

A.

The epistemological analysis of the changes in musical language runs parallel to the technological development of the computer as an aid to musical composition. The mutual influence becomes evident already in the planning stage of the computer program. For the evaluation of <sup>the</sup> conclusions that will be derived from this inter-marriage of art and science, the gratification at the fact that ratio and irratio interact in the process of fertilization is playing a decisive role. √ All aesthetic criticism is conditioned on the imaginative faculty of the giver and <sup>power of</sup> the comprehension of the recipient - and by the resulting feedback. The cybernetic model of physiological information-processing in the human organism - in our present case of musical compositions - is therefore being realized in practice by an infinity of gradations of conscious or only partially conscious perceptions, as well as by information completely or imperfectly stored in one's memory.

A hybrid system, such as <sup>the</sup> computer - converter - analogous synthesizer, is to be understood psychologically, since the rational unambiguity of the digital computer is attenuated by the flexibility of the synthesizer that intermingles it with irrational activities. Part of the traditionally idealized image of interpretation is rescued through a technological backdoor. This kind of "Kulturkampf" is reflected also in another manner: the digital computer enables,

prior to composing, a calculation of the sequence of tones which, in so far as they do not transpose traditional information material, do not have their origin in the composer's musical consciousness. By incorporating the theory of probability and the random-generator, the rigid result of the calculation preceding the composition can thus be attenuated, yet there exists also the element of chance.

The development by leaps and bounds of techniques caused an as yet incalculable broadening of the musical scope. The danger of a horror vacui is evident. This state of affairs is not unknown in the history of music. The beginnings of both polyphony and meter in musica mensuralis <sup>(in the Renaissance-epoch)</sup> brought a wealth of information, combined with a new motivation, in musical language, which the conventionally trained contemporary musician was not prepared to grasp with his intellect and memory. Beyond the mnemonic assistance of the course of the direction of neumatic writing, it became necessary to develop a notation capable of visually expressing not only greater details but also the novel structures of sound.

Now, when we compare the wealth of information and its effect upon the music of ars nova with the electronic music of the 20th century, not only a great quantitative difference becomes evident, but there also emerge qualitative assessments in the interplay of ratio and irratio of the computers' instrumental range.

A new linguistic conception arises, which had already brought about the critical division between <sup>no to say</sup> mothertongue and foreign language in the active stage of the metamorphosis, until the process again becomes stable as usual. <sup>in history</sup> In the course of this acute transformation, the experiences from the tradition of creating and receiving play an important role. The automorphosis of each individual is connected inseparably with his heteromorphosis. The internal striving and the external influences together lead to the new conception. Every technical development remains superficial and transitory so long as it has no conceptual basis.

Again, when a new notation for the new music is under discussion, epistemological points of issue must be chosen, lest extraneous factors mislead us from the start. The decisive fact is that the electronic instrument creating sounds awakened an essentially new motivation in the activity of the brain, both in the composer's creative process and in the listener's receptive process. When the interpreter is eliminated, the composer no longer needs to take into consideration the technical difficulties in playing an instrument. Limits are now imposed by mental capacity, but not by the mechanics of members of the human body. Thus the traditional notation is a prescription for the instrumentalist who interprets the opus of the composer by subjectively intuiting <sup>those</sup> informations which do not lend themselves to notation.

As against this, the notation of computer music functions solely as a written emanation of the composer's thought processes. It informs the computer with the utmost exactness of all particulars of each sound of the composition and of the resulting macrostructure of the composition as a whole, which is realized by the computer on the basis of the instructions. Then the living reality of the sound echoes back to the composer, the vitally important feedback is established, which ensures the ongoing dialogue between the composer and the computer. This notation is constructed upon a basically different conception from that of the traditional notation.

All variants of "musical graphics" since the middle of the 20th century only served the far-reaching liberalization of the interpreter from the traditional notation by means of an associative picture-language or of other aleatoric proposals of execution, which ultimately eliminated the border of responsibility for the opus between composer and interpreter. So-called liberty turned into lost property. The notation for the computer, [however], concerns interpretation only in so far as composer and interpreter are one and the same person. The composer's responsibility has become absolute.

