking. If the aim is to raise the level of thinking through musilingua, the speed of absorbtion of information is of no consequence as long as the aim is achieved. Besides, the assumption that words are shorter is not necessarily true. It depends on how much detail is transmitted using musilingua, and at what speed. The point was raised that, if one is good at something and one is used to it, change to something new and difficult is resisted. The general feeling was that musilingua should be given a chance and that judgement should be reserved until it was better known.

Question: 'How will musilingua improve my musicianship?!

The answer to this question depends on a number of factors. To begin with, musilingua will encourage thinking about music in new ways, and this, in itself, is a step forward. This kind of thinking will probably encourage a more intellectual approach to music, and this may influence interpretation. It may improve aural ability and this may influence fluency in performance. It may increase the speed of grasping musical phrases, and this may lead to a better understanding of the structure of complete works.

In the general discussion which followed, the relationship between architecture and music as perceived by Schelling and Goethe was mentioned, as were Mozart's ability to hear an entire piece in his mind 'all at once', the relationship between music and matter, and the subject of synesthesia.

Evaluation

1. Evidence was obtained that. given a suitable framework, subjects can locate points on paper from musical dictation fairly accurately.

2. Subjects were receptive to the idea that music can convey meaning.

The results obtained, the questions asked and the points raised in the discussion were most encouraging, and gave every reason to believe that the research would progress well. The results were as expected and nothing fundamentally new was learned from this session. The format and presentation were satisfactory, and owing to the fact that an exact record would have to be kept and that sessions might have to be repeated due to absences or for confirmation of results, presentation of sessions prepared on tape in conjunction with written materials would be continued.

3.7.2. MUSILINGUA SESSION 2

As we continue to develop our musilingual skills, it might be as well to project our thinking forward in order that we may see how our present level of competence fits in with the whole picture, and have an insight into what we may be able to achieve in future, even though we can only get a glimpse of this at this early stage.

In later sessions we shall be considering sense, meaning and understanding in relation to Musilingua, and, in order to prepare ourselves for that stage, we should bear in mind that musilingually structured two and three dimensional configurations are concrete representations of our environment in the mind, and as such can become an integral part of the thought process. 'Wordless' thinking, that is thinking in images only may result in understanding, whereas when words are intertwined with thought, understanding may not arise, always bearing in mind that understanding can exist on many levels. We can do no better than to quote Albert Einstein verbatim.

> The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be "voluntarily" reproduced and combined.

> There is, of course, a certain connection between those elements and relevant logical concepts. It is also clear that the desire to arrive finally at logically connected concepts is the emotional basis of this rather vague play with the above mentioned elements. But taken from a psychological viewpoint, this combinatory play seems to be the essential feature in productive thought - before there is any connection with logical construction in words or other kinds of signs which can be communicated to others.
>
> The above mentioned elements are, in my case, of visual and some of muscular type. Conventional words or other signs have to be sought for laboriously only in a secondary stage, when the mentioned associative play is sufficiently established and can be reproduced at will.
>
> According to what has been said, the play with the mentioned elements is aimed to be analogous to certain logical connections one is searching for.
>
> Visual and motor. In a stage when words intervene at all, they are, in my case, purely auditive, but they interfere only in a secondary stage as already mentioned.

Einstein is here concerned with images and what he terms 'associative play'.

Transmitting these images from his mind to another is only possible through the medium of language, and this is where his problems begin. The denuding of an image in order to attach word labels to it is a tiresome and soul-destroying exercise, and then there is no guarantee that when the words are used by a receiver, the reconstruction they enable would resemble the original image. Musilingua may change this state of affairs, since words and language are absent from the picture. Moreover, Einstein was not only concerned with images, but with their movement through space. He may be said to have been a true space traveller when he performed his 'thought experiment' in which he imagined himself to be rising through space astride a light wave and looking back at the wave next to him. Proficiency in Musilingua may enable this kind of 'space travel'. and in conjunction with the manipulation of one or more configurations relative to one another, may give rise to an entirely new consciousness.

In our last session we divided a circle and a straight line into twelve equal parts, each of which was represented by a semitone. Today we are going to use this skill to find a point within the circumference of a circle. In order to do this we need two notes. The first of these will indicate the position along the circumference of the circle, and the second the position along a line running from the circumference to the centre of the circle. Remember that middle C is always along the circumference and that top C is the centre of the circle. Remember also that 12 o'clock is middle C, 1 o'clock C sharp, 2 o'clock D and so on.

Let us now find a point within the circumference of circle No.1. Listen to middle C first. C. Now, here is the first of the two notes. E flat. This note indicates the 3 o'clock position. Put the point of your pencil at the appropriate point on the circumference. Now imagine that you are riding astride an imaginary line which joins the 3 o'clock position and the centre of the circle. Stop when you get to the point indicated by this note. E flat, and make a dot to indicate where you stopped. To help you, I shall play middle C first, and then the note again. Remember that middle C is always on the circumference of the circle. Here, then, is middle C. Now here is the note. E flat. Now I shall play the two notes which indicate the point you have found. First, here is middle C again. Now here are the two notes. E flat E flat.

Now let us continue with a similar procedure. Please look at circle No. 2. Listen to middle C. C. Now listen to this note. F sharp. Put the point of your pencil in the correct position on the circumference. It should be on the 6 o'clock position. Now listen to middle C again. C. Now listen to this note. E flat. Indicate its position by making a dot along the imaginary line running from the 6 o'clock position to the centre of the circle.

We are now ready to find any point within the circumference of a circle by listening to two notes, the first of which will indicate the position <u>along</u> the circumference, and the second <u>within</u> the circumference.

Now please look at circle No. 3. Listen to these two notes and make a dot in the circle to indicate the position they dictate. Just before I play them, here is middle C again. Now here are the two notes. E flat E flat. Now, still looking at circle No. 3, listen to these two notes and do the same. First, here is middle C, now here are the two notes. A E flat. You should now be looking at two dots within the circumference of circle No. 3. Please join them with a straight line. You should be looking at a horizontal straight line running through the centre of your circle.

Now please look at circle No. 4. First I shall play middle C, and then four notes. When you have found the position the first two notes indicate, place the point of your pencil in the appropriate position but do not lift your pencil. When you have heard the position the third and fourth notes indicate, move your pencil in a straight line to that point, drawing as you go along. Now - here is middle C. C. And here are the four notes. C E flat F sharp E flat. You should have drawn a vertical line running through the centre of the circle.

Now please look at circle No. 5. There is already a dot in it. Here is middle C. Here are two notes. F, E flat. If you think that these two notes indicate the position of the dot, circle the Y. If you think they do not, circle the N. Here are the notes again.

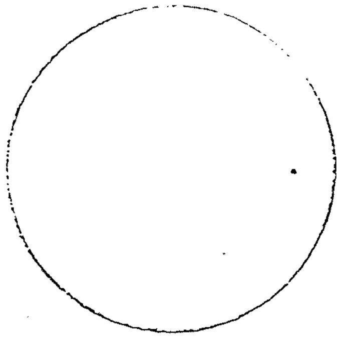
Now look at circle No. 6. There is a dot in it. Here is middle C. Here are six notes. D F sharp A A E F sharp. If you think the first and second notes represent the position of the dot, circle the letter a. If you think the second and third notes represent the position of the dot, circle the letter b. If you think the third and fourth notes represent the position of the dot, circle the letter c. Here is middle C again. Here are the notes again. D F sharp A A E F sharp.

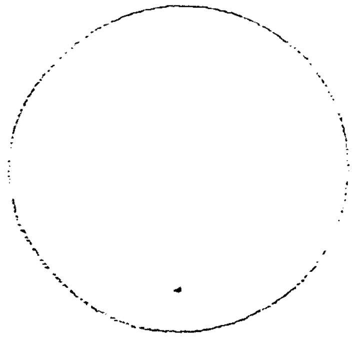
Now look at circle No. 7. There is a <u>line</u> in it. You will hear four notes. If you think the notes refer to the line in the upper half of the circle, circle the letter U. If you think they refer to the line in the lower half of the circle, circle the letter L. Here is middle C. If you think they refer to neither of the lines, circle the letter N. Here are the notes. F D G F.

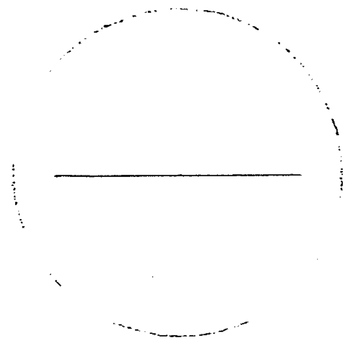
This is the end of the second session. Thank you very much for your cooperation. In the next session we shall use our knowledge to draw simple shapes musilingually within the circumference of a circle. Till then, it might be interesting to practice the skills we have learnt today. That is, practice becoming proficient at placing a point within a circle from dictation, and at imagining the notes when seeing a point within a circle, and at joining two points with a straight line.

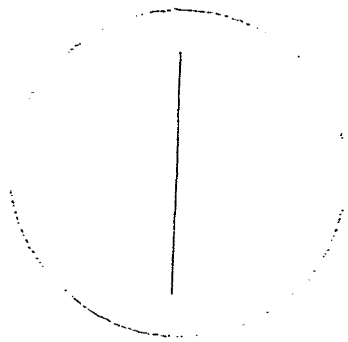
MUSILINGUA Session No. 2 Date 27/5/88 Venue RCM Time 9:30

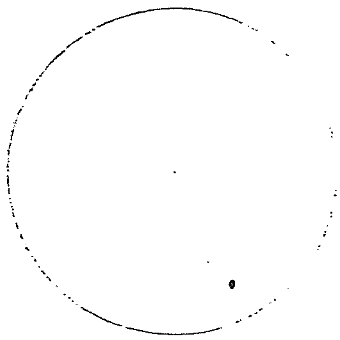
Name KEY

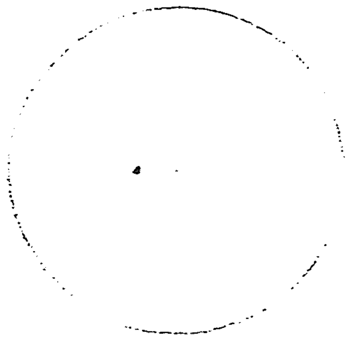
1 

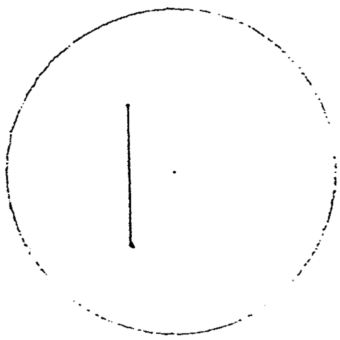
 2

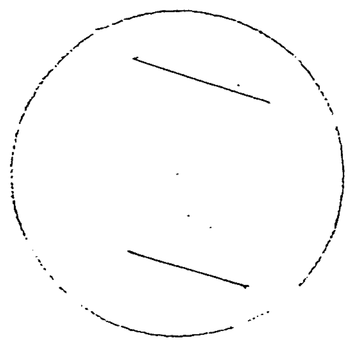
3 

 4

5 Y N 

 6 A B C

7 Y N 

 8 U L N

MUSILINGUA Session No. 2 Date 27/9/81. Venue RCM Time 0930

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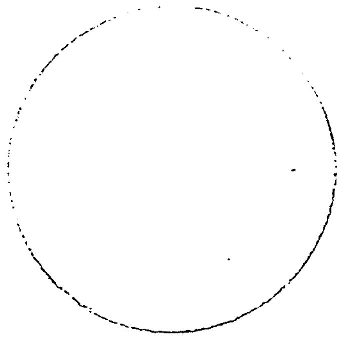

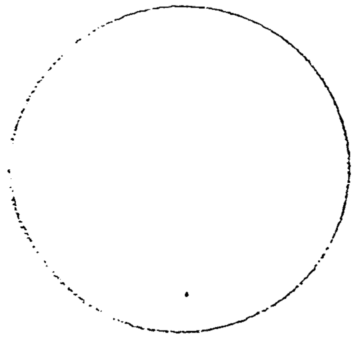

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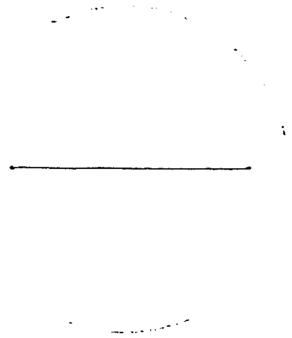

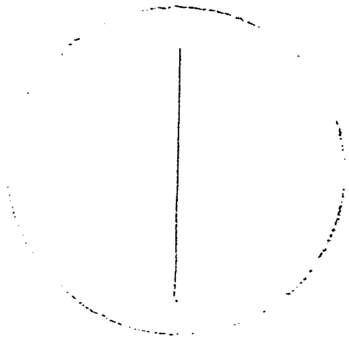

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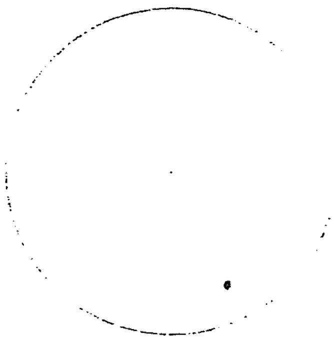
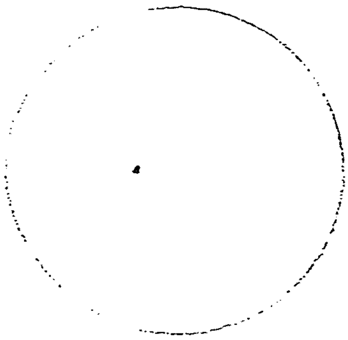
5 Y N

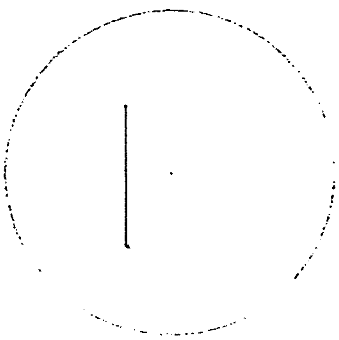


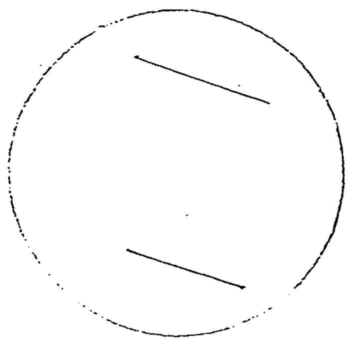


6 A B C

7 Y N

at quite!





8 U L N

MUSILINGUA Session No. 2 Date 27/5/88 Venue RCM Time 9.30

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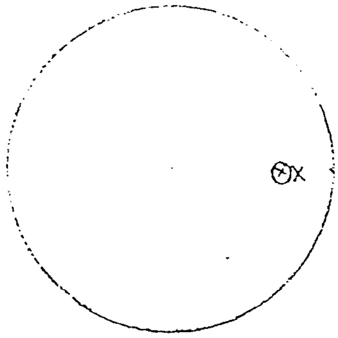
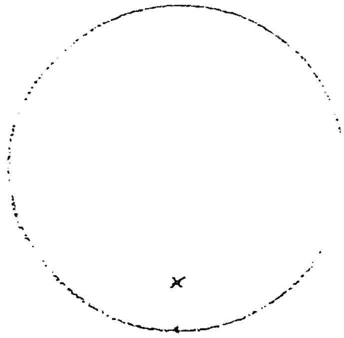
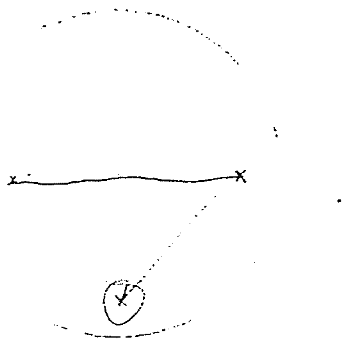
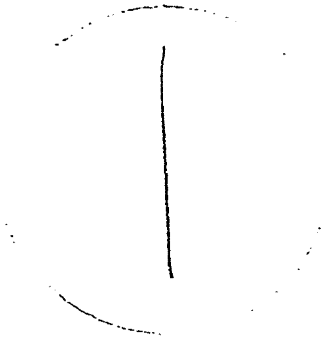
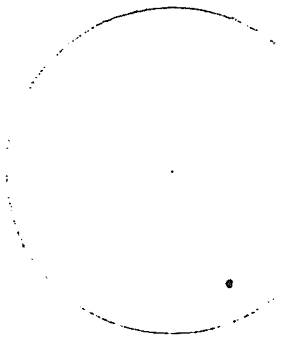
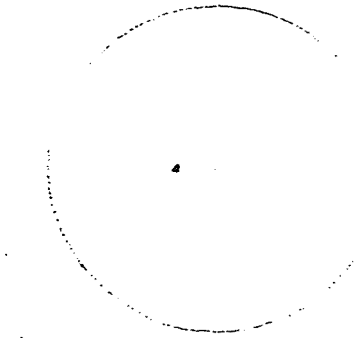
1 

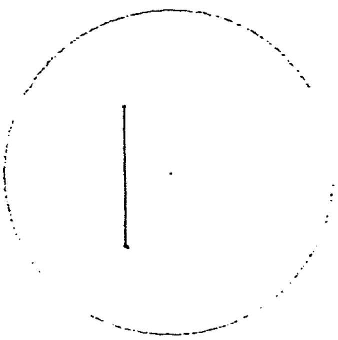
 2

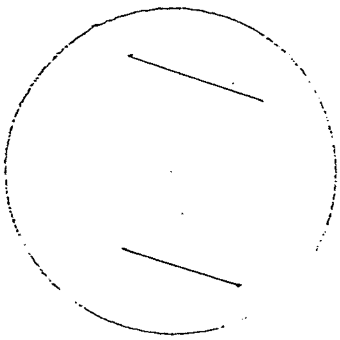
3 

 4

5 Y N 

 6 A B C

7 Y N 

 8 U L N

MUSILINGUA Session No. .. Date. .... Venue. ...... Time. ....

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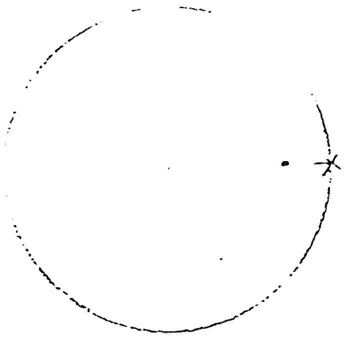

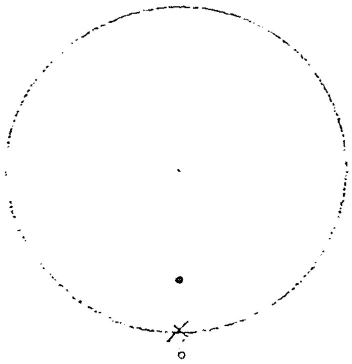
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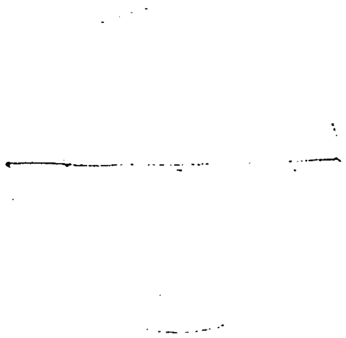

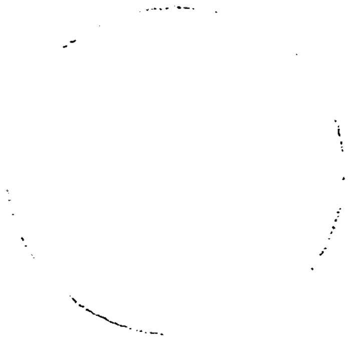
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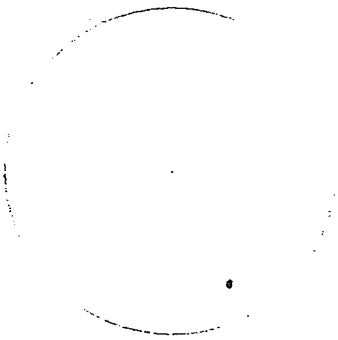

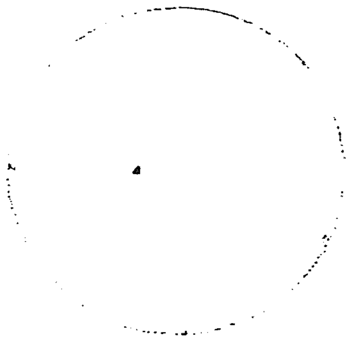
6 A B C

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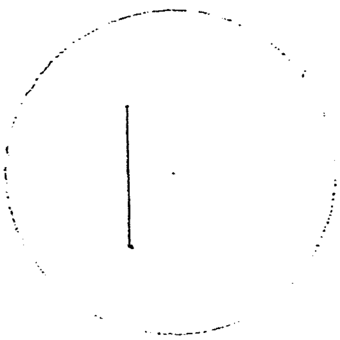

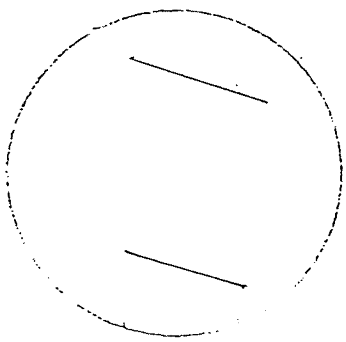
8 U L

MUSILINGUA Session No. 3. Date 27/5/88 Venue RCM Time 9.30

Name..

50%

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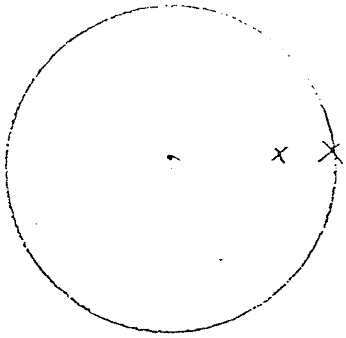

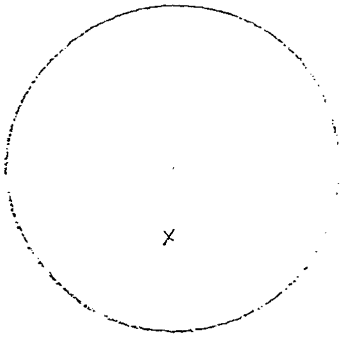

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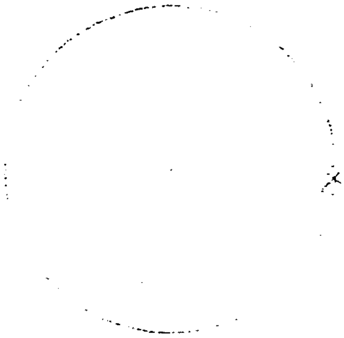

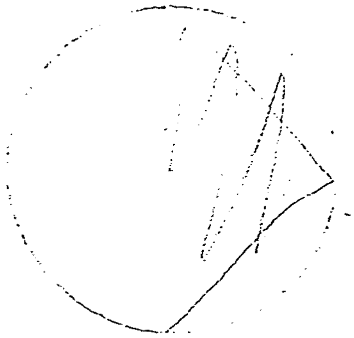

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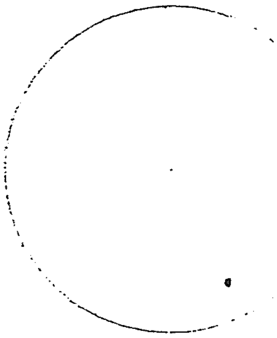
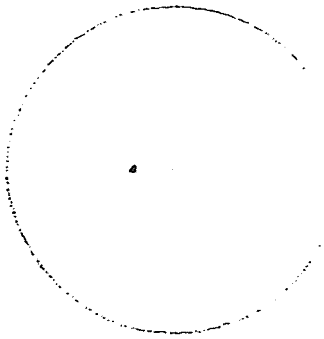
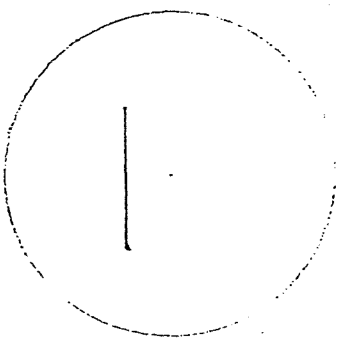
5 Y N

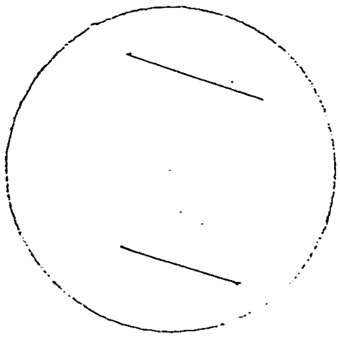




6 A B C

7 Y N





8 U L N

MUSILINGUA Session No. 2 Date. 27/5/88 Venue. KCM Time. 9:30

Name.. 25%

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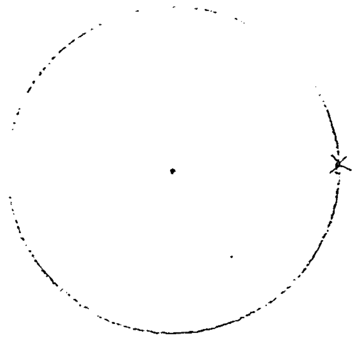

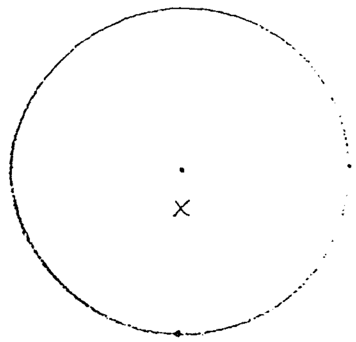

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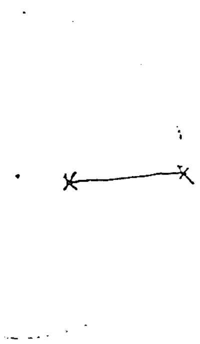

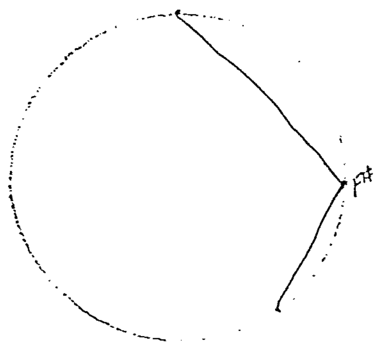

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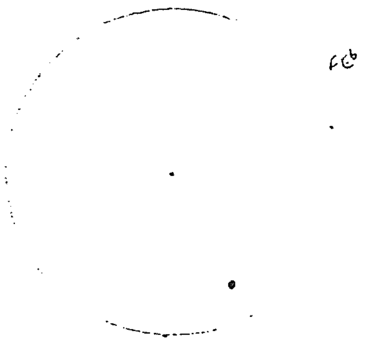
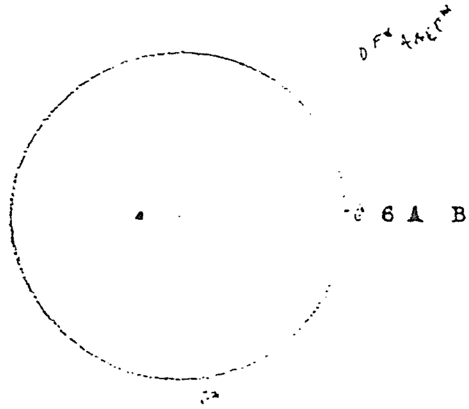
5 Y N





6 A B C

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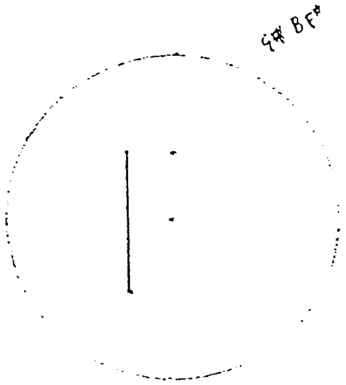
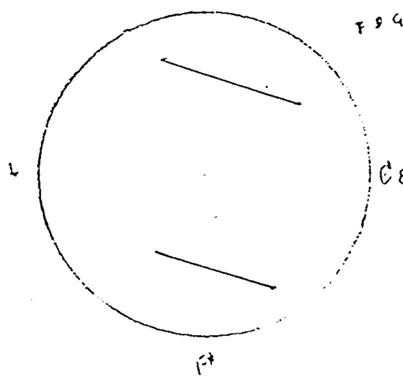




8 U L N

Results

It is most significant that two participants obtained 100%, and it may not be chance that both were males. The best female performance lagged behind considerably with 56%. In view of the fact that 100% was obtained, the question has to be asked - is the pacing correct, or should the level of difficulty be increased? This factor would be monitored in future sessions.

Participants' comments and discussion

Question: 'I can see how musilingua can describe a noun, but how can it deal with verbs?'

It was pointed out that in the later stages provision was made in the code for rotating three-dimensional configurations about an axis, and for moving configurations from one position to another in space. It would therefore be possible to dispense with the use of nouns and verbs as spearate entities occupying specified positions in sentences, because the noun and the verb would coalesce and this would enable thinking about the universe to assume new and different dimensions. The point was accepted, but it was evidence that participants would need time to get used to this idea.

Question: 'Why not begin with a line, rather than a dot, and then go on to a dot?'

The reasoning behind the question is clear - it may be easier to locate a configuration if more information is available. But before you can get a line, you have to be proficient at finding a dot - therefore beginning with a a line may prove more confusing in the end.

Question: 'If I miss the first note, I don't listen for the second. Is this wrong?'

It probably is, since, when patterns are constructed, it may be possible to guess the missed note, and also, advanced listeners will probably listen for phrases rather than individual notes. Concentration should never flag.

Next, the words invention, improvisation and extrapolation were discussed. First an attempt was made to define each word, and then differences were sought between them. The connection between these concepts and music and musilingua were discussed and it emerged that extrapolation might have a role to play in musilingua.

At the end of the session a short example of Tepehua whistle speech was played, and this was followed by a brief discussion on surrogate languages and the role of music in this connection.

Evaluation

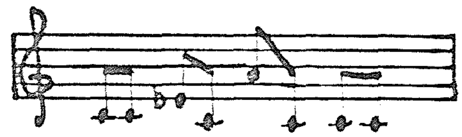
The results raise important questions. Are men better than women at three-dimensional visualization, and if so, could this explain why there have been few women composers and no known great one? Could these results throw some light on why men are generally more mechanically minded than women and form the majority of the builders and engineers of the human race? Could these results mean that musilingua could not be used universally because women would be worse at it than men, or would differences 'even out' with time? Are men and women equally good at the skill of language? Is there a correlation between skill in language and levels of general achievement and what cultural and educational factors are involved?

These fascinating questions can not be answered here, but the fact that the present research prompted their formulation is of some significance.

3.7.3. MUSILINGUA SESSION 3

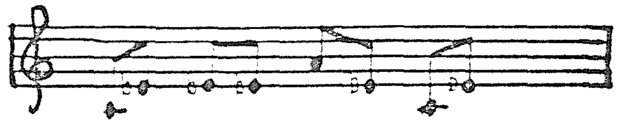
Hello. In this, our third session, we'll begin by playing shapes. Let's begin by playing the triangle in circle No. 1. You will remember that in order to find a position within a circle we need two notes, the first of which indicates a position along the circumference, and the second a position along a line which runs from the circumference to the centre of the circle. Now please look at circle No. 1. Here is middle C. I shall give you a minute to play the triangle in your head. The code is very simple. The first two notes indicate a position, and if followed by a further two notes, a line is drawn to the second position, and so on. If a line is not to be drawn to a new position, there is a pause before the new notes are heard. So - here is middle C again. Now try and play the triangle in your head. You should hear 8 notes......

1

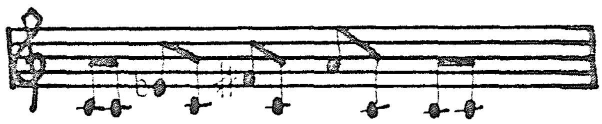


These are the notes you should have heard ... I shall play them again slowly, and try to follow the triangle as you listen. Let's do this exercise again ... Now do it for yourself. ... Now listen to the same notes speeded up whilst looking at the triangle ... Again ... Now, look away from the paper, listen to the notes again, and try to picture the triangle in your head as you hear the notes ... Relax ...

Let us now look at the triangle in circle No. 2. First of all, I shall give you a minute to play the triangle in your head. Here is middle C again. You should hear 8 notes ... Here are the notes you should have heard ... I shall play them again slowly, and try to follow the triangle as you listen. ... Let's do this again ... Now do it for yourself ... Now listen to the same notes speeded up whilst looking at the triangle ... Again ... Now look away from the paper, listen to the notes again, and try to picture the triangle in your head as you hear the notes ... Relax ...

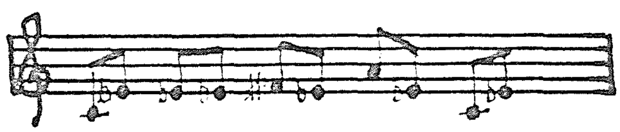
2 

Let us now look at the square in circle No. 3. Try and play the square in your head. You will need 10 notes. Here is middle C. ... Here are the notes you should have heard.

3 

I shall play them again slowly, and try to follow the square as you listen ... Let's do this again ... Now do it for yourself ... Now listen to the same notes speeded up whilst looking at the square ... Now look away from the paper, listen to the notes again, and try to picture the square in your head as you hear the notes ... Again ... Relax ...

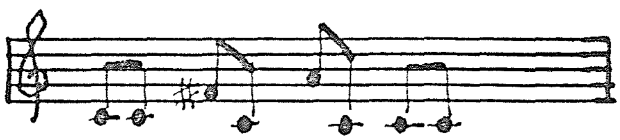
Let us now look at the square in circle No. 4. Try and play the square in your head. Here is middle C. ... Here are the notes you should have heard ...

4 

I shall play them again slowly, and try to follow the square as you listen ... Let's do this again. Now do it for yourself ... Now listen to the same notes speeded up whilst looking at the square ... Now look away from the paper, listen to the notes again, and try to picture the square in your head as you hear the notes ... Again ... Relax ...

So far we have played shapes. Now let us draw them. Please look at circle No. 5. Listen to the notes I shall play, and draw the lines you think you hear. Remember that the first two notes indicate a position, and if immediately followed by a further two notes, a line is drawn to the new position, and so on. You will hear 8 notes. Here is middle C. Here are the notes ... Here they are again ... Here they are for the last time ... Relax ...

5

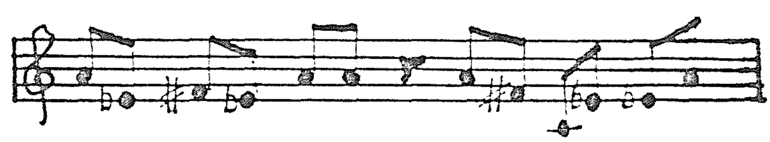


Now, please look at circle No. 6. Listen to the following notes and draw the lines you hear. First, here is middle C. Now, here are the notes ... Here they are again ... Here they are for the last time ... Relax ...

6

Now, please look at circle No. 7. Listen to the following notes and draw the lines you hear. First, here is middle C. Before I play the notes this time, let me remind you that if there is a pause before further notes are played, the new position is not joined by a line to the last one. Here, then, is middle C again. Now, here are the notes ... Here they are again ... Here they are for the last time ... Relax ...

7

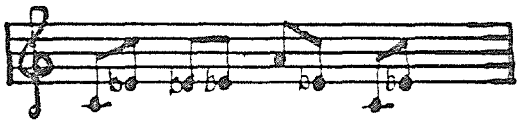


Now, please look at circle No. 8. Listen to the following notes and draw the lines you hear. First, here is middle C.

Now, here are the notes ... Here they are again ... Here they are for the last time ... Relax ...

8 

Now, listen to these notes. Say whether you think they describe the shape in circle 1, 2, 3, or 4. Indicate your answer by circling the appropriate number ...

 2

Before the next session, please think about the following. What exactly do we mean when we say that 'something' makes sense a) in language, and b) in music? What exactly do the words invention, improvisation and extrapolation mean a) in language, and b) in music? We have taken the first step towards becoming musilinguists. This is the end of the third session. Thank you very much for your cooperation.

