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THE PLACE OF ELECTRONIC MUSIC IN THE  
MUSICAL SITUATION

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## THE PLACE OF ELECTRONIC MUSIC IN THE MUSICAL SITUATION

### Summary

Electronic music involves new acoustical phenomena and is not identical with the playing of electronic musical instruments. It differs equally from the acoustical backgrounds of films and radio plays. The first stage of its history includes such notions as the division of sound (Busoni) and timbre shaping (Schönberg). Jörg Mager followed up both these ideas, but it was not until the development of methods of sound storage and the application of magnetic tape that electrically produced sound became available as raw material for composition. The electronic-music composer is confronted by the task of having to create, in this new and unlimited medium, orderly relationships and definite standards of form. Direct points of contact result from the present situation concerning "abstract" music, which in many recent instances has reached the limits of "playability". Work done with sinusoidal tones as well as with certain complex sounds releases new structural dimensions. Precise definition of the work is a fundamental technical and musical requirement of electronic music.

The situation is rather confusing. What is generally called "electronic music" nowadays, in reality has little to do with what is understood by the term here. Anyone playing on an electronic musical instrument, whether for artistic reasons or in order to promote the instruments industry, can be said to be making "electronic" music, as indeed, technically speaking, any music produced by electrical means can be so named. However, if the term "music" be taken to mean that special sphere of artistic creation and spiritual responsibility to which it has always referred, then in a very strict sense it could be maintained that electronic music is much more concerned with counterpoint than with electricity.

Along with electrical music appearing in the form of hit tunes, fugues and concertos, we have the unmonitored electric sounds, the decorative sound phenomena which can be used for certain illustrative purposes. Such naturalistic adjuncts are as far removed from music as nature from art. The extent of the general confusion prevailing in this regard can be estimated from the performance of "Musique concrète" at the Donaueschingen Music Festival of 1953. Many critics referred to these performances - a double confusion! - as "electronic music". It must be admitted, however, that the novelty of the phenomena, combined with the general unfamiliarity with the acoustical effects and ignorance concerning the technical methods, to some extent excuse the error.

The new acoustical material has been made available by the technicians and engineers. As "material" in the musical sense, however, it has still another function, its spiritual status can only be determined by the composer who familiarizes himself with it. Musically speaking, therefore, it is not the physical processes which are of decisive importance, but rather what the composer does with them.

#### Imitation and Background Effects

The electronic acoustic means have hitherto been accepted chiefly at the entertainment level. The situation is not unlike that of the earlier silent motion pictures and the first radio broadcasts. Technology makes new media available which become commercialized and are at once used for mass consumption. Regarded from this point of view, electronic music is a hopeless case. The "intelligent despisers", i.e., serious patrons of music, quite properly assign a lower function to these acoustical experiences. Such people will perhaps be reminded of the cinema organ which with its artificial vibrato quality poured an acoustical coating of sugar over the entire musical fare. As a matter of fact there is a great deal of objectionable "vibration" in electronic entertainment music.



The inventors of electrical musical instruments have been in a great hurry to incorporate a vibrato effect, the new electrical *qualité de luxe*, into their ingenious constructions, to serve, perhaps, as a substitute for expression, mood and nineteenth century sentimentality. The electric musical sound, however, is much more inclined towards rigidity than to such differentiations. Its diversities are of an entirely different kind. To attempt to escape from its material nature by improper devices is a waste of time. On the contrary, it is of the utmost importance to arrive at that nature by using the proper means.

Another field of application of electronic sound production is to the acoustic background of films and radio dramas. These sounds assail our hearing painlessly as real or surrealist mood contributions which often combine surprisingly well with the scene, word or image. Such effects can also be produced by microphone reproduction of sound processes, that is, with the methods of "*Musique concrète*", but the electronic methods should prove much more versatile, refined and easier to produce.

To the layman at first nothing is so impressive as this unshackled and yet easily managed noise dynamics which, psychologically speaking, has the effect of arousing multiple associations. The majority of these background effects would belong in the category of "white noise". Its astonishing effectiveness is due not least to the fact that it is localized by association on the part of the listener without any effort whatsoever. Powerful impressions follow one another with the ease of a succession of pictures; sounds roll past in the manner of a film; acoustic settings are changed in a matter of seconds; and this all happens smoothly like the arbitrarily succeeding numbers in a catalogue of noises, but without effort; one sound merging into another almost organically. These are totally new experiences in the realm of acoustics, unknown to earlier times. Their great effectiveness is probably due to the economy with which they are employed. The Cologne Studio has produced a great many sound-effect

settings for radio dramas. Generally several variations of a given setting are produced, the director of the drama being responsible for selecting the one he wishes to employ and incorporating it into the drama.

