NOTES ON
A PIECE FOR TAPE RECORDER

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Choosing the Sound Material

A DISCUSSION of electronic music inevitably brings up the important question of how the availability of new sound materials and the direct participation of a composer in shaping these materials may tend to influence his methods of composition. Any experienced composer knows the sounds and capabilities of the instruments he is going to use in his score. In the tape medium — my readers will remember that this includes sounds produced non-electronically and stored on tape, as well as sounds electronically produced — and especially in the category of non-electronic sounds, a sound is often chosen not for what it is but rather for what it will become through electronic modification.

I believe that the virtually unlimited source of sounds available to a composer who works with tape requires perhaps as great vigilance in selecting the proper material as would normally be exercised in determining an orchestral palette, if not greater. It is tempting to parade unusual sounds; and the structural unity of a composition can be seriously weakened by diverting attention with an overabundance of such sounds. To avoid creating these distractions in *A Piece for Tape Recorder,* I restricted my raw material to the following:

Non-electronic: a gong, a piano, a single stroke on a cymbal, a single note on a kettledrum, the noise of a jet plane, a few chords on an organ.

Electronic: four pure tones, produced on an oscillator, a tremolo produced by the stabilized reverberation of a click from a switch on a tape recorder.

The sounds of the piano and of the jet noise are used in an episodic manner, and serve to impart dynamic punctuation to otherwise slowly evolving sound texture. The remaining sounds are used in a secondary role of background accompaniment, sometimes obviously as plain old-fashioned sustained tones, sometimes with more subtle variations of timbre. The over-all structure seeks to effect a gradual transition from a type of sound material that possessed a certain clearly recognizable musical quality to the type of sound that is more closely identified with a complex noise spectrum. It was my hope that this transition would appear natural, and that the sense of unity could be preserved through a motivic affinity.

All of these sounds were drawn from the library of sound on tape maintained at the Columbia University Studio. Two of the non-electronic sounds were already used once in my earlier piece, *Sonic Contours*. Other material existed as the result of the extensive experimentation by Otto Luening and myself which preceded making our score for Orson Welles's production of *King Lear*.

Notation

The composition was put together from sketches that represented durations, timbres, and dynamics on a four-line chart. This chart was used when synchronizing the four tape recorders in the final mixing of the four tapes on which the entire sound material was prepared. The pitches were given approximate notation in a separate sketch made on regular music paper.