MUSILINGUA Session No. 3. Date. 3/6/88. Venue RCM Time 9 45

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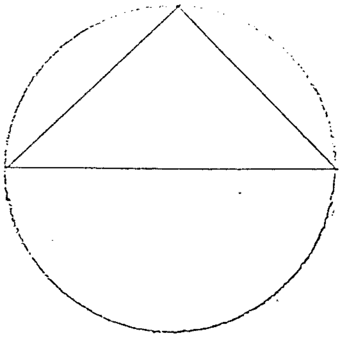
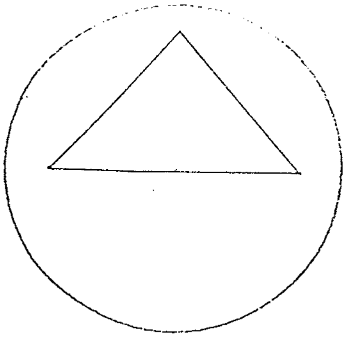
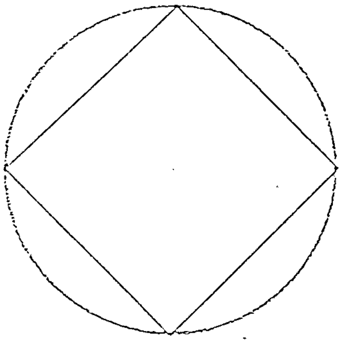
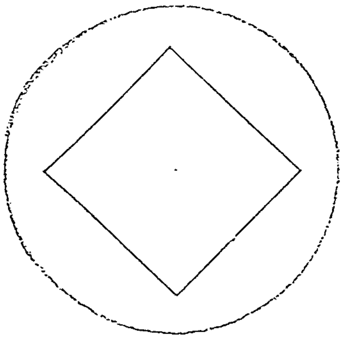
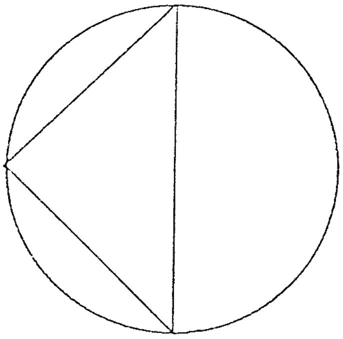
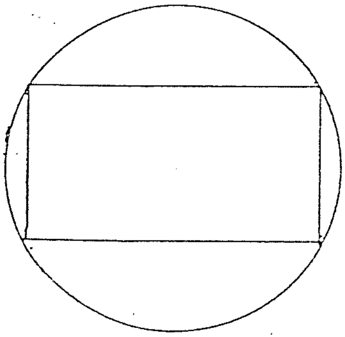
1 

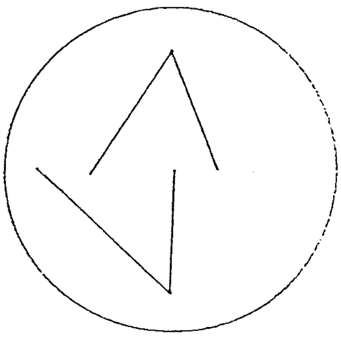
 2

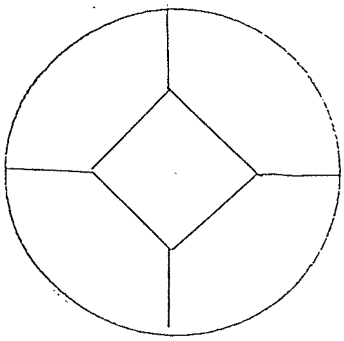
3 

 4

5 

 6

7 

 8

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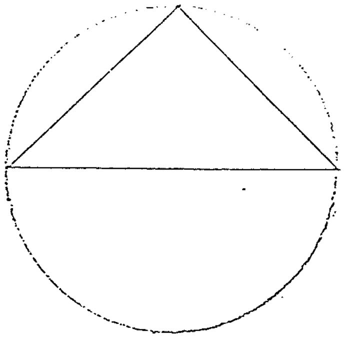
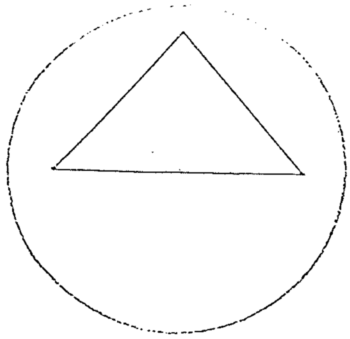
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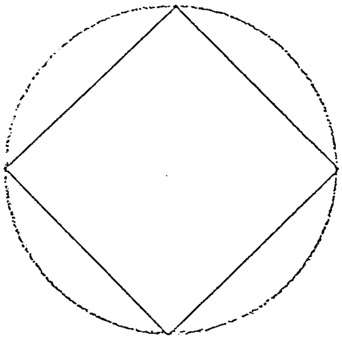
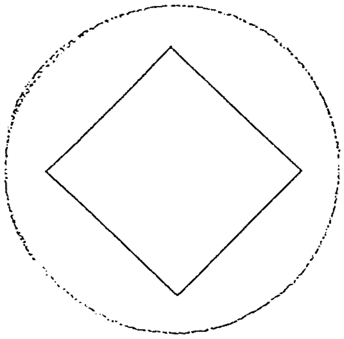
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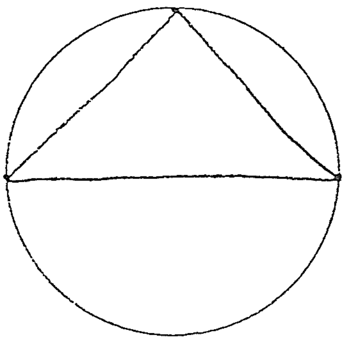
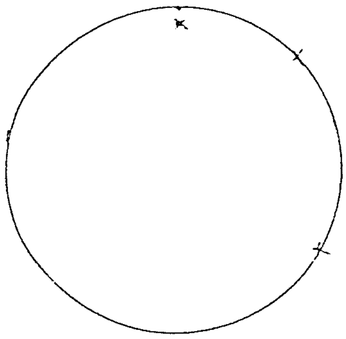
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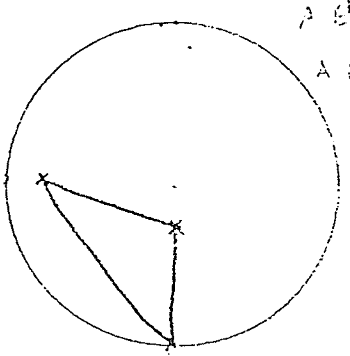
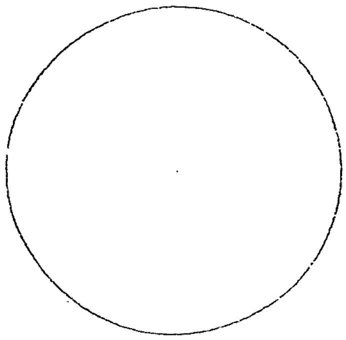
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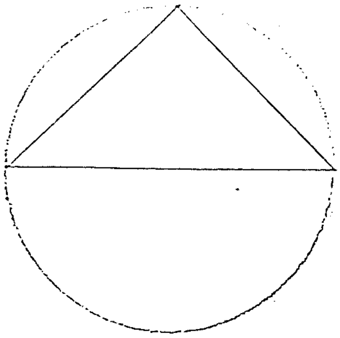
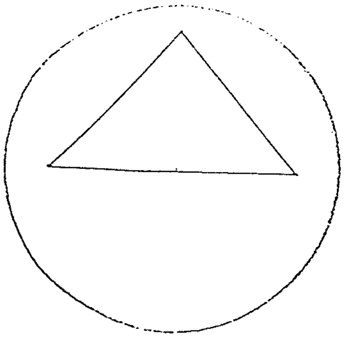
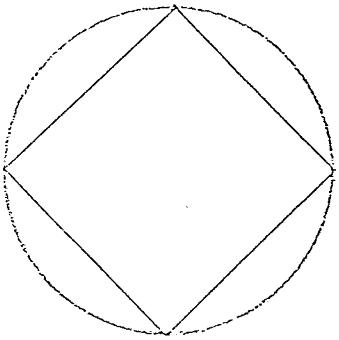
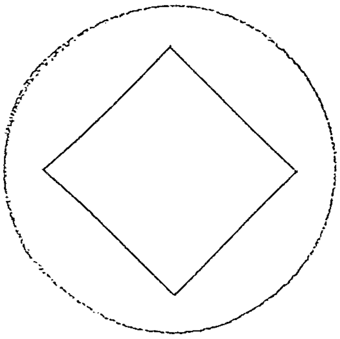
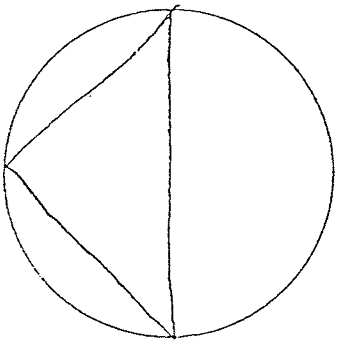
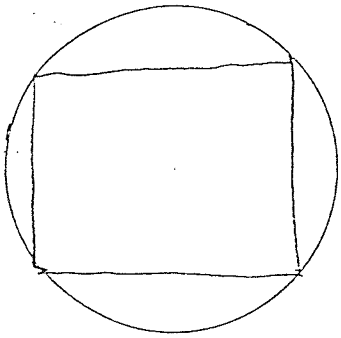
1 

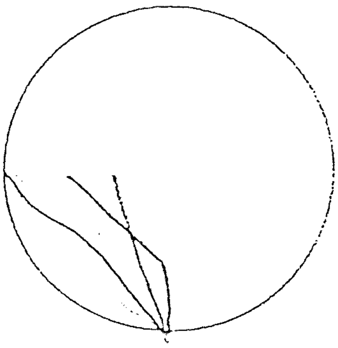
 2

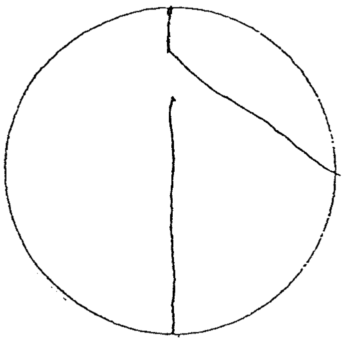
3 

 4

5 

 6

7 

 8

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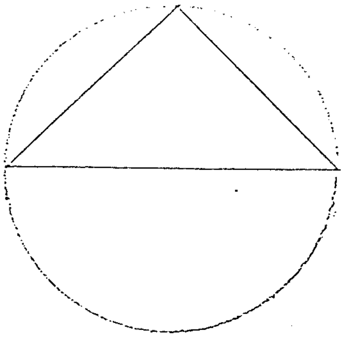
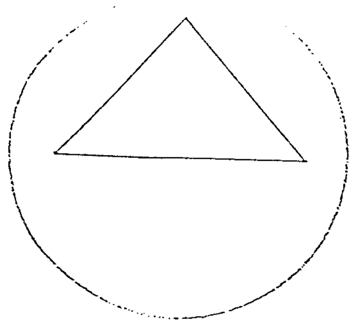
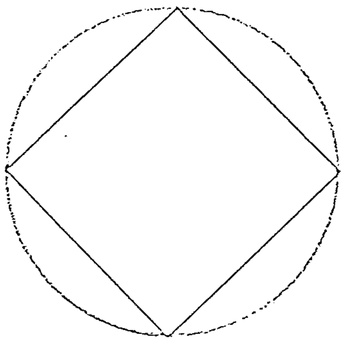
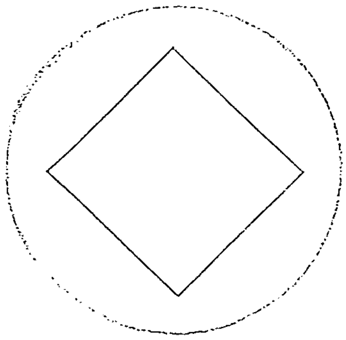
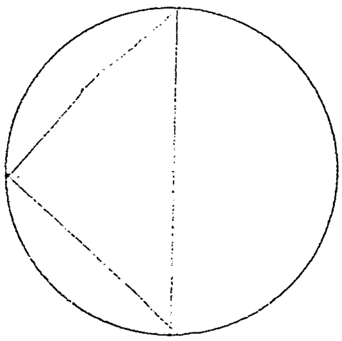
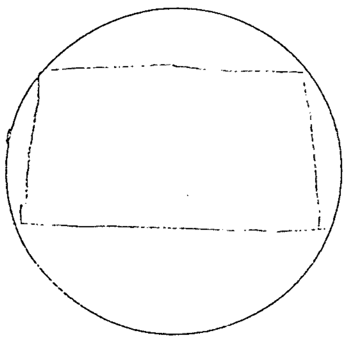
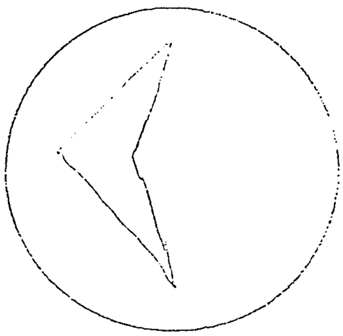
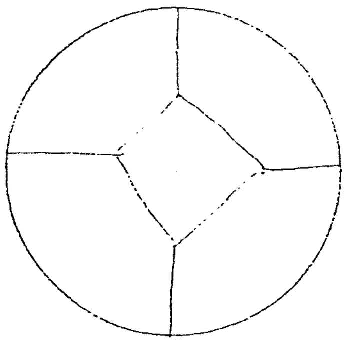
1   2

3   4

5   6

7   8

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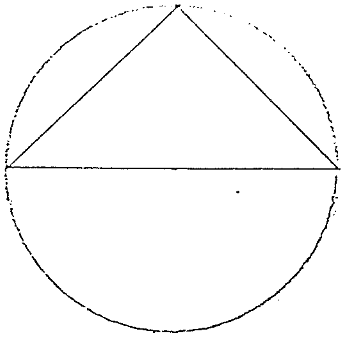
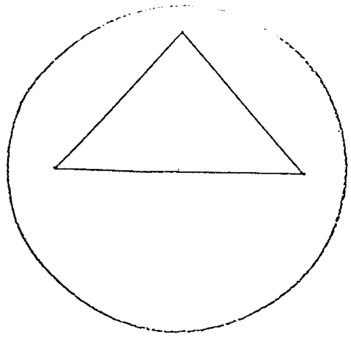
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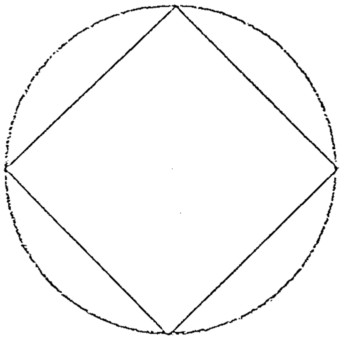
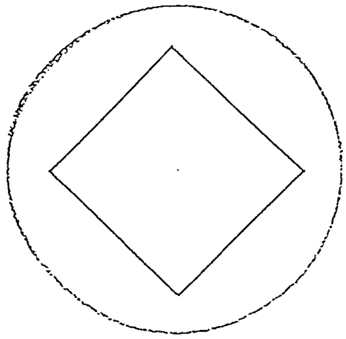
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C C F#C A CC

E DC EC A♭C B♭C

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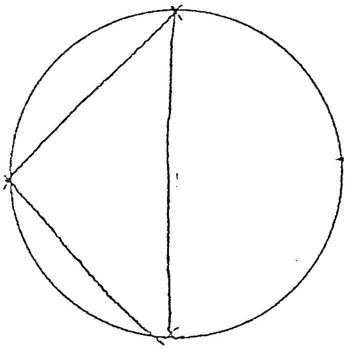
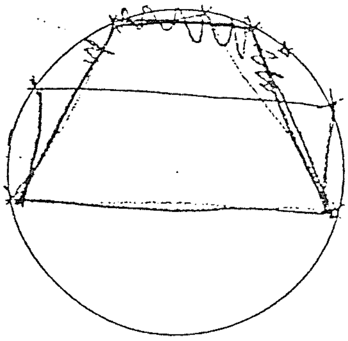
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A E♭ F#E♭ AA AFEFFA

CFEF FF AF

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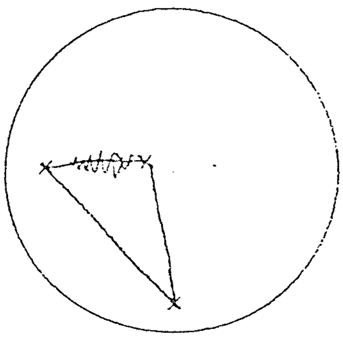
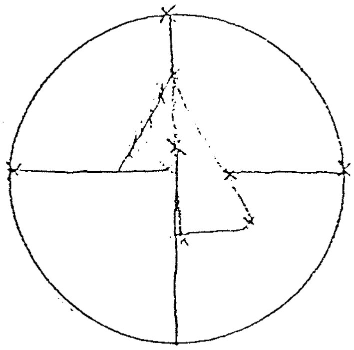
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CCCF

ECEF

FCCC

A CF#F

MUSILINGUA Session No. 3 Date. 3/6/88. Venue RCM. Time. 9:25....

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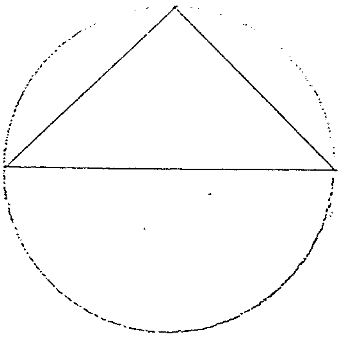
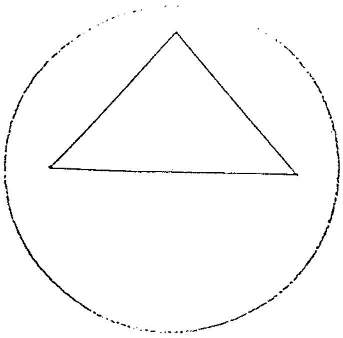
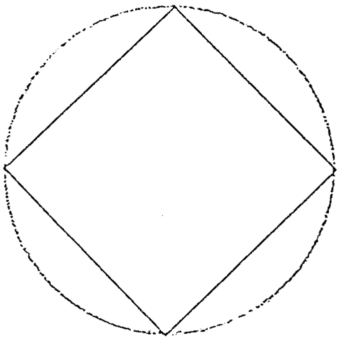
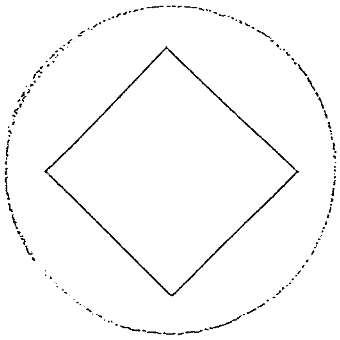
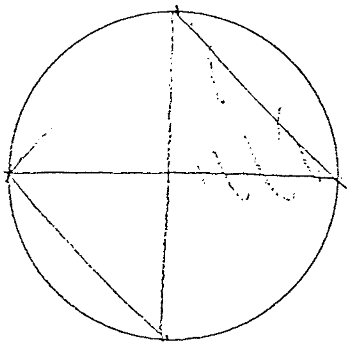
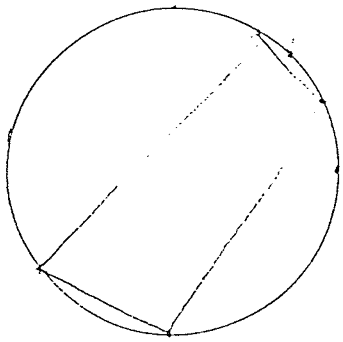
1 

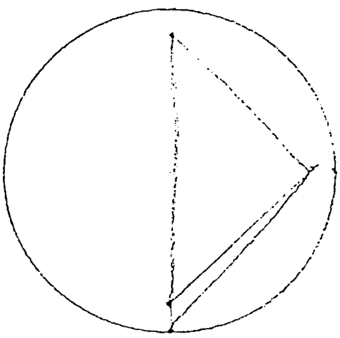
 2

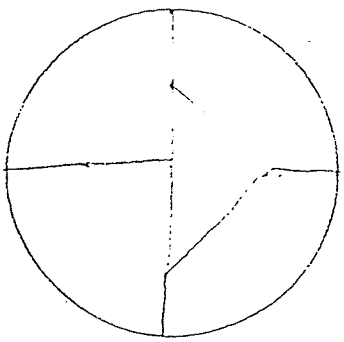
3 

 4

5 

 6

7 

 8

Results

The results show an improvement in the performance of all participants. Points to note are 1) that males consistently performed better than females, and 2) that the weakest members felt the strongest need to refer to conventional musical notation in order to be able to locate points on the paper from musical dictation.

Participants' comments and discussion

Participants made the point that they were beginning to get used to the idea that there is a relationship between pitch and dimension. Examples of 'eye music' were shown, and the discussion centred around musical notation and on whether the fact that music is written on a stave makes it easier to read then if it had been written in the style of letters. What emerged was that, since pitch in music is all important but in language it is of secondary importance, indication of pitch by relative height of notes is probably helpful.

Evaluation

The points of interest to emerge from this session were that 1) the poorest performers clung most to the security of the conventional notation and found it hardest to break with their customary modes of thinking, whereas the best performers seemed to make the adjustment quite naturally. It is evident that successful thinking in musilingua takes place unrelated to musical notation, the latter acting to slow down the thinking process and introducing an element of confusion. It also became clear that many musicians 'see' the notes they are listening to on the piano keyboard or on their instruments, or have to imagine themselves playing notes in order to be able to hear them. If this link could also be broken, it is to be expected that facility in musilingua would improve, and 2) the consistently superior performance of the men confirmed earlier findings, but caution must be exercised before drawing any conclusions owing to the very small sample and to the fact that the research is still in the very early stages.

3.7.4. MUSILINGUA SESSION 4

Hello. Today we are going to draw arcs and circles. Let us suppose that you are asked to draw an arc or a circle within the circumference of a larger circle. What information would you need in order to be able to do this? ... Well, first of all you would need to know where the centre of the circle is to be. Next, you would need to know what the radius of the circle is to be. Next, you would need to know whether to draw the whole circle or only a part of it, and precisely which part. If you had all this information, you could draw any arc or circle within the circumference of a larger circle.

Let us now follow the entire procedure step by step in order to see how the musilingual code works. Please look at circle No. 1. Here is middle C ... If I play two notes thus Eb A, you can easily find the point they dictate within the circle. But, if I make the first note long - thus EbA it indicates that what is to follow will be instructions to draw a circle or an arc. So, looking at circle No. 1, we can see the point dictated by these two notes, here they are again Eb-A and we know that the next two notes will indicate the radius or the arc of the circle we are to draw.

Now please look at circle No. 2. Here is middle C. Listen to these two notes A A The point they indicate is the radius of the circle, and it is marked with a This point will lie along the circumference of the circle, and will indicate either middle C or C an octave higher. Which of these it will indicate will depend on whether we are going to draw our arc or circle clockwise or anti-clockwise. Suppose we want to draw our arc or circle clockwise. It will then indicate middle C. But if we want to draw it anti clockwise, it will indicate C an octave higher.

Now please look at circle No. 3. Here is middle C. Listen to these two notes C F#. These notes instruct us to draw an arc from middle C to F sharp, which, you will remember, is half a circle. Notice that the dot at G is separate from the arc. This indicates that the arc is to be read clockwise.

Now please look at circle No. 4. Here is middle C. ... Listen to these two notes C F# Notice that the dot at is again separate from the arc, but it now represents an octave above middle C, so that arc is to be read anti-clockwise. Of course, the length of the arc depends simply on the interval between the two notes.

Now please look at circle No. 5. Here is middle C. Now listen to these two notes C C. The line on the circumference of the circle indicates the direction in which the circle is to be read.

Now look at circle No. 6. Here is middle C ... Now listen to these two notes C C The line on the circumference of the circle indicates the direction in which the circle is to be read.

Let us now practise making circles and arcs. Let us begin by making a circle. Please look at circle No. 7. Here is middle C. Here are two notes F# - A. Remember that the first long note is the instruction to make an arc or a circle. Here are the notes again, and the point you will have made will represent the centre of the circle F# - A

Now let's hear the next two notes, which will represent the radius. Here is middle C ... Now here are the two notes C A ... Here they are again C A. You should now have two points in your circle, the second representing the radius.

Now let's hear the next two notes, which will tell us whether to draw an arc or a circle. Here is middle C. Here are the two notes C C As it is an octave, you should have a complete circle, and in order to indicate that it is to be read clockwise, put a small line along the circumference, as you saw in circle No. 5.

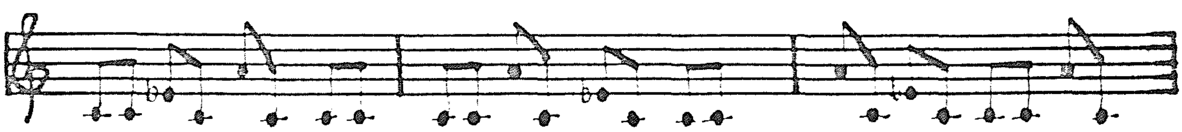
Now please look at circle No. 8. Let's draw an arc. First, here is middle C. Now, here are the two notes to give you the centre of the circle C - Eb Here they are again C Eb Now, here are the notes to give you the length of the arc C D Here they are again C D Remember that, if the arc is to be read clockwise, the line of the arc begins a short space from the dot in a clockwise direction and vice versa if it is to be read anti-clockwise. So, here is middle C ... and here are the notes again C D You should now be looking at an arc and a dot to the right of it.

As you see, the code is very simple, though it will take some time to get used to it. Practise making circles freehand, and then arcs of different lengths.

To end this session, let's do a little revision. Please look at circle No. 9. You will remember the shape from our last session. Play it in your head ... Did you hear these notes 1 ? Now, here is a question. Could it have been this 2 or this 3 or any of several other possibilities? The answer is, of course, that it could, depending on where you begin reading the shape and in which direction you want to go. In order to enable reading of the shape, a dot followed by a line indicates the direction, as we saw when drawing arcs. Practise, hearing the shape in as many different ways as you can, and try the same exercise with some other shapes.

Finally, I should point out that in Musilingua the recording of music on paper is not of prime importance, for it is mainly a means of thinking and communication in three dimensions, and we have no means of recording true three dimensional configurations, save in our mind. We need the code we have learnt only to enable us to think musilingually in relation to the concrete world we live in.

This is the end of the session. Thank you very much for your cooperation. In the next session, we shall begin to consider the third dimension.



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MUSILINGUA   Session No. 4   Date 10/6/88   Venue KCM   Time 9.15

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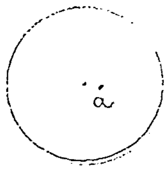

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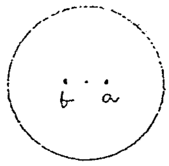

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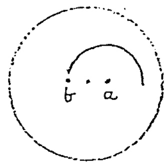

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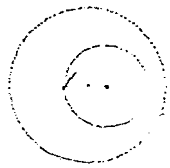

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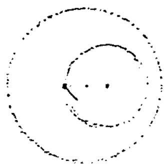

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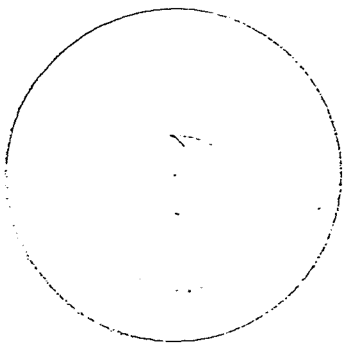

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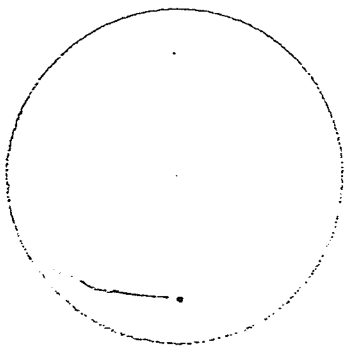

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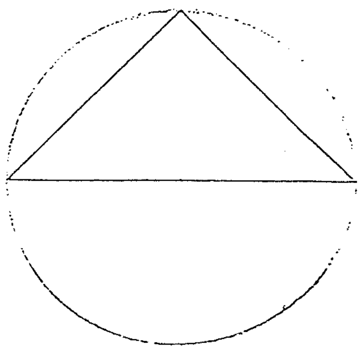

MUSILINGUA Session No. 4. Date 23/6/88. Venue RCM Time 9.40pm

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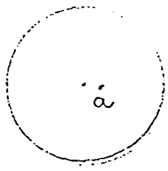
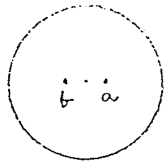
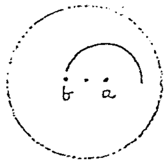
1 

2 

3 

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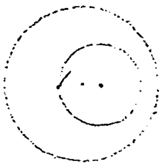
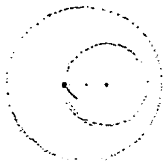
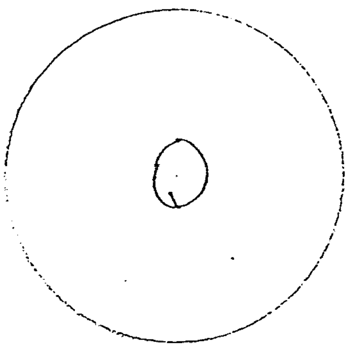
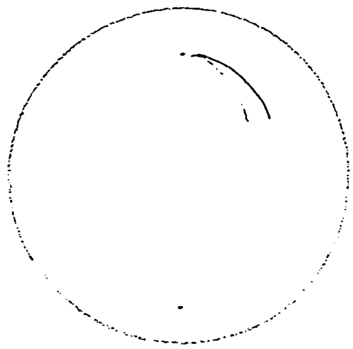
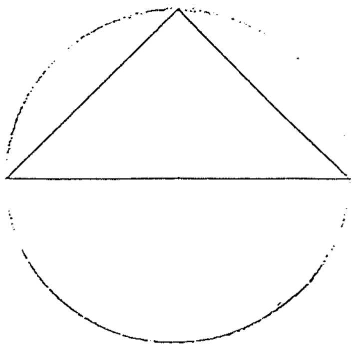
5 

6 

7 

8 

9 

MUSILINGUA Session No. 4. Date 10/6/88. Venue RCM.... Time 9.15

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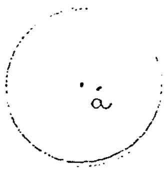
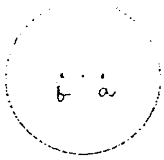
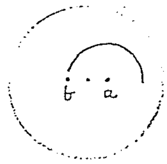
1 

2 

3 

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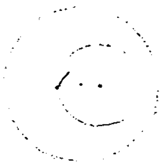
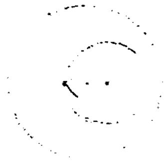
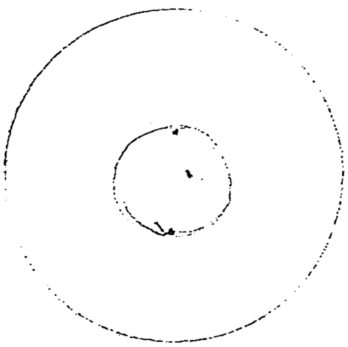
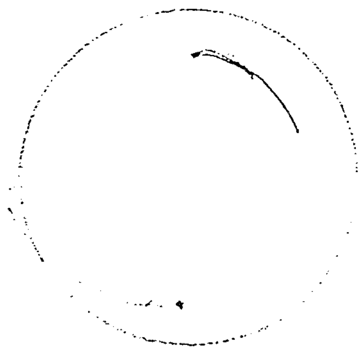
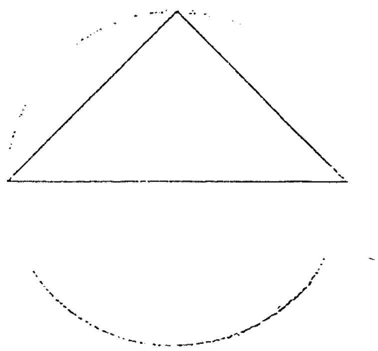
5 

6 

7 

8 

9 

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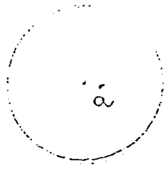
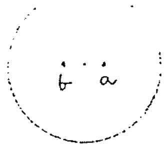
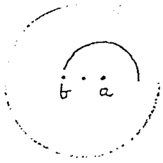
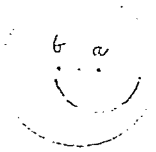
1 

2 

3 

4 

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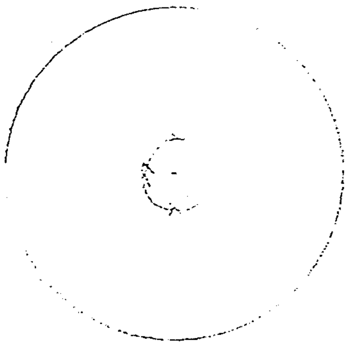
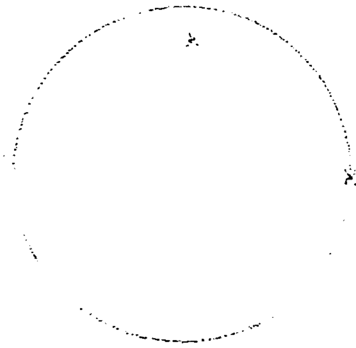
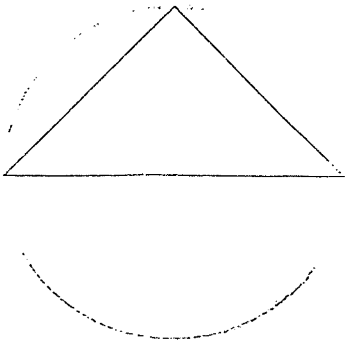
7 

8 

9 

MUSILINGUA   Session No. 4.   Date 10/6/88   Venue RCM....   Time ..9.15.

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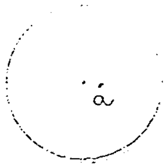

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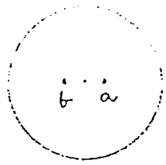

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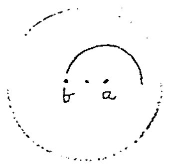

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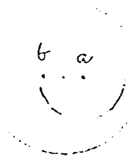

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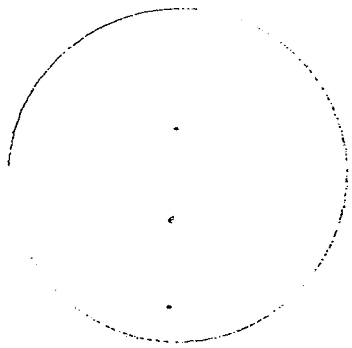

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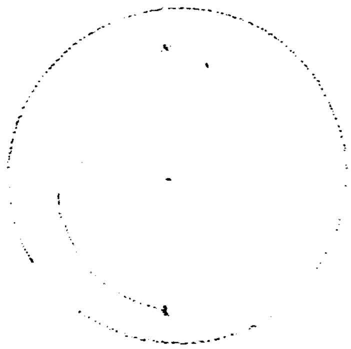

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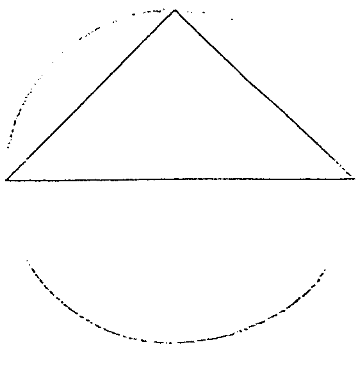

MUSILINGUA Session No. 4. Date 10/6/88 Venue RCM Time 9:15

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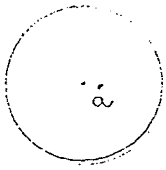

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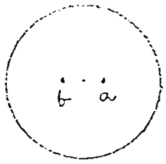

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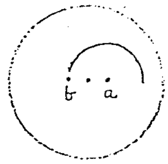

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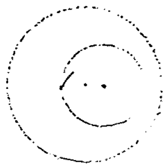

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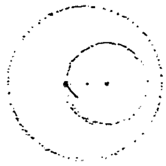

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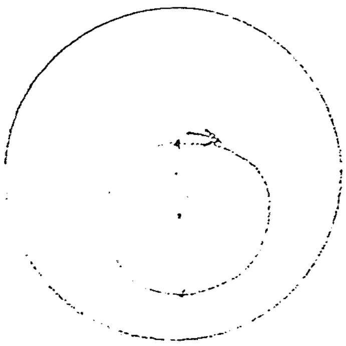

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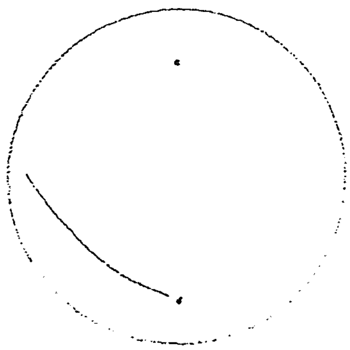

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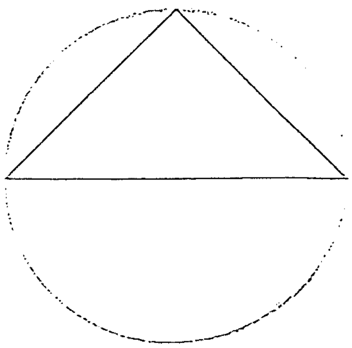


Results

The results show that the instructions for drawing circles were understood, but some difficulty was experienced because the concept was new. By the time participants had to draw a circle from dictation, some fatigue had set in. This was evident not only from the results, but also from their behaviour in the classroom. One of the women who sat next to a man glanced over at what he was doing and copied his work. She would probably have produced nothing had she not done so. As it happened, he was right. Another of the women also glanced at the work of a man next to her and copied from him. As it happens, he was wrong. She too would probably have produced nothing without copying. The results show that one man was right, one man was wrong, and that the three women would have produced nothing had two of them not copied from the men.

Participants' comments and discussion

Question: 'How can musilingua convey emotion?'

Part of the reason for the research was to find an answer to this very question, and it was hoped that participants would help to provide an answer to it. In the meantime there were two points worth bearing in mind in this connection.

1. Emotion can be of different 'kinds'. It could be a feeling such as happiness or sadness, or it could be a feeling of caring about a person or a thing - a feeling of involvement. Possibly musilingua would not create the same 'kind' of emotion as music, but it could be just as satisfying.

2. In the same way that emotion in language arises from meaning, so the inherent meaning in musilingua could create emotion.

A discussion ensued on 'what makes sense in language' and 'what makes sense in music'. Invention, improvisation and extrapolation were discussed again in this connection, and one conclusion was that extrapolation is more 'certain' than improvisation and more restricted in the direction it can take.

One of the participants said she was beginning to feel comfortable with musilingua, and another said she was no good at it.

Points made by participants showed that

1. There was some confusion between the meaning of radius and diameter.

2. It was not clear that the dot indicating the radius lies along the circumference of the circle, and that it indicates a C along the circumference of the new circle and not the one used to find the centre and radius.

3. The line indicating direction was confusing. It was thought to be an arrow rather than the continuation of the circumference.

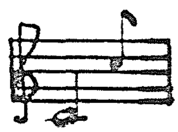
<u>Assessment</u>

Participants found this session more difficult than previous ones. This was undoubtedly mainly due to the fact that there was a greater amount of information to remember before a circle could be drawn, and it could not be done from dictation because, due to lack of practice, it was too fast. What added to the difficulty was the confusion which arose from the words circumference, diameter and radius, and the fact that it was not clear what the relationship was between the point indicating radius and C, which is not the same point as on the original reference circle. In fact, most of the confusion probably arose because there were two circles involved; the original circle and the dictated circle, and these were not conceptually separated. If this had happened at the outset there would probably have been no confusion.

At the end of the session participants seemed tired but well motivated and keen to improve their skill at drawing circles and arcs. They seemeed to sense that the research was leading somewhere.

3.7.5. MUSILINGUA SESSION 5

In our last session we were introduced to the musilingual code for circles and arcs. Let us remind ourselves of the code before we begin today's session, which will be partly concerned with the relationship between musical sense, and sense in the world surrounding us. Please look at circle No. 1. Let us pretend that we are going to draw the circle. Just look at it, and follow the instructions in your mind as you hear them. First of all, here is middle C. Now, here are the first two notes. Remember that a first long note indicates that the following instructions will be for drawing a circle or an arc.



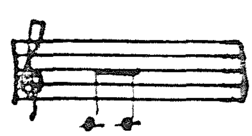
We have just been told that the centre of the circle or arc is to be, in this case of course, in the centre of the circle we are looking at. Now listen to the next two notes which will indicate the radius. First, here is middle C ... Now, here are the two notes ...

Consider this point as C in whichever position within the circle it is. It does not have to be at the 12 o'clock position, although in this case it is. Now listen to these two notes ...

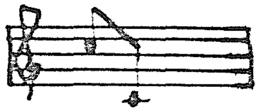
As we went from middle C to an octave higher, they instruct us to draw a complete circle in a clockwise direction. When we have completed the circle, we continue the line slightly, to show that it has been drawn in a clockwise direction. Look at the point where the line is slightly continued in the direction in which the circumference was drawn.

Now for further practice, let us repeat this process with circle No. 2. Here is middle C ... The first instruction will give us the centre of the circle

The second instruction will give us the radius

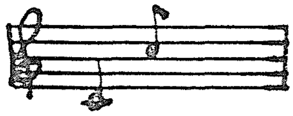


The third instruction will give us the length of the arc or tell us to draw a circle in a clockwise or anticlockwise direction.



This time, the circle is to be drawn in an anti-clockwise direction. Note that the little line indicates the direction in which the circle was drawn. It is simply a short continuation of the direction of movement.

Let us now begin to draw our own arcs, circles and lines from musilingual instructions. Please look at circle No. 1 again and have your pencil ready. Listen to middle C. Now listen to these two notes ...



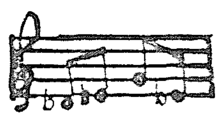
Make a point where the centre of your circle is to be. Now listen to these two notes

Make a point to indicate where the radius of the circle is to be. The point you have made will represent C on the circumference of your circle. Now listen to these two notes

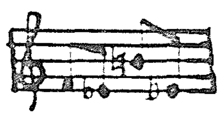
These notes tell us to make a complete circle in a clockwise direction. Don't forget to continue your line slightly to show that you have drawn the circle in a clockwise direction.

Now let us look at circle No. 2. This time we shall draw straight lines only. Remember that to find a point, we need two notes. If these are immediately followed by a further two notes, we join the points with a straight line. But if there is a pause, we lift our pencil and begin anew.

Listen to middle C ... Now listen to these 4 notes.

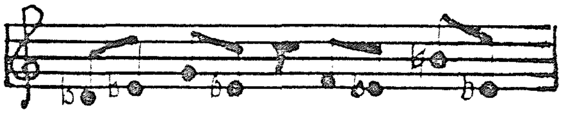


Have you drawn a diagonal line? Listen to them again ... Now listen to these 4 notes.



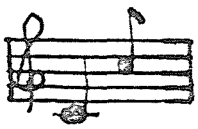
You should have drawn another line. Here are the last 4 notes again ...

I shall now play all 8 notes while you follow the shape you have drawn. Please pay special attention to the pause, which indicates that you lifted your pencil and began from a fresh point. First of all, here is middle C. Now, here are the notes



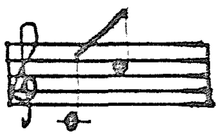
Here they are again ...

Now, please look at circle No. 3. This time we are going to draw only circles. Here then are the instructions for the first circle. First, here is middle C. Now listen to these notes



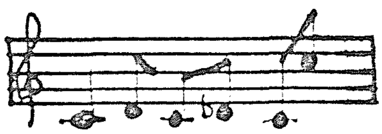
They indicate the centre of the circle. Now listen to these notes

They indicate the radius and the C position. Now listen to these notes



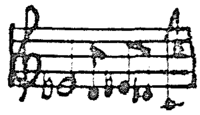
They indicate that a circle is to be drawn in a clockwise direction.

You should now be looking at a circle within a circle. You will now hear instructions for drawing another circle. First, here is middle C ... Now listen to these notes. This time, I shall not make a pause for explanations.



Again ... Again ...

Now, here are instructions for drawing another circle. Here is middle C ...

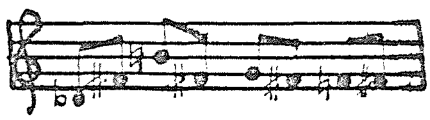


Again ... Again ...

Now, here are instructions for drawing yet another circle

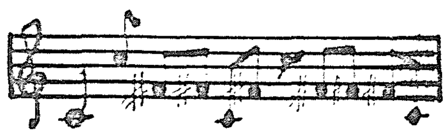
Again ... Again ...

Now please look at circle No. 4. We shall draw straight lines. Here is middle C ... Here are the instructions



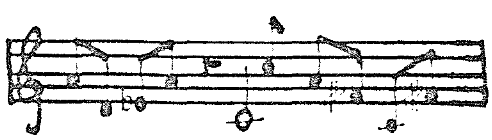
Again ... Again ...

Now please look at circle No. 5. This time, we shall draw an arc and a line. Here is middle C. Here are the instructions



Again ... Again ...

Now please look at circle No. 6. Again, we shall draw an arc and a line. Here is middle C. Here are the instructions



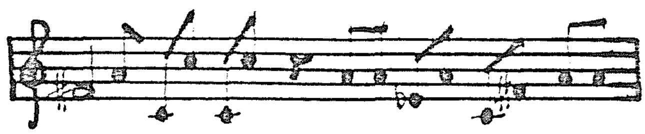
Again ... Again ...

Now please look at circles 7 and 8. Now listen to the following instructions. Do you think they fit with circle No. 7 or No. 8? Circle the number you think they fit. I shall play the notes three times. Here is middle C. Here are the notes for the first time

Again ... Again ...

Now listen to these notes. Do they fit the circle you did not indicate?

Here is middle C. Here are the notes



Again ... Again ...

Write 'yes' next to the circle if you think they fit.

Stop tape. Collect papers. Hand out keys. Write name on key.

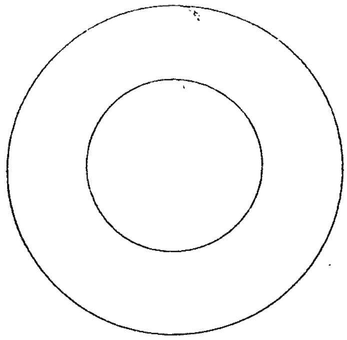
You are now looking at the key to the exercises we have done in this session. Please look at circles 3, 4, 5 and 6. Suppose that each configuration is in some way incomplete. Complete each, as you see fit, with a circle, a line or an arc. When you have done so, write what you think the completed configuration represents under the number of the appropriate circle. For example, you may think that a certain configuration represents an animal, or a house, or a car, and so on.

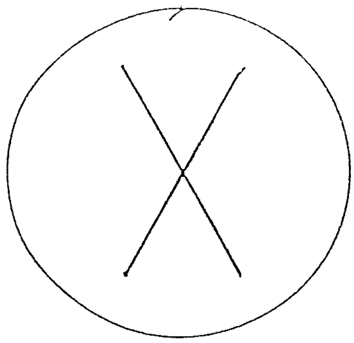
This is the end of this session. Thank you for your cooperation.