### The Opportune Moment of History

There can be no doubt that these complex combinations of musical sounds and noises are open to musical exploitation if they are first of all subordinated to a primarily musical scheme of things. Of greater importance here is the question of what musical scheme is broad enough to include the electronic means. Historical systems such as have crystallized in the personal styles of composers and in schools of music are eliminated on this basis, as are, for example, Oskar Sala's efforts to produce a "modern-sounding" orchestral substitute with the Mixturtrautonium. What has already been said earlier applies equally here, namely that the mere adoption of historical media, even those of modern music, inasmuch as they have become historical, cannot do justice to the material data of an electronic music.

Highly significant, on the other hand, are certain differentiating tendencies of the new music with respect to rhythm and acoustical effects, especially in the realm of twelve-tone music. Imitated twelve-tone music, of course, - for example imitations of Schönberg or Webern - will not produce electronic music any more than imitated Stravinsky or Hindemith. What we are referring to here are the musical boundaries which have been reached in the intensified twelve-tone technique, which at the same time constitute the limits of playability. It is not that limits are being imposed on virtuosity, but rather that the unplayability of this latest instrumental music is due to a rationalization of musical elements which is no longer reducible to manual performance. This definitely constitutes a genuine point of departure for electronic music. At the same time the true nature of the electronic musical media is revealed here by

the very fact that these media have become available for composition at the precise moment of history when they are needed.

### Concept and Realization

On the technical side, the phenomenon of electronic music can be said to begin with the invention of the electronic tube by de Forest and von Lieben in 1906. Strange as it may seem, it is nevertheless a fact that at about the same time Busoni and Schönberg conceived the idea of an infinite musical raw material. They were defeated, of course, in the realization of their dreams by the mechanical limitations of contemporary musical instruments - Busoni with split intervals and Schönberg with his tone-colour melodies. Busoni expresses this directly. "Further tonal development", he states, "is impossible with our present instruments." He refers to traditional music as "a minute fraction of a ray from that greatest star in the firmament of eternal harmonies - music" and mentions Cahill's electric organ as indicating for the first time the possibility of "free-flight tests for composers". By tone-colour melodies Schönberg means the method, unrealizable on any known instruments, of relating different tone colours in a manner analogous to the melodic combinations of notes in conventional music. The third of his Five Pieces for Orchestra, Op. 16, based on a single chord which is constantly changing in brilliance represents an attempt to realize something of this kind. Anton Webern's Orchestral Pieces, Op. 10, undertakes a similar task, but with different means.

Schönberg did not pursue the idea further in his subsequent career, while Webern merged it with his concept of the proportional series in which both the harmonic and the melodic employ the same interval proportions so that the consonances no longer depend on arbitrary or statistical factors but, excluding all illogical elements, on harmonic ratios, i.e., on acoustical structures which conform to the law of the permutations of series.

This is one of those turning points of electronic music, which is no longer merely copying Webern's inspired concept, but which "elevates" in both senses of the word. Many of Webern's constructions seem like premature electronic fragments. His permutations of sounds lead directly to the question of shaping sounds by the grouping of sinusoidal tones, which has become a current concern of electronic music. Timbre as a by-product of structural contours! This is indeed a contagious idea, even though the use of sinusoidal tones at first imposes certain limitations. A far-reaching, still unsolved question is whether electronic music as a universal source of all sounds possesses any coherent, form-sustaining force corresponding to tonality - most likely of the nature of a self-sustaining system of timbres.

Following up the ideas of Busoni and Schönberg, as well as the experiments of Stein, Moellendorf and Haba in quarter-tone composition, came Jörg Mager, who, in contrast to most inventors and instrument builders, wanted to "make all possible oscillations available to music for both melodics and harmonics, and even for all partials, on which the timbre depends." Mager, who was more an inspired craftsman than a systematic researcher, did succeed with his instruments (Electrophone, Spherophone, Partiturophone, etc.) in producing new acoustical effects ("fluid chord", "timbre trills"). In 1931 he produced the sound of the Parsifal bell at Bayreuth with an electronic circuit. A year later he produced the electro-acoustic sound-effects background for Hartung's production of Faust at Darmstadt. His last work was the vision music in the Ufa-film "Stärker als Paragraphen" (1936).