Although it would appear that the notation for the computer is the reverse of the notation for the interpreter, yet both have an essential element in common: both serve as mnemotechnical aids to the composer as well as to the interested listener who may become increasingly aware of the constellations of musical language. Without notation

it is no longer possible to master the wealth of information. The visibility of all the details of the musical process enables the composer to review his thought-process, it also compels him to pause and reflect during his emotional procedure and to organic discipline in the shaping of his opus. It is a basic condition for the conservation of outburst and reflection in extensive presentations. Here I would like to quote Oswald Spengler:

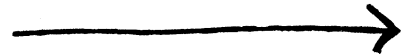
"The written record is the memory of all higher cultures, acquired by the individual in the course of his life and proportionate <sup>to</sup> /the rank of his personality. He whose soul lives only in his day and thinks in terms of present views has no culture." (from: R.K. Goldschmidt-Jentner: "Completer and Transformer", Fischer 1957). 13'

B. The basic technical data of the TALMARK notation have been indicated in the 1st chapter. Now follows the musical function.

In the finale of my opera "The Tower", the librettist Hans Keller makes the poetress say: "The material sound as such is fleeting, and with it the momentary effect. Unless it becomes a language, it will only provide short-lived senselessness".

The "momentary effect" is the acoustic effect. It should not be underestimated; the world of musical composition is full of acoustic effects. Their inner intelligence, reflecting the professional intelligence of the creator, reveals itself in the composition of the acoustic material as a first point of departure to a striving toward a language. If the acoustic effect is self-sufficient, it

resembles a rocket in fireworks, which is extinguished even before it has formed a connection. It evokes a short surprise, but it remains unproductive, even though it may contain a strong potential. It is being sacrificed for the sake of a momentary effect and goes up in smoke. √ The significance of the acoustic material as a creative germ for the growth of the complete musical idea is demonstrable by numerous examples from the orchestral music of the 19th century already. Here I would mention the <sup>opening</sup> / of the final song from Gustav Mahler's "Lied von der Erde".





With the composition of one single tone, the -low. basso note, the opening

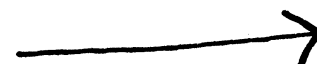
... / ... postulates an acoustic material which may be characterized as "thematic", from which the composition is developed as a whole.

The mixture of overtones arises from the acoustic properties of the instruments: contra-bassoon plus two horns plus a musically indefinable Tam-Tam sound [whose own series of overtones, so long as it lasts, changes the dominance within its own <sup>overtones</sup> / ... (always depending on the <sup>properties</sup> / of the instrument)]. The violoncello, the double bass and two harps intone the <sup>low</sup> ~~low~~ DO in the piccicato, which opens the long sustained DO of the other instruments with a characteristic attack time, followed by sustain level and final decay level. Mahler's orchestration of this single note is identical with the function of the Envelope Generator, the building stone of every synthesizer.



This does not mean that Mahler foresaw the electronic creation of sound, but his profound perception of the significance of sound in musical language already led him to the composition of the single note, from which the complete idea is eventually developed. With the utmost discipline in preserving the purity of the acoustic material Mahler avoids the immediate harmonization of the keynote with its triad in minor, in order to circumvent the conventional interpretation of the tragic nature of this chord. Slowly and with restraint the third and the fifth are introduced at a later stage. This composed sound becomes language only when the melodic motif of the oboe emerges from it, stilistically corresponding closely to the expectation of the conservative listener.

B2



Even this motif is initially a linear play around the same DO, transposed to a higher octave. Only very slowly the new structure is growing in all directions, always inspired anew by the original material. That is the meaning of the words of the abovementioned poetess in the opera: this through-<sup>composed</sup> / DO is no sound effect for a momentary impact, for it has turned into language and has built its unique world.

This short excursion into the orchestral music of the early 20th century was necessary in order to show clearly that with electronic music no artificially manipulated break with the past was engineered, but that only through<sup>it</sup> can the tradition-laden<sup>ai</sup> heritage be correctly recognized, evaluated and grasped. With the new possibilities of

producing acoustic material, there naturally will follow far-reaching changes in the sphere of musical language, for which we must prepare ourselves, even with the courage for trial and error.