MUSILINGUA Session No 5. Date 17/6/78. Venue KCM Time 9.30

Name ....KEY........................

1





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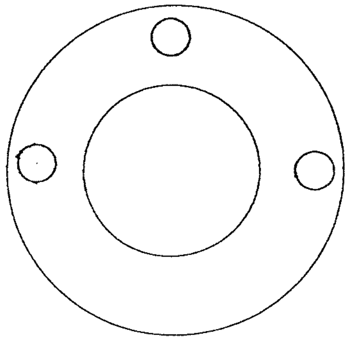

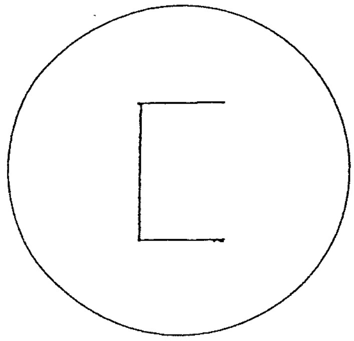

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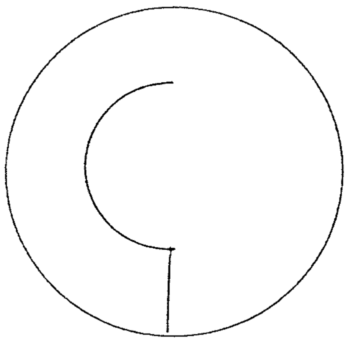

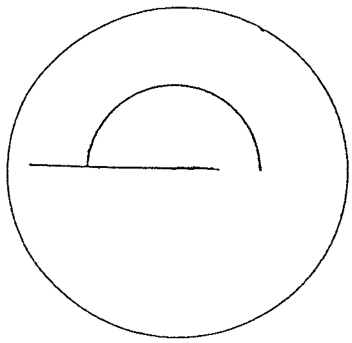

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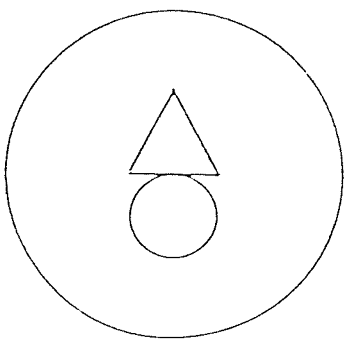

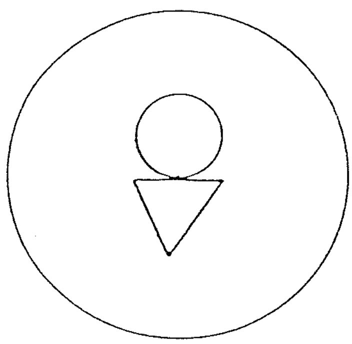

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MUSILINGUA   Session No 5.. Date 17/6/88. Venue RCM....... Time. 9:20

Name .....KEY..

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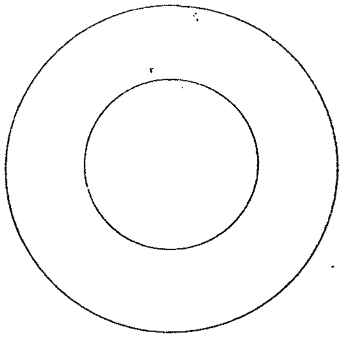

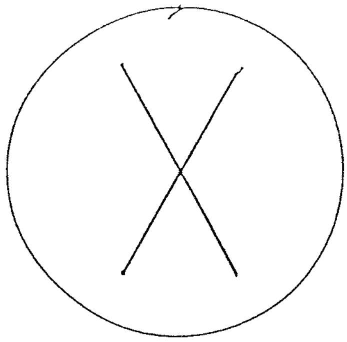
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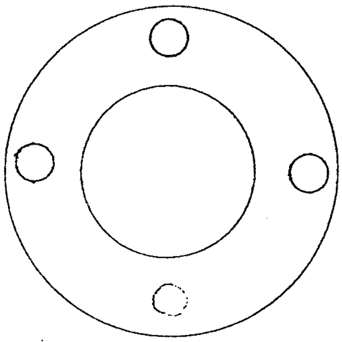
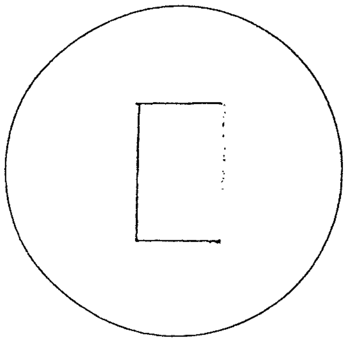


[illegible]
[illegible] 4 PEOPLE
AT A TABLE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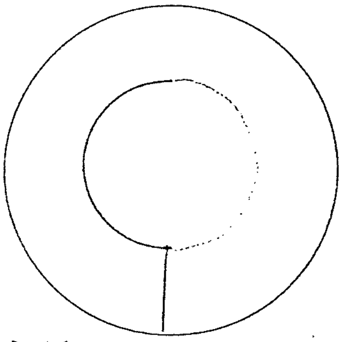
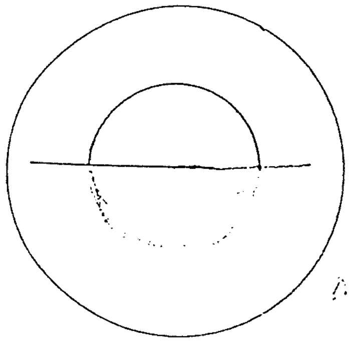


A BALLOON.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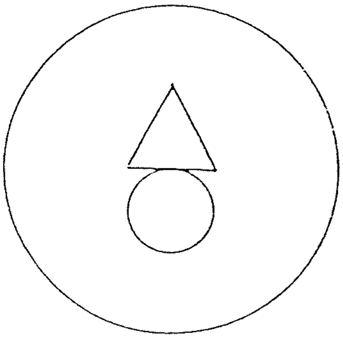

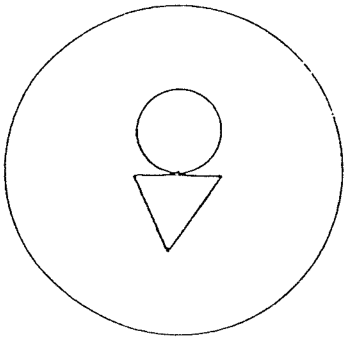
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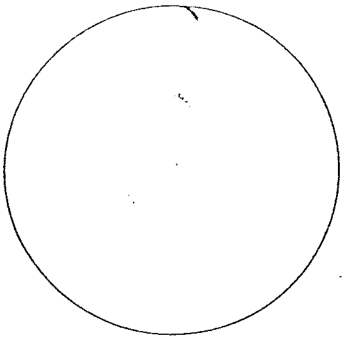
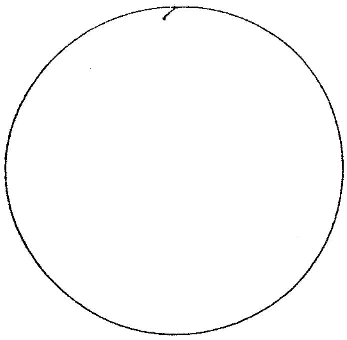
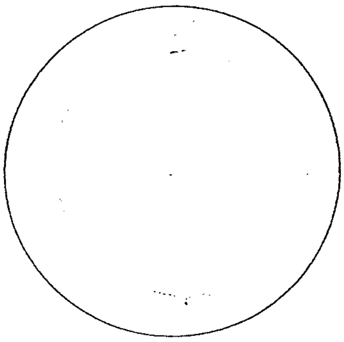
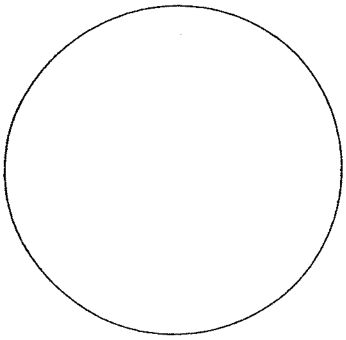
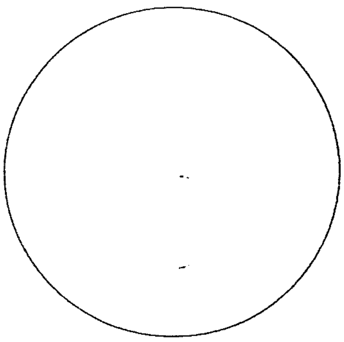
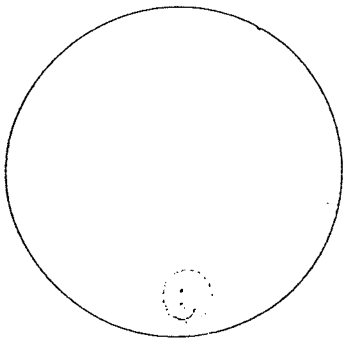
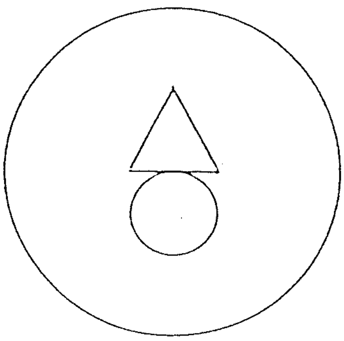
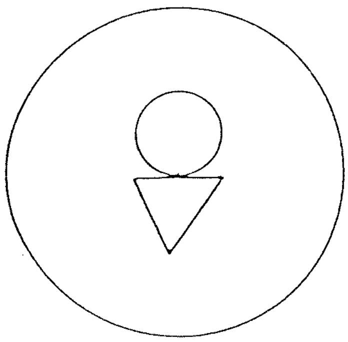
 Session No 5. Date 17.6.88 Venue R.C.M.. Time 9.30

Name ..

1   2

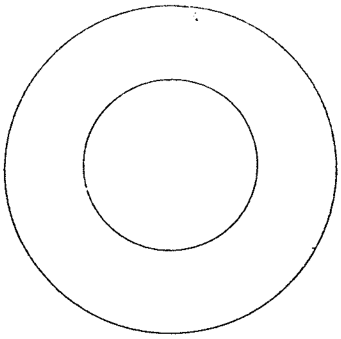
3   4

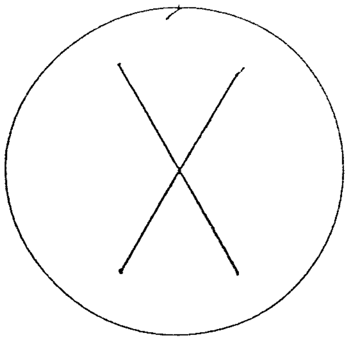
5   6

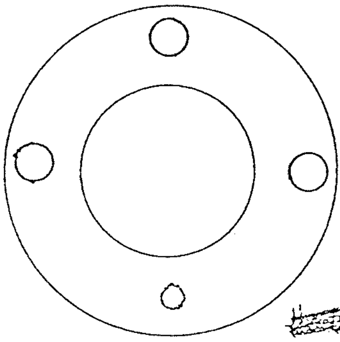
7   8

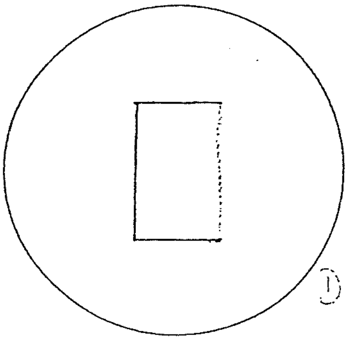
MUSILINGUA Session No 5. Date 17/6/88 Venue KCM Time 9:30

Name KEY

1 

 2

3 

 4

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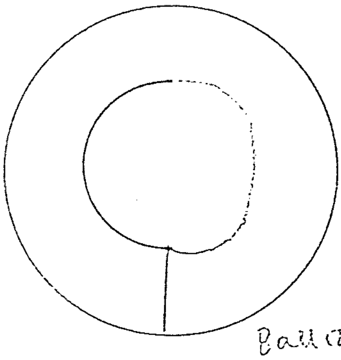
5 

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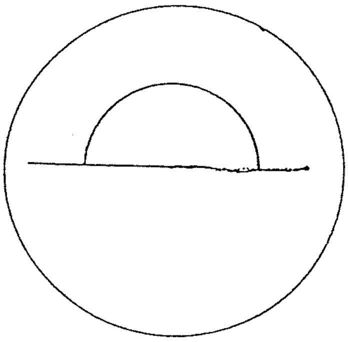 6

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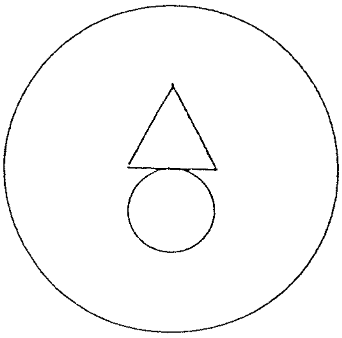
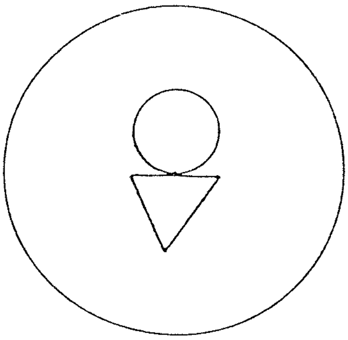
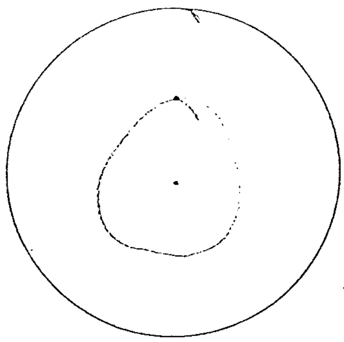
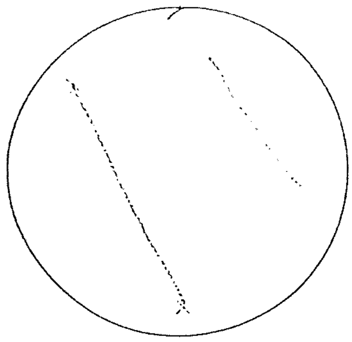
7 

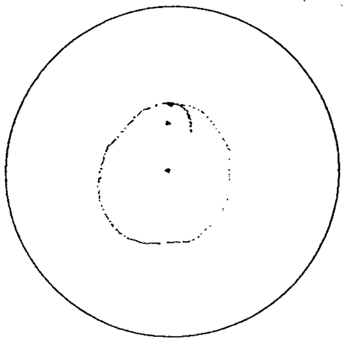
 8

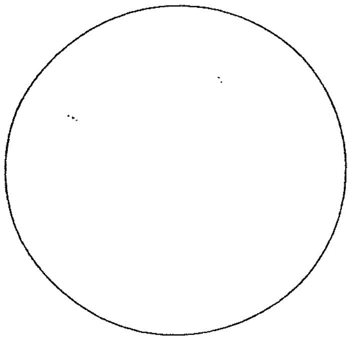
MUSILINGUA Session No .5. Date 17/6/88 Venue ..LCM... Time 9.30

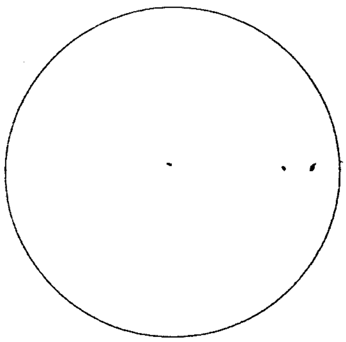
Name ....

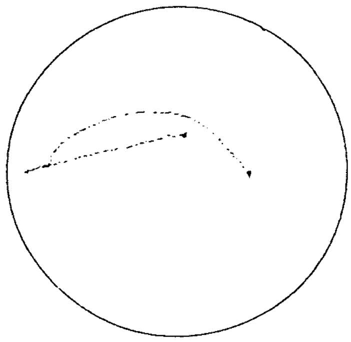
1 

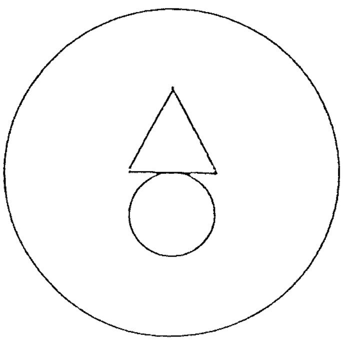
 2

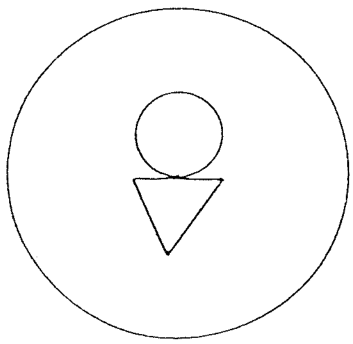
3 

 4

5 

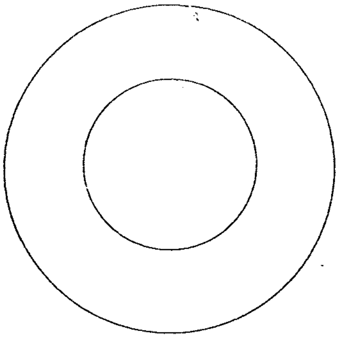
 6

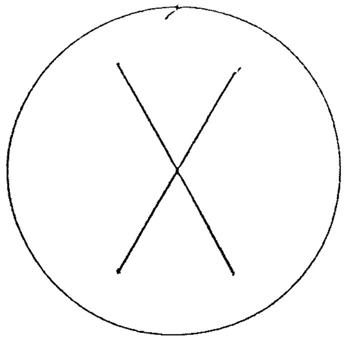
7 

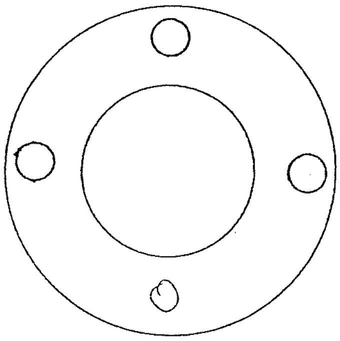
 8

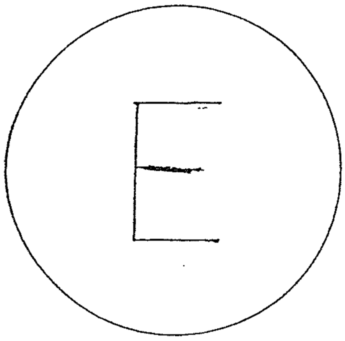
MUSILINGUA Session No 5.. Date 17/6/85. Venue RCM.......... Time 9:30

Name .....KEY.

1 

 2

3 

 4

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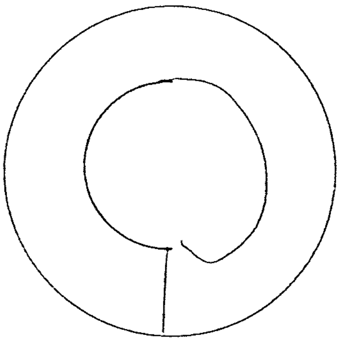
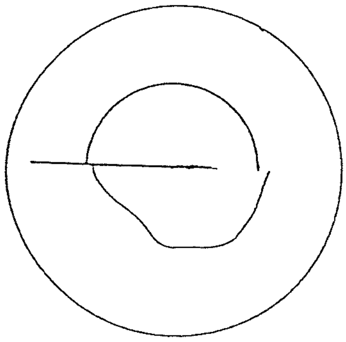
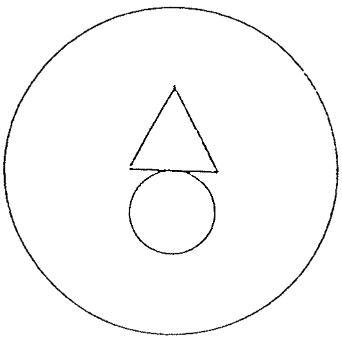
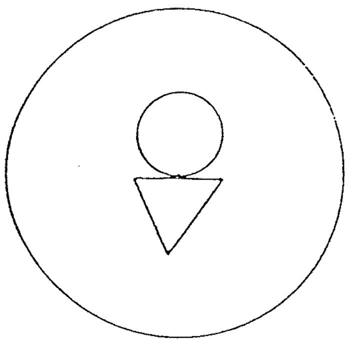
5 

 6

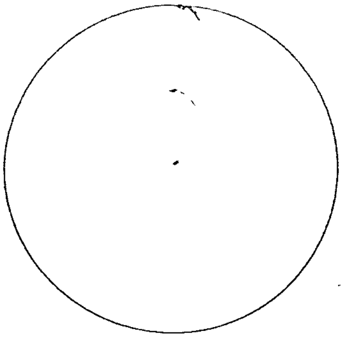
7 

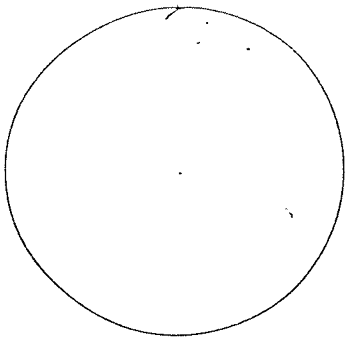
 8

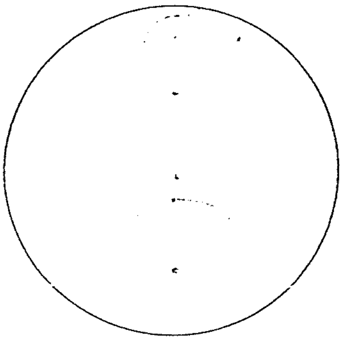
MUSILINGUA

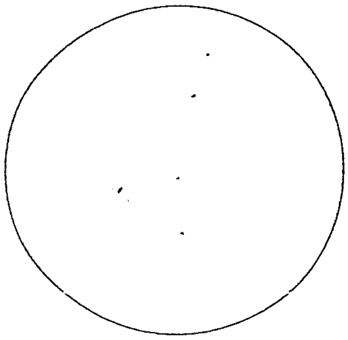
Session No ... Date ... Venue ...... Time. ...

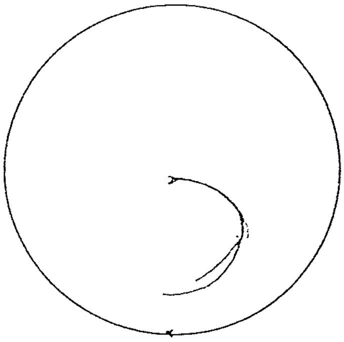
Name ...

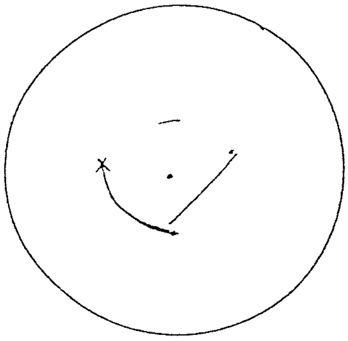
1 

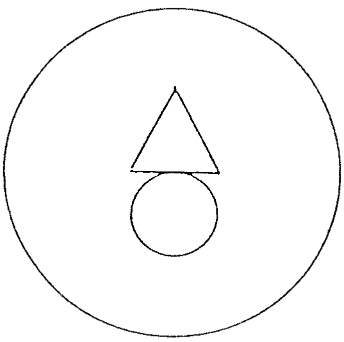
 2

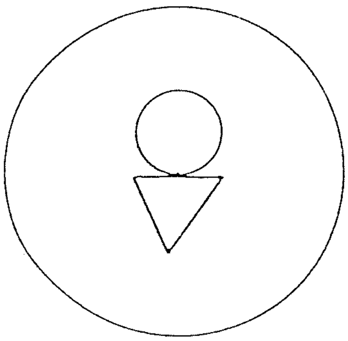
3 

 4

5 

 6

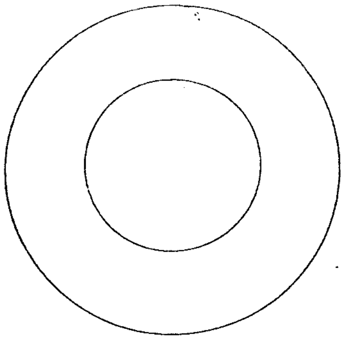
7 

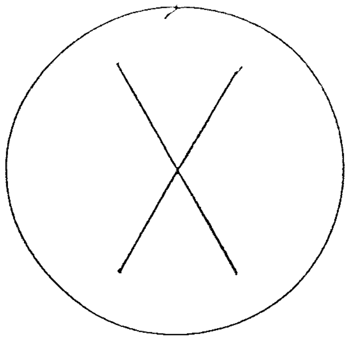
 8

MUSILINGUA   Session No 5.   Date 17/6/88   Venue RCA   Time 9:30

Name .....KEY.

1





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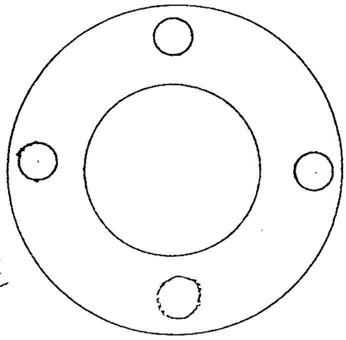
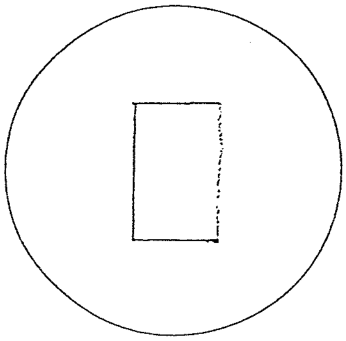


VILLAGE



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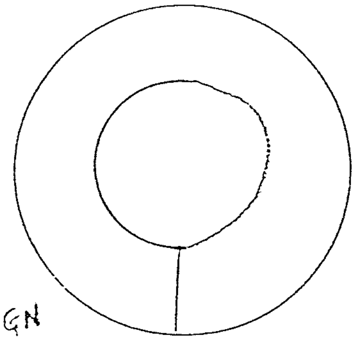
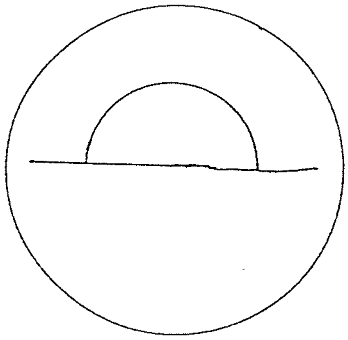


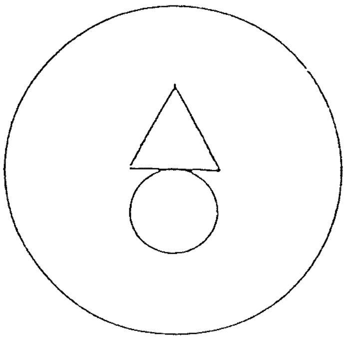
ROAD SIGN

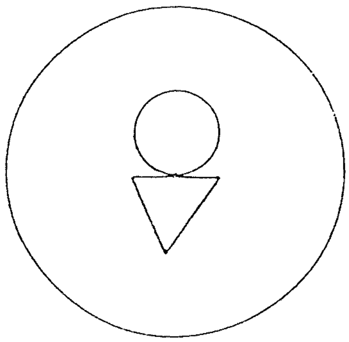


6

MORNING (SUNRISE)

7





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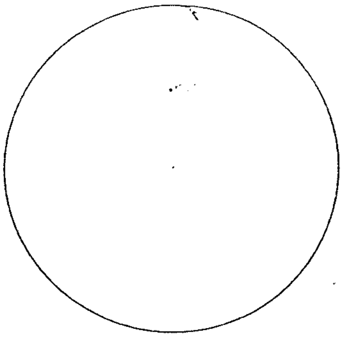
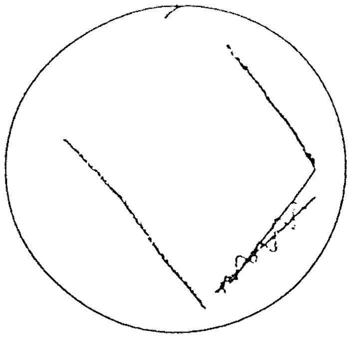
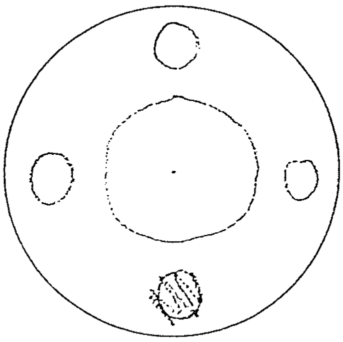
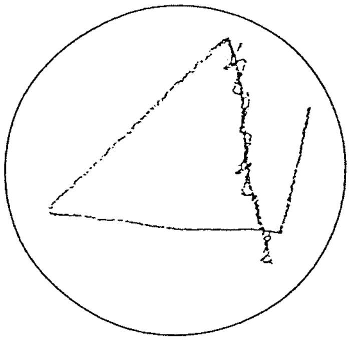
MUSILINGUA Session No 5.. Date 1/6/88. Venue [illegible] Time 9.30

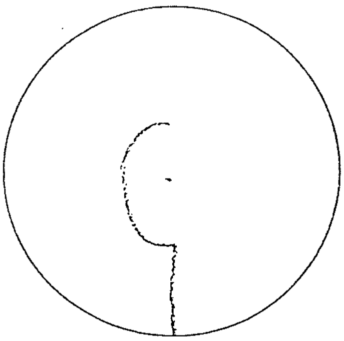
Name

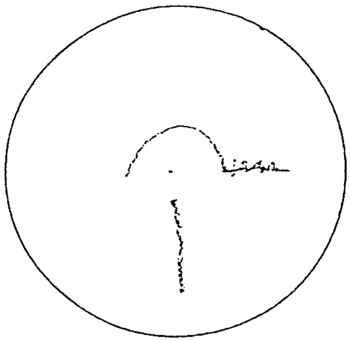
1 

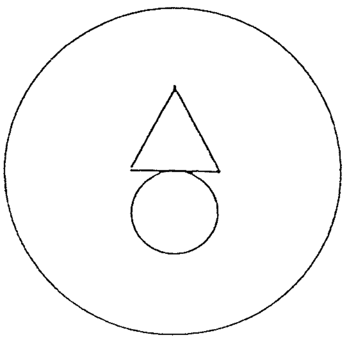
 2

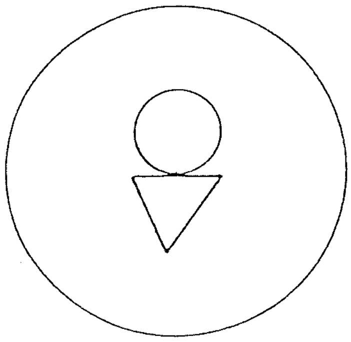
3 

 4

5 

 6

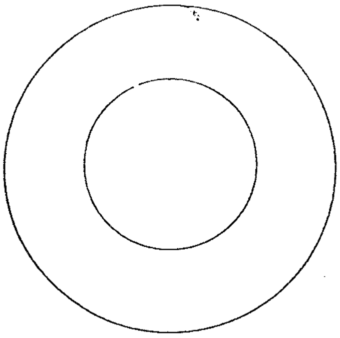
7  YES

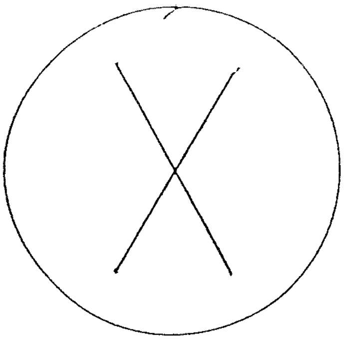
 8

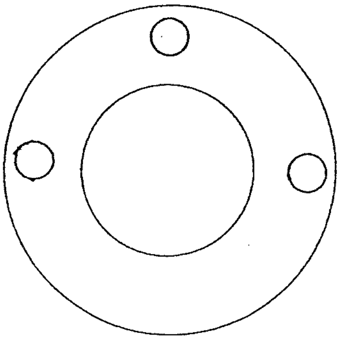
MUSILINGUA

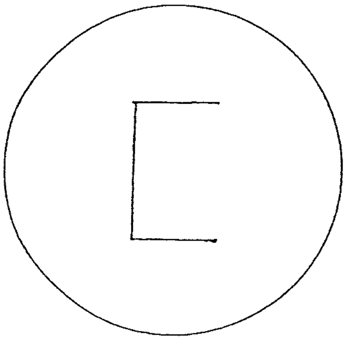
Session No . 5. Date 17/6/83 Venue RCM Time 9.30

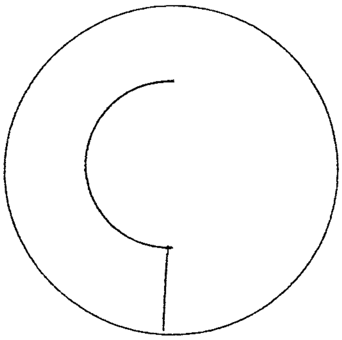
Name .....KEY..

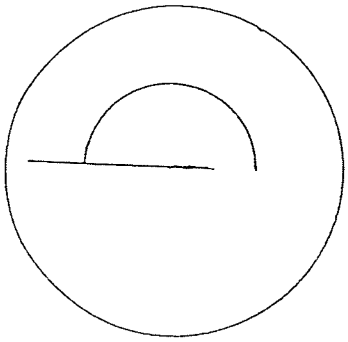
1 

 2

3 

 4

5 

 6

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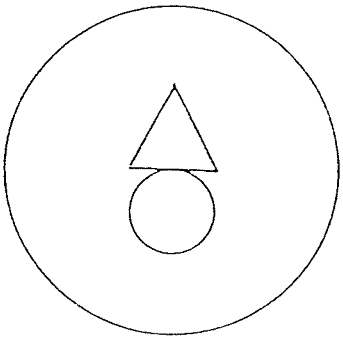
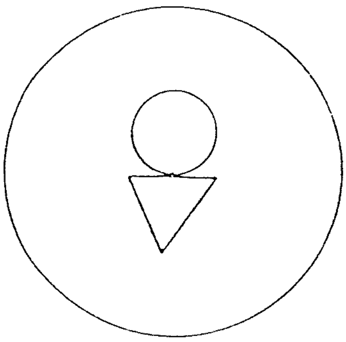
7 

 8

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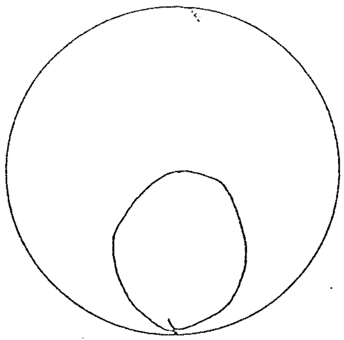
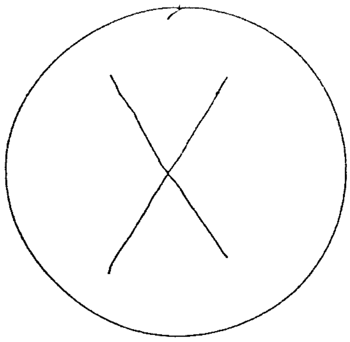
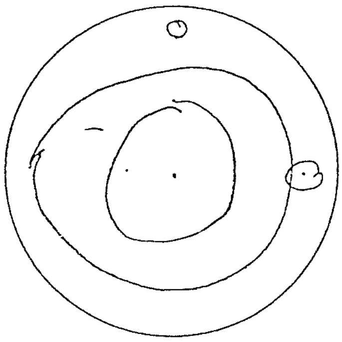
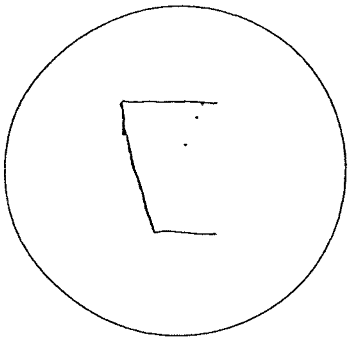
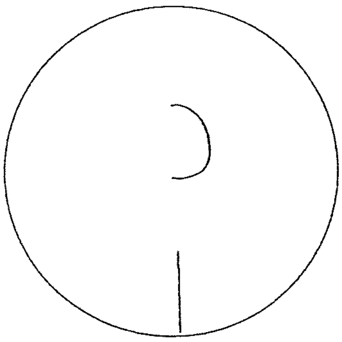
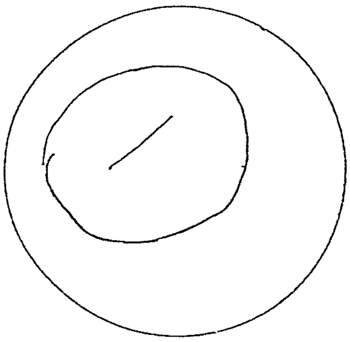
1 

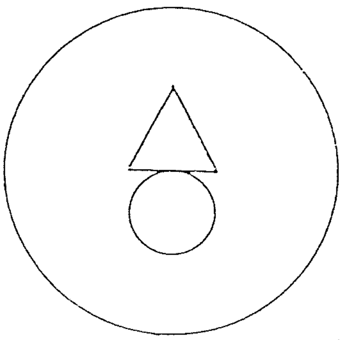
 2

3 

 ? 4

5 

 6

7 

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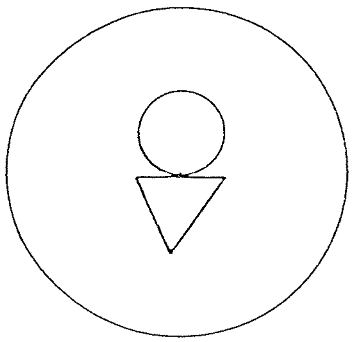
 8

"radius" = "diameter" ??

Results

The results show that participants experienced some difficulty with the combination of lines and circles.

Participants' comments and discussion

Members of the group were unanimous that the pace at the beginning of the session was all right, but later it became too fast. It was suggested that homework be given after each session, and a discussion ensued about the nature of the homework. It was agreed that there was little point in giving homework if conventional music would have to be read because we were trying to get away from the association with it. It was suggested that special homework tapes be prepared, so that individuals could practise on their own without the need for a friend to play notes to them. Also, there should be written work produced as a result of listening to the tape, and this should be checked at the next session. It was also suggested that musilingual tuition should begin with first year students, so that they can have a four year course.

Next, the question of perfect pitch was discussed. Is perfect pitch a help or a hindrance? It was pointed out that the key of C was chosen at random and any other key would do just as well. It was agreed that knowing the intervals was the only really important consideration, and so people who had perfect pitch would be neither advantaged nor disadvantaged.

Assessment

The link between circles and lines proved unexpectedly difficult. This may have been the case because 1) more information was needed to complete the drawings, 2) the code for lines and circles was not perceived as one and the same, 3) the information was given too rapidly, and 4) there was not enough practice prior to the session. Whatever the reason or combination of reasons, participants certainly felt insecure, as was evident from their request for homework. It became clear that, as more of the code was presented, their lack of practice between sessions made it more and more difficult for them to absorb, retain and utilize information. Being musicians, they were very aware of the importance of regular and concentrated practice, and they expressed their perceived needs by asking for homework, and for more frequent sessions. They proposed having two, and possibly three sessions per week. This was clearly desirable and indicated that the group was well motivated, but for practical reasons their request could not be acceded to. However, the point was well made.

3.7.6. MUSILINGUA SESSION 6

In this session we shall begin to learn the musilingual code for three-dimensional configurations. To begin with, however, in order to demonstrate the difficulties we would encounter when trying to describe even two-dimensional configurations using conventional language, let us try a little experiment. Listen to these verbal instructions, and on the top of your paper, in the first square, draw the configuration they dictate.

> Two parallel bars separated by two shorter cross-pieces inset from the ends of the bars.

Now listen to these verbal instructions and draw the configuration they dictate in the second square.

> A horizontal slab supported above an equal horizontal slab by two vertical pillars.

Now listen to these verbal instructions and draw the configuration they dictate in the third square.

> A rectangle with the two shorter ends pushed halfway towards the centre.

Are your three configurations identical? What you should have drawn every time is a configuration resembling a Roman numeral II. This example was taken from Edward deBono's book 'The use of lateral thinking' (p.32). We know that, had we been given the instructions musilingually, we could have drawn the configuration accurately. Think for a minute what words you would have chosen to use had you been asked to describe the Roman numeral II without referring to it as such.

Now, when we consider the problem of the third dimension, it is obvious that it is virtually impossible to describe a three dimensional configuration accurately using conventional language. But this certainly can be done using Musilingua. How? The principle is very simple. We can already find a point within the circumference of a circle. We now need to locate a point within the volume of a sphere. We can think of a sphere either in a static way, as millions of discs lying side by side and diminishing in circumference very gradually in two directions with the largest in the middle, or in a mobile way as a single disc revolving round a central axis.

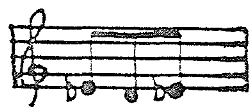
Either of these ways of thinking of a sphere would enable us to construct a musilingual code, but the second is of greater value, for it involves movement and enables any point within the sphere to be accurately pinpointed using only three notes. In other words, as we already know, we need two notes to find a point within the circumference of a circle, which we can now regard as a flat disc, and it is evident that a third note will enable us to locate a point within the volume of a sphere. Precisely how do we go about doing this?

Please hold your pencil horizontally in front of you with the point pointing to your left. Now hold it vertically, with the point pointing to the ceiling. Assuming the length of the pencil to be the radius of a circle, we can easily describe any point along its line, the point of the pencil being middle C. However, let us now take a further step. Hold the pencil in a horizontal position with its point pointing away from you. We have now entered the third dimension, and we have to learn the code to describe it. Let us begin with a simple example using a coin.