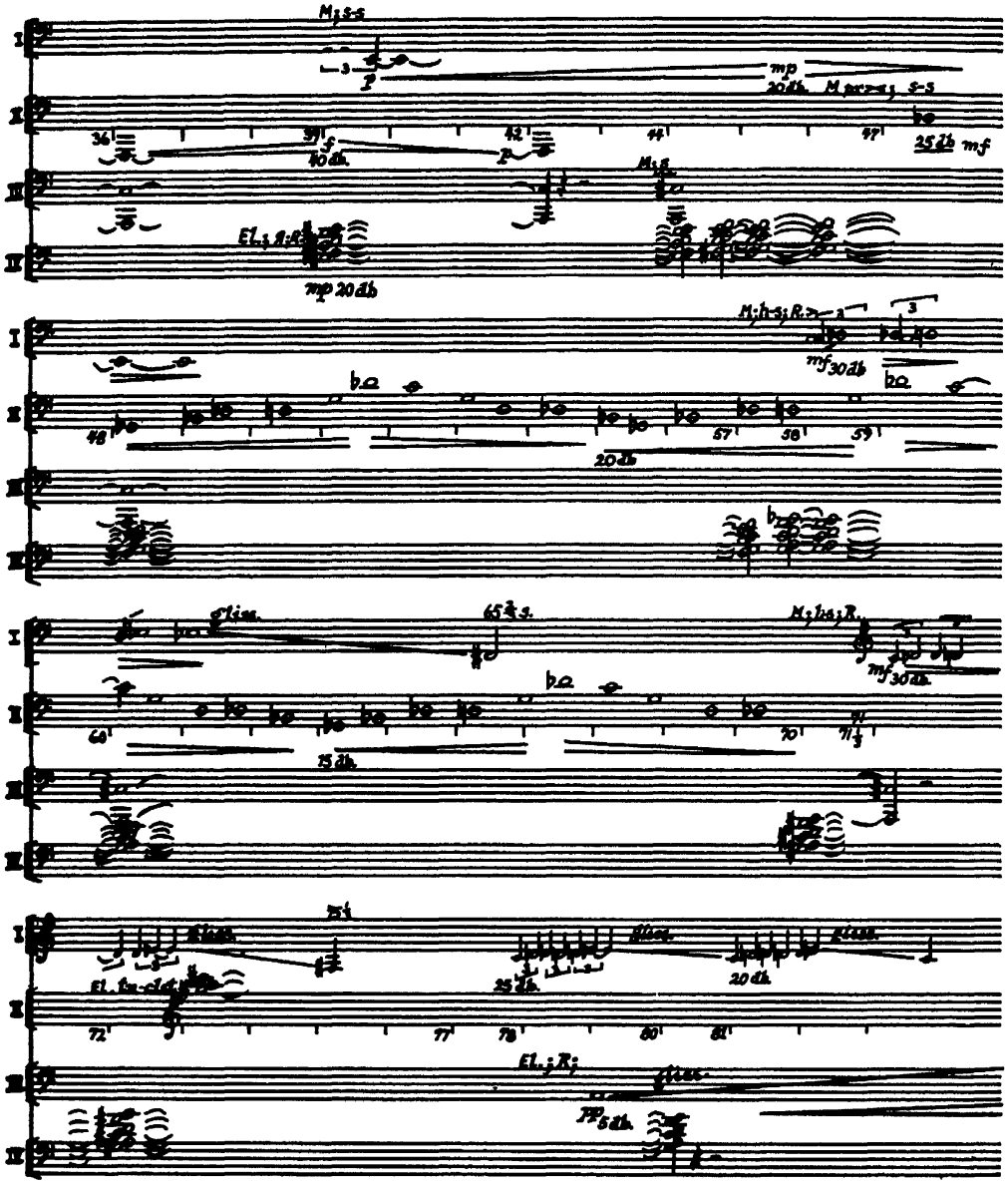
Since the Copyright Office in Washington does not grant a copyright on a work as a musical composition unless it is written or printed in ordinary musical notation, I rather unwillingly spent forty hours to produce a score, one page of which is reproduced here. My reluctance was based on the impossibility of describing many of the sounds in conventional musical notation. I thus attempted a pitch-approximation of the sounds, at the same time placing them exactly where they occur on the time scale. The following explanation of the methods used to represent durations, pitch, and dynamics accompanied the score.[1]

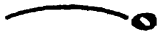
Durations

This score represents a musical transcription of sounds on four tracks of magnetic tape (each indicated by a Roman numeral) used in the final mixing

[1] The example and the explanation are copyright 1956 by Vladimir Ussachevsky. The work was completed in April of that year and has been recorded by Composers Recordings, Inc. on their disc CRI-112.

to obtain the composition. In this respect it is similar to a conventional four-line score; however, the difference lies in the flexible interpretation of conventional symbols resulting from calculating durations in terms of seconds, the expedient necessitated by characteristic flexibility of time units in individual lines. Frequently, therefore, an entire phrase is clocked with a stop-watch and notated as accurately



as possible within the proper time-space, without an attempt to establish precisely the relative value of each note to an over-all common denominator. Throughout the piece the latter, however, is roughly one whole note for one second. In some cases where the length of sound exceeds 20 seconds, the beginning of it is indicated by  and the end by  . The absence of the above or any other symbol indicates silence.

Pitch

Many sounds used in this score are rich in harmonics, and the pitches indi-

cated are frequently only of the predominant pitch impression. This latter, however, is indicated in the proper range as accurately as possible, and, on the whole, with a far closer pitch approximation than is customarily used in describing gong, cymbal, and drum pitches in the percussion part of an orchestral score.

Dynamics

A decibel scale of dynamics is used in addition to the usual musical dynamic marks to indicate intensity accurately. The arabic numerals throughout the score refer to the number of seconds from the beginning, and each measure, suggested by the small, regular dividing marks, is calculated in terms of one-second duration. Thus all the entrances and cessations of sounds are very precisely indicated.

Letter Symbols Describing the Sounds

Each component of a descriptive symbol is set apart by a semicolon; the letter or group of letters preceding a semicolon refers to the origin or character of a sound, the letter or two hyphenated letters following the semicolon describe the manner of bringing the sound into being. The third letter describes additional modification of sounds.