Much later than the production of sounds, practical results were obtained in the recording of sounds on magnetic tape. The electrically produced sound was not available as a means of actual musical composition until the methods of sound storage and tape processing were developed. The first attempts in this direction led to new acoustical models which could be put together to form montages of sounds. Such montages have a very definite

inhibiting effect on composition in the sense of moulded music. Doubtless, after much tedious, laborious work, such montages could be managed and given greater significance from a composing standpoint, and indeed the value of the synthetic montage method in art is greatly underestimated when the word is used in the current, derogatory sense, for example, referring to a photo-montage. What was discovered in these initial models and montages, i.e., a new acoustical raw material, does not belong to music proper, but rather to musical propaedeutics, and perhaps also to something that might be termed, in a general sense, applied art. Of great importance here, however, is the new treatment of the magnetic tape, which is normally only a passive receiver of recorded sound processes. The manipulation of the tape as a composing means is something new in music. It is just as certain that it is possible to "compose" by such tape-processing methods, not in the sense of a Chinese puzzle, but in the traditional musical sense, as it is that these methods can be used by unscrupulous persons for mischievous ends.

The altogether new idea of using the magnetic tape not only to record music and to retain it for documentary purposes, but also for the processing of fixed sounds and their transposition into other creative planes has only taken shape in the last few years. It appears to have arisen simultaneously in various places and among various persons - Pierre Schaeffer in the Paris Institute of "Musique concrète", the "Music for tape" group in New York (J. Cage, C. Wolff, L. and B. Baron, O. Luening, V. Ussachevsky, etc.) and the acoustics expert of Bonn University, W. Meyer-Eppler. The "Musique concrète" works begun in 1948, and so far confined to the assembling of sound effects, do not belong in this context as they consist of non-electronic transformations of sounds. The American "Music for tape", including some of John Cage's "Music for prepared piano", frequently intermingles concrete elements with electronic sounds. Cage's recordings of feed-back whistling tones are preliminary experiments. Baron's music for abstract films employs beat-note oscillators and

feed-back effects. The "drawn" film music of the Canadian, McLaren, achieves similar effects by a different method. A summary of all these different methods (Musique concrète, electronic music, prepared music and Music for tape) was presented by the French Broadcasting System at the Paris Convention, "Première décade internationale de la musique expérimentale", in June 1953.

The first public performances of Meyer-Eppler's experiments took place in 1951 at the Darmstadt summer courses in modern music and in a late evening programme of the Northwest German Radio Station at Cologne, entitled "The Acoustic World of Electronic Music", which marked the start of our genuinely musical operations. The first compositions (by H. Eimert and R. Beyer) were performed at the Cologne "Festival of Modern Music", 1953. Since then other compositions of H. Eimert, H. Heiss, K. Goeyvaerts, P. Gredinger, H. Pousseur and K.H. Stockhausen (who has received the first commission to compose "electronic music" from Cologne Radio) have become available.

### Fundamental Theoretical Concepts

Electronic acoustical phenomena can be classified as simple tones, complex tones with harmonic partials, tone mixtures, noises and intervals.

1. Simple tones, in this case, refer to the pure or sinusoidal tone, without overtones, which is not found in traditional music, but which is the basis of all musical sound processes. Its overtones, formed "subjectively" in the ear, are so weak that tone can be used in composition as an ultimate unit. The musical discovery of the sinusoidal tone terminates the historical analytical development that began with twelve-tone music and passed through the stage of Anton Webern's isolated tone to the tone as distinct from the overtones. Sinusoidal tones cannot be used to build up a system of tones in the traditional sense. They have no place in the traditional scheme of things, no "tonal" character. The sinusoidal tone system can thus be no



composition arrangement. The relationship between complex tones, tone mixtures and intervals contains the core of the much discussed timbre problem.