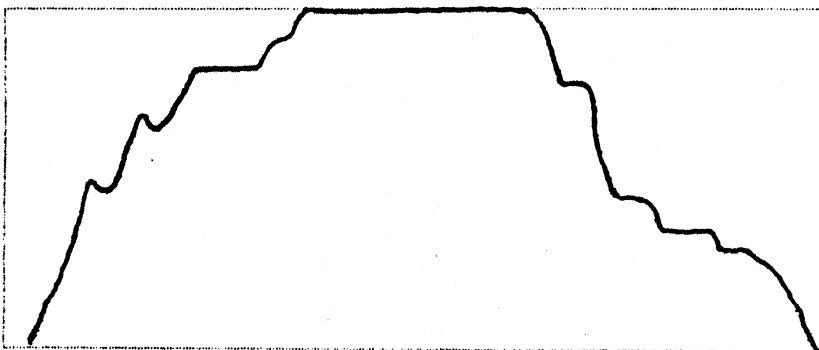
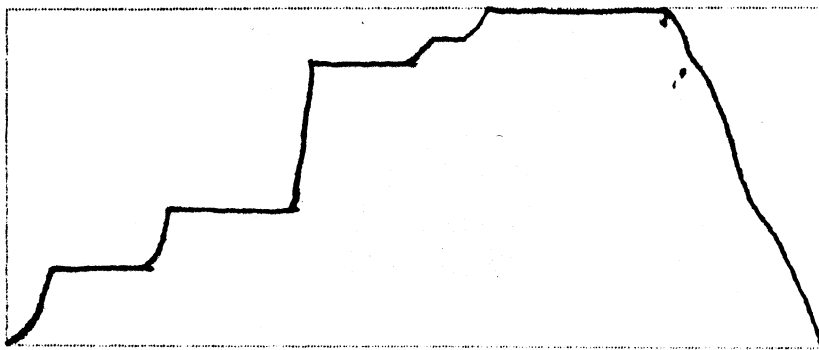
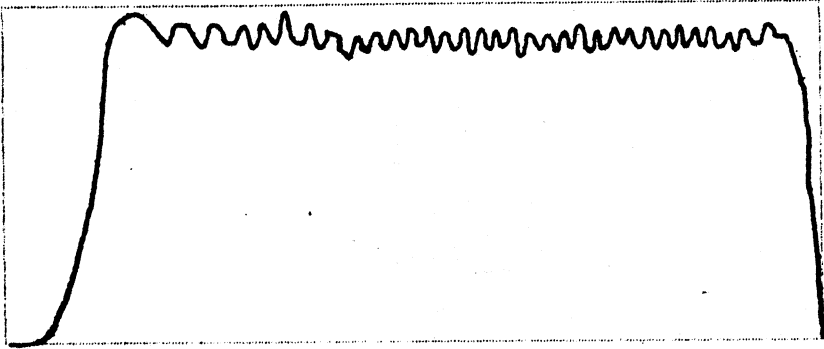
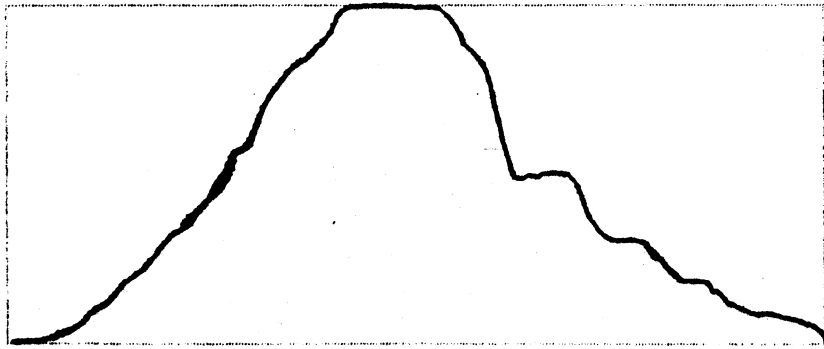
Out of these conceptual considerations arose (the TALMARK notation.) *the electronic notation to be developed in this course.*

This also is no breach with the classic notation, for it originated from the same motivation. It fulfills more precisely and comprehensively the visual mediation between thought and execution in the world of acoustics. ] 19' 20"

The significance of the acoustic material demands intensive concern with the quality of the internal structure of the initial sound.