Reverberated	R
Metallic, soft-struck	M; s-s
Metallic, hard-struck	M; h-s
Percussion	pr.
Electronic sound	El.
Electronic tone-cluster	Etn clst
Electronic treatment	el
Piano	P
Middle of a note	><
Roll and tremolo	
Oscillator	Osc.
Organ	O.
Wind	W. 

Developing the Sound Material

Without describing in detail the technical processes,[2] I hope it is understood that the available means of manipulating recorded sounds make it almost mandatory for a composer to run through a certain number of routine experiments before he can determine the full range of his raw material. Experience gradually teaches one what to expect. I now habitually imagine a sound as if it were changed by the following mutation techniques, among others:

pitch transposition through variation of tape speed;
snipping off the attack and listening to the body of the sound itself;

[2] Interested readers are referred to my article, *Processes of Experimental Music,* in *Audio-Engineering Society Journal,* Vol. 6, No. 3, July 1958, pp. 202-08.

playing it backwards;
depriving it of some of its harmonics through filtering;
reverberating it.

An intricate interrelation exists between an abstract formal concept which a composer might have formed about his forthcoming composition and the manner of developing his raw sound material. There can be a decided interaction between the two which makes itself felt through all the early experimental stages. In my *Piece for Tape Recorder* such interaction entailed a certain give and take between the initially vague formal plans and the composing of sound patterns from single sounds. I proposed to utilize the timbre of a gong, stretched to span almost the entire audible range, as a unifying element— a kind of a timbre leitmotif, if you will. But there are many more than thirteen ways of sounding a gong and coaxing a maximum of variety from its rich content.

For example, while melodic use of large gongs is impractical for the conventional orchestra (a series of small groups of Javanese gongs can be used, but their pitch succession will vary from one set to another), in the tape medium, creation of any type of scale is possible from any type of sound.

Since an appreciable change in timbre takes place during the life of the sound of a gong, I sampled various portions of it. The moment of striking the surface with a mallet contains several noise components which quickly disappear. Within a few seconds much of the metallic quality is gone, but the timbre is still complex. By first cutting the attack and then sampling various portions of the remaining sound, I arrived at three basic variations of the timbres. The middle of the gong sound, somewhat pale but tremulous, was made by transposition into a melodic line consisting of seven pitches of even duration which span a range of an octave and a half (see the example, Track II, between the 47- and 70-second marks). The sound containing the attack was used in two different ways. In one, it was modified by slurring the attack through speed variation and by electronic reverberation creating a succession of four pitches which rise chromatically and die out (see Track I, between the 58- and 82-second marks). In the other, the full impact of the attack was preserved. A thunder of six evenly spaced strokes of this sound was arranged in an ascending pattern at the interval of a fourth, to serve as a strong *sforzando* punctuation. (This occurs approximately 99 seconds after the opening of the piece.) The same sound, with the attack preserved, was further transposed over many octaves to a high register, where the resulting pinched, ping-like quality of the compressed

attack easily penetrated through a broad, wind-like spectrum. This sound was used frequently in the second half of the composition. Finally, a dynamically shaped, sustained line was derived from a long resonance of a large gong played backwards. In this instance the attack was faded out and a long, impressive, and relatively smooth crescendo was obtained. This sound was quite useful as a subtly changing lower and inner sustained tone (see Tracks II and III, up to the 42-second mark).

As I have pointed out, it was my intention to create a certain feeling of unity by developing much of the material from a single kind of timbre. As it turned out, all other sound material became secondary in both thematic and timbral importance. In the category of instrumental sounds, a few patterns originating from the piano were subjected to only the simplest of transformations, without cutting of tape or dynamic shaping of any sort. A piano chord which is reverberated and played backwards supplies a brief *ostinato* at the opening of the work; later, clearly pianistic patterns, their pitch and speed doubled by an upward octave transposition, are heard four times. Still later, a long, organ-like pedal point, derived from a low piano tone with the attack cut off, is used.