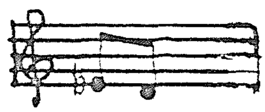
Take a 2p coin. Hold the coin with the obverse side facing you with the forefinger of your left hand on the circumference above the queen's profile and the thumb of your left hand on the circumference under her profile. The queen should be looking to your right, and you have formed a vertical axis with your thumb and forefinger. Now, with your right hand, turn the coin around the axis you have formed till the queen is looking away from you. That is, the obverse side will be vertical and to your right. You should now see only a vertical line, with the rest of the coin hidden from your view.

Now turn the coin again, till the queen is looking in your direction. That is, the obverse side will be vertical and to your left. Again, you will only see a vertical line. Now turn the coin so that you are looking at the reverse side. Your thumb should be on the circumference under the figure 2, and your index finger should be on the circumference above the letter P. We are now ready to locate points within the volume of a sphere using the idea of a disc revolving around a vertical axis.

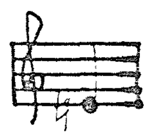
Let us now find our first point in three dimensional space. Please place your coin at 90 degrees to the paper, with the numeral 2 resting on the paper in the centre of the circle and facing you. Let us begin by describing the second E in the word PENCE. We need two notes. The first note will tell us which point on the circumference of the disc we need. It is the 3 o'clock position, or, as we know, E flat. The second note will tell us the position on the line running from the circumference to the centre of the disc. It is the note D. The third note will give us the third dimension. Please refer to the circle on the paper. As the E is to the right of the centre of the disc, it is pointing to the 3 o'clock position or E flat. So, the position of the second E in the word PENCE within the volume of a sphere can be described musilingually thus. Listen to middle C. Here is the description of the position of the letter E on the coin, within an imaginary sphere.



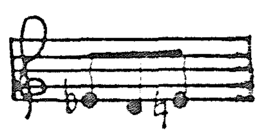
Now let us move the letter to a different position in the sphere. The first two notes, of course, remain the same



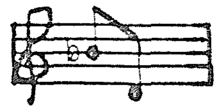
but the third will change to



Your coin should now be parallel to a line formed between the 4 o'clock and 10 o'clock positions. Here is the full description of this position in the sphere. Listen to middle C first. Here are the notes

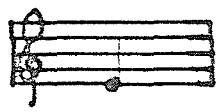


Now listen to these notes. The first will give us the position on the circumference of a disc, and the second the position along a line running from the circumference to the centre of the disc. You should be looking at the reverse of the coin. Here is middle C. Here are the notes.



Which position is being described? Here they are again.

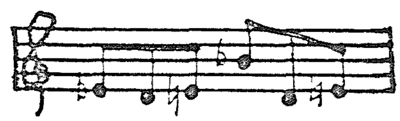
It is the letter W which is being described. Listen to the notes again. Now let us add the third note. Hold the coin as before, vertical over the circle on your paper with the numeral 2 over its centre. Listen to middle C first. Now here is the note.



Rotate the coin till it is in the correct position.

Think about the relative positions of the E and the W in the sphere.

Now listen to the following 6 notes. They will indicate two positions within the volume of a sphere. Move your coin to the correct position. First, here is middle C. Now here are the notes



Again ... Again ...

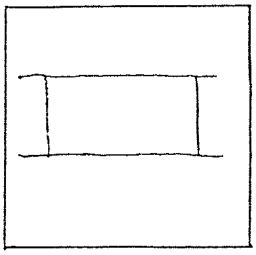
Now place your pencil on the coin so that it covers the E and the W. Your pencil should be pointing slightly up and away from you.

For practice till the next session try pinpointing positions within the volume of a sphere musilingually using a coin or a disc. Begin to imagine objects as if they were enclosed within the volume of a sphere. This exercise can be done also with people and animals. When they move, see them moving with the sphere they are enclosed in. This is the end of the session. Thank you for your cooperation.

MUSILINGUA

Session No 6.. Date 24/6/80 Venue ..NCM... Time ..9.00

Name . ...



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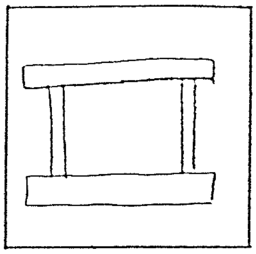

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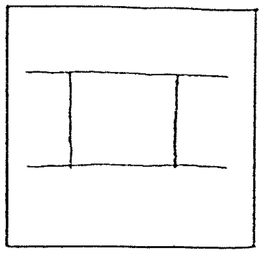

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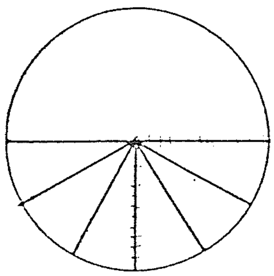

MUSILINGUA

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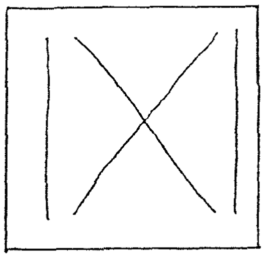

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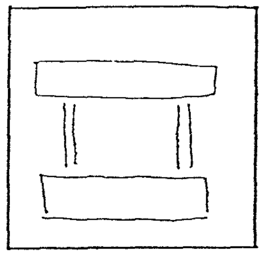

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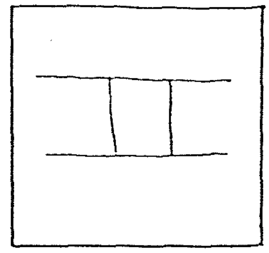

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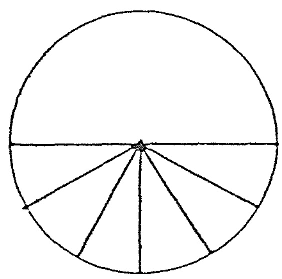
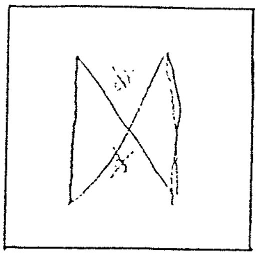


Session No 6. Date [illegible] Venue [illegible] Time [illegible]

Name



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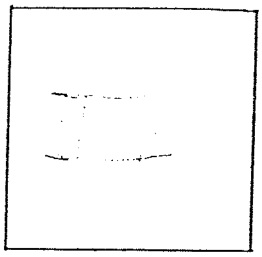

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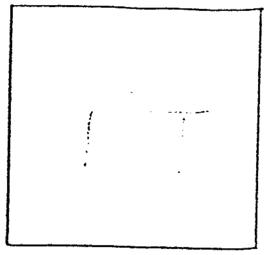

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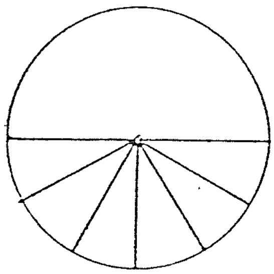

Session No .6. Date 24/11/88 Venue ..... Time .....

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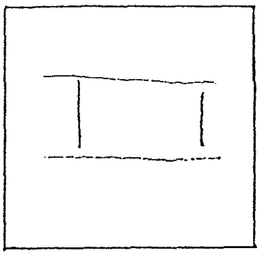

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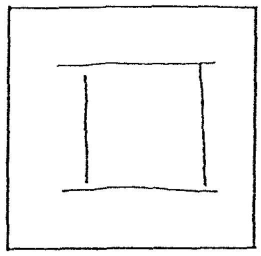

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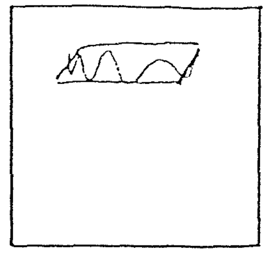

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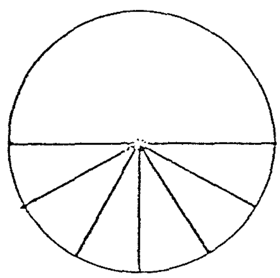
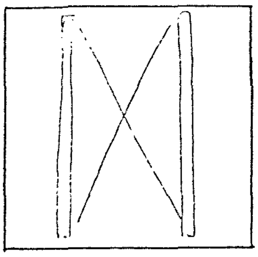


MUSILINGUA Session No 12. Date 24/6/87 Venue KCM.... Time 9 am

Name ... .



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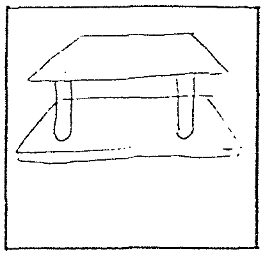

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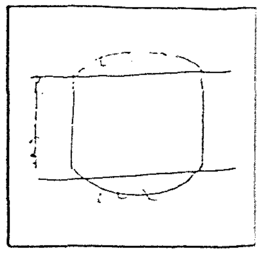

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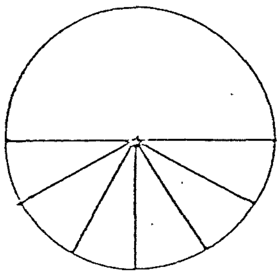


Results

In drawing shapes from verbal dictation, four points of interest emerged.

1. In box 1 the shape could have been drawn in a variety of ways because the words 'horizontal' or 'vertical' were not mentioned in the instruction.

2. In box 3 the rectangle could have been drawn in a variety of ways for the same reasons as in 1 above.

3. When the statement 'what you should have drawn every time is a configuration resembling a Roman numeral II' was made, not one of the participants argued that this was not so. (There was an opportunity at the end of the session to do so, but the point was evidently not picked up).

4. One of the participants drew one configuration in perspective.

The following points are also of interest.

1. One of the participants was unable to complete one of the configurations.

2. One of the participants added divisions to radii.

3. All but one of the participants depicted a slab as having thickness.

The following are the words chosen by participants to describe the Roman numeral II.

1. The third example we were given was a very precise description needing only mathematical measurements for greater clarity.

2. Two vertical parallel lines surmounted and underpinned by a single horizontal line slightly wider than the distance between the parallel lines.

3. Two horizontal lines, one beneath the other, connected by two bars at right angles to the first lines slightly inset from the two ends.

4. A rectangle with the two ends pushed in. Two sets of parellel lines a) vertical b) horizontal, a) slightly set in from the ends of the horizontal lines.

5. Draw two parallel lines horizontally about an inch apart. Draw two vertical lines about a centimetre apart from the top horizontal line down to the bottom (centred).

At the end of the second part of the session all participants' pencils were pointing in the right direction, although the angles varied somewhat.

Participants' comments and discussion

Before the session participants were curious about how the third dimension could be described musilingually, but no information was given. It was to be a surprise. One of the participants had evidently given the matter some thought and at the end of the session he remarked that he had expected a cylinder to be used to help in the description of the third dimension, but that he now saw what the limitations would have been.

Question: 'How do you describe speed musilingually?'

The simplest method of describing speed would be to relate the speed of transmission to the movement described. Another means would be to indicate the speed prior to the description, but this is not so satisfactory. If a fairly complex movement is being described, to make it happen at speed and to understand it would require great proficiency in musilingua, but, based on the results so far, the achievement of such skills is not beyond the realms of possibility.

Question: 'How does musilingua relate to sign language?'

It is, of course, possible to musilingualize sign language, and to dictate sign language musilingually. However, though this may be an interesting exercise it is not central to musilingua, which is concerned only with musilingualizing the universe of matter and its movement. What is of interest in this connection is that in sign language two hands are used operating independently. In musilingual description more than one configuration or movement can also be given by using several simultaneously transmitted instructions, each having its own distinctive timbre. This can not be done using language, since one word must follow another.

There was then a discussion about 'super babies' and the incredible abilities they display from a very early age. Their existence demonstrates that much of human talent remains hidden. Musilingua may be able to tap some of this hidden talent and this may lead to surprising developments.

There was then some discussion about the difference between seeing in three dimensions and creating three-dimensional configurations using musilingua. The difference was clear to all participants, and one of them expressed it in the following terms: 'A musilingually created shape is very personal because it is in true three dimensions'.

At the end of the session participants were told that the next session would be about drawing circles within a sphere.

Points to note:

1. The tape was not played straight through, but pauses were made at relevant points to give time for thought.

2. At the end of the tape, further explanations were given, some questions were asked, and there was a short discussion about the workings of the code.

Assessment

Participants coped extremely well with the third dimension. They evidently found the session fascinating and seemed surprised by their own achievement. However, had additional time not been given for questions and explanations, participants would probably not have reached the stage they did. If this session were to be presented on tape without any additional help, it would probably have to be split into three, with several exercises following each.

It became clear from the outset that from this stage onwards it would no longer be possible to monitor progress on paper. The teacher would have to observe each participant whilst in the process of following musilingual instructions. This raises two important points. The first is that, since the teacher is facing the participant while watching him, confusion arises between left and right. Therefore the teacher would either have to stand behind participants, which is not practical, or observe participants in a mirror with his back to the participants. The second point is that participants tended to watch each other while attempting to follow the musilingual instructions and this confused them. Ideally, practice at this stage should be done by individuals working alone, and if exercises are done in a group, arrangements should be made either for one participant at a time to describe configuratiosn and be observed by the teacher in a mirror, or to separate members of the group so that they have no visual contact.

Once proficiency was gained, it would be possible for the whole group to perform together provided they stood in a line facing a mirror into which the teacher was looking. The teacher would then be able to monitor the whole group at once. It is, of course, possible, that some individuals who will have reached very advanced levels in musilingua will be able to face participants and 'reverse' movements instantaneously. However, since musilingua is not meant to be signed, and observation of externalized configurations is only necessary for the purpose of monitoring and study, these points are not crucial to musilinguists, but they are of some relevance and importance to the teacher.

3.7.7. MUSILINGUA SESSION 7

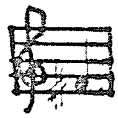
Hello. By the end of this session we shall have completed the learning of the basic code needed to draw lines, arcs and circles within the volume of a sphere. We shall have achieved the first of our objectives, namely, to learn the basic musilingual code. We shall also have achieved our second objective, which was to see whether we can communicate two and three dimensional configurations musilingually. Our third objective was to see whether we can communicate meaning, and we shall begin to examine this area after this session.

In today's session we shall learn how to make circles and arcs within the volume of a sphere. We need to be able to make circles and arcs of any size in any plane in a clockwise or anti-clockwise direction. Again, the principle is very simple. We begin by finding two points within the volume of a sphere which give us a line. We need six notes for this, the first of which will be long to indicate that instructions for drawing a circle or arc are to follow. The length of the line will represent the radius of the circle we are to draw on a plane which will be at 90 degrees to the line. Let us put this idea into practice. Imagine a sphere in the space in front of you. Hold your arms in a circle as if embracing someone. The circumference formed by your arms will represent the disc we shall use to find our points within the volume of our imaginary sphere.

Now imagine that you are looking at a clockface, so that 3 o'clock is to your right, 9 o'clock to your left, and 6 o'clock towards the floor. Imagine the disc you have formed with your arms can rotate around an axis in a clockwise direction from the 3 o'clock to the 6 o'clock position, and in an anti-clockwise direction from the 9 o'clock to the 6 o'clock position. From now on we shall use this imaginary sphere in the space in front of us to help us to describe and receive two and three dimensional configurations musilingually.

Let us now make our first circle using the three dimensional code. Whereas we needed six notes to make a circle in two dimensions, we need eight notes to do so in three dimensions. Three to indicate the first point, three to indicate the second point, and two to indicate whether it is to be a circle or an arc and whether it is to be drawn clockwise or anti-clockwise.

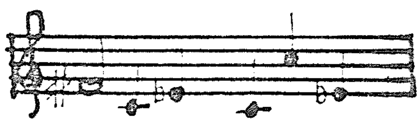
Please imagine the circle formed by your arms. Here is middle C. Now listen to this note



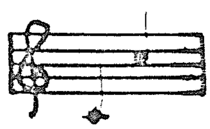
It is at a point closest to your body on the circumference of the circle formed by your arms or at the 6 o'clock position. To show that it is on the circumference we shall add the note C. Thus, these two notes

indicate a point closest to our body on the circumference of a circle formed by our arms. Now, here is another note. (E flat). It tells us that our disc remains static. Let us now find a second point. Here is middle C. Now listen to these two notes.

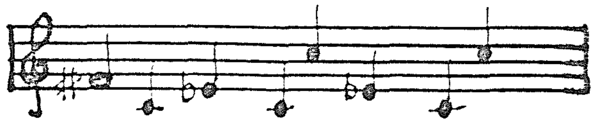
They indicate the middle of the circle. This note (E flat) tells us that our disc remains static. If we join these two points, we have a line running from the circumference of the circle to its centre. In fact, we have the radius of the circle we are to draw, with the last point we found being its centre, the circle to be drawn on a plane which is at 90 degrees to the line. I shall play the six notes again, and please follow the line with your hand.



Note that the first note was long to indicate that the following instructions would be for drawing a circle or an arc. Now here are a further two notes which instruct us to draw a circle in a clockwise direction.

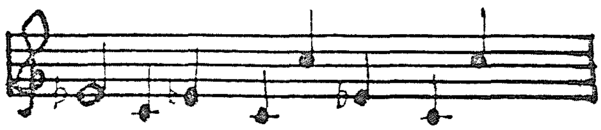


Remembering that we know the radius of the circle we are to draw, that the last point we were given is to be the centre of the circle, and that the circle is at 90 degrees to the line, describe the circle in the air. I shall play all eight notes once more slowly.



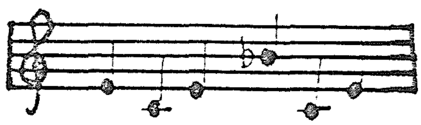
Describe the circle in the air. Again ...

Let us now draw another circle. Listen to middle C. Now please listen to these notes



Describe the circle in the air. Again ...

To end today's session, let us make just a line within the volume of our imaginary sphere. Here is middle C. Now listen to these notes



Describe the line in the air. Again ...

This is the end of this session. Thank you for your cooperation.

Results

All five participants got 100% right.

Participants questions and discussion

No questions and no discussion.

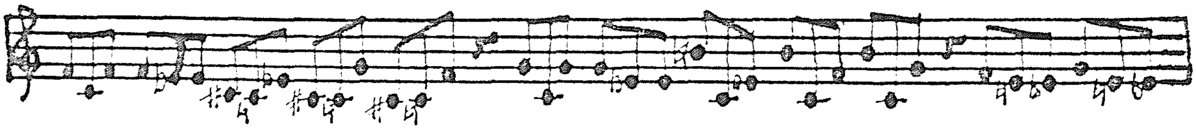
Assessment

The result was most surprising and gratifying. The code was easily understood and correctly applied. It certainly appears that participants are becoming accustomed to musilingual thinking and they are beginning to create their private internal three-dimensional world in relation to sound.

3.7.8. MUSILINGUA SESSION 8

Hello. In our last session we related Musilingua to the describing of configurations in our private sphere of space, and we saw that, if we consider sign language, for example, we can dictate signs through Musilingua, or, conversely, we can 'musilingualize' signs. Words simply do not enter into the picture. In today's session we shall carry these ideas a little further. Let us begin by looking at the letter H. Capital H. Now imagine that it is turning slowly in a clockwise direction, and that you are following its movement. Allow it to turn till it is the right way up again. Now imagine that you are looking at it from the side. You will see only a vertical line. Look at it from the top. Again you will see only a line. Look at it from the bottom. Again you will see only a line. Now look at the model head on. The outline is the same as the letter H. First, I shall turn it in a clockwise direction. Now, let us look at it from the side. Now from the top. Now from the bottom. Of course, though the view from the front could be unchanged in this model (curved model), the view from the side would be very different. This illustrates clearly that, seen from a stationary vantage point, the third dimension of a stationary object was hidden from our view, and so long as the relative positions do not change, we may not even assume that there is a third dimension to consider. However, when we <u>do</u> know of its existence, we can describe it musilingually.

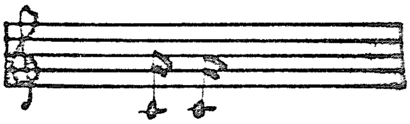
Please look at the model of a chair encapsulated in a sphere. Let us describe it musilingually. Listen to the chair. We shall describe it from the front so that the outline H is facing us. First, here is middle C. Now here are the notes played slowly.



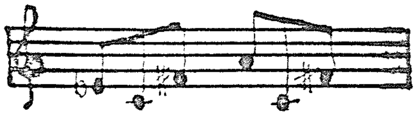
Now, here are the notes speeded up. Again ... Again ...

We have chosen to describe the chair as we see it from the front. Of course, we could have chosen to describe it from any other vantage point. However, once described, it has assumed its three dimensional configuration in our mind, and we can then proceed to manipulate it in any way we please, by rotating around an axis and moving it through space. The musilingual code for rotating a configuration round its axis is very simple.

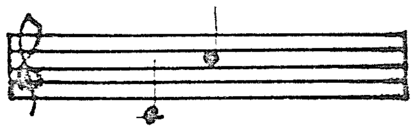
First, we indicate our intention of so doing by two short middle C's. Thus ... Then, using six notes, we describe a line within the circumference of our sphere. This line is the axis around which the sphere will revolve. Then, by playing a further two notes, we describe the extent of the rotation, just as we did with out two dimensional circles. To take a simple example, let us rotate our chair around a vertical axis. Here is middle C. Now listen to these notes



Now listen to these notes



We now have the axis. These next two notes indicate a complete, clockwise rotation.



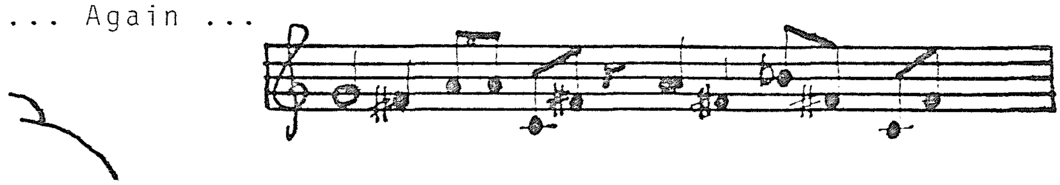
Movement from one position in space to another is indicated by three short middle C's, followed by the description of a line, an arc, or a complete circle.

It is now evident that, supposing we wish to describe the movement of the earth in its orbit musilingually, we can do so using the code we have just learned. Later, we shall learn the code to indicate solid surfaces, such as sheets of material or surfaces of spheres.

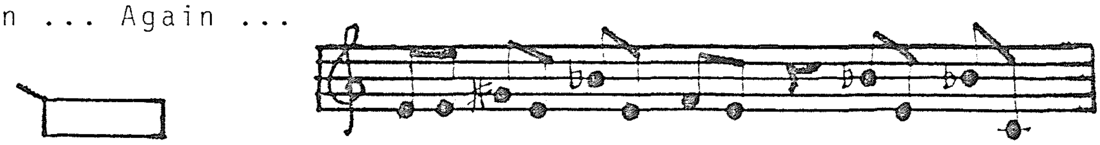
We shall now look further into the potential for using musilingua as a language. We shall use as the basis for the development of this aspect the work of the great psychologist Edward Titchener, who believes that wordless imagery can be the mental representative of meaning. He states that 'in large measure, I think, that is, I mean and I understand, in visual pictures' (p.16). Words are troublesome to him. He states 'Words come quickly and readily enough; I have only to let them come, in terms of internal speech. But then the words are apt to switch me off the visual track, to entangle me in secondary arguments, to bring up irrelevant associations; I can not trust myself to think simply in words' (p.11).

It seems clear that if Titchener could have created an manipulated his images musilingually, his framework of thought and therefore any outcome resulting from thought would have been very different. Let us take two of his images and musilingualize them. First, he states that 'Horse is, to me, a double curve and a rampant posture, with a touch of mane about it; cow is a longish rectangle with a certain facial expression, a sort of exaggerated pout. Again, however, these things mean horse and cow, are the psychological vehicles of those logical meanings' (p. 18).

Let us first play Titchener's horse. Now speeded up ...
Again ... Again ...



Now let us play his cow. Now speeded up ...
Again ... Again ...



We may regard his images as a kind of shorthand. Certainly, especially since only two dimensions are required, the object described has to be known. It must have been seen. For unknown objects, longhand would be required, that is, a more detailed three dimensional description. Either way, words would be intrusive, and thought could not proceed free of their encumbrance. Indeed, words could not describe three dimensional configurations and their movement at all effectively, as we have already seen for ourselves.

Titchener goes on to say 'And what holds of triangle and horse and cow holds of all the unpicturable notions of intelligence. No one of them is unpicturable, if you do but have the imaginal mind'. In our next session we shall explore this idea further in connection with Musilingua.

This is the end of this session. Thank you for your cooperation.

Results

Participants were able to follow the demonstrations using the models moving in response to pitch contours. (Musilingual dictation).

Participants' questions and discussion

There were no questions. Only requests for slow repetition.

Assessment

There is now no doubt that musilingual thinking is possible, and it is highly likely that an advanced musilingual thinker will have at his command a new way of thinking which is totally detached from language.

SOME THOUGHTS ON MUSILINGUA

At the start of the project I have to confess that I joined the group chiefly with the intention of ensuring that their interest was maintained, and in monitoring what would happen. I had not expected that my own modest performance might itself assume any importance in the project, nor that I would have found the extensive interest in it that I did.

It is clear now that there is a great deal of exciting research to be done into the way in which musicians "think" aurally, and the processes which are involved. The detail of this lies beyond my report, but I found it interesting to note in the group that those who have demonstrated the best ability under traditional methods of aural testing did not show so well when faced with these new concepts - indeed, the College prizewinner dropped out after one week with what I understand to have been the weakest response to the opening stimuli. Conversely, those who showed more aptitude for Musilingua were the students whose approach has always demonstrated greater cerebral qualities.

For myself, suffering from the mixed blessing of perfect pitch, the earlier sessions seemed rather basic, although I accept that this may not apply to everyone. Once it had been established that the taped examples hardly ever strayed outside the notes C, E flat, F sharp and A, there was almost a predictability to some of the tests. My impression was that for a group such as this, the earlier material could have been condensed quite sharply without any prejudice to the overall results, and that other notes of the scale could have been introduced rather more freely and at an earlier stage. In effect, much of the earlier work only involved perception of four notes rather than twelve.

However, I did find matters more challenging when we started to move into three dimensions. The models helped, but even so I did not feel I had mastered this level to the extent I would have wished. This may also have been because I was not entirely clear as to where this aspect of the work would lead. It was one thing to have cut-and-dried examples in two dimensions which could be seen as an end in themselves, but the three dimension work took us off the sheets of paper and into a more abstract world where I suddenly found I had to think very much harder and in a different manner.

At this point the course came to an end. I would welcome a second run, using the benefit of the first series of sessions, and it may be that the experience of the first series will enable the second pilot group to be given a clearer idea in the early stages of where the whole project may be leading. It is a field in which I sense we are only just scraping the surface, and the unquenchable enthusiasm with which the concept is being shared by Mr Bardi is a great encouragement and stimulus to proceed further.

4 October 1988 Nicholas King

MUSILINGUA

The MUSILINGUA sessions were a very enjoyable and interesting experiment, and fascinating from both the musical and linguistic points of view. However I feel that the test results, and to some extent the enthusiasm and involvement of the subjects may have been slightly affected by the presentation of the course, and with larger groups this could lead to adverse results.

One of the areas where I felt the presentation was slightly at fault was the early sessions, where the subjects were first introduced to the idea of MUSILINGUA as a totally new language. Although this may indeed be feasible, our group (even with nearly a term's work) got only the most distant view of this possibility, and I have a feeling that these high claims of MUSILINGUA may give all but the most passionately committed subjects a certain degree of skepticism which could be avoided. If, for example the subjects were told that they were helping in research for ~~transmuting~~ sign-language into pitch, I think this would inspire a much more healthy attitude in the group, and would set them much more realistic targets.

When participating in research of this kind, especially if the subjects are young people (students and schoolchildren - which I presume by and large they will need to be for MUSILINGUA research) it seems to me ~~that the subjects~~ to be vital that they are not given a sense of inadequacy for participating in the experiment. In our group, I think that many people who had all the basic ability to get every test absolutely correct were infact inhibited from doing so, either by over-presentation of the material or insufficient explanation in certain areas. For example, although the term "radius" is elementary, I think it would be surprising how many music students don't know the difference between this and a diameter — this point was not sufficiently explained and, in general the superficial mathematical elements of MUSILINGUA could be played down much more — either that or clearly and consistently explained so that nobody feels embarrassed about "speaking up".

Another way in which the system could be made more easily digestible in the early sessions is to stick exclusively to the C - Eb - F# - A pitches. Although the sessions did infact largely do this anyway, it takes a while for the subject to register that this is happening. I think that progress would actually be much quicker if the subjects began with dissecting a line into these four (or five) points only, so that they could immediately begin thinking in diminished 7ths. We didn't get much further in our sessions than simple geometrical figures, and these are all based around transposed diminished 7ths anyway. To actually tell this to the group, rather than to let them discover it for themselves, would speed up the sessions and give the group more confidence to tackle the more severe problems of three dimensions.

The way in which these problems, and some others, could have been made inconsequential was with more provision for the subjects' work away from the sessions. As long as the system is prepared to sacrifice the ideal of working without traditional notation from the very beginnnig, this would be best achieved by providing exercises for the subject to take home and have played to him by a friend. Also simple shapes could be drawn out for the subject to decipher and put into musical notation - results could then be compared and played, and the system could be come to terms with that much more quickly. if this was done for, say the first six or seven sessions, musical notation could subsequently be dispensed with - I don't envisage that subjects would want to cling to it, as they would have acquired enough confidence in the new system.

Finally, some of the tapes did move very quickly! Although it was part of the research not to reveal and compare answers until later sessions, a few demonstrations, and some time spent on breaking down the more complicated shapes, step by step, pitch by pitch, would have been very valuable. I think the main point that I am trying to make is that, for best results in the tests, the subjects should be made to feel that what they are doing is reasonably easy to accomplish, and that they all recognise that they have, more or less, the ability to do the tests, and that they have been prepared in the right way to be able to take those tests. I remember feeling, after the event sometimes, that many aspects of MUSILINGUA were infact very easy but that this realisation had been obscured by clutter of unnecessary detail which may have affected concentration during the sessions.

MUSICLINGUA

F. CROSS

My impressions of musilingua are very varied and at the time they were quite confused. All throughout the course I felt as if I was struggling to fully understand and comprehend all the further implications that musilingua raised.

To begin with, I think we all, including myself regarded the whole thing with a healthy scepticism. As the course progressed, I found myself becoming more involved with it but at the same time ~~being~~ I was feeling slightly rushed by the speed at which I was expected to progress. Because the whole concept was so new to me, I needed more time to practise the preliminary methods and get them really absorbed into my ~~w~~ way of thinking. I never thought that I had the technical side of things really under control and I thought more time outside of the tape could have been spent profitably discussing what we had just done.

I was originally under the impression that musilingua was about aural independantly, so initially I was not prepared for what was to come. The whole concept was alien to my previous way of thinking and therefore it took me a while to take it seriously.

One problem was the use of the tape. I thought this was an unnecessary distraction in the development of the whole scheme. The impersonal and restrictive qualities of the tape made the sessions more difficult than necessary. Clarity is very important in musilingua and I felt that using a tape was really not the best idea - rather to talk and discuss what was said on the tape would have been much more satisfactory. For me the use of the tape created extra pressure, ~~for me~~ especially with time limits used for all the tests. I also felt that I wasn't doing justice to the expections which were held of me.

Once I had started to understand for instance how to recognise a circle and whether it was clockwise or anti-clockwise, I would have liked to have then seen quite a few more examples of this particular shape to get the sound of the shape into my memory. I also think a little recap. at the beginning of every session would have been useful a) to get me back into thinking musilingually and b) not to listen straight to the tape without having warmed up beforehand.

The distance between writing down the points (ie listening to separate pairs of notes) and actually hearing the series of notes without writing them down and still realising what the shape was, was for me a very large gap. The trouble came when the series of notes was too fast for me to dictate them all on paper, but at that stage I still wasn't musilingually aware of what the overall pattern was describing, so I was stumped on both sides. I couldn't hear the notes quick enough to write down, and I wasn't advanced enough to hear the shape musilingually.

The way in which I could draw the shapes was by writing down the letter-names of the notes as they were played and transforming them onto the circle afterwards. I realise that this was the wrong approach, but as a musician, I could take the notes down with comparative ease purely as an aural test. I felt this was one of the major problems - that we were intent on listening to actual notes being played (always a middle 'C' was sounded) rather than thinking musilingually, therefore we were always being made aware of the technical, musical side of things rather than ~~the~~ being made to think differently from the very start. Maybe, if we had not written anything down at all and therefore dispersed with the technical approach,

our minds would have been less taken up with worrying about intervals etc, and been more receptive to the possibilities of a creative and new language.
Towards the end of the course when we had disposed of the tape and paper and purely used discussion and communication to help in understand, I felt much more at ease. My whole approach became more relaxed and more willing to learn. Instead of our pens dictating the shape on paper, our actual bodies were being used to participate in the description. This I found involved me much more with the inner understanding of musilingua. Using coins and pencils and describing circles radiating from our bodies put things into perspective - much easier than drawing on paper.
At the end of the course, I felt that I wasn't thinking musilingually naturally. This was due to us moving too fast, and being expected to think musilingually after a very short space of time. I had to concentrate quite hard on the basics which seemed to distract me from making as much progress as I wished.
I always felt there were some slight inadequacies in the system - how to depict emotions and describing words which are more important than describing solid objects. It would also take a while for people to be able to use it readily - as of course it takes every language. Maybe it wouldn't or couldn't appeal to people who are not musical, and in this way it seems quite a specific method of communication. I can imagine that when one is really proficient at musilingua it does open up expressive avenues that at present music and language separately cannot do. It was also very interesting taking the course and discussing the advantages of musilingua and how (hopefully) it would become a primary language.

3.9. TOWARDS THE STRUCTURING OF A COURSE IN MUSILINGUA

Following the first term's work at the Royal College of Music, a fresh group of six students began the study of Musilingua and attended weekly sessions for one and a half terms.

Based on the experience gained in the first term, far-reaching changes were made in the presentation. The proposed changes arose from a critical evaluation of the original course, and a thorough examination of the apparently weak points together with confirmation of the findings from students' verbal and written comments. The following are the main points which were taken into consideration in the planning of the new course:-

1. Presentation of material on previously prepared tapes is inflexible and does not take into account the varying abilities of the group, so that an ideal pace for a particular group can not be determined.

2. Objectives must be clearly stated at the outset and methods of assessment must show clearly whether these objectives have been achieved or not. (Programmed learning methods could make a contribution here).

3. Continuous assessment must take place by the researcher of the participants and vice versa. To this end, rather than ask the participants for an assessment at the end of the course, written comments and criticism should be prepared and handed in after every session by each participant.

4. There should be a continuous free flow of comments among the group (including the researcher) throughout each session, and thus there can be no fixed lesson plans which must be covered in a given time.

5. Homework should be given after each session, which should contain two distinct elements. The first should be revision of material covered, and the second the preparation of some new material based on the skills learnt during the session.

6. There should be no writing during training. Musilingua should be learnt and thought about in a way similar to mental arithmetic, but, whereas in mental arithmetic the numerals are commonly 'seen', in musilingua sounds and shapes would be combined and held in the mind.

Bearing in mind the foregoing, the following is the proposed outline of the musilingua research for the new group.

1. Explain the musilingua code first for two and then three dimensions as the research proceeds at the rate required by the group's progress.

2. Make shapes in the air and then only in the mind from slow dictation i.e. note by note. (This could be said to be the equivalent of writing).

3. Listen to the <u>whole</u> shape played slowly or very fast, memorise it, <u>and then</u>, after varying intervals of time have elapsed, outline it in the air and imagine it. (This could be said to be the equivalent of writing from dictation). Naturally, shapes would be progressively more complex as the skill improved.

4. Sing or write music while following a shape being drawn in the air, or a light on a screen. (This can be said to be the equivalent of normal reading).

5. Be shown a complete shape to look at (two or three dimensional, simple or complex, constant shape static or mobile, changing shape static or mobile). (This can be said to be the equivalent of rapid reading or the normal observation of the physical world).

6. As well as the above, some iconic British Sign Language signs can be linked to musilingua, in the later stages using two tracks (to represent two hands in action).

<u>Exercises and assessment</u>

1. Which tune (say out of three) corresponds to the shape you are looking at? a) static drawn, b) moving in air. The above in two dimensions.

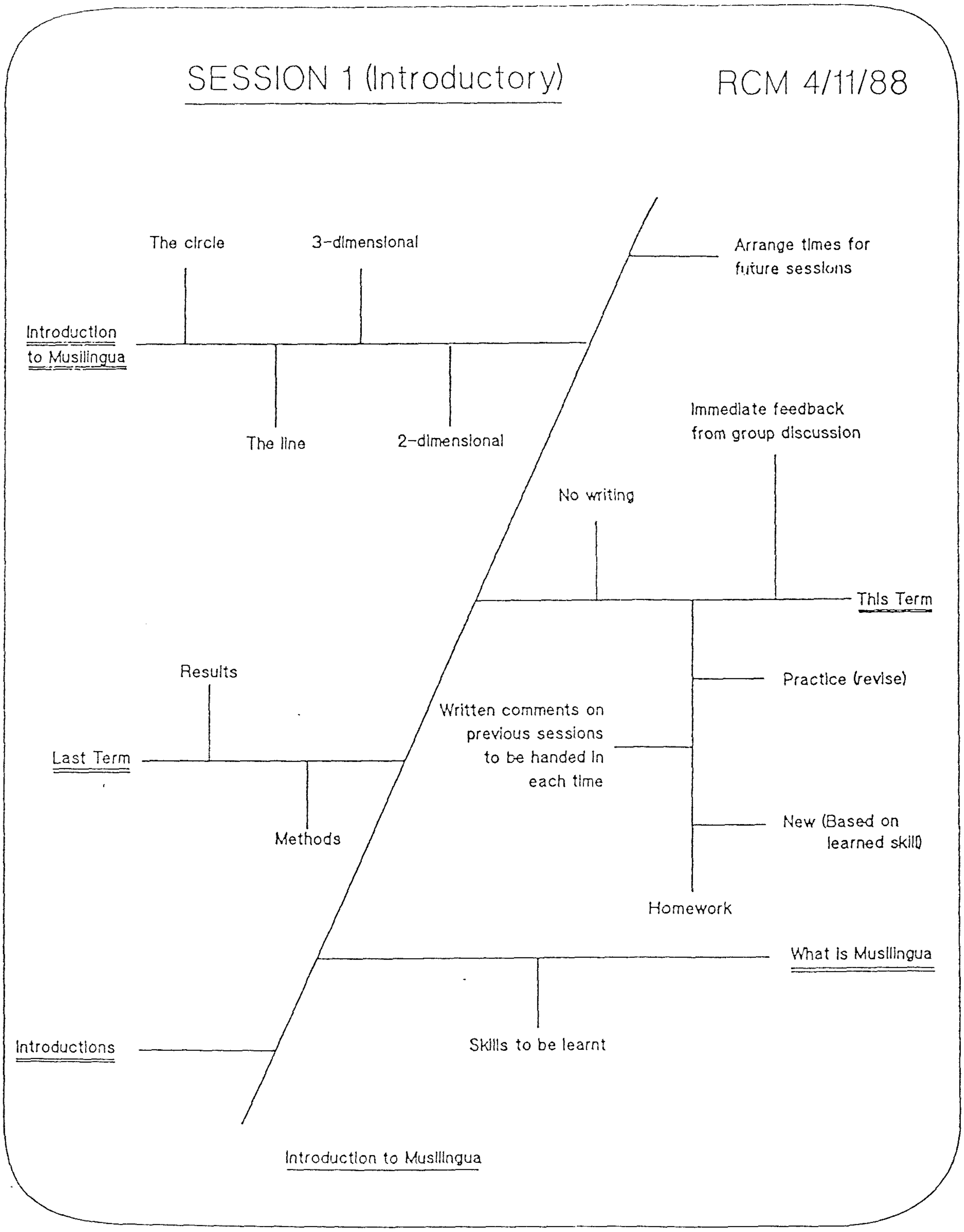
2. One tune. Pick out shape it represents from three or four (two and three dimensional) static and mobile shapes.

The proposed outline was followed in the sessions, each of which will be described in the following order:-

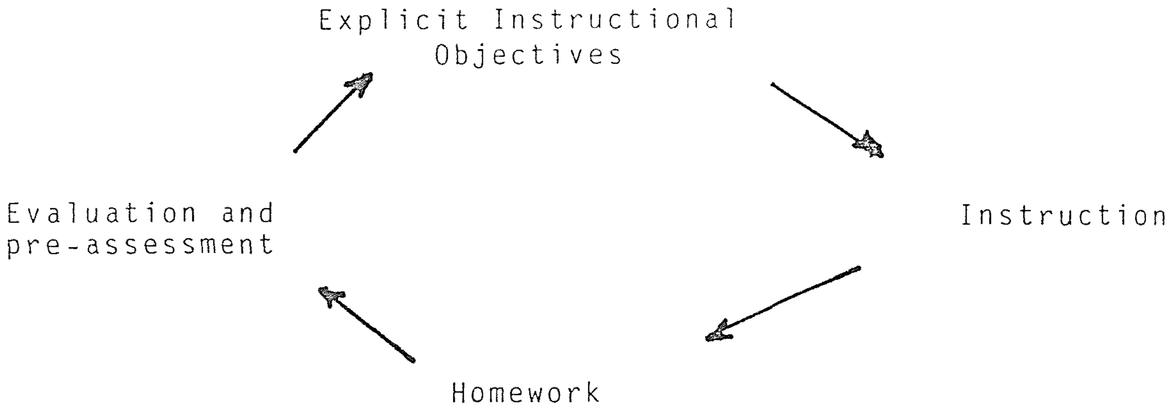
1. Evaluation and pre-test
2. Objectives
3. Instruction and class practice
4. Homework
5. Post-session notes
6. Students' comments

Session 1

This was an introductory session in the form of a discussion. Information was given to the students in stages, with breaks for questions and discussion, and the plan followed was that given in the recall pattern entitled 'Introduction to Musilingua'.


