

# A Case for Subjectivity – Part I

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## Abstract

Knowledge from Psychoacoustics has recently gained increasing attention in technology. In this context it can be observed that, on the one hand, scientific Psychoacoustics is overestimated regarding its application potency and, thus, contributions are expected from it which it cannot render. On the other hand, Psychoacoustics is also underestimated in that it is considered to be primarily "subjective" and, hence, not based on solid scientific grounds.

It is the purpose of this paper to point out the position of Psychoacoustics and, in a more general way, of Psychophysics - in the context of sciences and arts. In doing so, a stringently phenomenal line of arguments will be presented, i.e., a line of arguments which is solely based on actual perception and not on fiction. Virtual Reality will be used as an illustrating example.

## 1. Introduction

Many psychoacousticians have already experienced that their field of specialization is regarded as not being stringently scientific, particularly by (some) engineers. This fact has, even if it were not intended, a discriminating effect in the interplay of the technical sciences. The justification of such a behaviour normally runs along a line of arguments as depicted in the following. An identical line of thinking is often applied to Psychophysics in general.

Psychoacoustics deals with what is perceived auditorily, i.e. the auditory event, auditory percept, auditory object, etc.. In other words, it deals with what is often denoted as sensory "sensations". Such sensations are regarded as subjective, as they are obviously, in each case, solely accessible by one specific person (so-called introspection). To other persons, the sensation is only accessible through a description by the directly perceiving subject.

According to conventional wisdom, sensory sensations are thus rated as "subjective", i.e. they are assigned a lesser degree of reality than physical objects would be assigned. Actually, physical objects are usually taken as

being existent independently of observers and, consequently, called objective, which means in essence, independent of a specific observer. Along these line of thinking, sensory sensations are, at best, "images" of the real physical objects, namely, of the presumably intrinsically "real" world.

In connection with so-called Virtual Realities and/or Virtual Environments, a slightly different interpretation of reality can be observed. As is well known, the percepts in Virtual Realities are induced by technologically-provided stimulation of the sensory organs with physiologically-adequate signals. Such Virtual Realities are adjudged an illusionary character only. This distinguishes them from the real world - an electrical engineer would

probably call the latter the "effective", i.e., RMS-worlds. To be sure, however, this effective world is (only) a percept itself (see above), in other words and following this line of thinking, it is only an image of the essentially real, objective worlds and such, consequently, kind of an illusion.

Question: Is now the Virtual Reality the illusion of an illusion of a presumably real world, the latter maybe even existing beyond sensory perception?

Those readers who had the chance to get in touch with some fundamentals of epistemology, or those who have at least read Sophie's World [1] or seen the film The Matrix [2] may not be surprised by such doubts as to the essence of reality. Others may not have yet developed such doubts at all - which, to be sure, exposes psycho-acousticians and, in general, psychophysicians quite frequently to discriminating comments along the lines denoted above.

## **2. On the Approach of Psychophysics**

In Psychophysics itself, such doubts do normally not come to the fore as, in this field of specialisation, the following three premises are normally agreed upon:

(i) Object of psychophysical research is anything that is sensorily perceived. This includes sensory objects, sensory sensations, sensory events, sensors percepts, etc. All of these are thus, without doubts, taken as being existent.

(ii) In turn, anything that exists in the perceptual world is, in essence, something that is perceived.

(iii) The appearance of anything perceived is inevitably linked to functions of biological organisms, particularly to brain functions.

In the following we shall now elucidate that, on the basis of the above presuppositions, a stringently perception-based integration of Psychoacoustics into the canon of sciences and arts is feasible in such a way that any doubts, as expressed above, become obsolete.

For the sake of further illustration it is important to stress at this point that, besides sensory percepts, further kinds of percepts do exist. Following a categorial scheme proposed by Lungwitz [3], these further percepts are emotions (e.g., pain, fear, sadness and gladness) and the concepts (thoughts, ideas, remembrances).

Concepts denote sensory percepts and emotions, each in a more or less abstract form. Please mind, however, that concepts are percepts themselves, i.e. perceptual phenomena. This means that they exist in a perceptual world associated to an actively working brain. On the other hand, they are of phenomenological character, namely, they describe other perceived items, other percepts, in other words, they stand for something else, namely for sensory objects, emotions or other concepts.