### New Systems of Arrangement

The technique of electronic composition requires a good deal of knowledge of a kind not generally found among musicians. This includes familiarity with the operation of the apparatuses, as well as at least an elementary acquaintanceship with the field of acoustics (which in its modern form is essentially electro-acoustics). But with the mastery of the "material" the work of composition is just begun, i.e., the methods of producing and processing electronic, musical material must grow logically and directly from the nature of these materials. It is something different from the case where a composer makes himself familiar with the technique of the violin, trumpet or celesta with a view to composing for these instruments. Whether he regards any given kind of tone-producing means as his "instrument" or whether he considers tape recording as the new technical form of electronic instrumentation, nevertheless the fact that he is no longer moving in a solidly constructed tonal system places him in a totally new situation. He finds himself in a realm in which the musical material for the first time appears as a continuum, capable of being shaped, including all known and unknown, all imaginable and all possible sounds.

This demands thinking in new dimensions, a form of thinking which is inseparably bound up with the electronic sound materials. In the history of music and musical theory there are plenty of examples of the fact that thinking, even in the initial stages, is directed to the "actual" storerooms and is capable of comprehending hidden and unrevealed meanings. It has been said that with electronic music the history of music levels off, as its material is without tradition and its naturalistic sounds present themselves to the ear devoid of historical associations -

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the sculptor's stone is also unhistorical and so is the catgut which the violinist calls a "string". All acoustical materials are necessarily devoid of history and tradition. It is only man using them who is historical. And for him alone is the question of any importance as to whether the electronic acoustical material contains those components of order which in the traditional sense can be called elements of music.

The oldest and most conservative of all tone rationalizing processes can be said to be the setting up of orderly relationships. The simplest monochord investigation sets up such orders as well as the ecclesiastical octave excerpts, classical harmony theory or twelve-tone technique. What is represented in romantic functional harmonics as tension between a natural base and "spiritual motion" has been relegated by twelve-tone technique to the abstract. The tones derived from the natural base of harmony themselves become an objective relationship, a process which is possible only by a dialectic process. Electronic music is not twelve-tone music, but embraces an infinitely greater number of combination possibilities. Accordingly, it is so to speak more "atonal" than atonal music, but does not share its shock effect. While creating relationships between the elements, it appears abstract by the standards of traditional harmonics. The fact that the abstract forms are derived from a naturalistic all-tone sound material, constitutes the unique opportunity of electronic music. It joins the elemental to the ordered side of sound by reaching into chaos and drawing forth the very foundation plans of music. This is its "style", in the broadest sense in which the term is currently used, the style of our period, which takes the measure of the antithetical in its extreme span: the elemental and the abstract, absence of restraint and precision, dream world and consciousness.

The ear quickly imposes a limit on the tonal division concept of Busoni. With electronic means these smallest interval values distinguishable to the ear can be produced without difficulty.

However, the basic unit of electronic music is not some microscopic interval, but belongs to quite a different dimension. It appears not as a division, but as something abstracted from the musical sound. It is produced by the generator as a pure tone (without overtones) having the form of a sinusoidal oscillation. This sinusoidal tone, which is well known in acoustics, is something totally new in music. Also new is the possibility of composing by structural arrangement of sinusoidal tones combined into sounds. For the first time it is then possible for the sound structure to become an integral part of the opus structure. Other structural dimensions are opened up by the possibility of working with given complex sounds. Such sounds can be the subject matter of music only if their production is mastered. Incidental sounds, on the other hand, are spontaneous forms which can be produced in unlimited numbers. They should be left to background music.

Both technically and musically speaking, accurate definition of the work is a fundamental requirement of electronic music. The confusing double sense of the word "composed" should be borne in mind here. The inspirational act of composition has nothing to do with the practical business of putting things together. The methods applied to this latter activity are extremely tedious. Just recently in the Cologne Studio we have succeeded in accomplishing something at this practical level by means of direct tape loop control during the mechanical unwinding of the tape. Putting this in terms understandable to the layman, it is possible, with this loop control, to produce a four-voiced Bach choral with sinusoidal tones in a single step, i.e., without any hard tape cutting. The machine, so to speak, "interweaves" the choral. If the latter is one minute long, then the machine requires approximately 10 minutes to do the job.

It will be difficult, however, for the layman to understand the importance of this process. In the simplest terms, it means that the machine does what the composer wants it to do, the

exact opposite of "mechanical music". It would be an error to suppose that it is merely necessary to construct apparatuses and machines in order to produce electronic music. People not machines are the prime requisite - technicians and musicians ceaselessly engaged in a cooperative effort to solve the problems of electronic music.