SESSION 1 (Introductory)
RCM 4/11/88
The circle
3-dimensional
Introduction to Musilingua
The line
2-dimensional
Arrange times for future sessions
Immediate feedback from group discussion
No writing
This Term
Results
Practice (revise)
Written comments on previous sessions to be handed in each time
Last Term
Methods
New (Based on learned skill)
Homework
What is Muslingua
Introductions
Skills to be learnt
Introduction to Muslingua

3.9.2. SESSION 2 RCM 11/11/88



OBJECTIVES

<u>The Musilingua code relating to the circumference of a circle</u>

At the end of this session the learner will be able to

1. Outline in the air from slow dictation straight lines having each extremity on a point along the circumference of a circle (4 notes).

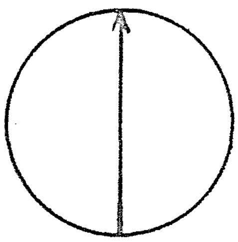
2. Outline in the air from slow dictation straight lines having each extremity on a point along the circumference joined to one or two other similar straight lines to form angles or triangles (6 or 8 notes).

<u>Instruction and class practice</u>

A very brief introduction to musilingua was given, and the objectives for this session were outlined. Then students were asked to imagine a vertical circle facing them, roughly of the circumference of their arms in an embracing position. They were asked to imagine that this circle was the dial of a clock. 12 o'clock represents middle C, and each hour represents a note, so that 1 o'clock would be C sharp, 2 o'clock D and so on round the dial till the octave is completed so that 11 o'clock would be B. It was explained that any octave could be used.

First a single note was played (a small electronic organ was used throughout the course) and students were asked to point to the relevant part of the circumference on the imaginary circle in front of them. After each action was performed, students were given confirmation by being shown a pointer indicating the correct position on a circle drawn on a sheet of paper hanging vertically in front of them.

Then an explanation was given that if one note follows another immediately, the two points are joined by a straight line. The notes for the following lines were played, and students were asked to outline what they heard in the air. (The arrows indicate the direction in which the lines were drawn). Confirmation was given after each action was performed using the pointer, and time was allowed for asking questions and for discussion.



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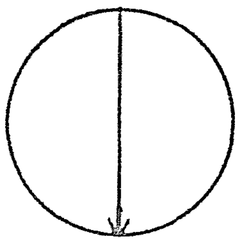

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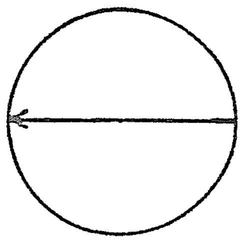

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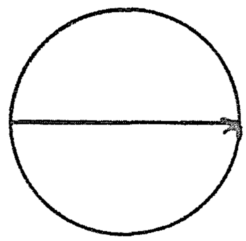

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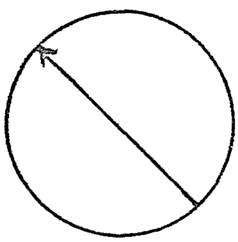

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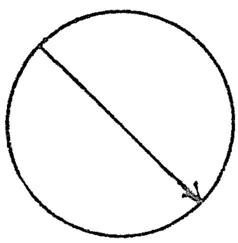

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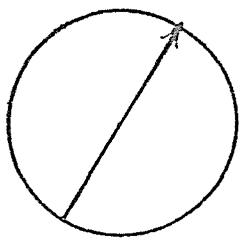

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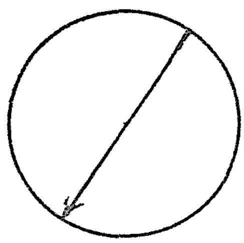

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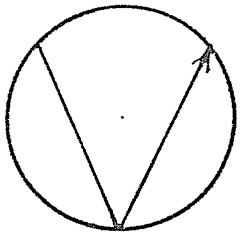
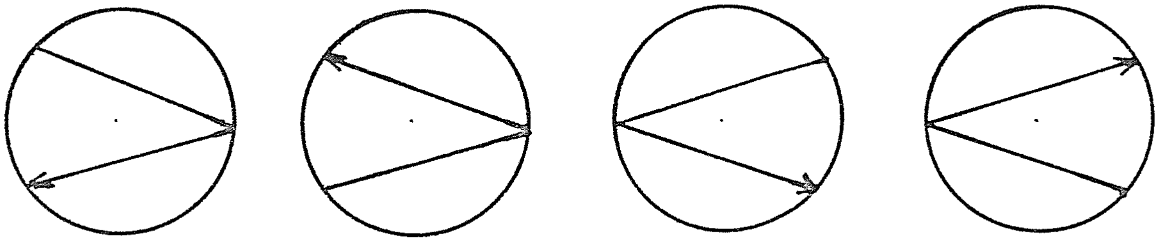
Next, six notes were played and students were asked to outline what they heard in the air. Confirmation was given after each action. The notes for the following angles were played.

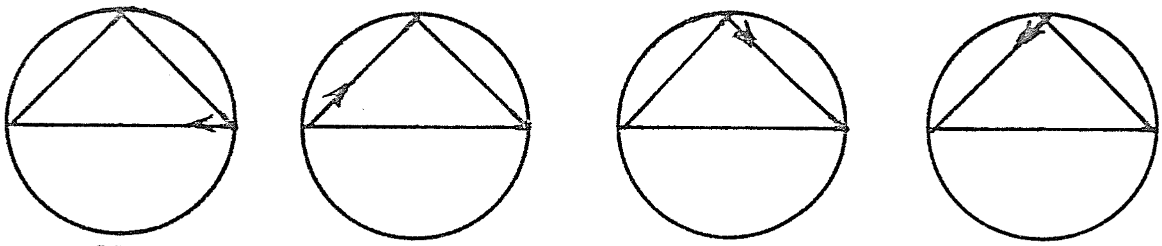


9 10 11 12

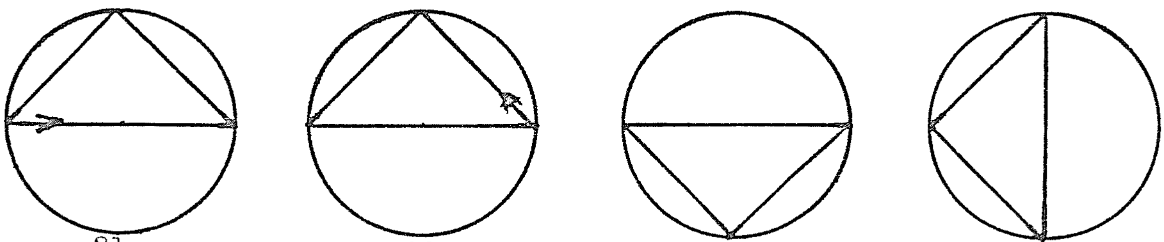


13 14 15 16

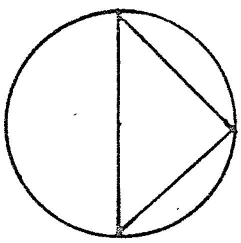
Next, eight notes were played and students were asked to outline what they heard in the air. Confirmation was given after each action. The notes for the following triangles were played.



17 18 19 20



21 22 23 24



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The pattern for triangles 17 to 22 was repeated for each of 23, 24 and 25, giving a total of 24 instructions consisting of eight notes each.

Homework

Students were asked to 1) Revise all work done in class, 2) Practise the British flag in as many ways as possible (imagining that it was in a circle), 3) Try to invent as many new configurations as possible and practice combining the tune with the configuration. Students were advised that in the beginning they might need an instrument to help them (which they would play themselves), but that as they improved they should try to either sing or whistle the notes, and finally only imagine them. They were also advised to begin slowly and only allow the tempo to increase once they had had adequate practice and gained confidence.

Post-session notes

Students readily accepted the idea of relating pitch to dimension and followed all instructions without difficulty. They saw the exercises as a challenge and seemed to derive a great deal of satisfaction when they got them right. The session lasted just over one hour, and this was too short a time to cope with this part of the course. Probably four forty minute sessions spread over a period of two weeks would be required to allow for adequate practice and acclimatization before continuing to the next set of objectives.

The point was raised by a student that one could three-dimensionalize using Musilingua, and students were told that this was indeed the case, and that the code for doing so would be learnt later. Another student raised the point that configuration could not be very precise, and students were asked to consider whether absolute precision was essential for Musilingual communication to take place.

There was general agreement that, if a configuration could be grasped, absolute precision was not essential. Finally, the point was made by the only student who had participated in the first term's research that the presentation this term was much better because it was flexible and there were opportunities to stop and think and ask questions. There can be little doubt that this latter point is valid, and that the tapes used in the first term were inflexible. Having reached this stage, and in retrospect, it seems surprising that the tapes held the students' interest as they did, and were so successful in teaching the code.

Students comments

Nicola Jones

I found the first session last week very interesting. I wonder whether this form of musical communication will be governed by our aural capabilities. If we have to stop and think of how an interval sounds it will slow the process down a lot. I can't imagine ever possessing such a strong aural perception that I could actually hear an object spinning on a table for instance.

I also wonder how we could convey more than two notes at once. Would it be possible to convey a whole orchestral score using this 'sign language'?

~~At~~ I found at first, last week, that I was hearing two notes and simultaneously visualising them on the keyboard in order to give them a name and identity. As the session progressed however and I became more familiar with the system we were using, I found that I automatically put the notes in their position on the circle or line, without having the imaginary keyboard intercepting.

I thought the session went at just the right speed for me. I was able to keep up, but also I had to think hard and felt that we were moving ahead and achieving something.

Friday 11th [illegible]

Primarily, a little too much to take in all at once. You expect us to be very quick, ~~a~~ - just a little slower would be more appropriate.

I don't think it's a good idea to keep telling us what happens when we completely master the art and then tell us that takes months of practise. The whole concept almost becomes completely out of reach, and makes "us" feel a bit negative.

On the plus side, you are so enthusiastic about the whole idea, that that can't help but rub off on us. Not to mention that it's completely fascinating."

Jill - Maria
Handed in on 25/11/88

3.9.3. SESSION 3

EVALUATION AND PRE-ASSESSMENT

After homework practice to assess whether the learner will be able to

1. Recognize a line outlined in the air from 3 possibilities after hearing one played rapidly (4 notes).
2. Recognize a triangle outlined in the air from 3 possibilities after hearing one played rapidly (8 notes).
3. Listen to 3 lines (4 notes each) played rapidly and say which represents the line outlined in the air.
4. Listen to three triangles (8 notes each) played rapidly and say which represents the triangle outlined in the air.
5. Sing a line outlined in the air.
6. Sing a triangle outlined in the air.
7. Learner outlines any shape in air and asks group for tune.

Owing to pressure of time, only 1 - 5 were covered. No mistakes were made by any of the students.

OBJECTIVES

<u>The Musilingua code relating to radii</u>

At the end of the session the learner will be able to

1. Outline in the air from slow dictation straight lines having the first extremity on the circumference of the circle and the other within the area of the circle and vice versa.
2. Combine two lines as in 1 above to make angles.
3. Outline in the air from slow dictation straight lines having both extremities within the area of the circle.
4. Combine two lines as in 3 above to make angles.
5. Combine two lines as in 1 and 3 above to make angles.

6. Outline in the air from slow dictation triangles having at least one point lying along the circumference of the circle.

7. Outline in the air from slow dictation triangles having all points within the area of the circle.

8. Outline from slow dictation four-sided shapes having points either on the circumference of the circle or within its area.

Instruction and class practice

The words radius and diameter were defined. An explanation was given that a radius was divided into 12, each division representing a semitone, with the centre of the circle being the highest note, and the note along the circumference being the lowest. This was demonstrated using the pointer on the circle drawn on paper which was hung facing the students. Several points along imaginary radii were indicated and the relevant two notes were first imagined by the students, and then played. When it was clear that students had grasped the principle, it was proposed to present the following lines and configurations but due to pressure of time only 12 could be presented. (Till the second in 3, and the first circle only in 4 and 5).

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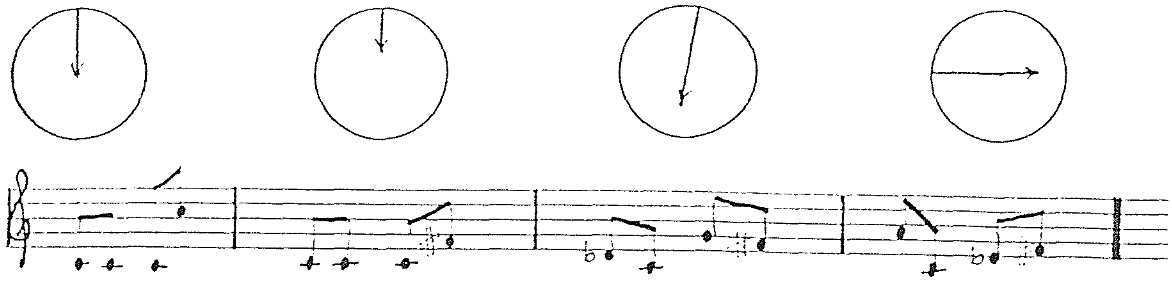

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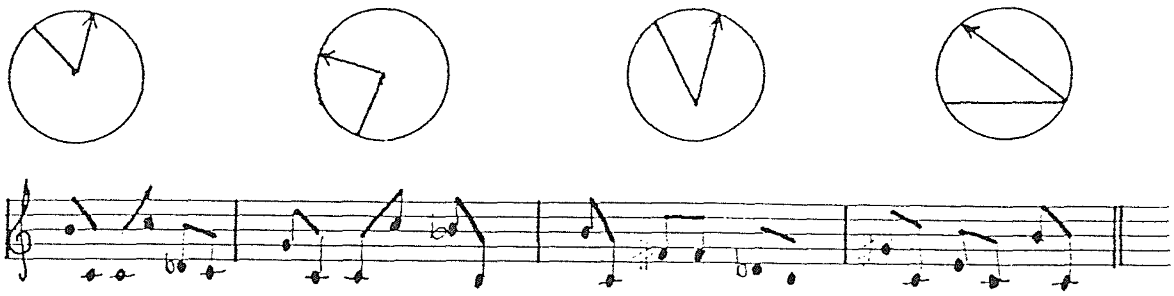

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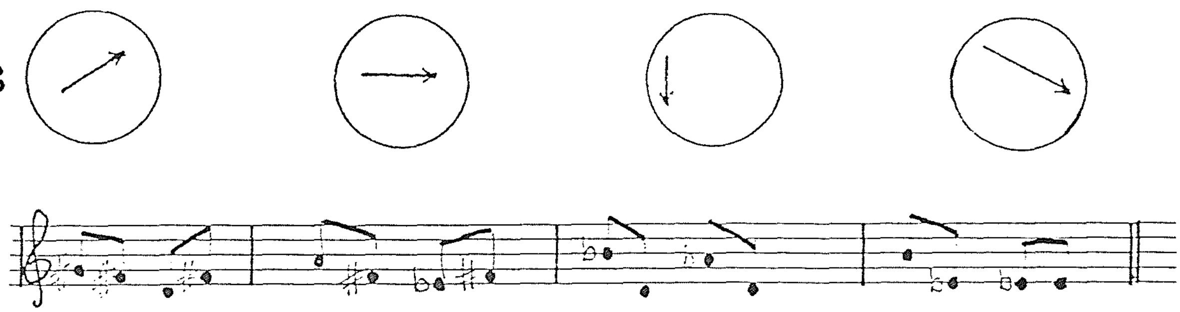

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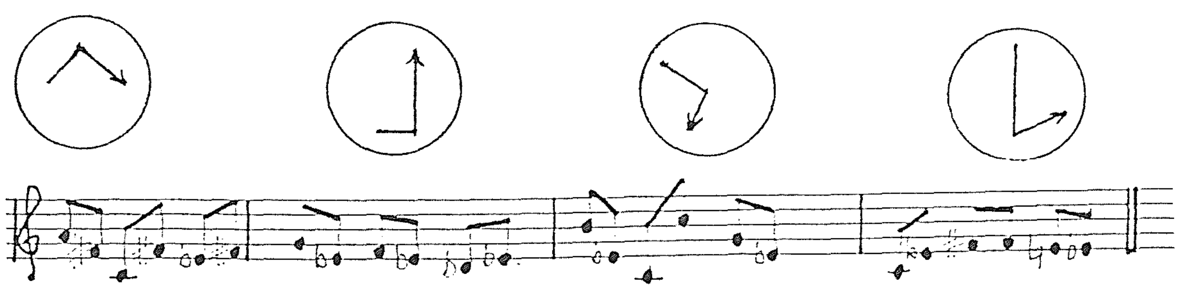

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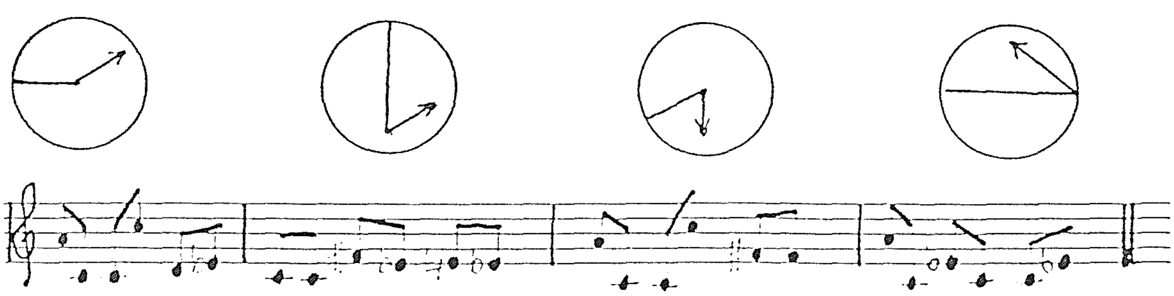

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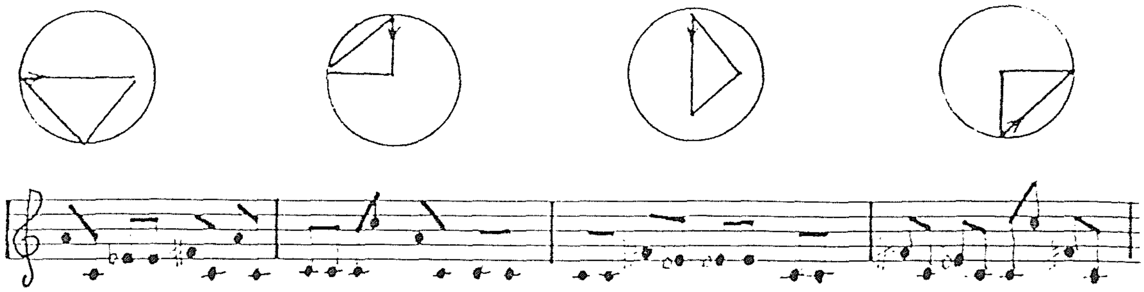

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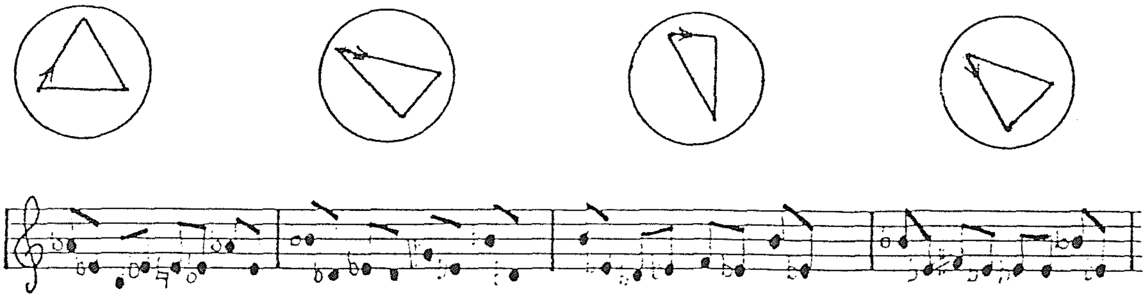

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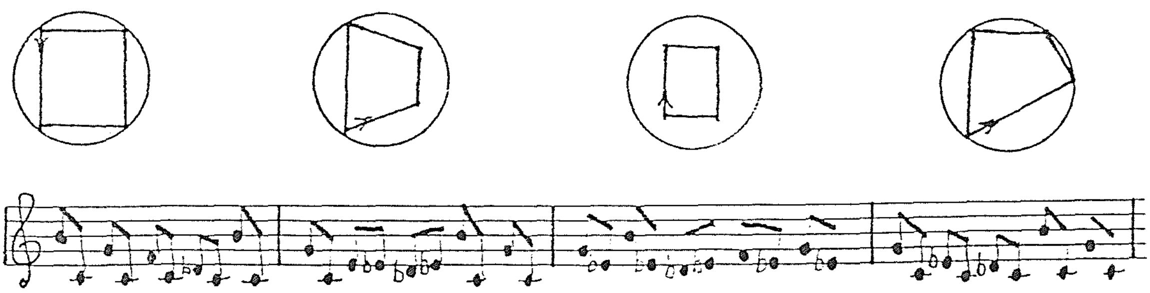
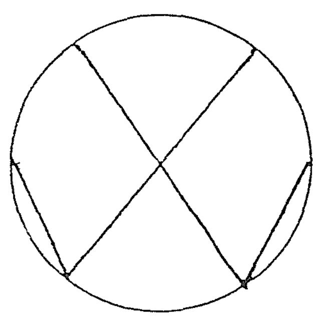


Homework

1 Practise this shape



2 Make own shapes

Homework

Students were asked to

1. Practise the V_W symbol

2. Practise making their own configurations

Post-session notes

The assessment which was done using the circle drawn on paper and the pointer showed that students performed well in spite of the fact that a week had elapsed since the last session. It would therefore appear that the 'private space' concept was readily accepted. The technique of making deliberate mistakes during assessment worked well, and each mistake was spotted immediately. Students were not told in advance that mistakes would be made. Another successful exercise was to make an outline in the air, repeated several times, and to ask students to imagine the tune, which was then played, and students were asked to say whether it was correct or not, and if not, what precisely was wrong.

Students were unanimous that they could have continued for longer than an hour if they had had breaks. A suggestion was made that configuration be related to familiar chords, which can be used as anchors to aid thinking. It is interesting to note but only to be expected that the security of chords should be sought regardless of the configuration they describe, and it is also a comment on the way of thinking of musicians trained in Western music. It is to be expected that, as students' skills improve they will be happier in the chromatic world, though it is likely that the break from the familiar will not be easily achieved. This episode highlights the harmonic limitations (some might say boredom) of Western music.

A discussion as to whether Musilingual ability would improve aural skills ensued, and there was general agreement that it would. Two of the students said they 'saw' intervals on the piano keyboard when they heard the notes.

Students' comments

None this session.

3.9.4. SESSION 4

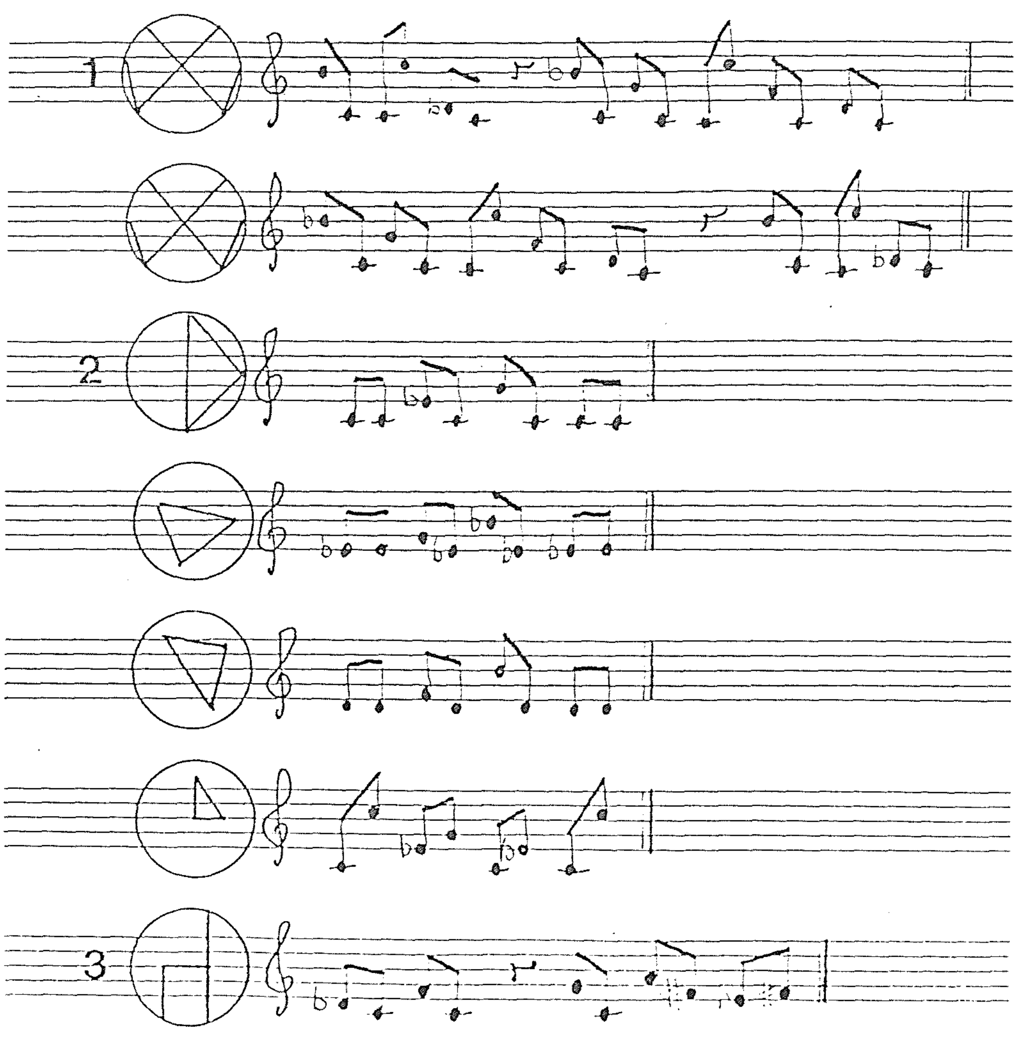
EVALUATION AND ASSESSMENT

After homework practice to assess whether the learner will be able to

1. Recognize the VW symbol from two tunes played rapidly in succession.

2. Trace in the air from slow dictation 4 triangles presented singly, and then in succession.

3. Make a mental outline of tune and say what object it represents.



OBJECTIVES

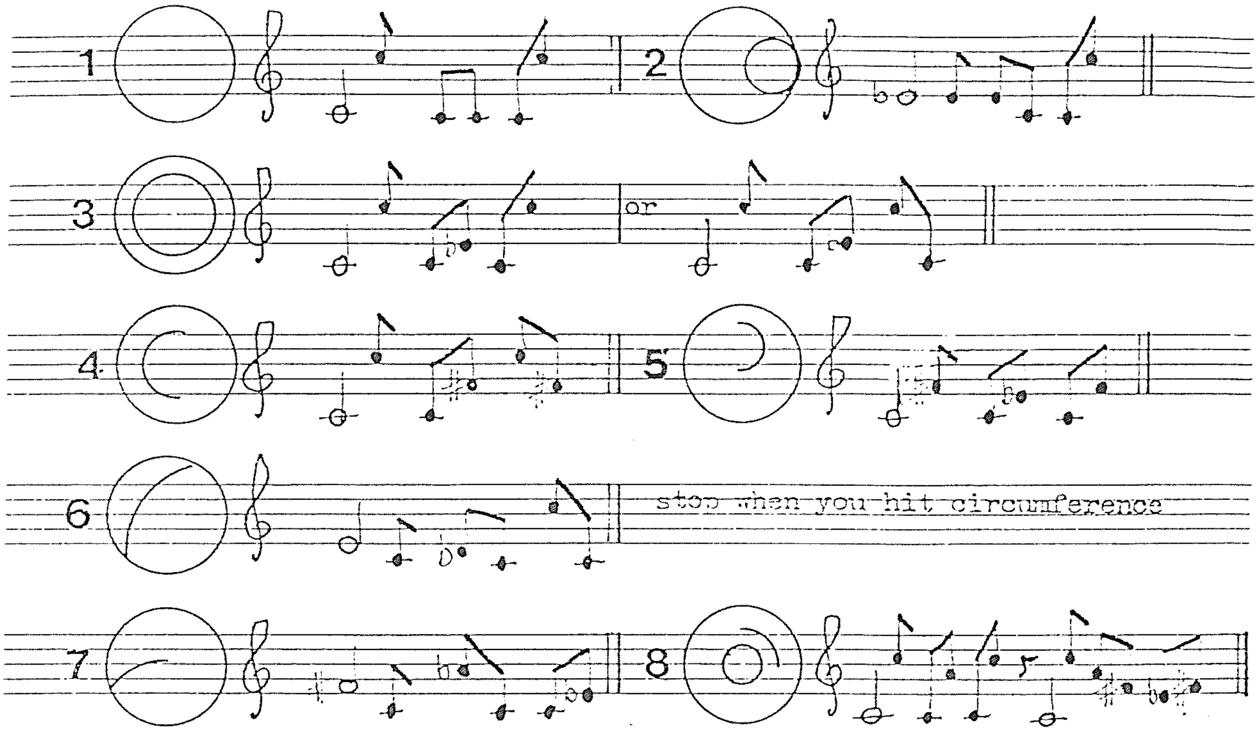
The Musilingua code relating to circles and arcs

At the end of the session the learner will be able to

1. Outline in the air from slow dictation complete circles of any radius having their circumference within the area of the 'private space' circle.
2. Outline in the air from slow dictation any arc of any complete circle having its circumference within the area of the 'private space' circle.
3. Outline in the air from slow dictation any arc of any circle having its circumference partly outside the area of the 'private space' circle.

Instruction and class practice

An explanation was given that in order to be able to draw a circle, two points had to be known. The first was the centre of the circle, and the second, the radius. Each of these points is indicated by two notes. Two further notes are then needed to indicate whether a circle is to be drawn clockwise or anti-clockwise, or if only an arc is to be drawn. If a complete circle is to be drawn clockwise, its starting point is the point indicated by the radius, which will be either the highest or lowest note depending on whether the circle is to be drawn clockwise or anti-clockwise. If the higher note is sounded first, the circle will be drawn anti-clockwise, and vice versa. Similarly, if an arc is to be drawn, the reference point is the point indicated by the radius, but the interval will be less than an octave. If the instruction is to draw an arc or a circle, the first note is long, and is followed by five short notes. The following examples were used to help with the instruction. First the notes were played, and after a short pause the circle or arc was traced using the pointer over the circle on the paper hanging vertically facing the students.



Homework

1. Practise car within circumference of circle

2. Practise faces e.g.

Post session notes

One of the students stated that she had tried to explain Musilingua to a friend but had difficulty in explaining radii. Circles and radii were explained again, and she said she could now explain it, and did so.

After several slow playings, the $\genfrac{}{}{0pt}{}{V}{W}$ symbol was grasped. Students appeared to find it easier to grasp once they knew where to begin. When the triangles were played separately, they were grasped easily. However, when they were played in rapid succession, they were not remembered. This is undoubtedly due to the fact that the configuration was not created upon the first hearing and the succession of notes was not remembered - all this due to lack of practice and a much too rapid progress through the various stages. However, when the 'chair' was played slowly three times, two participants (one student and the vice-director) said they thought it was a chair! This is of very special interest, because they were the only two people present who had been members of the original group and were the subjects of the Electroencephalographic investigation. After two more playings, all the other students also received the 'chair'. Later the vice-director said that though he received the 'chair', he had to think very hard because the electronic organ was flat and he had perfect pitch. This result is most gratifying, for it is the first time that an object was received musilingually, and significantly it was transmitted in two dimensions. The tremendous potential for three-dimensional transmission has been adequately demonstrated.

As the session took place on the last day of term, students were asked whether they would like to stop the course, or continue next term. They unanimously requested that the course continue next term. (Unbeknown to them, the Vice-Director had made continuance contingent upon their verdict).

Nicola Jones

My reactions are definately speeding up with the circle system now. Sometimes it takes some time to work out where the notes are on the circle. * I found the line a bit confusing at first, but now that I fully understand the system things should start improving.

* Notes other than E flat F# A & C.

handed in on 25/11/87

Friday 6th Nov.

Made easier to follow the [illegible] as you went over last weeks ground again briefly. "Step two" seemed to follow easily from "Step one" (last week). But again I am put off by the ultimate goals we will not attain. A much better speed, however.

Jill-Marie

Handed in on 25/11/88

3.9.5. SESSION 5

EVALUATION AND ASSESSMENT

After homework practice to assess whether the learner will be able to

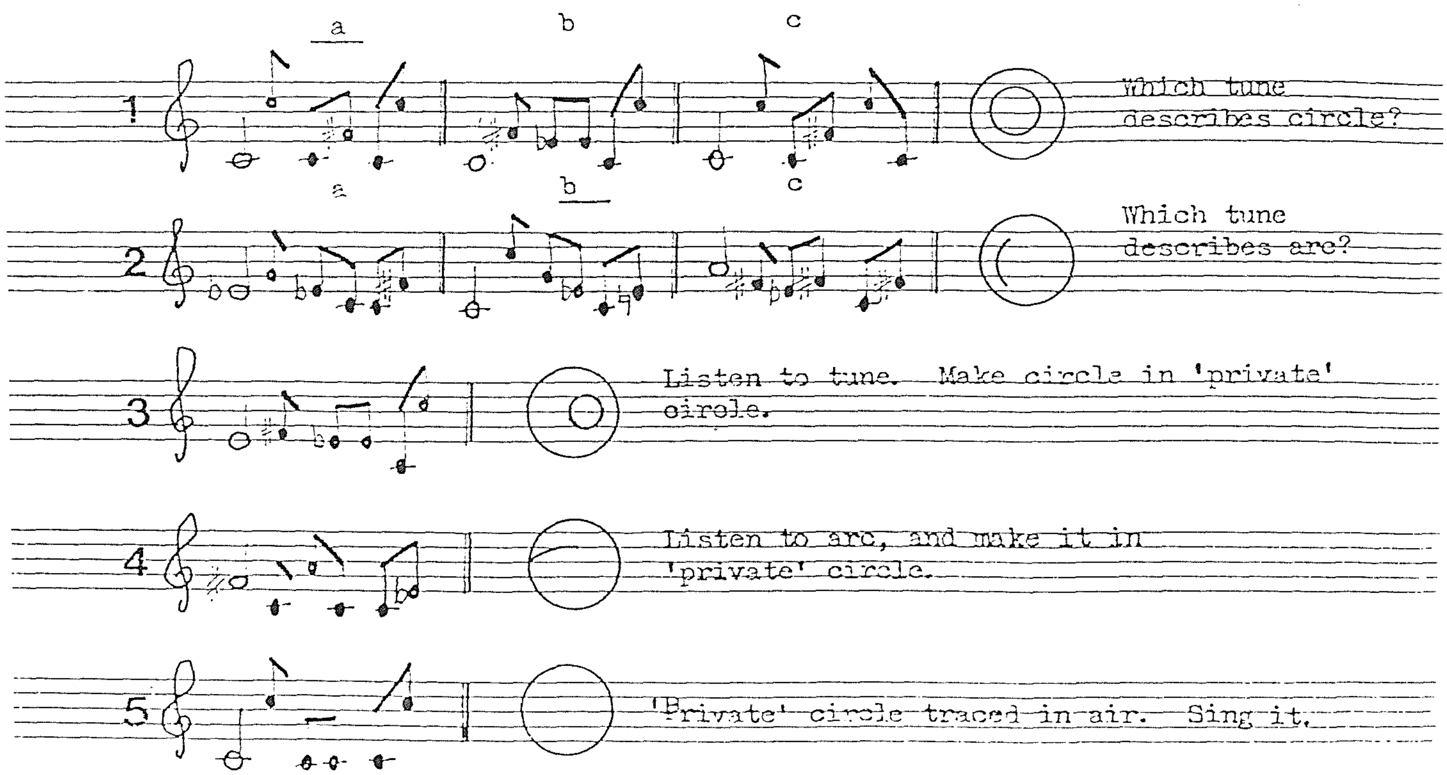
1. Recognize a circle drawn in the air from 3 tunes played slowly.

2. Recognize an arc drawn in the air from 3 tunes played slowly.

3. Trace in the air from slow dictation a circle having its circumference within the area of the 'private circle'.

4. Trace in the air from slow dictation an arc of a circle having part of its circumference outside the area of the 'private circle'.

5. Sing a circle traced in the air.



OBJECTIVES

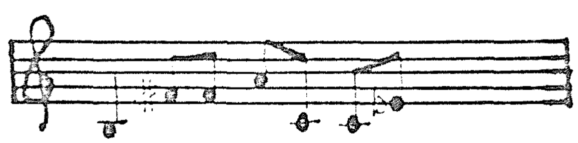
The Musilingua code relating to arcs whose centre is outside the circumference of the private circle

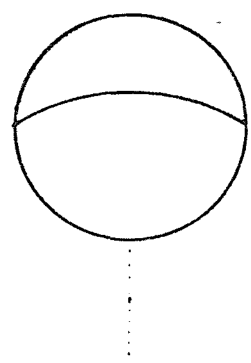
At the end of the session the learner will be able to

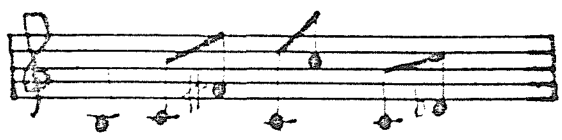
1. Outline in the air from slow dictation any arc of any circle having its centre outside the circumference of the private circle.

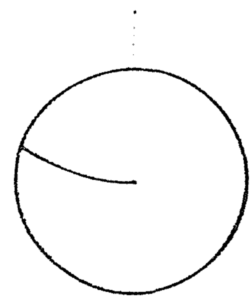
Instruction and class practice

An explanation was given that the centre of the circle is outside the circumference of the 'private circle'. It is now necessary to imagine a line which lies outside the circle and is a continuation of the radius, is of the same length as the radius, and is also divided into twelve. There are twelve such 'external radii'. In order to indicate the centre of the circle, a note is played which is a semitone below the lowest note of the octave used. This indicates that a point along the 'external radius' will be described. The next two notes describe a point along the 'external radius', which is to be the centre of the circle. The next two notes describe the point which will determine the length of the radius of the circle or arc and also indicate that this will be the lowest note. (Or the highest, depending on whether the circle or arc is to be drawn clockwise or anti-clockwise). This point may be within the circumference of the 'private circle', or on any point along any of the 'external radii'. The next two notes describe the circle or arc to be drawn. The following examples were given.



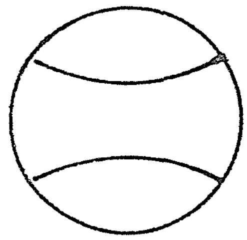






Homework

Practise



Post-session notes

British Sign language 'car'  was played and the students were asked to use both hands to indicate the equivalent spatial movement. They did this successfully, and were most surprised to be told that they had just signed 'car' in British Sign Language.

Right hand

Left hand

One student made the very relevant point that if one associates Musilingua with sign language, one is back to square one with randomness. It was agreed that this was perfectly true, and that sign language used in conjunction with Musilingua should be regarded only as an exercise in learning Musilingua and in fluency, but that true Musilingual thinking is a process entirely separate from this. However, what is of interest in this connection is that, whereas music has a rhythm which 'moves forward', musilingualizing sign language is tied to movement through space, but in the latter case there is a double random situation i.e. the random British Sign Language sign and the Musilingual code. The existence of a code in Musilingua was compared with sight, in which there is no code, and the point was made that if the Musilingual code could be dispensed with, really high levels could be reached. It was, however, agreed, that Musilingua afforded the only means of creating configurations mentally in true three dimensions, and therefore, at this juncture, having a code is better than nothing.

DAVID ANDREW JONES

MUSILINGUA COURSE 2 AUTUMN TERM '88

SESSION 1

I am convinced that this method of presentation works much better than the isolated tape arrangement of the original course. The opportunity for the participants to raise queries at any point, or to verify their understanding of the basic ideas of the language is absolutely critical.

At first, I was worried by the absence of writing materials, at least for the initial stages! However, I think this is offset by the opportunities for general communication within the group; although perhaps a 'blackboard' arrangement as used in the second session might be made use of, to ensure everyone grasps the initial stages with no misunderstanding. I understood Dr. Robinson's comments regarding the writing as "interfering with the thinking" to refer only to the fact that writing involved muscular activity, which (obviously) registered on the E.E.G. and prevented them from getting a clear reading. I can't see how the use of writing materials in the very early stages can be anything but beneficial and clarifying, but I also see that it is not completely necessary to use them.

An excellent introduction to the general principles was made.

SESSION 2

Again, very much clearer than the original course. This is exactly the kind of "exercise" the participants require to give them confidence to progress to more advanced stages. The use of a "blackboard" certainly adds clarity to the ideas.

As suggested during the session, it may be an idea to introduce the participants to what common chords look like when they are put into "MUSILINGUA". After all, an error of one or even two semitones is not crucial in communicating a general outline, so if participants are familiar with the shapes of chords they can already instantly recognise, they can latch on to a more harmonic way of thinking which will be vital for long and complex patterns.

(SESSION 3 – Absent)

Musilingua

I think that it would help to describe the points on the circumference of the circle and words as like co-ordinates because as soon as I thought of them like that it all clicked into my mind. So far I've found it very easy (apart from that) and you seem to explain what you want us to do very clearly. Apart from the one comment I think that it's really beneficial and I'm very grateful to take part in the research.