A single note on a kettledrum served as the basis for the complex wind-like sound mentioned above. This sound, one of the oldest in our sound library at Columbia, had been previously used to construct several tape solo passages in *Rhapsodic Variations for Tape Recorder and Orchestra* and in *King Lear,* both written by Otto Luening and myself. In *A Piece for Tape Recorder,* its transpositions by tape-speed variation form a vertical sonority roughly akin to a minor seventh chord, which is in turn shifted up and down as a unit, its broad spectrum imparting a decidedly confused impression as far as pitch is concerned. More easily definable in its approximation of a pitch area is a sound of a cymbal which is used to form a brief three- to four-note motif appearing towards the end of the composition. The upper edge of the complex sound derived from this non-melodic instrument draws, as it descends, an easily perceived contour. Material derived from an organ is used very briefly in the form of two chords: once as a dynamic accent in a loud passage, and later as purely a timbre of a dark color. I employed electronically generated sounds sparingly. In a curious way they serve a tonally stabilizing function in the midst of complex sonorities which undulate between relative clarity and almost noise-like indefiniteness. A cluster of sinusoidal tones, with their characteristic "steady-state" quality unadulterated by reverberation, first appears in the 73rd second

of the composition. Contrasted to this "dead-level" tone, a melodic line is constructed from an electronic warble-like tone, characterized by an intense vibrato, the rate of which is changed with every new pitch level. This helps take away the usual monotony, not to say irritation, often engendered by an electronically induced vibrato.

Formal Organization

Some composers do all the organization in the silence of the mind; others need the physical impact of the sound. Most composers indulge in some improvisation and retain, or attempt later to recapture, that part of their subconscious utterance which they feel belongs to their conception.

The tape medium is particularly felicitous for giving the composer a chance to hear and to shape his sound material as he proceeds. His decisions regarding the final form of a composition are not infrequently influenced by the results of his experimentation with the sound material. Nevertheless, some electronic composers maintain that an advantage of electronic music is that it can be completely realized by precise specification of certain acoustical and musical components. Others disdain the rigors of numerical "total organization" and let the sine tones fall where they may. Both sides have representatives who do not wish to have their compositions assume any one final form and prefer the sequences of patterns to be rearranged for each individual performance.[3]

It is outside of my topic to debate the comparative merits of these approaches. However, one must note the existence of the improvisatory element. Within the limits of my experience, I can testify that engaging in an experiment in which the machines themselves assist the improvisation is often valuable as a stimulant. Such improvisation can create sound patterns that would indeed be hard to imagine in advance. The improvisation also has the advantage of being recorded and, hence, available for examination. The value of improvisatory material ranges from zero upward, but there is no denying that it assists the composer's imagination in making decisions regarding sound materials and the evolution of a final form. This, to me, seems legitimate.

It must be made clear that the experimental procedure just described refers to using the machines to produce the mechanical repetition of single notes or patterns. Similarly, they can create modifications of

[3] This may raise some lively issues with the Office of Copyright which, one supposes, issues the birth certificates on the assumption that the composer's new baby will retain its features.

pitch relationships or timbre which can be induced either automatically by the machines themselves or by the continuous control of the operator. Skill of the subtlety approaching that of a performer is required to exercise such control. Creative experience is equally important for making those instant judgments which can directly influence the ultimate quality of the improvised material.

As I have said earlier, the interrelation between the development of the material and the final form of the work certainly played a part in the composition of *A Piece for Tape Recorder*. The abstract aim was two-fold. First of all, I wanted to achieve a kind of large, assymetrical arch on both a dynamic and a pitch scale. The ascent was to be accomplished through a series of little arches, while the descent would consist of a long, gently undulating line of a predominantly gray timbre, punctuated by fragments of the thematic material used in the first part. The second aim was to start the composition with a sound pattern possessing in large measure those qualities which would permit the listener to make associations with definite pitches and, at times, conventional rhythmic patterns. Gradually the timbres with a greater noise content would be introduced, but the motivic unity would persist. The composition was to end quietly with an impression that the last few notes were largely noise descending by discernible intervals of thirds, fourths, and sixths.

This plan was carried out in the finished work, and it seems that one reason for its thoughtful reception can be found in its sense of direction and unity. Dynamic punctuation, originating from diversified sound material, helps to separate main sections of the work. Unity is imparted by the motivic consistency and the derivation of the principle motif from one timbre, highly modified though it was by manipulations peculiar to the process of composition in electronic music.