



The Essence of Human Hearing

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Abstract

The experimental data of the sound, investigated by Fletcher and Munson, were analyzed to interpret the feeling-effect of Pythagoras, being the fundamental motivation of singing and music in general. It has been pointed out that this feeling-effect is beyond any reality. Moreover, it is shown that the minimum wave related energy of sound, considered in relation to the energy of a single electron, enables to determine the relation between the natural, i.e. the wave related time, and the artificial, i.e. with the human life connected time. This observation suggests the idea that the artificial time appears to be causally related to the time of the breaking of the human voice, the mutation. This spectacular idea has been confirmed by experimental data, showing that both the difference between the energy of the single electron and the minimum sound energy, as well as the difference between the artificial, i.e. the human related time, and the natural time, yield the same order of magnitude of 10^{12} .

Keywords: Time; Electron; Hearing; Sound; Biophysics; Fundamental Units; Dualism; Dynamics; Irrationalism

Introduction

The experimental and theoretical investigation of the essence of the phenomenon time has shown that the whole being should be described instead of the classical system of units meter-kilogram-second-ampere (MKSA) by a dual system, given by dynamics and statics [1,2], in the course of which the dynamics is the basis of the category time and of the electromagnetism, whereas the statics reflects the existence of the gravitational interaction, i.e. of the category mass and of the category length. A further result of the analysis of time was the observation that there is a causal connection between the physical and biological processes of hearing and seeing of humans. It will be shown that especially the process of hearing, as well as the modern interpretation of the feeling-effect of Pythagoras, is very informative.

The Physics Related Feeling-Effect of Pythagoras

It is assumed that the philosopher and mathematician *Pythagoras*, who lived roughly in the fifth century B.C. in

south Italy, was the observer of the fundamental law of the causal connection between length and the natural number. It should be pointed out that this interesting law, which is valid for the whole being, has been detected by *Pythagoras* by means of his personal *feeling-effect*, appearing *only* in the specific case, when – by using a string with constant tension – the length of this string is doubled and an octave in sound is heard.

This only human related feeling-effect is used, mostly instinctively, world-wide, in all musical cultures. This possibility of the feeling-effect is given as a result of the application of the law of *Pythagoras* in music, using the effect of the frequency of the sound. This means that the *Pythagoras* related feeling-effect appears as an automatic addition to the effect of frequency f of the given music. Furthermore, it should be mentioned that according to the dual system, showing the existence of the relation $f = (t)^{-1}$, a causal connection of the frequency f with the phenomenon time t should be given [1]. Nevertheless, this law of time is valid only in connection with effects of nature, not in connection with the specific existence of human. Therefore,

it is interesting that this specifically human related process of the feeling-effect is, as known, world-wide the basis of any musical culture, using instinctively the feeling-effect of *Pythagoras*, an effect, which cannot be described by the basic units meter, kilogram, second, ampere, i.e. by the classical system of units (MKSA). It is evident that this effect is a pure emotional process, which can be assumed to be related on the one side to the dual system in form of the non-observable state of the dynamics, as well as on the other side to *specific human related peculiarities*. Thus, to be able to investigate the true nature of the feeling-effect, it is advantageous to start this intention by the analysis of the experimental data of sound, which were obtained by *Fletcher and Munson* and also presented in Dorda G [3], particularly in Figure 1.

The Analysis of the Experimental Data of Sound by Fletcher and Munson

The experimental data of *Fletcher and Munson* about the sound are very rich in substance. First of all, the data were used to confirm the existence of the dual model, being formulated instead of the classical system of units MKSA and named "dynamics & statics" [1]. Moreover, these data are also useful to disclose the important evidence that the loudness of sound depends causally on the sound intensity as well on the sound pressure, what demonstrates their direct causal relation to the energy of the sound. Besides, all the observed experimental data have been shown in dependence of the frequency f .