Brigitte 2/12/93

3.9.6. SESSION 6

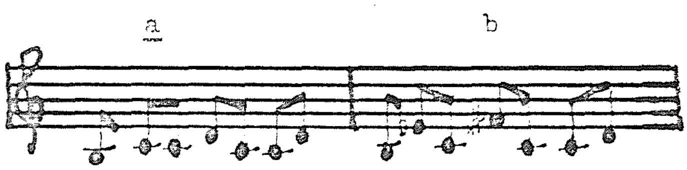
EVALUATION AND ASSESSMENT

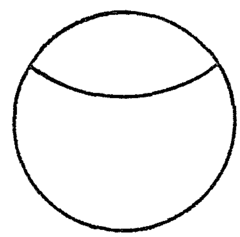
After homework practice to assess whether the learner will be able to

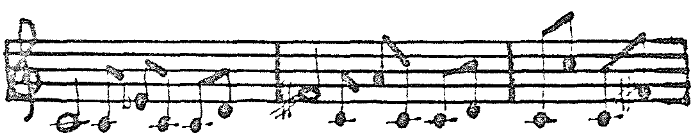
1. Recognize an arc drawn in the air within the private circle having its centre outside the private circle.

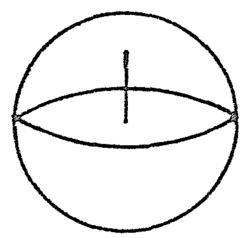
2. Trace in the air from slow dictation and say what object it might represent

3. Sing an arc and trace it in the air and ask whether it is correct or not.

1 



2 



OBJECTIVES

<u>The Musilingua code relating to the third dimension (Straight lines)</u>

At the end of the session the learner will be able to

1. Trace in the air from dictation any straight line within the volume of the private sphere.

2. Combine two lines as in 1 above.

3. Combine three lines as in 1 above.

Instruction and class practice

The session began with revising how to find a point within the circumference of a circle. Students were then asked how they would describe the third dimension. One student said that one would have to find something along a line at 90 degrees to the disc, but he could not be more specific than that. The other members of the group had no idea how to proceed. In order to avoid confusion arising from performing actions opposite students (so that left would be right and vice versa) the entire group sat in a straight line with the researcher in the middle. The code as used last term was demonstrated, but the students said it was confusing because the disc revolved first one way, then another. They thought the disc should only revolve clockwise, and that all the points on the horizontal clockface should be used to describe the third dimension. It was agreed that this code would be used, even though there was clearly no need to use the whole circle, and half would suffice. One student commented - 'what if we ever communicate with beings from outer space - how are we going to explain that this is a kind of shorthand? Shouldn't we stick to the complete code?' At this stage it was pointed out that it is possible to locate no fewer than 1728 points within the volume of a sphere.

It was agreed that the code will be as follows:-

1. The leading edges of the circumference of the vertical disc face the twelve and six o'clock positions to begin with.

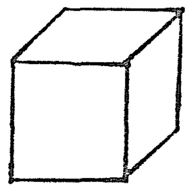
2. The first two notes indicate a point on the vertical disc.

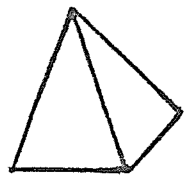
3. The third note indicates a position on the horizontal clock face upon which the vertical disc revolves.

Several lines and angles were practised using the third dimension.

Homework

Practise





Post-session notes

This was a truly memorable session because the students became involved in a lively discussion about the best way to describe the third dimension, and how best to devise the code. Their comments showed remarkable insight, and there was no doubt that they had grasped the principle involved. When it was agreed to adopt their suggestion and to use the entire circle, they conceded that at some later stage, when proficiency will have been gained, half the circle (or disc) would suffice. It was very clear that the unlocking of the third dimension was an exciting experience, even though it was realized that a great deal of practice would be needed in order to be able to create mentally three-dimensional configurations from rapid musical dictation, or to musilingualize three-dimensional objects rapidly, not to mention hearing them in their entirety simultaneously. It is significant that for the first time the group had an insight into the possible states of mind offered by Musilingua, and regarded their achievement as not beyond their capabilities. It is unlikely that this level would have been reached had the group not been involved in free discussion and exchange of ideas. It is certain that the first group, who had less opportunity for discussion, did not reach this level as a group.

At the end of the session students were told that the Musilingual code has provisions for enabling

1. The rotation of configurations about an axis.

2. The moving of configurations along straight lines.

3. The moving of configurations along circles and arcs.

4. The filling in of frames to form sheets.

5. The filling in of frameworks to form solids.

Musilingua Term ①

The concept of musilingua is a very original and exciting art and the initial stages of explaining the ideas behind it was clear and well thought out. I became slightly dismayed to find all the other students experimenting with this theory had perfect pitch or ~~absolute~~ very good relative pitch due to the fact that they were singers. I felt at a disadvantage and wished for another student of my own standard to be present. But when talking about the circumference of the clock face, I understood & was interested. The second lecture that started to go into more detail in the centre points inside took me far longer to fathom than the other students. It brought me to the point of asking what if somebody with lesser great pitch control had to keep pitching points inside the clock face? would not the answers be slightly different to those with perfect pitch? They were when experimenting not so much with triangles but with more complicated structures. So I am continuing with the experiment to see if I can improve my pitch conception although I can not see myself as a master student and leave that task to others.

Rachel Edwards

3.9.7. SESSION 7

EVALUATION AND ASSESSMENT

After homework practice to assess whether the learner will be able to

1. Trace in the air from dictation a line within the volume of a sphere.

2. Trace in the air from dictation two lines within the volume of a sphere.

3. On being shown a line, recognize which of two tunes describes it.

4. On being shown two lines recognize which of two tunes describes them.

OBJECTIVES

The musilingua code relating to the third dimension (arcs and circles)

At the end of the session the learner will be able to

1. Trace in the air from dictation a circle of any radius in any plane within the volume of a sphere.

2. Trace in the air from dictation any arc forming part of the circumference of a circle of any radius in any plane within the volume of a sphere.

Instruction and class practice

The session began with the revision of drawing circles within the circumference of a disc. Students were then asked how they would go about drawing circles in different planes within the volume of a sphere. Only one student suggested that a disc along a line might solve the problem, but it was pointed out that the line was free to revolve about its own axis and so the plane of the disc could not be determined.

An explanation was then given that in order to draw circles within the volume of a sphere it was necessary to know 1) where the centre of the circle is to be, 2) the radius of the circle, 3) the plane of the circle and 4) the dimension and direction of the arc. The procedure is first to indicate a point within the volume of a sphere (using three notes), then to indicate a second point within the volume of a sphere (using three notes). This would give a line within the volume of a sphere, and the length of the line would be the length of the radius, the second point given would be the centre of the circle to be drawn, and the circle would be drawn on a plane which would be at 90 degrees to the line. The lowest point of the circle would be the lowest note of the octave used, and if the circle is perfectly horizontal, the furthest point from the observer would be the lowest note of the octave used. Clockwise and anti-clockwise direction and length of arc would be dictated in the same way as before.

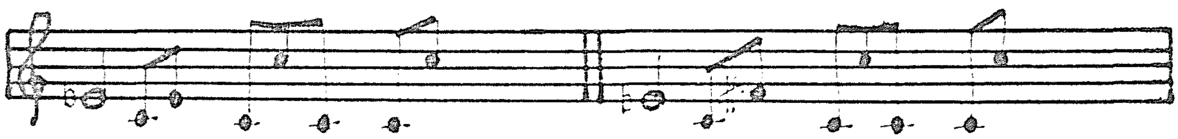
In order to demonstrate, a perspex disc with a hole in its middle was used, and a pencil was inserted into the hole so that it was at a 90 degree angle to the surface of the disc. The pencil and disc were held in several different positions in space and circles were musilingualized, with all students taking part, correcting each other and asking each other for clues. It was then made clear that because of the arrangement being used, there was no flexibility in the size of the circles and arcs, and that further practice would be needed with larger and smaller circles and arcs. Several examples were tried using the private sphere.

There was then a discussion on 'what is a good tune'. Surprisingly, students seemed unprepared for the question. 'Easy to hum', 'memorable', 'simple' were the only suggestions made. It was agreed that in the next and last session the subjects for discussion would be

1. What is a good tune?

2. Meaning

The following instructions were used in class to practice circles in the 'private sphere', some other examples being tried by students individually.



Homework

1. Choose any circle within 'private sphere' and musilingualize it by first singing or whistling it (checking on an instrument if necessary) and then trying to imagine the notes in combination with its spatial location.

2. Think about 'what is a good tune'.

3. Think about 'meaning' in language and in music.

Post-session notes

This session was most remarkable because, once explanations had been given, there was total involvement on the part of the students. The model used was lying on the desk, and at one stage it seemed that every student wanted one to himself. Arms were moving about in all directions within the 'private sphere' and there was an atmosphere of excitement and concentration. This session confirmed that student involvement in the learning process is of very special value and importance, certainly in the later stages of Musilingua study.

Students' comments

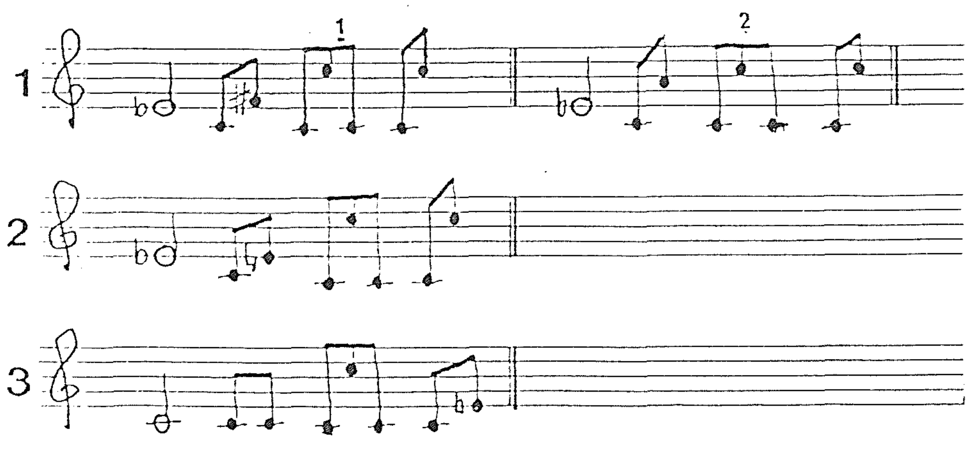
None this session.

3.9.8. SESSION 8

EVALUATION AND ASSESSMENT

After homework practice to assess whether the learner will be able to

1. Say which of two tunes describes a circle outlined in the air.
2. Trace in the air from dictation a complete circle.
3. Trace in the air from dictation an arc.



OBJECTIVES

To summarize, evaluate, criticize and discuss Musilingua and the course to date.

Instruction and class practice

The session began with a discussion on 'meaning' in language and music. It was pointed out that meaning in language is independent of words, and that once words had helped to create meaning they were no longer needed. Words could then be regarded as the tools which created the meaning, rather than the bricks which sustained it, since the original meaning could be expressed using different words. This being the case, what was the equivalent in music? Was the arousal of emotion through music the same as the creation of meaning through language? Meaning in language is more precise than meaning in music. How precise does meaning have to be? Is more joy derived from precision in meaning originating from language than in meaning originating from music? Is superior intelligence more concerned with the detail or with the general?

One student made the point that you can not say colour in Musilingua. 'You can say 'the cat is crossing the road,'but you can not say the brown cat is crossing the road'. The question is - how important is it to know that the cat is brown? Is it important enough to devote a part of the Musilingual code to the description of such detail? Does detail make for happiness as emotion in music brings happiness?

Next, the question, 'what is a good tune' was discussed. It was pointed out that some tunes are mainly melodic, some are mainly harmonic, and some are a mixture of melodic and harmonic. Bearing in mind that judgements are purely subjective, how is it that there is generally fairly close agreement about what a good tune is? The work of Voss was discussed in this connection. Is there indeed some form of universal which determines what a good tune is? Is there a test which can yield results independently of subjective judgements but agree with most of them?

It was pointed out that music has certain advantages over language. Several voices can be sounded simultaneously in music. (Harmony and counterpoint). In language one word has to follow another in linear fashion. If music were to convey meaning and several voices were to sound simultaneously, more meaning could be transmitted per unit of time than in language. This would clearly have some effect on the thinking process. Is it possible that the power of music to create emotion lies in its ability to condense sound into time through the use of harmony, making language seem ineffectual by comparison?

This discussion led to an examination of music therapy, and the power it has to create and change mood. Noticeable and measureable physiological changes can occur as a result of musical excitation; for example, an increased pulse rate can be measured if exciting music is imagined (not listened to or played). In some cases music can have an effect where language can not. It is sometimes possible to communicate with people through music initially, whereas communication through language is impossible. Language is undoubtedly an important part of the intellectual life, and music of the emotional life.

Perhaps Musilingua could serve to satisfy both the intellectual and emotional needs of the individual.

Finally, students were asked to give a written assessment of the course, and in particular to say whether they believed that Musilingua should form a part of aural training courses. It was interesting to note that students had discussed Musilingua with their friends, but not with their professors. It was gratifying to note that all the students who had attended the first session were present in the last, bearing in mind that attendance at the sessions was voluntary.

Students' comments

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55A Madeley Road
Ealing
London
W5 2LS.

19/5/89.

Dear Mr Bardi,

May I begin by apologising for not writing any sooner, I have been very busy. I do hope that the delay has not inconvenienced you too much.

My general impressions of the course were those of excitement of being involved in something which was completely new and previously unexplored. I am very taken by the idea of this musical language eventually superseding our own, and in doing so creating the conditions for a universal language,(literally), which would also provide almost unlimited possibilties of communication within our own race, governed only by the speed at which it was possible to comprehend the musical messages. One could imagine that a future civilisation which commanded sufficient intelligence to be able to use the Musilingual language to any benifit, would be in any case hampered by the limitations of our present system of communication, namely the speed at which it takes place, and the random selection of sounds to represent concepts and physical items in the real world. It would be interesting to experiment with a person who had learnt the language since birth, and had adopted it as a natural way of thinking. We would then have some idea as to how quickly this language could be mastered, and whether indeed the human race <u>did</u> have to develop further in order to use it. My one disappointment about the course was that we never really had enough time to see just how good we could get.

Leaving aside conjecture, the language does of course have enormous practical benifits other than those already discussed. In the area of Aural training, the advantages are obvious. It is well known that the brain often constructs 'models', especially in the solution of mathematical problems, here one is being provided for a field in which I propose the brain normally only operates in terms of pure sound. For those with a not particularly keen sense of pitch, of Aural facility, the advantages of having an external 'model' to latch onto, are clearly beneficial to the retention of melodies in the head. In the Aural training of young children, the 'code' of the clockface could be seen by them as a sort of game, and would therefore generate interest, as well as providing a much needed 'model', consequently inproving their standard of Aural perception. This, I beleieve would help the cause of more complex kinds of music, such as 'classical' music, the main obstacle in the way of its appreciaction by a wide portion of the populace, being the lack of Aural facility. This of course can be aquired through interest and constant listening, but if the skill had been fostered at an early age, then many more people would not be satisfied with their limited powers of musical perception, and hence become quickly tired of listening solely to 'pop' music.

I do hope that this has been of use to you.

Best of luck for the Ph.D. and that it subsequently gets the attention it undoubtedly deserves.

Yours sincerely,

Keith Hewitt

Keith Hewitt.

Flat 1, 558, Harrow Rd.
London. W9 3QG.
Saturday 21st.

Dear Mr. Bardi,

I hope the following will be of some use to you!! Do let me know, if that's possible..!!

The whole concept and idea of musae lingua, is marvellous, it opens up so many possibilities, not only for musicians, but also handicaped people. For the musician, if taken to extremes mus. ling. can improve sight-reading powers, tremendously, - if you see a phrase as a shape, rather than a series of notes. Also acurally, if singing in a choir (or playing in an ensemble.) when you can see the other parts below, you would have much more awareness of harmonic progressions, and therefore, hopefully, bad intonation would not be a problem. As a singer, mus. ling. is of great importance to me, as I am constantly required to perform all kinds of pieces, after only one rehearsal. If sight-reading and listening abilities are improved, it is of prime importance.

The above is perhaps in an ideal world, when one has the time to spend practising music and being taught it every week. Initially, the idea is difficult to grasp, when we begin discussing how it could be a superior method of communication to speech. This idea is automatically rejected, as an almost preposterous idea, although, when you think more about it, speech does seem to be fairly limiting. However to re-think your entire method of communication, and change accordingly is something that not everyone will welcome with open arms. This kind of thing then becomes very difficult to dispute, as we do not know the extent of the possibilities. I have spoken to many friends about musicking both musicians and non-musicians, and both parties were interested and keen to know more. Sadly, I couldn't give them all the answers.

As for changing aural training to this I'm not sure. I think it would probably

(2)
be difficult to mix mus. ling. with the traditional methods, as they are so widely different. Mus. ling. is very "rare" as it is something that you think about when not in the lessons!! The traditional methods are very strict - 30 minutes a week, and definitely not designed for interest, where as mus. ling. is completely the opposite, and kept my interest right through the course of lessons, and discussions. I think this also has more opportunity for development by students. Each person can have their own opinion, and take from it what they require, unlike the traditional methods of aural training.

However, I think it would be a good idea to use mus. ling. instead of traditional methods. ~~Both~~ ~~involve~~ Mus. ling. involves thinking of intervals, aural perception, remembering melodies etc. - ie the things which traditional aural seeks to find, but mus. ling. is much more approachable.

Jill Maude. (Marsden)

ROYAL COLLEGE OF MUSIC

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Shepherds Bush
London W12 7BX.

Dear Mr Bardi,

I apologise profusely for not writing sooner but life is absolutely choc a bloc. Apart from wanting to say how much I enjoyed Musilingua I think that the only comment I would make is that you have to be absolutely precise when describing the code and how it works. Sometimes I got muddled with the various descriptions you gave. Also when beginning the 3 Dimension, I think it would be more logical and easier if you ~~you~~ use the whole clock face instead of 1/2 as it follows on better from the previous 2 Dimensions. Anyway Good Luck for your PhD, Sincerely yours

Bridget Evans

Musilingua

I'm very glad that I did partake in the course although sometimes it was a bit over my head! For aural perception it is an excellent way of increasing a students ability to recognise intervals - especially the 1st stages primarily geared towards the circumference of the clockface. Later when discovering the basics of lines & circles, having to pick out points makes recognising intervals quicker. The idea of Musilingua is a very good one (understatement) and I hope to see it some day as part of the curriculum in aural training. But more clarity is needed when explaining the different parts of the 'formulae' of recognising points in and up to 3 dimensions. Sometimes I

felt I got lost so it is important
to give as clear an explanation as
possible to avoid misinterpretations
maybe also to ~~devise~~ clarify the
methods of creating shapes so as
to devise A goes before B etc like
noun before — or punctuation rules.

Sorry this is a bit confusing —

thanks again,

Rachel Edwards.

Musilingua

I found the course very interesting and helpful for aural and concentration. The concentration aspect is particularly important in musical performance and musilingua made me listen to the notes and intervals being outlined. It is so easy when playing an instrument to switch off and stop listening because you can hear the sounds, but when you have to imagine the notes in your head and hold them there it is a stretch of the concentration. Often in practice or performance our concentration is side tracked by outside thoughts, but this never happened to me in Musiligua during an exercise.

When I began the course I found that the easiest way to hear the notes being outlined was to work out what they were using the set code and then imagine them being played on a piano. Having done this I could hear the intervals and notes. Gradually however the middle stage was removed and I could immediately relate to notes that were pointed to on the circle or line etc. without having to transfer them to a keyboard, so the unnecessary visual stage that has always been present in my aural training was no longer needed. As a result my aural capacity is greater and I feel that Musilingua should be part of the aural curriculum. I can also hear unusual intervals such as the augmented 4ths much quicker now as the line from 12.00 o clock to 6.00 oclock is frequently used, and more adventurous harmony no longer suggests the trouble that it used to.

I don't know whether it would be very accurate to try to communicate a peice of music to someone else using musilingua, as ~~pointed~~ pointing to different positions in the air is not precise. The problem of rhythm and many lines at once would be difficult too. However the reverse process of being able to see an object and transfer that into sound is possible and the fact that we imagine notes on a keyboard before we can hear them shows that there is a strong visual and aural link. How far it is possible to go with this process is impossible to say until the musilingua system has been studied for a long time. I would think that it would be fairly limited however as music is always moving forward and objects are more likely to be stationary. Then, even if you can hear the notes involved you have the problem of where one note ends and the next note begins, or are they played simultaneously, what about rests and dynamics too?

3.9.10 FINAL ASSESSMENT

Several factors militated against the achievement of very advanced skills in Musilingua by the participants.

1. One term is far too short a period for information to be absorbed.
2. One hour per week with no homework between sessions is far too little.
3. The subject was an unknown quantity, and it took time for participants to get an idea of what was involved before they could begin to make real progress.
4. The subject was not perceived to be of importance, because it was not on the syllabus, there were to be no examinations, and attendance was voluntary.
5. The value of studying Musilingua was not appreciated until the end of the course and so, although there was curiosity at the beginning, there was weak motivation till the later stages.

Only three participants (all men) reached the stage from which it would have been possible to continue. Having grasped the three-dimensional principle, the next stage would have involved wire-bending exercises and work with solids and lattices. To become proficient on this level would undoubtedly require years of practice, but the results obtained suggest that the achievement of such skills is well within the bounds of possibility.

Research into Musilingua can only continue satisfactorily if it is accepted as a subject in the aural training syllabus, and as such is taught for a period of three years. Only then can it be known whether it can fulfil its promise as a new tool for communication and for developing musicianship. However, based on the results to date, it is evident that Musilingua, presented at any stage, offers the individual a new perspective, and it is likely that it enhances general musicianship, though the research will have to be replicated on a larger scale for conclusive proof to be obtained.

3.10 AN ELECTROENCEPHALOGRAPHIC INVESTIGATION

An EEG investigation was carried out using two subjects. (Mr. Nicholas King, Vice-Director of the Royal College of Music, and Mr. David Jones, an M.Mus. student at the College). The investigation was carried out by Dr. Neil Robinson, Head of Clinical Research at Medelec Ltd. (A Vickers company) and his wife, Dr. Paulette Robinson. The research was carried out at the Surrey hospital because the computer at the Medelec laboratories was out of action. Unfortunately it has not been possible to obtain any results from the Drs. Robinson to date in spite of repeated attempts by me both by telephone and letter, and by the Head of Southampton University's School of Education Professor Christopher Brumfit. In the absence of these results, the interpretation of the events during the course of the research and the statements made by the Drs. Robinson, all of which can be verified by the subjects, have to be taken on trust until such time as the investigation can be repeated or the results can be obtained. Some of my conclusions are based on the Drs. Robinson's statements and on what I saw on the screen. Had I suspected that the results would not be obtainable, I would have taken careful notes and prepared myself to interpret the findings. As it is, all I can do is to repeat what happened and what was said, and put my trust in the Drs. Robinson's expertise.

I first made contact with the Drs. Robinson on the recommendation of the Mill Hill Medical Research Centre. I explained the concept of Musilingua, and the value of determining in which part of the brain Musilingual thinking would occur. I explained that I was curious to know whether it would be in a part of the brain associated with language, or music, or a combination of the two, or possibly in a part of the brain used for mathematics or three-dimensional thinking or some other combination. I explained that I could provide two Musilingually trained volunteers as subjects. The Drs. Robinson then proposed a date for the investigation and said that they proposed to use EEG equipment. They pointed out that, since Musilingua was an entirely new concept, getting positive results was not guaranteed, and everything would depend on where precisely in the brain Musilingual thinking would occur. The brain could be thought of as having surface and deep layers rather like an onion (Dr. Neil Robinson's explanation) and, depending on where the activity would take place, it may or may not be possible to record it. It was a risk which would have to be taken. The Drs. Robinson asked me to let them have a research proposal, and there was then some discussion as to the best method of presenting information to the subjects. I sent the following research proposal for their consideration.

2.4.3. PROPOSED RESEARCH PROJECT: MUSILINGUA

OBJECTIVES:

To determine the nature of Musilingual thinking through the location of activated brain cells in linguistic, musical, two and three-dimensional, and Musilingual thinking.

METHOD:

Present subjects with one or more stimuli in each category and record brain cell activity.

LANGUAGE

1. Present words visually
2. Present words orally

MUSIC

1. Play music
   a) Ask subjects what images it evokes.
   b) Ask subjects what emotions it arouses.

2. Play first four notes of Beethoven's fifth symphony. Ask subjects to pretend they are conducting an orchestra and continue.

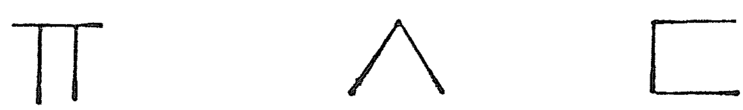
3. Memorise a succession of notes.

4. Play two bars of unknown melody. Ask subjects to improvise.

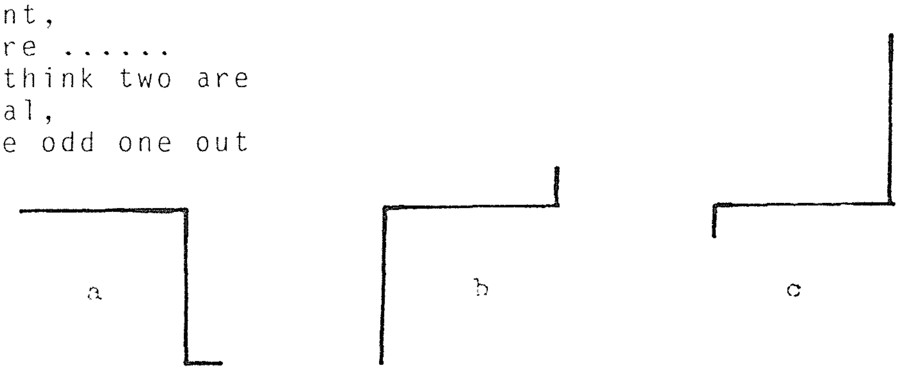
5. Show two bars of unknown melody. Ask subjects to improvise.

TWO AND THREE DIMENSIONS

1. Complete each figure with one line only



2. Are these figures identical?
If you think they are, tick here ......
If you think each is different,
tick here ......
If you think two are identical,
ring the odd one out



3. Are these figures identical?
If you think they are, tick here ......
If you think each is different,
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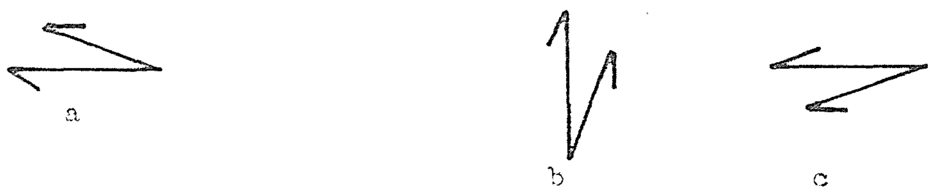
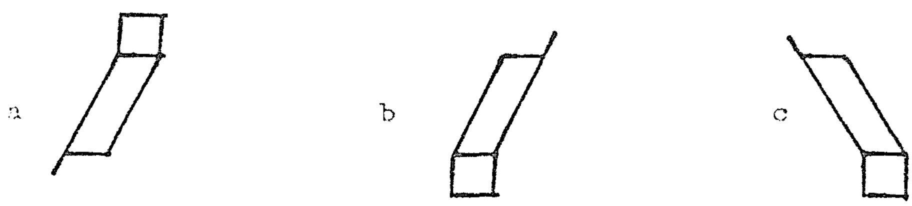
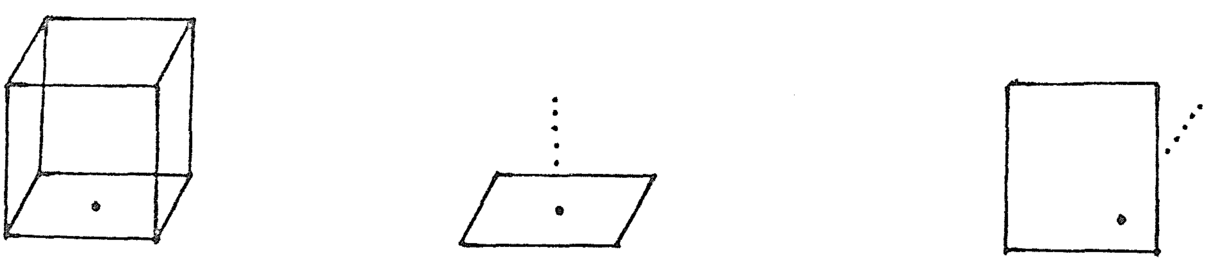


4. Are these figures identical?
If you think they are, tick here ......
If you think each is different,
tick here ......
If you think two are identical,
ring the odd one out





5.

5. Imagine you are standing on the circle in the cube. First imagine you are standing in the middle of a square, and then imagine you are standing in a corner of a square. If I were looking at you when you were standing in the corner, would I see your shoes? Yes/No. If I were looking at you when you were standing in the middle of the square, would I see them? Yes/No. Assume only one face of the cube is transparent each time.

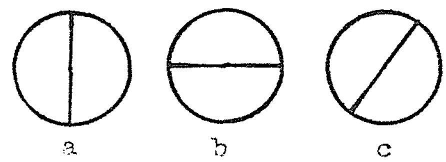
MUSILINGUA

1. Play vertical line. Ask subjects to draw it.

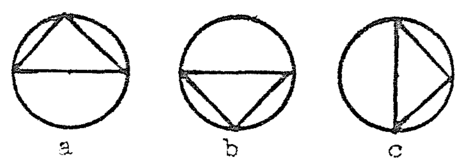
2. Play horizontal line. Ask subjects to draw it.

3. Play triangle. Ask subjects to draw it.

4. Play one. Which is it, a, b or c?



5. Play one. Which is it, a, b or c?



6. Play 'chair' while subjects are looking at three-dimensional wire model. Is is correct?

B.G. Bardi
July 1988

3.10.2. RESEARCH PROCEDURE

The first subject was Mr. David Jones. After he had been 'wired up' a section of the brain was visible in colour on a screen. He was instructed to count backward from one hundred in sevens. The area of activity in the brain was clearly visible on the screen. The subject was then asked to look at a screen on which appeared moving spirals, and was told to imagine that they were in three-dimensions. The area of activity in the brain changed. The subject was then asked to read a passage about Hodgkins disease. Again, the area of activity changed. The subject was then shown colour pictures of different kinds of capsules and asked to study them. Again the area of activity changed. The subject was then asked to listen to classical music. Again the area of activity changed, one area being extremely active. The subject was then asked to listen to pop music. There was hardly any activity. The subject was then asked to listen to Musilingua and to draw the sound he heard. The following are the notes he heard (tape 16) and his results.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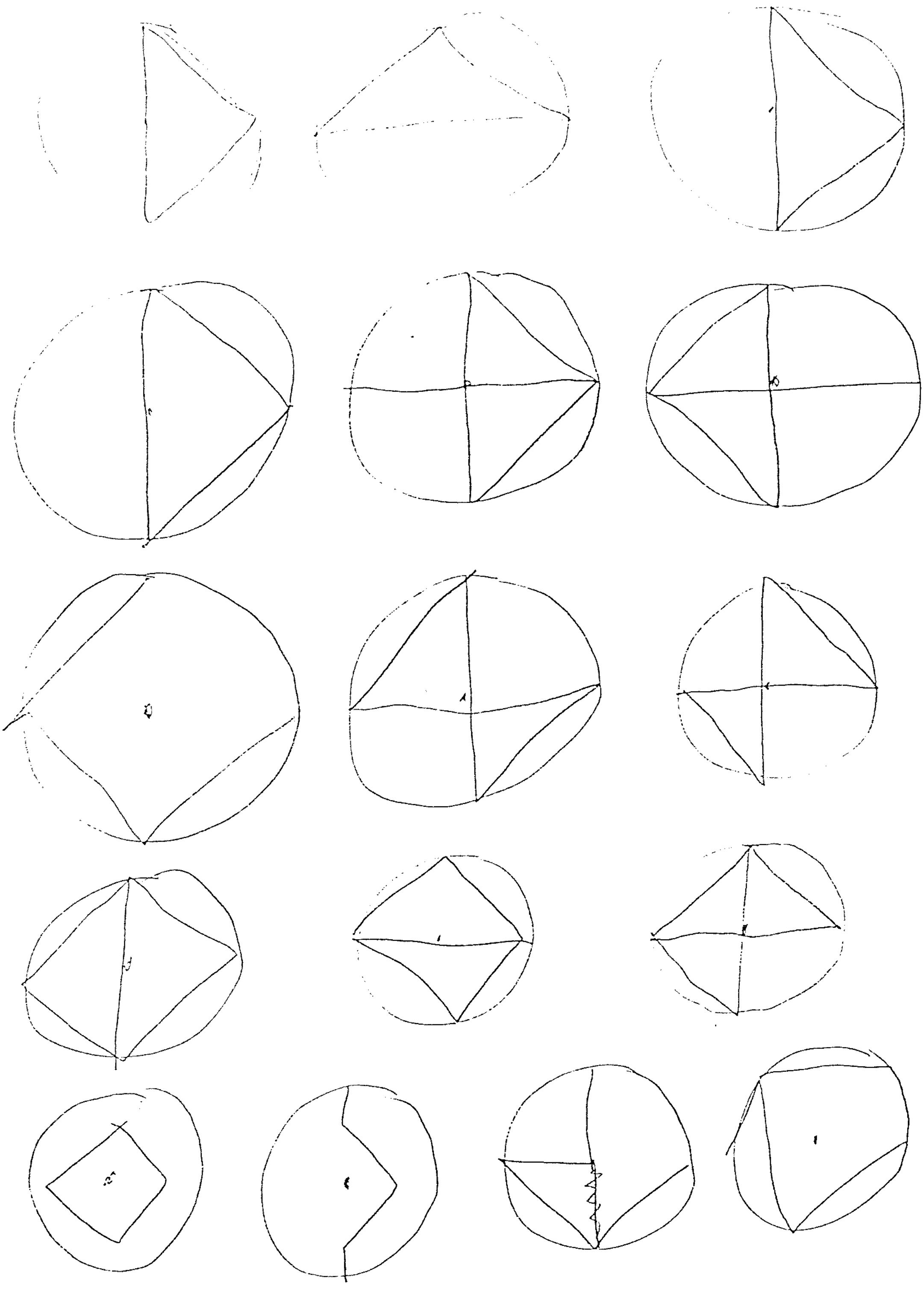
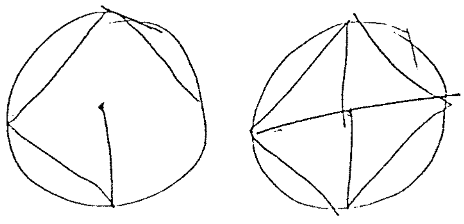
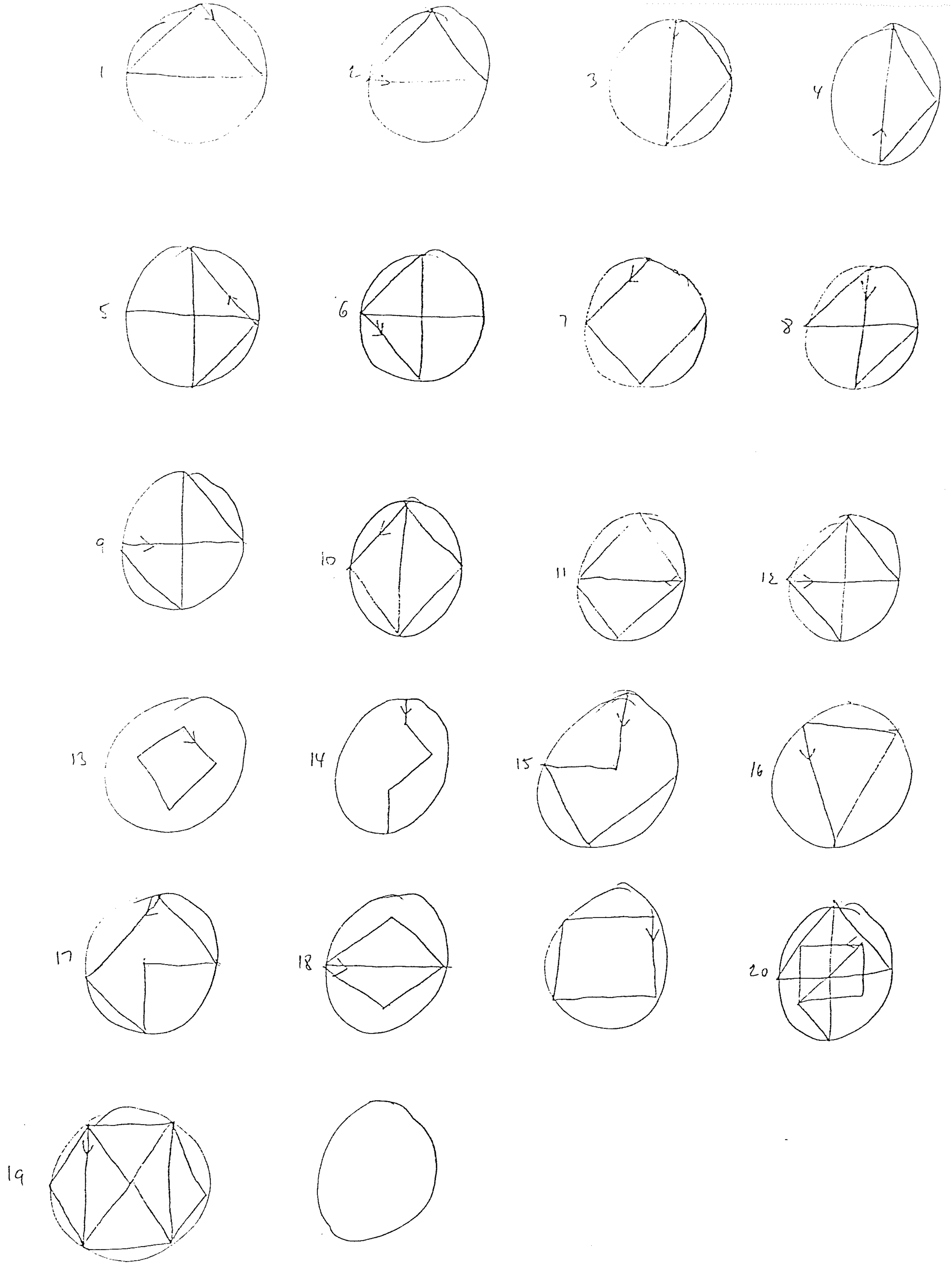
David Jones





David Asked to stop – losing concentration.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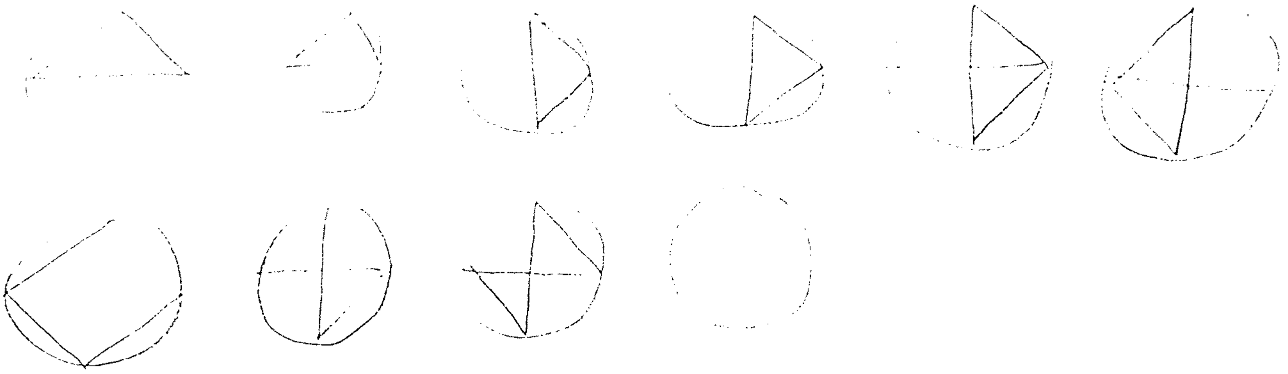


At this point an area of the brain was activated which had not been activated till then. After their initial surprise, the Drs. Robinson pointed out that there appeared to be some interference from muscular activity and it may be that which was having an effect on the change of location of the activity. The equipment was thoroughly checked, and the subject, who had been sitting with a pad on his knee, was asked to lie on a couch, relax, and just imagine he was drawing the shapes he heard. The Musilingua tape was played again, and this time the area of the brain activated was clearly seen, and it was the same as the last time. Both experimenters stated that they had never seen that part of the brain activated before. They said it ws possible that the equipment was faulty and that they would check the equipment again carefully before using it with the next subject. At this point Mr. Jones said that he would have to leave for an appointment, and I drove him to the station while Mr. King was being 'wired up'.

Upon my return I found that Mr. King had been through the first stages of the research, and the Drs. Robinson told me that the results so far had been as expected and that they were ready for the Musilingua part. The Musilingua tape was then played to Mr. King, and he was asked to draw shapes. (His results follow those of Mr. Jones). At this point there was some considerable excitement because there was clear confirmation that Musilingual thinking occured in a part of the brain which the researchers stated they had never seen activated before. This confirmed the earlier findings with Mr. David Jones. Dr. Neil Robinson said that this was a very exciting result, and that Musilingual thinking appeared to be 'a higher intellectual activity' and the 'next fascinating question is how Musilingua could be used in cases of aphasia'.

The Drs. Robinson promised to send me their report of the research within the following three weeks, but, as stated earlier, no communication has been received from them to date, and no explanation has been forthcoming. Clearly, the investigation will have to be repeated, possibly using more sophisticated equipment such as Positron Emission Tomography apparatus, but this is beyond the scope of this thesis. All that can be said now is that the results obtained appear to bode well for the future.