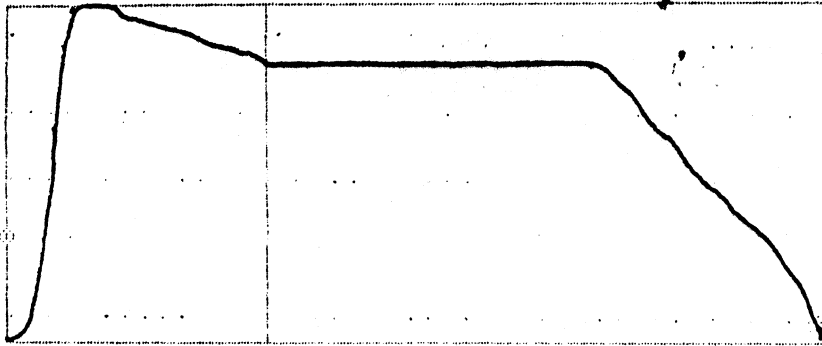
The latter corresponds to the first letter which is followed by others to form a word, which is followed by other words to form a sentence, etc. After all, the single letter in language also is a sound, and before Grammar deals with the rules and regulations of syntax (gramma = letter), the phonetic content of the single letter in every language must be understood as acoustic material. By reason of this analogy with linguistics I call my following expositions a grammar of sounds. It has neither rules nor regulations. It does not aspire to being a theory or a method. It will try to find an individual orientation in the newly disclosed acoustic realm of computer music, for which - metaphorically speaking - the system of icons serves as a compass.

Here I would like to present only one example, to demonstrate the realization of this "grammar of sounds" in musical composition, An arbitrary limitation to the employment of sonorous means has determined the use of only four oscillators in the following. Each of them produces a form of waves that were developed by the composer.

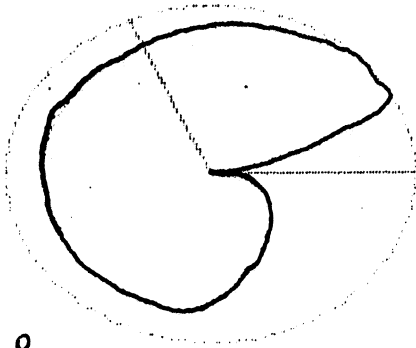


Each wave form is provided with its attack-decay curve, so as to formulate the acoustic characteristic of the sound. For each part there appears its icon on the computer screen.

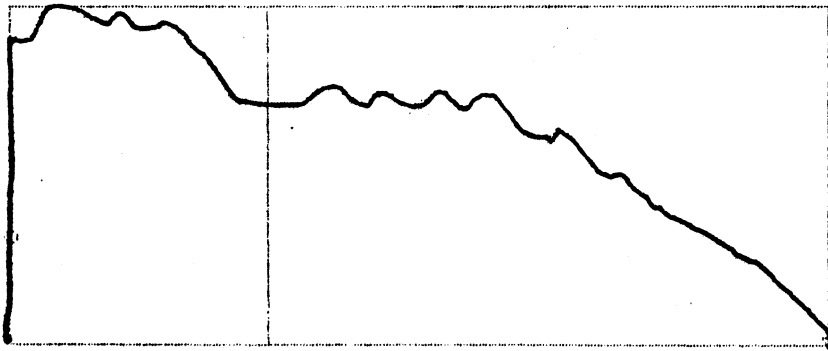
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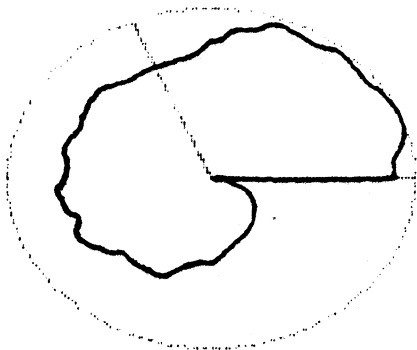
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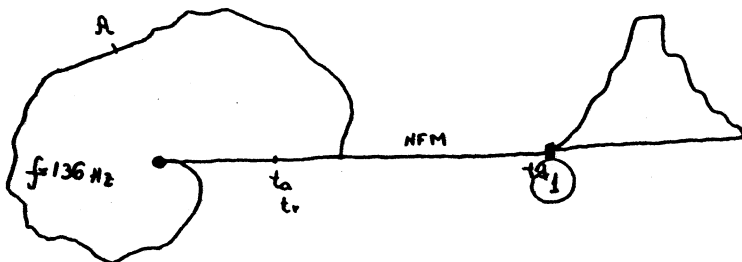