The careful analysis of the experimental data of *Fletcher and Munson* [4], given in the Figure 1 in [3], can be divided into two parts:

- The part, related to a variable magnitude of the number of sound quanta. This part does not show an important effect on the feeling-effect, i.e. the loudness of sound has no relation to the so-called "feeling-effect" of *Pythagoras*.
- The part with quasi lowest "masses", i.e. with single wave related sound quanta. In similarity to part 1), it has no relation to the so-called "feeling-effect" of *Pythagoras*. This second part is now the object of investigation.

It is supposed that the limit curve of the sound of *Fletcher and Munson* is given by single quanta of sound and is expressed in wave-form by energies hf , i.e. in dependence of the frequency f [3,4]. Thus, it is predicative to compare these experimental data with the experience, given by the human sound of singing. Human singing is realizable between the highest value of about $f = 1400$ Hz, the soprano, and the lowest value of about $f = 80$ Hz, the bass. The limit curve of *Fletcher and Munson* shows in the region of the soprano or of the children singing voice of about $f = 1400$ Hz until the specific frequency of about $f_0 = 700$ Hz a *constant* relation. It is evident that this region represents a constant energy and

can therefore be represented by an equation, given in the classic form by $E = m l^2 s^2$, where m is the quantum mass of the considered sound, l the sound quantum related length, and s the sound quantum related time. Between the specific sound frequency of about $f_0 = 700$ Hz and the lowest frequency of the bass of about $f = 80$ Hz, a quite different development of the relation between the intensity, i.e. the energy, and the frequency of the sound is given, which can be expressed within the scope of classical physics by the equation of force, i.e. by $F = m l s^2$. It is evident that the frequency f_0 as well as the related time t_0 show a specific, far-reaching frequency-limit between both states of sound, as it represents the *mutation*, i.e. the breaking of the voice, of the human being. The classic equations, given by $E = m l^2 s^2$ and by $F = m l s^2$, show that the effect of mutation should be described by a *direct* (!) change of the category length from the squared form l^2 to the linear form l , together with a related change of the corresponding quasi quantum "mass".

Thus, it is supposed that this specific effect takes place only at the limit frequency of about $f_0 = 700$ Hz, i.e. at a frequency, which represents the sound at a natural state. Considering now the dual system, the equation $t_0 = (f_0)^{-1}$ is valid, and therefore the natural, wave related limit-time is given by $t_0 = 1.4 \times 10^{-3}$ s.

It should call attention that the time of about $t_0 = 1.4 \times 10^{-3}$ s is an *experimentally* observed limiting time of being, whereas the used, i.e. by the MKSA-system *artificially* established limit time shows to be given by the puberty vocal change, the mutation, of the male between about his thirteenth and seventeenth year. Seen in this connection, it should be referred to the in [2] described finding that each human has his *personal time*. Thus, it is now proposed to assign the personal time of human to be the so-called artificial time. As a consequence of this proposal, it is possible to assume the validity of the spectacular idea that the relation between the artificial and the natural time is given by the relation between the energy of the electron charge e and the related wave energy, represented by the limiting energy of the sound hf_0 . This spectacular proposal appears to be a far-reaching idea, as it allows to interpret by this model the real nature of the so-called electron charge. In this case, it is assumed that the difference between the energy of the single electron charge and the minimum wave energy of sound represents the (numerical) difference between the *artificial*, i.e. by the human determined value of the limit-time, given in fact by the breaking of the human voice, the mutation, and, on the other side, the *natural*, i.e. the wave related limit-time, which is given by the minimum of the limit sound, i.e. by t_0 .