Some further encouraging results in support of this view come from the Japanese neurologist Tadanobu Tsunoda (1985). Resulting from his studies of how the brain processes music, Tsunoda claims that, probably because of the environmental sounds and the tonality of their language which influence the Japanese, a different part of their brain from everyone else in the world is activated when they listen to their own traditional music. (The left side of the brain). This is powerful 'circumstantial' evidence which could confirm the findings of our own Electroencephalographic investigations, and gives reason to believe that, whereas in the case of music heard there is no 'end product', in the case of Musilingua, linked as it is to thinking, the end product may be astonishing, particularly if an entirely new area of the brain is activated. Tsunoda's work is yet another illustration of the existence of tremendous dormant potential in the unplumbed depths of the brain.

3.11. MUSILINGUA: THE PREROGATIVE OF CREATIVITY EMOTIONALITY AND INTELLECTUALITY IN THE ACQUISITION OF AURAL SKILLS AND IN THE DEVELOPMENT OF MUSICIANSHIP

The argument to be put forward here is that Musilingua should form an integral part of the aural training syllabus of music students because of the unique contribution it can make in the areas of pitch discrimination leading to melodic fluency and harmonic facility, and in the grasping of form and structure leading to an intellectual appreciation of music resulting in keener musical appreciation and enhanced musicianship. Further, in the more advanced stages of Musilingual study abilities are developed which form the basis for the transformation of pitch sequences from mere melodic patterns to meaningful entities thus elevating music from a primitive to a highly sophisticated means of communication.

The aim of musical training is two-fold. Firstly, it is to inculcate in the individual an appreciation and enjoyment of music based on knowledge and facility in musical skills and this is entirely subjective and does not lend itself to measurement and testing, and secondly, it is to equip the individual to externalize his musical ability creatively through composition, singing or the playing of an instrument - and this can be effectively tested and evaluated. Our concern is with the latter area, and the question to be asked is - what precisely can be tested in the area of aural skills, and how can such testing give an accurate indication of the level of proficiency reached? The following is an analysis which isolates the aural skills needed by musicians and demonstrates the means used for testing. It is important to remember that there is a close link between the methods of training and the nature of testing, and that in some tests impression marking plays an important role.

Aural skills fall into three broad categories. 1) Pitch 2) Rhythm 3) Combinatory. Memory is the overriding factor which is essential for the reconstruction of past events and for the projection of future events. It encompasses the ability to bring to mind and if necessary reproduce a single note or a melody or a chord or harmonic progressions including counterpoint, form and structure and enables the imagining of any of the foregoing in new combinations. Indeed, the range of skills required by the musician parallels in many respects those required by language speakers. The past, present and future play a prominent role in consciousnes, but in the absence of memory, appreciation of the present only would cause total disorientation. Memory is specific to language and to music so that it is possible to have total amnesia in language but excellent memory in music, as is evidenced by the case of Clive Wearing whose plight prompted the founding of the Amnesia Society. (Equinox: The Prisoner of Consciousness. Channel 4, 14/8/86, presented by Jonathan Miller).

Testing is designed to enable individuals to demonstrate their abilities to

1. Recognize the pitch of single notes sounded singly.

2. Recognize the pitch of single notes sounded as part of a chord.

3. Memorize a succession of notes or melody sounded on its own.

4. Memorize more than one melody sounded within harmonic progressions.

5. Recognize intervals between notes sounded consecutively or simultaneously.

6. Memorize chord progressions.

7. Distinguish and memorize rhythmic patterns produced as monotones or in conjunction with melodic or harmonic progressions.

8. Recognize styles of music and compose original music in different styles.

In testing most responses are elicited using stratagems based on the requirement that something has to be heard before a response can be given in writing or otherwise. It should be borne in mind that the major-minor tonal system

forms the basis of aural training in most Western Music Academies, and that tests are accordingly oriented largely towards this system. An examination of an aural training syllabus (King, 1988) illustrates the preceding. (Appendix 3). The tests are graded from I to V and have a practical and a written part.
In the practical part, candidates are required to

1. Sing at sight a melody
2. Identify intervals
3. Identify errors
4. Recognize modulations
5. Sing a note sounded as part of a chord
6. Identify instruments in an ensemble
7. Improvise
8. Evaluate and compare performances

In the written part, candidates are required to

1. Reproduce a melody
2. Reproduce a rhythmic passage
3. Reproduce a progression of chords
4. Reproduce two-part phrases
5. Improvise answering phrases
6. Reproduce four part harmony
7. Reproduce three-part contrapuntal passages

3.11.1. CREATIVITY

It is evident that in the process of being tested the testee is not required to display any creativity in the early stages, and very little in the later stages. Aural skills are perceived to consist mainly of the ability to recognize and repeat notes, intervals and rhythms. What is true of the testing procedure naturally applies equally to the training procedure. It consists essentially of training in sound recognition and mimicry. In order to be able to perform in this area, a point of reference is needed, and this could be either the visualization of notes on an instrument (e.g. the 'seeing' of intervals on a keyboard, or 'feeling' notes on the fingerboard of a violin) or the relating of notes to the tonic sol-fa system. In either case, the points of reference contribute nothing to the musical growth of the individual, and act merely as crutches in a low-level exercise.

This situation can be represented diagramatically.

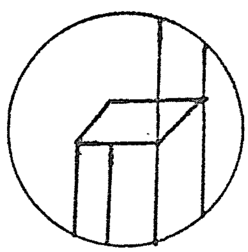
Notes heard → Point of reference (e.g. visualization on keyboard) → Notes repeated or interval named

No creative process is involved, there is no new end product, and it is a closed system.

Since Musilingua relates to the 'private sphere', the point of reference, instead of being a crutch, becomes central in the process of creativity which leads to sense, meaning and understanding. This sequence operates from the very earliest stages, and it is an open system.

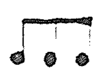
This situation can be represented diagramatically.

Notes heard → Point of reference (Cradle for true 3-dimensional configurations) → Meaning → Understanding



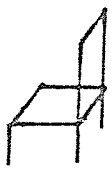
When the eye is used instead of the ear as a starting point, the situation can be represented thus.

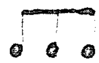
Notes seen → Notes reproduced on an instrument or sung. No creativity. No sense. No end product. Closed system.



And in Musilingua

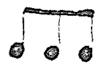
No notes seen → Object musilingualized. Creativity. Sense leading to understanding. End product. Open system.

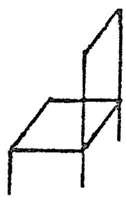




or

Notes seen →





Musilingua not only offers a revolutionary method for the individual to acquire musical skills at the same time as developing his musical psyche, but also enables hitherto impossible methods of testing to be used. For example, Musilinguists can respond to the instruction 'play the chair' by producing notes without having heard any, or they can be asked to name an object by listening to its 'signature'. The cycle of recognition/repetition is absent. For the testee, responses are creative from the very earliest stages, and it is possible to measure advanced abilities without the subjective judgement of the tester interfering at any stage of the process, thus rendering the tests perfectly valid.

3.11.2. EMOTIONALITY

Emotion is related to the curiosity-fear continuum. An uncertainty has to be investigated or a question must have an answer in order to restore equilibrium - there must be a resolution to an unfinished episode - and before the end of this process there is tension. It is this element of constant surprise and anticipation both of the surprise and the resolution of uncertainties which injects interest into life, and this is true of music which, however, has at its disposal only the world of sound as a tool for creating tension. This is achieved by the use of suspension, the creation of dissonance, surprise modulations, unfinished phrases, unexpected silences, syncopated and irregular rhythms and various combinations of the foregoing, all of which cause a temporary imbalance which, if not corrected before the end of the piece, may leave the listener frustrated or in an excitable state. All this is applicable particularly to a complete composition, but, for example, a cadence sounded on its own may have a similar effect albeit on a reduced scale.

In the course of aural training there is very little emotion involved, the exercise being mainly an 'ear' exercise, and hence the process becomes isolated from the concept of 'music', in which emotion plays a major role, and so the budding musician, in the course of his aural training, instead of having the opportunity to develop his emotional capabilities in music, develops mainly his ear, making the exercise boring because of its limitation in the short term, and limiting for the long term. There are other ramifications. Associating music with boredom even for the briefest of periods is undesirable.

In Musilingua it is impossible to create tension artificially, because the balance of the music does not relate to meaningless sound, as in music, but to meaningful matter in the physical universe. Relating sound to matter and matter to sound is an enriching experience which is sustained through time by emotional involvement which can not exist unless there is total concentration. Emotion arises from the very intimate contact with the universe of matter through sound, and although the 'ear' is needed, the study experience is not fragmented but is part of a complete and natural process of growth and development. The student benefits both in the short term and in the long term, and aural training becomes pleasurable and never boring from the very earliest stages.

3.11.3. INTELLECTUALITY

You can not have half a sign. We accept what we see as a whole until there is the realization that what we see is only a part of the whole. We then fit all the available information together to make a whole and then a new whole and so on. Gestalt psychologists have pointed out that the whole is greater than the sum of its parts, so that in many ways the whole determines the nature of the parts instead of the other way around. A melody transposed remains essentially the same, even though each individual note has a different pitch. The 'soul' of the melody arises from relational properties and does not reside in individual notes. In the build-up leading to the whole there are a series of 'holding operations' and constant modification occurs as expectation is transformed into certainty. If three notes are sounded, and then no more, they are accepted as the whole. But if these notes are followed by more notes, the modification is continuously carried on, the nature of the whole being in a constant state of flux so long as new information (notes) is fed into the experience of perception. If there is pre-knowledge of the approximate nature of the whole, there is constant expectation for it to be fulfilled, but if only a part of the imagined whole is presented in total isolation from all other parts, this is intellectually limiting and frustrating. Yet this is precisely the situation in the conventional aural training procedure. Chords and short melodic lines are presented without giving the individual the opportunity to hear them in the context of their true existence, and this develops an attitude to music which is limiting because it is based on 'ear' training dealing with isolated fragments. Once this attitude has been inculcated, a great and difficult leap is required to reach the level at which the whole can be appreciated as the entity that it is.

Musilingua, by its very nature, can deal only with the whole, for any configuration is a whole. Aural training in Musilingua therefore encourages the perception of the whole at every level. It is only a small step from imagining a 'small whole' to imagining a 'large whole', but the nature of the training is vital for the development of an intellectual appreciation of music. We know that a house is a house whether we stand in close proximity to it or whether it is on the horizon. It is as though we have a powerful zoom lens, and as we manipulate it, more and more enters our field of vision; and though the house becomes smaller, we see it as the same house albeit in relation to something previously unseen. Throughout the process of manipulation of the lens we constantly have the whole picture. What we never did was to concentrate on one of the tiles on the roof to the exclusion of all else. Yet this is what is almost done in 'ear' training, for it may be argued that the zoom lens operates also for sound. As more and more notes are added, the 'whole' is built up until the maximum power of the lens is reached. We have strong evidence that this is so from Mozart, who was able to hear the whole composition 'all at once', and then, in the process of composition, zoom in to individual notes and harmonies always retaining the whole structure in mind exemplifying the Gestalt idea of the whole influencing the nature of the parts. Schumann believed that only when the form is quite clear will the spirit become clear.

This argument suggests that aural training through Musilingua will encourage the development and growth of an intellectual appreciation of music which may not occur naturally in individuals. Musilingua may, through training, make the facility of genius available to lesser mortals.

3.11.4. INDEPENDENT MUSICAL IMAGING

To hold in the mind large tracts of sound is only possible if the creation of this inner world is not hampered by a clumsy and inefficient method of locating, memorizing and allocating each note its correct position in the overall scheme. By definition, a musician is a person skilled in the performing or composing of music, and with the possible exception of singers, a musician plays at least one instrument. When listening to or imagining music, reference is often made to the instrument as a means of helping to establish pitch. Indeed, if asked to reproduce a melody by singing, a musician may well imagine himself playing the melody on his instrument even to the extent that the muscular movements needed to play the melody are activated partially. When listening, a musician may involuntarily be 'playing' a melodic line on his instrument or 'feeling' the chord in his fingers. This use of the instrument as an aid to the location of pitch and the reproduction of music without actually playing is a debilitating factor in the process of the mental structuring and holding of sound.

It is, of course, hardly surprising that this happens, in view of the many hours of practice needed to become proficient on an instrument during which this process is constantly reinforced. However, ideally, in order to achieve the maximum power for inner imagination and structuring, the physical/mechanical tie to the instrument must be severed totally, and the creation of the 'mental notes' should relate directly to the cochlea and not pass through an intermedium. In cases where musicians find pitch by relating notes to the tonic sol-fa system, whether they have perfect pitch or not, there is no escape from the major-minor system which offers security and an anchorage point in a turbulent sea of notes. Again, a limiting factor which acts to restrict possible achievement.

Training in aural skills should aim to free musicians from these bonds and enable them to image independently of 'aids'. Yet, surprisingly, conventional aural training methods encourage and reinforce these habits. Frequently notes can only be known if they are named, or 'seen' on the keyboard or 'felt' in relation to an instrument. It is entirely possible that a musician, upon hearing a melody, will 'see' the notes on a stave and at the same time think C E G E, or that notes will be recognized by relating them to a certain key. In the course of training and in tests the naming of notes is a frequent requirement. This dependence, far from being encouraged in the course of aural training, should be totally obliterated, and the independence achieved will enable high levels of musicianship to be attained. Strange as it might seem therefore, conventional aural training methods may actually serve to hamper the achievement of true potential in musicianship.

Musilingua, by using the 'private sphere' and relating pitch to spatial dimension only and not to an instrument or a key or to names of notes, cuts out the debilitating stages and offers total independence in sound imaging from the early stages leading to the ability to grasp, hold and manipulate vast volumes of sound. Relating sound to spatial dimension is a very different matter than relating it to some extraneous factor, and the cochlea, which is itself a three-dimensional structure with perhaps 20 000 'keys' or sensory cells arranged along a membrane that coils round itself two and a half times, has a much closer affinity to the 'private sphere' than any known instrument. The cochlea may be termed the 'private instrument', and it is a miracle of miniaturization very far superior to anything man has produced or is ever likely to produce.

Where there is a direct link between the perception and the imaging of sound the energy loss in the process is minimal and the saving in time is tremendous, and it is mainly these two factors which act initially to enable greater achievement. Musilingual thinking effectively frees the mind from entanglements and allows it to soar. The effect of enhanced thinking on performance is inestimable, and this applies equally to instrumentalists and singers.

Through detachment from extraneous and rigid reference points in the imaging of sound a sensation can be achieved which is akin to the one described in relation to language early in this thesis. Where there is detachment from speech 'you know without knowing how you know', and in this case 'you hear without knowing how you hear'. It is in this realm of advanced musical thinking, in which the emotional and intellectual elements are in perfect balance and harmony that the highest achievement of human capability is reached.

Finally, it is important that the preceding proposal be seen in true perspective. It is no more than one practical spin-off fortuitously arrived at along the route of investigation motivated by the theory of Musilingua, which is itself not necessarily directed at the solution of practical problems.

3.12. CONCLUSIONS

The present research has brought us to the brink of investigations into simultaneity as it relates to Musilingua, and has made thinking about developmental aspects possible, since a more advanced stage of presentation of sound information is concerned with simultaneity rather than successivity enabling the structuring of configurations instantaneously upon hearing a chord made up of notes of different timbres.

Concern with the concepts of simultaneity and successivity can be found in Einstein's work (1913). He takes great care to define simultaneity.

> We must take into consideration that all our judgements, in which time plays a role, are always judgements about simultaneous happenings. (1913, p.28)

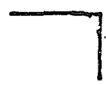
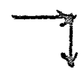
The physical world is simultaneously available to consciousness through the functioning of the senses, but simultaneity cannot be understood unless there is an understanding of successivity, and this is impossible without memory. Absolute simultaneity is never literally possible. 'We should not apply to the concept of simultaneity any absolute quality'. (Einstein 1913, p.32)

In the early stages of musilingua, if notes are presented very slowly, memory plays a relatively minor role, and time a relatively major role. The faster the notes are presented successively, the greater will be the role of memory, and the less important will be the role of time. If notes are presented simultaneously (i.e. in chords) the role of time becomes relatively even less significant from a subjective point of view, but if memory does not function there can be no outcome, for the configuration, even if formed instantaneously, can not continue to exist. It is, however, important to remember in this context, that memory can be specific to, for example, music, or language or a succession of events.

In the early stages of musilingual thinking we are concerned with the reaction of an individual to the 'physical' world created in his mind through sound, and it is not till much later when more advanced stages are reached that considerations of simultaneity and successivity begin to play a role. We should note that what actually happens must happen in the present, and that one part of the mind, i.e. memory, may be thought of as a 'time recording machine', recording a multitude of simultaneous events in the order in which they happened, this only enabling time to become meaningful subjectively.

It may be well to assess the stage we have reached in musilingua from which, hopefully, further progress could be made in future. How, then, does a musilinguist's reaction to the outer world differ from a linguist's? If an object is named, say 'chair', the linguist has a mental picture of a chair based on his idea of the function of a chair and his experience of 'chairs'. He may react to it with some measure of emotion if at some time in the past he has had a pleasant or an unpleasant experience relating to chairs or if certain feelings relating to 'chairs' were aroused.

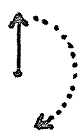
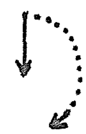
The musilinguist's reaction would be totally different. If a line is drawn thus the observer has no idea whether it was drawn from left to right, or from right to left. However, dictated musilingually, the observer will have this information. The observer can imagine the direction of the 'force' flowing along the line. The observer will have an emotional reaction to the line because the force is dissipated when the line stops and appears to be evenly distributed in the space around the end of the line. The line has come 'alive' and stays alive for as long as it is imagined musilingually, and in this case there is a feeling of doubt and anticipation. This feeling will vary somewhat depending on the length of the line (which relates to the magnitude of the force reaching its end), and the spatial orientation of the line (which will relate to the direction of flow of the force and the point of its dissipation in relation to the musilinguist).

If two lines are drawn thus  the linguist sees an angle, and his emotional reaction to it is weak. In musilingua these lines can be presented either thus  in which case there is a feeling of doubt or indecisiveness because of the pattern of the dissipation of forces flowing along the lines and this is a continuous process so long as they are imagined, or thus  in which case there is a feeling of togetherness and cooperation, the joint dissipation of the forces moving unitedly in new direction, or thus  in which case there is a feeling of aggression or anger and unrest as the flows of forces along the lines collide creating an 'explosion', or thus  in which case there is a feeling of purposelessness, coolness and distance as the forces are dissipated separately into space.

In each case where lines of force meet head-on or at an angle or where they flow in the same direction and unite at one point there is a unique intensity and density in the resultant force distribution. The slightest variation in angle and difference in force of flow (dependent on the length and spatial orientation of a line) will significantly affect the final distribution of force, and it is the nature of these 'force patterns' which occur at the points of meeting taken in toto (i.e. in the complete configuration) which determine the nature of the emotional reaction to it.

Thus, a musilingually structured configuration can be described as consisting of 'lines of force' which create 'force patterns' whose nature depends upon the relationship of the lines to each other, the whole 'pulsating' configuration enabling close emotional contact with itself, bearing in mind that this does not apply only to the outer configuration but also to its internal (i.e. invisible and unpalpable) structure in true three dimensions. It is possible, therefore, for example, to create the configuration of a chair musilingually which, because of the direction of the flow of energy along the various lines or arcs will either be a 'calm' chair, or an 'angry' chair, or a 'friendly' chair, or a 'threatening' chair. By changing the directions of the flow of energies in the same configuration, the emotional reaction to it is therefore also changed. The chair is 'alive' with energy throughout, sustaining a continuous emotional reaction to it. Such emotional reaction to objects enables a prediction to be made as to how colour can be musilingually expressed and experienced, and illustrates that colour does not have to form a separate part of the musilingual code but can be integral with the totality of perception. Naturally, this process can be taken further where there are several configurations in relative movement to each other possibly continuously changing their own configuration or 'emotional signature'.

It is at this point that considerations of rotational forces plays a role, since the energy balance within and about rotating configurations will be affected by such movement. In its simplest form, if a line ← is rotated thus

 or thus  or thus 

or in an anti-clockwise direction, it is clear that the 'energy pattern' along and at the end of the line will be different in each case, depending also on its precise spatial alignment relative to the musilinguist. If an entire configuration with all its active forces were rotated, it would be possible to sense the immense range of variations in the force fields created by the rotating 'energy patterns'. The object will emit sound-energy patterns to which the musilinguist can relate on the physical, emotional and intellectual levels. In this connection, we have discussed earlier the mental rotation of objects (p.120) and abilities in the visio-spatial field (pp. 169, 180, 287)

This stage in thinking could not have been reached had the simultaneous presentation of notes not been considered and tried, for it is very difficult to hold whole configurations in mind if notes are presented successively and fairly slowly. Although we are in the very early stages of this investigation, we know that possibilities for investigating musilingua from a developmental aspect are feasible.

Bearing in mind that to date only musically highly literate adults with a short history of musilingual training have been the subjects, future research could be based on longitudinal studies beginning with very young children. Apart from the study of the stages of development of musilingual abilities per se, such developmental stages should be investigated in relation to theories of cognitive development, for example to Piaget's sensorimotor, preoperational, concrete and formal stages of cognition.

The EEG results (p.288) appear to indicate that musilingual thinking occurs in an apparently hitherto unused part of the brain. This requires confirmation. McLuhan (1962), asks: 'Does the interiorization of media such as 'letters' alter the ratio among our senses and change mental processes?' (p.24). Later in 1967, he is concerned with the relationship between the world of acoustic and auditory space and visual Western man. He says

> Years ago when I was working with Carpenter on anthropological matters, I used acoustic and auditory space frequently as a basic counterploy to visual Western man. I gave it up because I found that the literary people made desperate attempts to visualize auditory space. But you cannot visualize auditory space, that is: a total field of simultaneous relations, without center or margin. (p.275)

In musilingual thinking there appears to be a new relationship between what McLuhan has called the 'auditory man', and the 'visual man', and since the visual part of the 'new visual man' or 'musilingual man' is not concerned with the linearity of printed material as are the 'literary people' but rather with the cohesiveness of the 4-dimensional world, and the 'auditory' part of 'musilingual man' is not concerned with language but with pure sound, the balance between the senses with which McLuhan is concerned, that is, the 'hot sound' in relation to other sensory experience finds new levels. Musilingua removes successivity from both sound and vision affording simultaneity in both, both being inextricably bound together, the only successive element in the picture being the passage of time which elapses while the configurations are sustained and manipulated in the mind. Subjectively, in this situation, time plays a minor role since it does not intrude into consciousness whilst thought is in progress, and this is as near as it is possible to arrive at true simultaneity, for, in the absence of time, configuration would collapse.

It appears, then, that Musilingua could have a role to play in enhancing musical thinking and in the development of general musicianship. It would undoubtedly be of value to experiment further with Musilingua in the syllabus of music students, and, since musical literacy has been recognised by the government as being 'a prerequisite for a well educated member of society' (Mrs. Rumbold, Education Minister, 16/5/89) and music is to be included as a compulsory subject in the national curriculum, this could ultimately have implications for the school curriculum. In particular, simple Musilingual exercises in the form of games could be incorporated into kindergarten activities.

The implications of this proposal relating to the provision of courses in Musilingua for the training of specialist teachers are self-evident. Such courses could be offered both in colleges of music and in teacher-training colleges.

The research has produced evidence, albeit tentative, that the metamorphosis from pitch to configuration rather than from pitch to instrument or pure pitch exchange is tantamount to a release from some physical aspects of musical activity. The imaging of acoustically constituted configurations appears to be an experience totally unlike any known in the realms of musical thinking. Music is heavily dependent upon physical sensation for the arousal of emotion, and the more primitive the music the more this holds true. But Musilingua appears to elevate music from the physical to the cerebral affording independence from the external physical world through the creation of an internal one in true three dimensions, and it is the process and the result which arouse emotion linked to understanding.

It is therefore arguable that there will be an equivalent situation in the realm of 'linguistic' thinking where the equation $C = {}^{P}1 + {}^{P}2 + \ldots {}^{P}X$ (C= configuration and P= pitch) as in Musilingua would apply, rather than C = S (where C= configuration and S= sound-label) as is applicable in language. In the equation $C = {}^{P}1 + {}^{P}2 + \ldots {}^{P}X$ time is a major factor in building and bonding images, yet in C = S the role of time is comparatively minimal. The mental tie to time in Musilingual thinking, which manifests itself as the requirement for total concentration throughout the thought process holding together pitch and configuration appears to be one of the main factors giving Musilingua its power. This raises the question as to what equivalence, if any, there is between 'linguistic' and Musilingual consciousness, and in this context one area above all is of special interest.

The fascinating question arising from the preliminary research described in this thesis is concerned with the understanding of the state of mind of advanced Musilingual thinkers, and in particular with how abstract ideas will be dealt with on this level. Conventionally, to reach the abstract it is necessary to have a link with the concrete, and this is nowhere better illustrated than in the Chinese language with its ideograms, in which, for example, a woman  and a child  placed side by side  mean 'good' or 'love'. This relationship between the visible and the invisible is yet another illustration of an age-old preoccupation which arises only on the higher levels of thinking. A chimpanzee can learn to recognize a limited number of symbols, and the matter stops there. The creative opposite is found in the proposition in the Koran that horses were created by Allah out of the south-west wind. Such an act of creation - from the invisible to the visible - is a reversal of the act of abstract thinking which entails movement from the concrete to the abstract and which is achievable only on higher levels of thought.

The contrast between the state of consciousness of a chimpanzee and that of Homo sapiens illustrates how difficult it is to evaluate the nature of another consciousness when one is totally encapsulated in one's own, and the question 'how does one express abstract ideas Musilingually?' looms large.

This question has its roots in the immediate and compelling need to relate the unknown to the known i.e. Musilingua to language, and therein lies the answer. Musilingua can not be related to language. It is impossible to have a Musilingual dictionary and words can not be used to explain words. Emotion and abstract ideas are expressed in Musilingua in totally different ways to those in language. A single word label is not used to encapsulate an idea or emotion. Reference is thus not made to an idea or emotion through the use of a label, but the emotion or idea is felt as an integral part of present experience. Memory and extrapolation act to enrich the experience, but its power lies in its life in the present, in the process of its unfolding through time. It is the totality of the event which creates the emotion or the abstract idea in which the mind is totally engrossed, and not a mere sound or written reference to existence. It is impossible in Musilingua to refer to existence, only to be integral with it in the journey through time. When a word is said,there is an instantaneous creation of an image, but in Musilingua the image is continuously being built up, so that the process of creation in which the invisible (sound) brings forth the visible (configuration) requires total intellectual and emotional involvement for as long as its power is extant. This is not to say that the process will require a great deal of time. Relatively speaking it may be instantaneous resulting in instantaneous outcomes albeit on different levels to those achievable through language. But if time is totally removed from the equation, configuration collapses absolutely for dimension is sustained by the energy of time. The past, the present and the future are fused into a 'super present'.

The expression of an abstract concept Musilingually is therefore not likely to be uniform as would be the case in language in which rigid word-labels are used, but rather there will be variation through a range of shades depending even on such diverse factors as the mood and personality of the thinker. Equally, the interpretation of the message will depend on a number of factors constituting the receiver's state. An effective outcome of abstract thinking on such high levels may be said to be the occurence of the event rather than the result of the occurence of the event which alone is subject to observation and measurement. Of course, it could be argued that unless abstract thinking can be concretized it is of no value. A nebulous idea is of no value to a scientist. But if such an idea is regarded as an envelope or shell for a parcel of thoughts, each having a high degree of specificity, the picture changes. The abstract idea, nebulous when regarded in isolation from the elements constituting it, becomes the entity within which thrives a colony of distinct determinate particles. Seen in this way, far from being useless to the scientist, it may enable thought to proceed on higher levels than would otherwise be possible. Thus, the nature of Musilingual thinking, or thinking in wordless realms can only be understood if it is considered in isolation from linguistic abstract thinking.

Most importantly, the achievement of a Musilingual state of mind will mean total divorce from the present real world, in which there is constant concern with detail and seeking answers to questions, and in which finding answers and solving problems is equated with success. Admittedly, a level of such success is essential for survival. But, whereas this success is of prime importance in our lives, it is nevertheless an extremely primitive preoccupation which does not enter directly into higher states of consciousness which may be sustained by the details of reality but into which these details do not intrude. On such levels of consciousness there are no outcomes and no time considerations. Subjective timelessness and the constant regeneration of the state of the universe in the 'super present' afford total harmony in the monadic mind-matter relationship. 'People like us, who believe in physics, know that the distinction between past, present and future is only a stubbornly persistent illusion.' (Einstein 1955, in Dyson 1979, p.193) The creative act of mentally structuring, holding and manipulating true three-dimensional sound-based configurations in the 'super present' is a beautiful and unique subjective experience, quite unlike that arising from listening to the essentially one-dimensional linearity of conventional music.

It is quite impossible to predict, at this stage, what the effect of Musilingual thinking will be upon the educative process in general, and how, more specifically, true 4-dimensional thinking will affect memory, learning, powers of extrapolation, originality and imagination. However, the present research <u>has</u> revealed that Musilingual thinking has beneficial effects upon concentration, 3-dimensional visualization and memory, and learning. Further research in these areas is likely to prove most fruitful, but it is beyond the scope of this thesis. One of the main factors militating against such research being undertaken immediately is that participating subjects would have to be proficient Musiliguists and some considerable time will be needed for the training of such subjects.

However, as has already been demonstrated, some benefits resulting from Musilingual competence manifest themselves during the very process of training so that even elementary students of Musilingua may profit from its study. On such elementary levels Musilingua could have a role to play in non-speech communication for mentally-handicapped people. At present, manual signing and signing systems and symbols and symbol systems are tied in some way to language and may have as their basis graphic symbols or two-dimensional cutout shapes which are related to meanings and ideas. But even the more sophisticated symbol systems such as Blissymbolics remain tied to language and linguistic thinking and all that this entails, and this is hardly surprising because they originated from the seminal idea of attaining a 'universal language'.

Musilingua, if it is developed further, through enabling the imaging of the universe in true three dimensions totally independently of language and the shackles of grammar has the potential to offer a new communication system for the mentally handicapped. Indeed, since in Musilingua sound is directly related to dimension and configuration, mere training in Musilingua could produce a whole host of unexpected and beneficial outcomes.

For example one of the most startling remarks made by a blind man in the course of this research was:- 'Yes, I can visualize that clearly'. In order to function effectively the blind have to construct a scalar model of the world based mainly on tactile information. However, it is frequently impossible to make physical contact with every part of an object, for example if it is too large, and so its outer configuration may not be known and there may be no information about its internal structure and contents. Dearth of information can be a serious handicap.

Musilingua enables the precise description in true three dimensions of the outer configuration and internal structure of an object regardless of its size and without the necessity for physical contact. As architects of their own world blind people may have in Musilingua a most powerful tool for enhancing their thinking and quality of life. Indeed, in some respects they may cease to be disadvantaged at all. Blind Musilinguists would afford the opportunity to evaluate Musilingua from a new standpoint.

Finally, it must be stated that even if this thesis will have done no more than provoke thought about possible new avenues for further research, it will have served some useful purpose.

3.13 PROJECTED FUTURE RESEARCH

It will be clear that the work reported in this thesis can only be a beginning. Future research is expected to be in four phases.

Phase 1

The study of advanced Musilingual ability when there is simultaneous presentation of two or three notes of different pitch and timbre enabling the instantaneous location of a point in space, and not consecutive presentation of notes of different pitch but the same timbre as hitherto, (the former being harmonic as opposed to melodic presentation) leading to a position where sound emanating from the entire audible gamut enables the simultaneous presentation of one or more complete acoustically constituted configurations and the sustaining of complex resonating structures through time or changing fractions or whole structures instantaneously.

Phase 2

The study of the ability of young children to deal with dimension, volume and movement in relation to sound in non-speech non-language situations.

Phase 3

A repetition of work carried out at the Royal College of Music with school children of different ages and at various levels of musical training.

Phase 4

The introduction of musilingua into the syllabus of music students.

NEW RESEARCH

If research in this direction proves positive, the study of 'force patterns' relating to musilingually structured configurations and the relation between the musilingual description of the universe and the basis of the balance in music could be investigated further.

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APPENDIX 1

SUMMER INSTITUTE OF LINGUISTICS, INC.

October 30, 1985

B.G. Bardi
61 Lyndhurst Gardens
Church End, Finchley
London, England N3 1TA

Dear Mr. Bardi:

Your letter of Oct. 20th received with payment for the materials requested. Enclosed are two cassettes: one with Mazateco and Tepehua examples, the other with Amuzgo examples. Enclosed also find the written key to the Amuzgo cassette. The Mazateco and Tepehua are the data described in the articles you already have access to.

Yes, you may use parts of the tapes to illustrate your thesis. Acknowledgment should read somewhat as follows: "From personal field recordings of George M. Cowan of the Summer Institute of Linguistics. Used with his permission."

Yours sincerely,

George M. Cowan

George M. Cowan

f

P.S. I will be very interested to receive information on your research and copies of anything involving this data.

HUNTINGTON BEACH, CA 92647 / (714) 536-9346 / TELEX: LINGUISTA HTBH 678-306

George M. Cowan   Mazateco Whistle Speech   (Presented in part at the summer meeting of the Linguistic Sic.je Society of America, 1 August 1947 , at Ann Arbor, Michigan)

13. TEXTS. Each text is numbered as a separate paragraph. Within each paragraph, the letters A and B represent two different speakers. The successive utterances of each speaker are numbered A1, A2, etc., or B1, B2, etc.

The whistled utterances are cited between square brackets. Tones are represented by numerals from 1 (high) to 4 (low). Individual punches or syllables of whistle are separated by a comma; a medial pause is indicated by a semicolon. A glide from one tone to another is marked with a dash (3–1, 1–3, 2–4, 3–4, etc.). A glide or whistled syllable that is long in duration is marked by a following colon.

1. [3–1, 3–1, 3–1] (call to burro or mule; no spoken equivalent).

2. [1, 3, 1, 3, 1, 3] (call to dog; no spoken equivalent).

3. [1–3:] *hme*^{1}-*ni*^{3} 'What?'

4. [4, 2–4, 3–4] *ha*^{4}-*vi*$^{2-4}$-*ri*$^{3-4}$ 'Come here, friend!'

5. A: [1–4:, 2, 3, 3, 3, 3–4] *hme*^{1} *kʔoa*^{4}-*sʔį*^{2} *khi*^{3}-*ma*^{3}-*ni*^{3} *nthao*$^{3-4}$ 'What is there such a wind for?' B: [1, 4, 4] *hę́i*^{1}-*la*^{4} *kʔoa*^{4} 'It will probably rain.'

6. A: [1, 2, 4, 3] *hña*^{1} *khoa*^{2}*ʔai*^{4}-*ni*^{3} 'Where are you coming from?' B: [3, 2, 2, 4, 3] *ni*^{3}*ʔya*^{2} *khoa*^{2}*ʔai*^{4}-*nia*^{3} 'I am coming from Huautla.'

7. A1: [1, 3, 3, 4] *hña*^{1} *ti*^{3}-*ʔmi*^{3} *ntʔai*^{4} 'Where are you going now?' B1: [4, 2, 3, 4] *i*^{4} *ti*^{2}-*vhia*^{3}-*vi*^{4} 'I am going here.' A2: [3, 2, 2, 3] *ni*^{3}*ʔya*^{2} *ti*^{2}-*vhia*^{3} 'I am going to Huautla.' B2: [1, 3, 2, 4, 3, 4] *ho*^{1} *čǫ*^{3} *khoa*^{2}*ʔai*^{4}-*ni*^{3} *sʔai*^{4} 'What time this afternoon will you come?' A3: [2, 3, 4, 2, 4, 3, 3–2, 4, 2, 4] *li*^{2}-*koi*^{3}-*la*^{4} *khoi*^{2}*ʔe*^{4} *ʔnta*^{3} *nčaǫ*$^{3-2}$-*la*^{4} *khoi*^{2}*ʔe*^{4} 'I will probably not come until tomorrow.' B3: [1, 3, 2, 4, 3, 3–2] *ho*^{1} *čǫ*^{3} *khoa*^{2}*ʔai*^{4}-*ni*^{3} *nčaǫ*$^{3-2}$ 'What time tomorrow will you come?' A4: [3, 3, 4, 2, 4] *nči*^{3}*sę*^{3}-*la*^{4} *khoi*^{2}*ʔe*^{4} 'I will probably come at noon.'

8. A1: [1, 3, 3] *hña*^{1} *ti*^{3}-*ʔmi*^{3} 'Where are you going?' B1: [3, 1, 2, 3, 4–3] *či*^{3}*kį*^{1} *ti*^{2}-*vhi*^{3}*kʔa*$^{4-3}$ 'I am going to get firewood.' A2: [2, 3, 2, 3, 1–3] *ȼį*^{2} *khoi*^{3}*čʔa*^{2} *či*^{3}*kį*$^{1-3}$ 'Shall we both not go and get firewood?' B2: [4, 2, 3, 3, 2] *sʔai*^{4}-*la*^{2}-*ni*^{3} *khoi*^{3}*čʔa*^{2} 'We'll go together later and get it.' A3: [1, 3, 2, 1–3:] *čo*^{1}*ya*^{3}-*la*^{2}-*nai*$^{1-3}$ 'Wait for me.' B3: [4, 3, 3–2, 2, 3–4, 3] *to*^{4}-*nka*^{3} *he*$^{3-2}$-*ti*^{2}-*vhia*$^{3-4}$-*ʔni*^{3} 'But I'm already going.' A4: [4, 3, 2, 2, 1, 3, 1–3] *to*^{4}-*hnko*^{3}*tho*^{2}-*la*^{2} *čo*^{1}*ya*^{3}-*nai*$^{1-3}$ 'Just a minute wait for me.'

9. A1: [1, 3, 3] *hña*^{1} *ti*^{3}-*ʔmi*^{3} 'Where are you going?' B1: [2, 3, 2, 1–3] *ti*^{2}-*vhi*^{3} *si*^{2}*ša*$^{1-3}$ 'I am going to work.' A2: [1, 3, 3, 2, 1–4, 3] *hña*^{1} *ti*^{3}-*ʔmi*^{3}*ni*^{2}*šai*$^{1-4}$-*ʔni*^{3} 'Where, then, are you going to work?' B2: [1, 1, 3, 3–1:, 2, 3, 2, 1–3] *hą*^{1}-*nta*^{1} *šo*^{3}*hmi*^{3}-*hą*^{1} *ti*^{2}-*vhi*^{3}*si*^{2}*ša*$^{1-3}$ 'I am going to work there at the spring *šohmi*.' A3: [1, 3, 2, 4] *ho*^{1} *čǫ*^{3} *khoa*^{2}*ʔai*^{4} 'What time will you come?' B3: [2, 2, 4, 2, 4] *kǫą*^{2} *šǫ*^{2}-*la*^{4} *khoi*^{2}*ʔe*^{4} 'I will come when it is afternoon probably.' A4: [1, 3, 3–4, 3, 3, 2, 4] *hña*^{1} *ti*^{3}-*ʔmi*$^{3-4}$-*ʔni*^{3} *nka*^{3} *khoa*^{2}*ʔai*^{4} 'Where will you go then when you come?' B4: [2, 3, 2, 3] *li*^{2}-*hña*^{3} *ti*^{2}-*vhia*^{3} 'I am going nowhere.' A5: [3, 2, 2, 3–4, 3] *tʔį*^{3}*la*^{2}*na*^{1} *ntai*$^{3-4}$-*ʔni*^{3} 'Well, may you go well then.'

10. A1: [1, 3, 3, 2, 4] *hme*^{1} *ši*^{3} *ti*^{3}*-ñʔąį*^{2}*-ve*^{4} ‘What are you doing there?’ B1: [3, 2, 2, 3, 3] *ka*^{3}*vhe*^{2} *ti*^{2}*-va*^{3}*te*^{3} ‘I am picking coffee.’ A2: [3, 2, 2, 3, 3–4, 3] *ʔa*^{3}*-kǫą*^{3} *nkhį*^{2} *ti*^{3}*-li*$^{3-4}$*-ʔni*^{3} ‘Well, have you picked a lot?’ B2: [3, 3, 2, 4, 4, 3–2, 3] *sʔa*^{3}*-hnko*^{3} *la*^{2}*ta*^{4}*-la*^{4} *ti*$^{3-2}$*-na*^{3} ‘I have probably picked only one *lata*.’ A3: [3, 4, 2–3, 3, 3, 2–3, 3, 3, 3, 2–4, 4] *ʔa*^{3}*-¢i*^{4}*-ni*$^{2-3}$*-ʔni*^{3} *ka*^{3}*vhe*$^{2-3}$ *ši*^{3} *ti*^{3}*-vi*^{3}*čai*$^{2-4}$*-ve*^{4} ‘Is it your own coffee that you are picking there?’ B3: [2, 3, 2–3; 4, 4, 2, 3, 4] *li*^{2}*-¢ʔą*^{3}*-hįą*$^{3-4}$; *to*^{4}*-čo*^{4}*ʔnta*^{2} *¢o*^{3}*ʔva*^{4} ‘It is not mine; I am only working as a hired man.’