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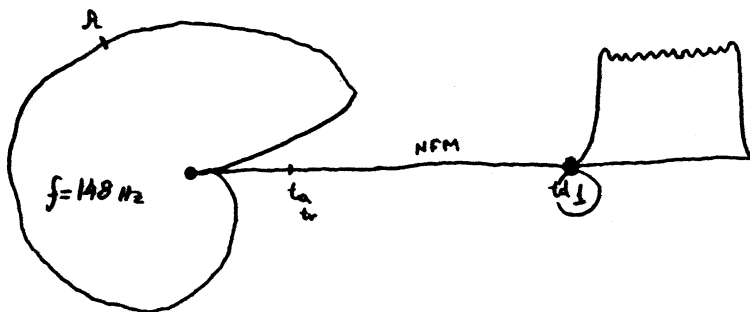


Four envelope curves plus decay curves are likewise being developed.

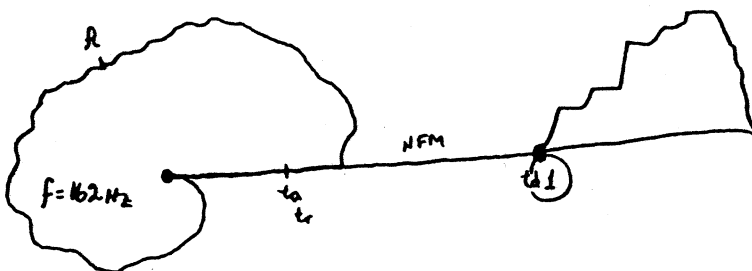
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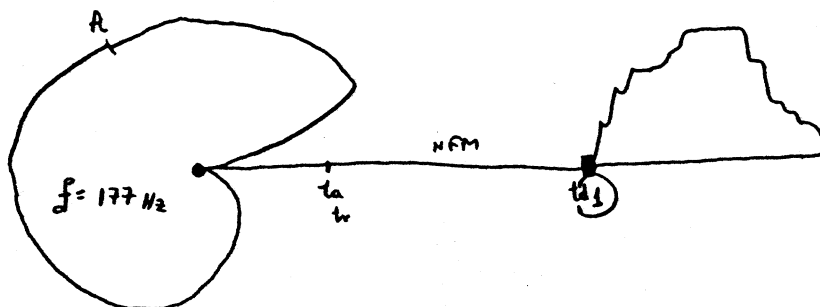
(2)  
OSC #2



(3)  
OSC #3



(4)  
OSC #4



Now the components can be arranged in different ways, whereupon there emerges a series of variants from predetermined partial phenomena; here follow several illustrative examples. (All the examples are recorded on the attached tape in the same sequence). The icons shown here contain only part of the possible informations, so as to avoid being overwhelmed at the very beginning by an uncontrollable abundance. Every composer can choose his own way to acquire vital acoustic experiences.

As soon as the composer has mastered the transfer of the sound to its icon, he can write down his composition at his desk, and then pass the icons in their reverse order via the scanner and the computer. Thus the icon is translated into its sound and the composition is musically realized.

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