The so-called cut-off voltage of MOS-transistors refers to the existence of the limiting value of the electron charge, what shows to be 1 Volt. This circumstance guarantees that the

energy of 1 eV of the electron manifests its single existence. Thus, the specific energy of the electron of 1 eV can be considered to be the assertion of the physical existence of the *artificial* time, whereas in contrast to this, the wave energy in form of hf_0 can be related to the existence of the *natural* time. Identifying both energies with the intention to transform the localized state of the electron in form of eV_0 to its quasi non-observable wave state in form of hf_0 , the resulting difference of these *energies* can be assumed to be the identical value of the difference between the artificial and the natural *time*. Considering eV_0 to be 1.6×10^{-19} J [5] and the minimum wave energy to be $hf_0 = 4 \times 10^{-31}$ J, thus we obtain the relation between the artificial and the natural energy, given by about 0.4×10^{12} . In comparison to this result, it is therefore very interesting that the relation of time, obtained between the time of the mutation and wave related limit-time t_0 , yields the value of about the same order of magnitude, i.e. 10^{12} . This result suggests that the energy of $eV = 1$ Volt of the charge of the electron seems to be in fact the human related form of the limiting wave energy hf_0 . Furthermore, this important idea is confirmed by the equation $hf_0 = h(t_0^{-1})$, which demonstrates the causal connection of the wave related energy with the phenomenon time.

Finally, it should be pointed out that the unexpected identity of the values of the relation of the sound *energy* with the values of the *time*, observed between the human related and nature related magnitudes, suggests to be a consequence of a physical unity of the sound energy with the phenomenon time. This observation can be considered to be in fact a consequence of an unity of the categories length, mass, time and ampere, a unity, which was already supposed in connection with the description of the essence of the phenomenon time [1,2], being in fact based on the freely chosen value of the velocity of light c .

Discussion

The analysis of the phenomenon time has shown that its effect is related to a single human, thus showing his personal time [2]. This fact furthermore implies that the human can freely decide between different mentally given motivations. The faculty to decide by the mental seems to be from the physical point of view somehow limited, and that not only by the velocity of light c , but also by the finiteness of the human nature. As a consequence of this finiteness of the localized state of dynamics, it can be assumed that also the related non-observable part of dynamics, based on the existence of time, is limited. Independent on this unanswered, i.e. open question, a quite different situation is cognizable in connection with the feeling-effect of *Pythagoras*, because it shows no relation to the phenomenon time. The consequence of this fact is that the feeling-effect is absolutely independent

of the classical categories length, mass, time and ampere, i.e. the *only* origin of this effect appears to be the single human. Thus, it should be called attention to the far-reaching experience, which manifests that this feeling-effect is a fundamental, mental, non-observable process of the single human, showing no form of any limitation. Thus, finally, we can, quasi in similarity to *Pythagoras*, state that his feeling-effect must imply metaphysical aspects.

Conclusion

The analysis of the phenomenon time disclosed that the dualistic system “dynamics & statics” should be considered to be the fundamental background of the classical units meter, kilogram, second, ampere [1,2]. This new model of being also manifests the existence of the localized as well as of the non-localized state of dynamics. The experimental data of sound, shown by *Fletcher and Munson* and analyzed in Dorda G [3], suggests the possible existence of a limit between the localized and the non-localized dynamics, which discloses that this limit supports the in this paper presented interpretation of the feeling-effect of *Pythagoras*, suggesting that this effect seems to be a single human related mental, metaphysical effect.

Considering the localized part of the sound, it was possible to observe and determine the natural, i.e. the wave related time. It was deduced from the given limit frequency f_0 and thus related to the whole natural being. In contrast to this, it has been shown that the human related time, represented by the breaking of the voice, i.e. by the mutation, is an artificial time. The analyses of these both times, described in Dorda G [2] and distinguished in “deceased time” and “living time”, made it possible to determine their relation.

In a similar way, the relation between the energy of the electron charge e and the energy of the minimum wave energy of the sound was investigated. This specific exploration reveals an unexpectedly high value of both these relations, being identical and showing an order of magnitude of roughly 10^{12} . Thus, it is not surprising to create in this connection the daring idea that the electron charge and the wave related minimum energy hf_0 form a pair of twins.

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