11. A1: [1, 3, 3, 2–3] *hme*^{1} *ši*^{3} *ti*^{3}*-ñʔąį*$^{2-3}$ ‘What are you doing?’ B1: [3, 2, 2, 3, 1–3] *ka*^{3}*vhe*^{3} *ti*^{2}*-vʔe*^{3}*škoa*$^{1-3}$ ‘I am gathering coffee.’ A2: [3, 2, 3, 3, 2, 3, 2, 1–3] *ʔa*^{3}*-nkhį*^{2} *ma*^{3} *ka*^{3}*vhe*^{2} *ši*^{3} *vʔe*^{2}*škoi*$^{1-3}$ ‘Are you gathering a lot of coffee?’ B2: [2, 3, 3] *nkhį*^{2} *ma*^{3}*-ni*^{3} ‘A lot.’ A3: [1, 1–3, 3–4, 3, 3] *ho*^{1} *thį*$^{1-3}$ *roa*$^{3-4}$ *ma*^{3}*-ni*^{3} ‘How many *roa* are there?’ B3: [3, 3, 2, 4, 3, 3] *hnko*^{3} *ki*^{3}*nta*^{2}*-la*^{4} *ma*^{3}*-ni*^{3} ‘Probably one *quintal*.’

12. A1: [1, 3, 3, 2–3, 4] *hme*^{1} *ši*^{3} *ti*^{3}*-ñʔąį*$^{2-3}$*-ve*^{4} ‘What are you doing there?’ B1: [2, 3; 3, 1, 2, 3, 3] *li*^{2}*-hme*^{3}, *či*^{3}*kį*^{1} *ti*^{2}*-va*^{3}*te*^{3} ‘Nothing; I am cutting firewood.’ A2: [3, 1, 3, 1, 4, 4] *ʔa*^{3}*-thį*^{1} *či*^{3}*kį*^{1} *ya*^{4}*-ve*^{4} ‘Is there firewood there?’ B2: [1, 1] *thį*^{1}*-ni*^{1} ‘There is.’

13. [1, 3–4, 2, 3, 2] *hme*^{1}*-ni*$^{3-4}$ *li*^{2}*-koi*^{3} *neʔoe*^{2} ‘What is it? I did not hear.’

14. A1: [1, 1, 3, 3, 2, 4] *hme*^{1} *čʔa*^{1} *ši*^{3} *ki*^{3}*-čʔai*^{2}*-ve*^{4} ‘What did you bring there?’ B1: [1, 4, 1, 1] *čʔa*^{1} *na*^{4}*hme*^{1}*-ni*^{1} ‘It is a load of corn.’ A2: [1, 3, 3, 4, 3] *hña*^{1} *ti*^{3}*-ʔmi*^{3}*koai*^{4}*-ʔni*^{3} ‘Well, where are you going with it?’ B2: [3, 2, 4, 2, 3, 4] *te*^{3}*na*^{2}*nko*^{4} *ti*^{2}*-vhi*^{3}*koa*^{4} ‘I am taking it to Tenango.’ A3: [3, 3, 3, 3, 2, 3, 2–4, 3] *ʔa*^{3}*-ti*^{3}*-ʔmi*^{3}*ka*^{3}*te*^{2}*na*^{3}*-ni*$^{2-4}$*-ʔni*^{3} ‘Are you going to sell it then?’ B3: [2, 3, 3, 2, 2–3] *ti*^{2}*-vhi*^{3}*ka*^{3}*te*^{2}*na*$^{2-3}$ ‘I am going to sell it.’ A4: [1, 1, 3, 2, 4, 4, 2, 3, 1–3, 4] *ho*^{1} *thį*^{1} *čʔai*^{3}*-ʔni*^{2} *ʔi*^{4}*-ta*^{4}*te*^{2}*na*^{3}*-nai*$^{1-3}$*-vi*^{4} ‘How much will you take then? Sell it to me here.’ B4: [4–3, 4, 3, 3, 3, 2, 4] *ką*$^{4-3}$ *tąǫ*^{4} *kʔoa*^{3} *nka*^{3} *hnko*^{3} *ka*^{2}*ša*^{4} ‘I will take $2.50 a box.’ A5: [3, 3–2, 2, 2, 2, 4, 4, 2, 3, 2–3] *ʔa*^{3}*-kai*$^{3-2}$*-li*^{2} *hao*^{2} *vi*^{2}*šo*^{4} *ka*^{4}*-hao*^{2} *¢hoa*^{3}*-le*$^{2-3}$ ‘Won’t you take $2.25? I will give that to you.’ B5: [3, 2, 2, 4, 2, 3; 3, 3, 2, 3, 4] *nka*^{3} *hą*^{2} *vi*^{2}*šo*^{4} *vʔai*^{2}*-na*^{3}; *hña*^{3} *nka*^{3} *ti*^{2}*-vhi*^{3}*koa*^{4} ‘Three pesos are given to me where I am going with it.’ A6: [4, 3, 3–2, 3, 3, 4, 3] *to*^{4}*-nka*^{3} *khį*$^{3-2}$ *ti*^{3}*-ʔmi*^{3}*koai*^{4}*-ʔni*^{3} ‘But that is far you are going with it then.’ B6: [4, 4, 3, 4, 3] *to*^{4}*-ya*^{4} *sʔe*^{3}*-la*^{4}*-na*^{3} ‘I will just drop the matter now.’ A7: [1:, 4, 3] *čhi*^{1}*-nko*^{1} *čʔai*^{4}*-ʔni*^{3} ‘Well, you sure want a lot.’

In Language Vol. 28,1947pp.285 and 286

WHISTLED TEPEHUA – RECORDED EXAMPLES:[33]

Informant: Juan Santiago of Huehuetla, Hidalgo, Mexico.
Procedure: Each example is first spoken, then whistled.

I. Sentence Intonation Contours.

A. Command	/at'anu:t'itš/	'Come in!'
	/ašt'ak̹ni:t'itš/	'Give it to him!'
	/at'ama:t'itš/	'Lie down!'
B. Statement	/katanu:yaʔ hu: yu:tš/	'He will go in.'
	/kato:laʔ hu: yu:tš/	'He will sit down.'
	/hu: yutši: štak̹nił hu: maliya/	'He gave it to Mary.'
C. Question	/ha: katšinaʔ hu: tšaway/	'Is he eating?'
	/ha: tamau:ł hu: alašuš/	'Has he bought oranges?'
	/ha: ap'inaʔ hu: łi:/	'Are you going tomorrow?'

II. Word stress

A. On two-syllable words (in sentence-final position)

/hu: yu:tš mák̹ni:/	'He killed him.'
/hu: yu:tš mak̹ní:/	'He kills him.'

B. On three-syllable words (in sentence-final position)

/wenk̹'o:łtš hu: pí:talúʔ/	'Peter ate.'
/wenk̹'o:łtš hu: malí:ya/	'Mary ate.'

III. Three consonant cluster (repeated 2 times)

/ukšk'u:t/	'tobacco'

IV. Vowel to consonant transition glides (each pair is given 3 times, first 2 times at normal speed, third time at half speed)

A. Contrasting /a:/ and /u:/ before /k/ (contrast in final syllable)

/lak̹'atam ha:k/	'It is a banana.'
/lak̹'atam hu:k/	'It is a deer.'

B. Contrasting /u/ and /a/ before /ł/ (contrast in second syllable)

/ha: uł hu: šk'o:y/	'Did the dog eat it?'
/ha: ał hu: šk'o:y/	'Did the dog go?'

V. Whistled Spanish

¿Qué estás haciendo?
Estoy trabajando.
¿Porqué no veniste?
No estaba yo.

Cowan George M. Taped examples presented under the title " Segmental Features of Tepehua Whistle Speech", to the International Congress of Phonetic Sciences, Montreal, August 23, 1971

NOTES TO ACCOMPANY THE "EXAMPLES OF AMUZGO WHISTLED SPEECH" CASSETTE RECORDING

The original recording was done on a wire recorder, later copied on to reel, then copied on to the present cassette. The original was done under field conditions at a time when I was beginning the study of the Amuzgo language. The transcription are the drills I prepared and used with the Amuzgo speaker to gain better facility in speaking and hearing Amuzgo. They are in no way to be considered a final or definitive writing or phonemecization of spoken Amuzgo, which was done much later by others. This actual recording was done much later. The transcription was not done from the recording but in actual living contact with the Amuzgo speaker in the village of Xochistlahuaca, GRo., Mexico. The speaker for the transcription, and later for the recording was Gregorio Balliera de Arango

In the transcription the apostrophe represents a glottal stop. Following a stopped consonant the glottal is realized as a glottalized consonant usually. The symbol "j" represents aspiration, preceding a nasal or liquid consonant it may represent a voiceless homorganic nasal or liquid. A raised "n" following a vowel represents nasalization of the preceding vowel or vowels. The "x" represents a variety of alveo-palatal grooved fricative.

Tone is not written on the transcription but the language is tonal and there are many tonal pairs, some occuring in the drills. The whistle following each spoken utterance helps identify the tonal contours and pitches of the spoken. Tonal contrasts may also occur on nasal consonants.

The arrangement is straightforward to page 14, with the entire lists being said, then whistled. Pages 14-17 only the numbered utterances are on the recording. Then follows p. 19 and six frames, with ten items for insertion in each frame. Then pp. 20-21 with two whistled texts. One has to watch carefully here because sometimes he speaks first then whistles the same, sometimes he whistles first, then speaks. The pauses come irregularly also. Nor can one assume the whistle included only what spoken or vice versa.

George M. Cowan
1816 Florida Apt. 104
Huntington Beach California 92648
U.S.A.

Amuzgo frames - for tone drills. Gregorio de Ara Yo:

Que hay carne?	A wa se'
Que hay una casa?	A wa w'a
Que hay una flor?	A wa lja'
Que hay una piedra?	A wa tsjo'
Que hay un papel?	Ā wa tsam
Que hay un palo?	A wa ts'am
Que hay un huipil?	A wa chue
Que hay un tambor?	A wa tsam'
Que hay caña?	Ā wa tsjo
Que hay una bander?	A wa sam

Que hay carne grande?	A wa se' t'ma
Que hay una casa grande?	A wa w'a t'ma
Que hay una flor grande?	A wa lja' t'ma
Que hay una piedra grande?	A wa tsjo' t'ma
Que hay un papel grande?	A wa tsam t'ma
Que hay un palo grande?	A wa ts'am t'ma
Que hay un huipil grande?	A wa chue t'ma
Que hay un tambor grande?	A wa tsam' t'ma
Que hay caña grande?	A wa tsjo t'ma
Que hay una bandera grande?	A wa sam t'ma

Que es carne tuya?	A se'nna'
Que es casa tuya?	A w'a'nna'
Que es flor tuya?	A lja'nna'
Que espiedra tuya?	A tsjo'nna'
Que es papel tuyo?	A tsam'nna'
Que es palo tuyo?	A ts'am'nna'
Que es huipil tuyo?	A chue'nna'
Que es tambor tuyo?	A tsam'nna'

Que es caña tuya?	A tsjo'nna'
Que es bandera tuya?	Â sam'nna'
Que es carne mia?	A se'nnaya
Que es casa mia?	A w'a'nnaya
Que es flor mia?	Â lja'nnaya
Que es piedra mia?	Ä tsjo'nnaya
Que es papel mio?	Ä tsam'nnaya
Que es palo mio?	Â ts'am'nnaya
Que es huipil mio?	A chue'nnaya
Que es tambor mio?	Â tsam'nnaya
Que es caña mia?	Â tsjo'nnaya
Que es bandera mia?	A sam'nnaya
Que es nuestra casa?	Â w'aya
Que es nuestra flor?	A lja'nnaya
Que es nuestra piedra?	A tsjo'nnaya
Que es nuestro papel?	Â tsam'nnaya
Que es nuestro palo?	Â ts'am'nnaya
Que es nuestro huipil?	Á chue'nnaya
Que es nuestro tambor?	Ä tsam'nnaya
Que es nuestra caña?	^ tsjo'nnaya
Que es nuestra bandera?	A sam'nnaya
Prestáme tu carne.	Cataijndai' se'nna'
Prestame tu casa.	Cataijndai' w'a'nna'
Prestame tu flor.	Cataijndai' lja'nna'
Prestame tu piedra.	Cataijndai' tsjo'nna'
Prestame tu papel.	Cataijndai' tsam'nna'
Prestame tu palo.	Cataijndai' ts'am'nna'

Prestame tu huipil.	Cataijndai' chue'nna'
Prestame tu tambor.	Cataijndai' tsam'nna'.
Prestame tu caña.	Cataijndai' tsjo'nna'
Prestame tu bandera.	Cataijndai' sam'nna'
Que hay un perro?	A m'a catsue'
Que hay un gato?	A m'a chmai^{n}
Que hay un caballo?	A m'a caso
Que hay un pajarro?	A m'a casa
Que hay un cuije?	A m'a tyochcwa^{n}
Que hay un ratón?	A m'a tyochi'
Que hay un aguila?	A m'a cachi
Que hay una cobija?	A wa liaso
Que hay una milpa?	A wa n'amljo
Que hay platano?	A wa taisa
Que está tu perro?	A m'a catsue' tsmai^{n}'
Que está tu gato?	A m'a chmai^{n} tsmai^{n}'
Que está tu caballo?	A m'a caso tsmai^{n}'
Que está tu pajarro?	A m'a casa tsmai^{n}'
Que está tu cuije?	A m'a tyochcwa^{n} tsmai^{n}'
Que está tu ratón?	A m'a tyochi' tsmai^{n}'
Que está tu aguila?	A m'a cachitsmai^{n}'
Que está tu cobija?	A wa liaso'nna'
Que está tu milpa?	A wa n'amljo'nna'
Que está tu platano?	A wa taisa'nna'

APPENDIX 2

Eidgenössisches Militärdepartement
Département militaire fédéral
Dipartimento militare federale

Bundesamt für Infanterie
Office fédéral de l'Infanterie
Ufficio federale della fanteria

3003 Bern, 6. Juni 1985

✆ 031/67 44 70

Unsere Zeichen / Nos signes 09.0.2

Ihre Nachricht vom / Votre communication du

Ihre Zeichen / Vos signes

Herrn
Marc B a r d i
Liestalerstrasse 4

4414 Füllinsdorf

Signale

Sehr geehrter Herr Bardi

Sie erhalten als Beilage

- Trompeter-Ordonnanz für die Infanterie 1883
- " 1898
- " 1903/09

Diese Ordonnanzen beinhalten verschiedene Signale. Das Ihnen interessant erscheinende dürfen Sie fotokopieren. Wir bitten Sie, uns die Ordonnanzen gelegentlich zurückzusenden. Die Fotokopien aus der Tambour-Ordonnanz 1917 können Sie behalten.

Wir stehen für weitere Fragen gerne zur Verfügung und grüssen Sie

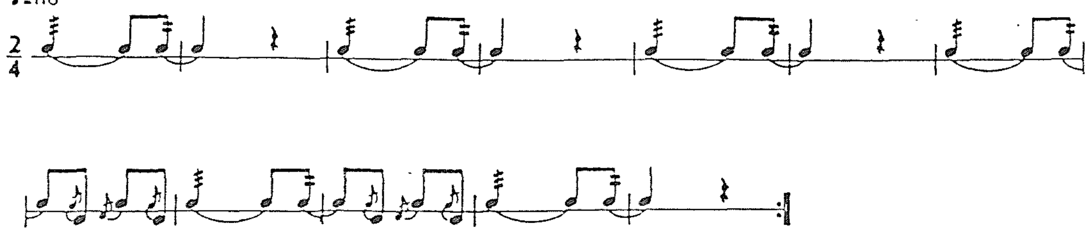
freundlich

BUNDESAMT FUER INFANTERIE
Büro Militärmusik

Blaser

Zapfenstreich — **La retraite**

♩=116

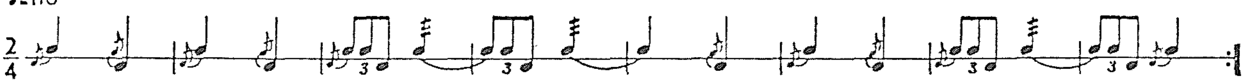


Gefechtsabbruch
Signal Zapfenstreich ohne Wiederholung

Cessation de combat
Signal la retraite, sans répétition

Fahnenmarsch — **Marche au drapeau**

♩=116



1882 Tap

Trompeter-Ordonnanz

für

die schweizerische Infanterie

vom schweizerischen Militärdepartement genehmigt
den 3 April 1883.

Ordonnance pour les trompettes

de

L'INFANTERIE SUISSE

adoptee par le Département militaire fédéral
le 3 Avril 1883.

Lith C. L. Wehrlin Berne

Trompeter-Ordonnanz

für die schweizerische Infanterie.

Inhalt.

I. Allgemeine Signale:
  a) Signale für den einzelnen Trompeter.
  b) Signale für die Bataillonsmusik.
II. Taktische Signale.
III. Signal- und Ordonnanzmärsche.
IV. Soldaten- und Vaterlandslieder.
V. Als Beilage: *Eine Anleitung zur Behandlung der Instrumente.*

Ordonnance pour les trompettes

de l' Infanterie suisse.

Contenu.

I. Signaux généraux:
  a) *signaux pour le trompette.*
  b) *signaux pour la musique de bataillon.*
II. Signaux tactiques.
III. Marches:-Signaux et marches d'ordonnance.
IV. Chants de soldats et chants patriotiques
V. Comme annexe: *Une instruction pour l'entretien des instruments.*

Trompeter-Ordonnanz

für die schweizerische Infanterie

Inhalt:

I. Allgemeine Signale.
II. Taktische Signale.
III. Signal- und Ordonnanzmärsche.
IV. Soldaten- und Vaterlandslieder.
V. Als Beilage: *Eine Anleitung zur Behandlung der Instrumente.*

ORDONNANCE POUR LES TROMPETTES

DE L'INFANTERIE SUISSE

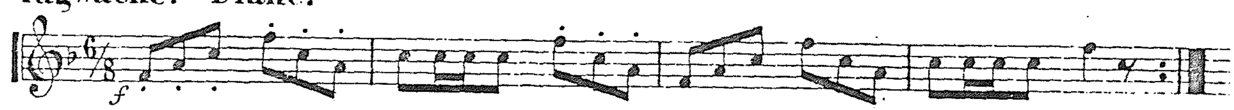
Contenu:

I. Signaux généraux.
II. Signaux tactiques.
III. Marches:-Signaux et marches d'ordonnance
IV. Chants de soldats et chants patriotiques.
V. Comme annexe: *Une instruction pour l'entretien des instruments.*

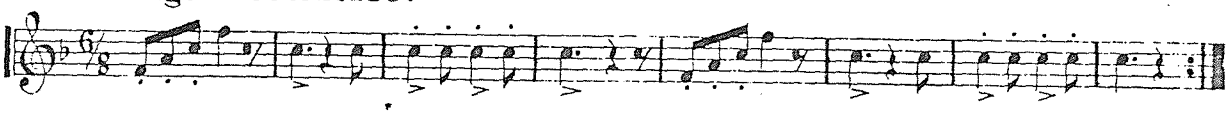
I. Allgemeine Signale. Signaux généraux.

a. Signale für den einzelnen Trompeter. Signaux pour la trompette.

Tagwache. Diane.



Sammlung. Assemblée.



Achtung. Garde-à-vous Appel.

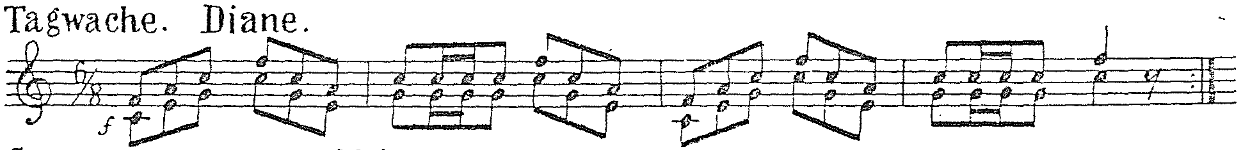
Trompeter raus. Trompettes a l'ordre

I. Allgemeine Signale. Signaux généraux.

{Die oberen Noten sind für B - Instrumente.
{Die unteren Noten sind für Es - Instrumente.

{Les notes supérieures sont pour des instruments en Si-♭
{Les notes inférieures sont pour des instruments en Mi-♭

Tagwache. Diane.



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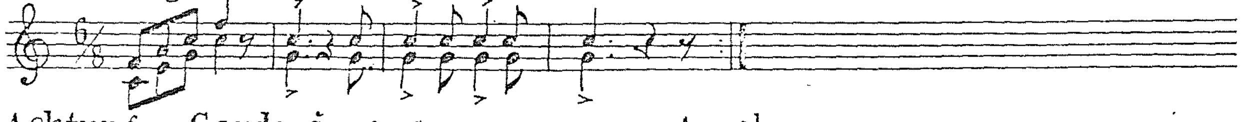
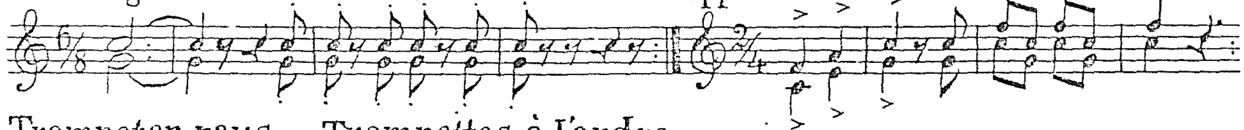
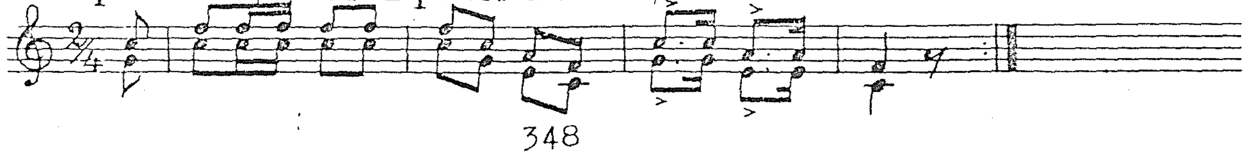


Achtung. Garde-à-vous. Appel.



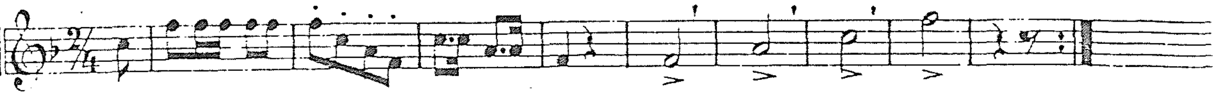
Trompeter raus. Trompettes à l'ordre



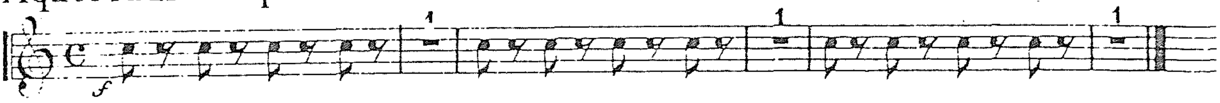
4.

Feldweibel raus. Sergents-majors à l'ordre

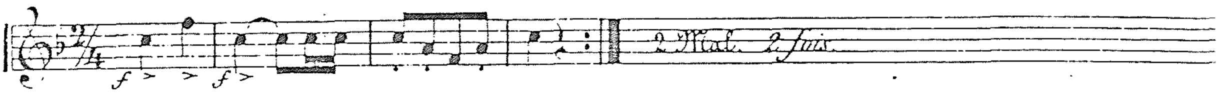
Offizier raus. Officiers à l'ordre.



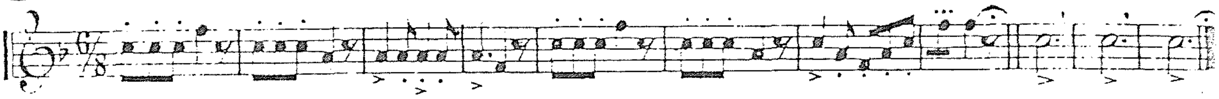
Piquet raus. Piquet à l'ordre.



Wachtaufziehen. Pour la garde.



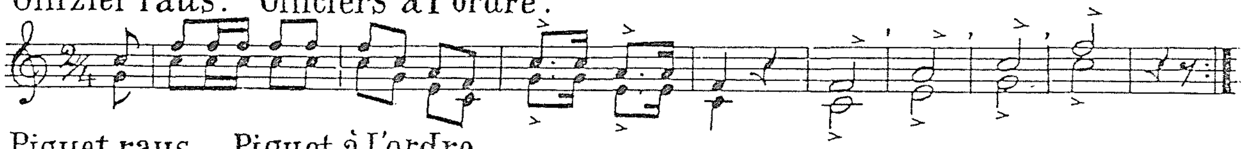
Zum Fassen. La distribution.



4.

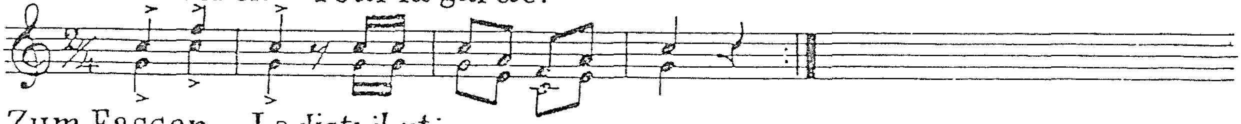
Feldweibel raus. Sergents-majors à l'ordre.

Offizier raus. Officiers à l'ordre.

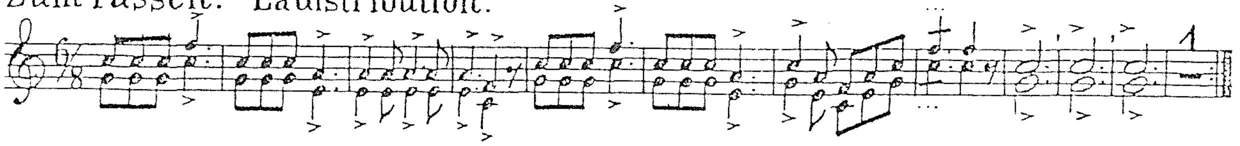


Piquet raus. Piquet à l'ordre.

Wachtaufziehen. Pour la garde.



Zum Fassen. La distribution.



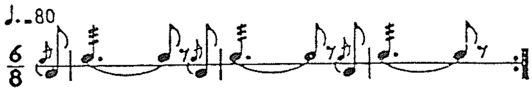
Gasalarm **Alarme contre les gaz**

Wird auch durch Anschlagen an Glocken, Gongs, aufgehängte Metallstäbe und dergleichen oder mit Sirenen gegeben; Blasinstrumente sind verboten.

Peut aussi être donné par des cloches, des gongs, sur des barres métalliques suspendues et choses semblables ou au moyen de sirênes; les instruments à vent sont interdits.

Ende des Gasalarms
Fin de l'alarme contre les gaz

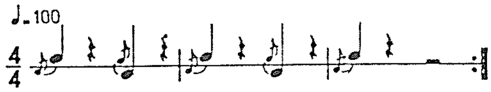
(mit demselben Instrument)



(avec le même instrument)

Fliegeralarm
Alarme contre avions

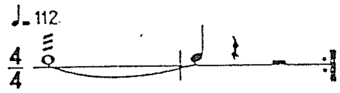
Wird auch durch 5 kurze Zeichen mit: Trompete, Pfeife, Kirchenglocken etc. gegeben.



Peut aussi être donné par 5 signes courts de trompette, sifflet, cloches d'églises etc.

Ende des Fliegeralarms
Fin de l'alarme contre avions

(mit demselben Instrument)



(avec le même instrument)

Alle 4 Signale werden mehrmals wiederholt — Tous les 4 signaux sont à répéter plusieurs fois

TAMBOUR-ORDONNANZ 1917

Bedeutung der Signale

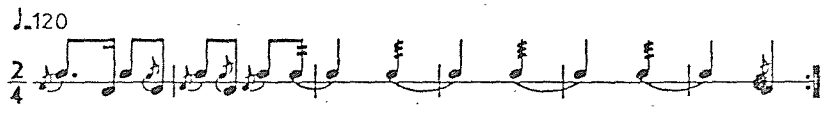
Tagwache:	Aufstehen und Arbeitsbeginn
Zapfenstreich:	Verlesen in 1/2 Stunde
Appell:	Verlesen
Alarm:	Jeder begibt sich so rasch als möglich, feldmarschmäßig ausgerüstet, auf den Sammelplatz
Achtung:	Aufpassen
Halt:	Unterbruch der Übung
Vorrücken:	Fortsetzung der Übung Bei Truppentransporten: Einsteigen, bezw. Aussteigen
Gefechtsabbruch:	Gefechtsende
Offiziere raus:	Offiziere besammeln sich dort zur Besprechung, wo das Signal geschlagen wird
Sammlung:	Mannschaft besammelt sich dort, wo das Signal geschlagen wird
Fahnenmarsch:	Begrüßung der Fahne oder des Inspektors
Fliegeralarm:	In Fliegerdeckung
Ende des Fliegeralarms:	Gefahr feindlicher Flieger ist vorbei
Gasalarm:	Gasgefahr, Gasmasken anziehen
Ende des Gasalarms:	Gasgefahr ist vorbei

Signale Signaux

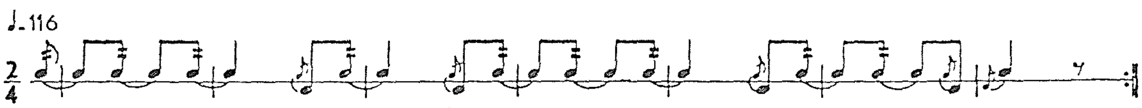
Tagwacht La diane

Tagwacht vereinfacht La diane simplifiée

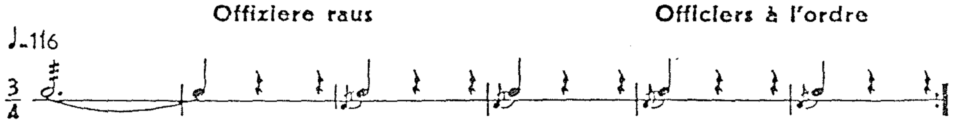
Alarm L'alarme



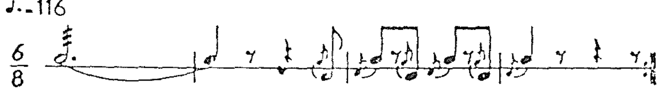
Sammlung Rassemblement



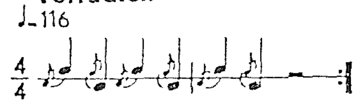
Offiziere raus Officiers à l'ordre



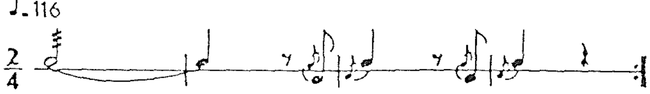
Achtung Garde à vous



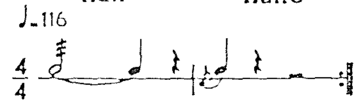
Vorrücken En avant



Appell L'appel



Halt Halte



APPENDIX 3

ROYAL COLLEGE OF MUSIC

PRINCE CONSORT ROAD, SOUTH KENSINGTON, LONDON SW7 2BS

AURAL TRAINING SYLLABUS

Aural Examinations in five grades are held annually in the Summer Term only, and are taken by all undergraduates except those in their fourth year.

Each examination comprises three parts :-

a) Written paper (50%) given in Week 6 lasting 30-45 minutes;
b) Practical paper (25%) given in Week 7 during normal class time;
c) Assessment of year's work (25%)

Students are entered for examinations on the recommendation of their Aural Professor by Week 9 of the Spring Term. Not more than two grades may be attempted each year. Grade I may be omitted; Grades must otherwise be entered sequentially.

Tests are pitched at a' = 440cps. Metronome speeds given are for crotchets; pro rata speeds will apply where a dotted crotchet unit is an alternative.

This Syllabus is current at February 1988. Any subsequent amendments will be published on the Examinations notice-board.

General

Students absent from either the Practical or Written paper automatically fail the examination as a whole. An indifferent attendance record during the year will be reflected in the Assessment mark.

A short period of fair copy time will be given at the end of each written examination.

Examinations will start punctually, and no allowance can be made for late-comers. Candidates are advised to be present ten minutes before the starting time.

Candidates absent from an examination for medical reasons must produce certification to Room 44 within five days of the examination.

In tests where First Study instrument is offered, percussion specialists will be expected to use a small glockenspiel or similar instrument.

College Regulations for Aural Examinations

Candidates will be allocated an examination number, which should be used on all scripts. Candidates should not write their name on any script.

No candidate will be admitted more than 15 minutes after the starting time of the examination, and no candidate may leave the examination until the end.

Candidates should arrive in adequate time to study the seating plan for each examination.

Candidates are responsible for supplying their own pens, ink, pencil, eraser, ruler and other writing equipment. Answers should be written in ink; manuscript workings will be accepted in pencil provided that the writing is legible.

No papers may be taken out of the examination room.

Collusion between candidates is strictly forbidden. Candidates should signal the attention of an invigilator by raising their hand if need arises. Any instance of collusion will be reported to the Director and may result in partial or complete disqualification of a candidate.

Bags and instruments should be left at the back of the examination room. All corridors between desks should be kept clear during the examination.

NICHOLAS KING
Assistant Director of Studies

February 1988

GRADE I

(Concurrent with Hindemith - Elementary Training, chapters 1 to 3.)

Practical

1. To sing at sight (in any convenient octave) a simple melody beginning on the tonic, not longer than four bars, in 2/4, 3/4 or 6/8 time. There will be no leaps greater than a perfect fifth. Tonic chord sounded. MM = about 60.
2. To sing at sight to "ta" on any convenient monotone whilst clapping an independent rhythm a passage not longer than six bars in 3/4 or 4/4 time. There will be no note-values less than a semiquaver. MM = about 60.
3. To identify up to four diatonic intervals not exceeding an octave, each played up to two times.
4. To identify simple pitch errors of notes in a two-part passage played twice, and in isolated chords of three or four notes (of which one might be a seventh chord or of other non-diatonic nature).

Written (30 minutes)

All tests are played four times and commence on a downbeat. The first playing is counted in with a complete bar of beats. Time-signatures are given in all tests.

1. A simple melody beginning on the tonic, not longer than four bars, in 2/4, 3/4 or 6/8 time. There will be no leaps greater than a perfect fifth. Tonic chord sounded before each playing. MM = about 60.
2. A rhythmic passage on a monotone not longer than four bars, in 3/4 or 4/4 time. There will be no note-values less than a semiquaver. MM = about 60.
3. A progression of four three-part chords (SAB) in 3/4 or 4/4 time, with or without passing notes, ending on a standard cadence. First chord given. Tonic chord sounded before each playing. MM = about 60.
4. A simple two-part phrase in treble and/or bass clef, four bars long, in 2/4, 3/4 or 4/4 time. First beat given. Tonic chord sounded before each playing. MM = about 60.

GRADE II

(Concurrent with Hindemith - Elementary Training, chapters 4 to 5.)

Practical

1. To improvise a short answering phrase of about four bars to a given opening. The test may be sung or played at the keyboard or on First Study instrument. The given opening may be sung or played once before attempting the test. Bass clef instruments will be expected to play from a treble clef at an appropriate pitch. Transposing instruments should play the test as seen.
2. To sing at sight (in any convenient octave) a tonal melody of six bars, containing syncopations and other rhythmical features. Tonic chord sounded. MM = 80 to 100.
3. To sing any diatonic interval requested by the examiner above or below a given and identified note, and to name the second note. Several examples will be given.
4. To recognise modulations by name or relationship to the tonic in a short piano piece in the Classical idiom played once through with appropriate pauses. The modulations are restricted to tonic, dominant, subdominant and their relative majors or minors. The opening key will be identified and a tonic chord sounded first.
5. To identify errors in a two-part instrumental or keyboard passage of about 12 bars in length played twice.

Written (30 minutes)

All tests are played four times. The first playing is counted in with a complete integral bar. Time signatures are given in all tests.

1. A tonal melody of six bars in simple or compound time. Tonic chord sounded before each playing. MM = 80 to 100.
2. A rhythmic passage on a monotone, four bars long, of greater complexity than in Grade I. MM = 60 to 80.
3. A two-part passage in Palestrina style, approximately four measures long. Time signature and opening of each part given. Tonality announced and chord sounded before each playing. MM = 60 to 72.
4. A progression of four-part (SATB) harmony in Bach style, four bars long. Bass line and first chord given. Tonic chord sounded before each playing. MM = 48 to 60.

GRADE III

(Concurrent with Hindemith - Elementary Training, chapters 6 to 7, and Edlund - Modus Novus, chapters 1 to 4.)

Practical

1. To improvise a balanced sentence from a given melodic opening, including modulations as directed to closely related keys. The test may be sung or played at the keyboard or on First Study instrument. The given opening may be sung or played once before attempting the test. Bass clef instruments will be expected to play from a treble clef at an appropriate pitch. Transposing instruments should play the test as seen.
2, To sing at sight (in any convenient octave) a melody with emphasis on leaps and time changes, eight bars long. First note sounded. MM = 80 to 100.
3. To sing at sight (in any convenient octave) the middle line of a three-part contrapuntal passage in Hindemith style not longer than six bars, the outer parts being played by the examiner. First note sounded. MM = about 60. (See dictation exercises in Elementary Training, page 226.)
4. To sing any note as requested by the examiner from a three- or four-part non-triadic chord played not more than twice, and then to sing a perfect fourth or perfect fifth above or below that note, as requested by the examiner. Up to three tests will be given. (See pages 84 to 86 of Elementary Training.)

Written (40 minutes)

Tests 1 to 4 are played four times. The first playing is counted in with a complete integral bar.

1. A melody in 20th Century style, four bars long. First note sounded. MM = 60 to 80.
2. The rhythm of a complex melody up to six bars long. MM = 80 to 100.
3. A two-part passage in Baroque style, six bars long, not necessarily performed on the piano. Time signature and first note in each part given. Tonic chord sounded before each playing. MM = 72 to 90.
4. A four-part progression, four bars long, in Classical style, to include chromaticism. Time-signature and first chord given. Tonic chord sounded before each playing. MM = not faster than 100.
5. Identification of instruments used in a piece for small ensemble. A recorded extract will be played twice.

GRADE IV

(Concurrent with Hindemith - Elementary Training, chapters 8 to 9, and Edlund - Modus Novus, chapters 5 to 8.)

Practical

1. To improvise a short piece in a recognisable tonal style (Baroque, Classical or Romantic) of the candidate's choice, including suitable modulations, based on either a melodic motif or a rhythmic motif (candidate's choice). The test may be sung or played at the keyboard or on First Study instrument. The given opening may be sung or played once before attempting the test. Bass clef instruments will be expected to play from a treble clef at an appropriate pitch. Transposing instruments should play the test as seen.
2. To sing at sight (in any convenient octave) a tonal melody, about twelve bars long. Tonic chord sounded. MM = about 60.
3. To sing at sight (in any convenient octave) a 20th Century melody containing leaps and rhythmic complexities, not longer than eight bars. First note sounded. MM = about 60.
4. To sing and identify any note from a three- or four-part cluster or group played up to three times, one note being identified and played by the examiner; and to sing any interval above or below this note. Up to three tests will be given.
5. To recognise unrestricted modulations by name or relationship to the tonic in a short piano piece in the Romantic style played once only with appropriate pauses. The opening key will be identified and a tonic chord sounded first.

Written (45 minutes)

1. A two-part passage in 20th century style, not longer than six bars. The complete passage will be played once, then each half twice, then the complete passage again. Tonic chord sounded before each playing, and seven preparatory beats before the first playing. Time-signature, pitches and rhythms of part of each half will be given, including the opening. MM = 60 to 100.
2. A simple piece of 19th century piano music, about eight bars long. The complete passage will be played once, then each half twice, then the complete passage again. Tonic chord sounded before each playing, and seven preparatory beats given before the first playing. The opening of each half will be given. MM = 60 to 100. Questions may also be asked on character identification, and commentary on style, phrasing, harmonic structure, etc.
3. Identification of instruments used in a piece for small chamber ensemble (which may include Early Music instruments). A recorded extract will be played twice.
4. Simple comparison of and analytical questions on two recorded performances of the same short solo piece or extract (which may include an accompaniment), played twice in sequence (ABAB).
5. Identification of errors (pitch, rhythms, dynamics, speed, etc.) in a short piece of Classical or Romantic style played twice. The candidate is to mark the errors on the given correct version.

GRADE V

(Concurrent with Edlund - Modus Novus, chapters 9 to 12.)

Practical

1. To improvise a short piece on a set or mode as directed by the examiner. The test may be sung or played at the keyboard or on First Study instrument. The given opening may be sung or played once before attempting the test. Bass clef instruments will be expected to play from a treble clef at an appropriate pitch. Transposing instruments should play the test as seen.
2. To sing at sight (in any convenient octave) a melody of late Romantic style with tonal implications. The melody will be about sixteen bars long. First note sounded. MM = about 60.
3. To sing at sight (in any convenient octave) a 20th century melody containing leaps and rhythmic complexities, not longer than eight bars. First note sounded. MM = about 60.
4. To sing and identify any note from a four- or five-part note-cluster or group played up to three times, one note being identified and played by the examiner; then to sing any interval above or below that note. Up to three tests will be given.

Written (45 minutes)

1. A three-part contrapuntal passage in 20th century style, about eight bars long. The complete passage will be played once, then each half twice, then the complete passage again. Seven preparatory beats will be given before the first playing. The complete opening bar (including key, clefs and time signature) will be given, together with other material during the course of the test. MM = about 60.
2. A keyboard piece in late Romantic or early 20th century style, about eight bars long. The complete passage will be played once, then each half twice, then the complete passage again. Seven preparatory beats will be given before the first playing. The key, clefs and time signature will be given, together with the first chord, which will be sounded. MM = 80 to 100.
3. Comparison of two recorded performances of the same short concerted piece or extract, and analytical questions based on the piece (which may include multiple-choice answers). The two performances will be played twice in sequence (ABAB).
4. Identification of errors (pitch, rhythm, dynamics, speed, density, timbre etc.) in a short piece of Classical or Romantic style played twice. The candidate is to mark the errors on the given version.