Concepts may be remembrances, i.e. recollections of a specific person (individual concepts); or they may summarise attributes of categories of sensory objects in an

abstracting way, such as the concept "living beings" does. Between concepts there are coordinative (i.e., spatial and temporal) relationships just as they exist between sensory objects.

### **3. Objectivity, Subjectivity and Measurement**

At this point we want to comment in a more sophisticated way on the terms subjective and objective, namely, in such a way as they are defined in Psychoacoustics - in contrast to the way in which these terms are often used naively in everyday language. In Psychophysics, objectivity denotes the amount of congruence of the percepts of different observers, as compared in an identical stimulus configuration. Consequently, there is never anything such as absolute objectivity or absolute subjectivity. In fact, absolute objectivity and absolute subjectivity are regarded as the end-points of a scale of the degree of objectivity (1%-100%). N.B.: Various statistical metrics are in use to determine the degree of objectivity.

The highest degrees of objectivity are observed for abstract concepts that, by definition, can be standardized inter-individually to a very high degree. This holds, for instance, for the concepts of mathematical logics which, by definition, do not contain any individual features any more. This means that all individuals which accept the relationships within mathematical logics, use and communicate the mentioned terms in the same way. Consequently, they assess lines of thoughts in this field as right or wrong with quite some inter-individual consistency. Whether all individuals involved actually have the same percepts to start from can be left out of the limits of the current discussion.

For quantitative sciences, the procedure of measurement is of high relevance. For this reason, we shall briefly deal with this item. Measurement is the representation (imaging) of set of objects to be measured on a set of concepts - particularly an organized set of numbers, i.e., a scale. To make this imaging applicable, it is further required that the coordinative relationship between the objects correspond to those as existing between their individual representatives.

### **4. Psychophysics as Compared to Other Fields**

We start the discussion with Physics, because this science is characterised by having developed measuring procedures such that inter-individual differences between judgements of different observers are minimized as far as possible. Further, sophisticated mathematical description methods have been developed (theories) which to a high extent abstract from inter-individual differences. This holds for the physical objects, which are, consequently, conceptual constructs, as well as for the relations between these. Hence, abstraction from sensory objects is part of the physical methodology. Nevertheless, of course, the physical theories are objects of perception themselves, they are percepts, that is, they are linked to biological brain functions.

Mathematics is generally taken as not being indentured to sensory objects. Thus, it is a conceptual science (germ. ... Geisteswissenschaft. We prefer conceptual sciences to the common translation humanities, because it is more specific in our context.) This holds for mathematical Signal Theory as well, i.e. this is also a conceptual science. Eventual

relationships of computational signal-processing algorithms (french: logiciel) to sensory events must, consequently, be assessed by suitable measuring procedures.

It is at this point that Psychophysics enters the game. The objects of research of Psychophysics are the sensory objects and events themselves and not conceptual abstractions from them, be they individual or categorical. Accordingly, inter-individual differences of what is perceived are quantitatively assessed in Psychophysics. Also, when conceptual systems are being developed, i.e. psychophysical theories, inter-individual differences are preferably included in the theory and not abstracted from.

In summing up: If we denote the perceptual world of sensory objects as "nature", then Psychophysics is a pure natural science (germ. ... Naturwissenschaft). In Physics there is already a profound amount of conceptual constructs included, although, to be sure, physical theories always require experimental verification in the world of sensory objects to be finally accepted. Applied Mathematics, however, and also Signal Theory, the latter one being derived from the first one, have already moved away significantly from nature. Finally, "Pure Mathematics" is a pure conceptual science.

At the beginning of this article we have already pointed at a frequently uttered conception as to which the physical world is conceptually hypothesised as an "objective" world beyond perception, the existence of which could be concluded logically from the sensory (perceptual) world. Not only is that this conclusion perceived itself, i.e., projected by the brain, and thus does, in fact, not lead beyond the perceptual world. Also, the fictional conclusion that it did, may even actually hinder an insight which is essential in Psychoacoustics, namely the following.

All objects of scientific research, be they sensory objects, emotions or concepts, are indeed percepts. In other words, they exist in the worlds of perceiving observers, which means that the brains of the observers are involved in the perception processes under consideration. While in Mathematics and Physics what is perceived can, as a rule, be considered to be independent from a specific observer - i.e., it is more or less the same for each individual observer and, accordingly, has a high degree of objectivity - this can often not be presumed in Psychophysics.

Thus, in Psychophysics, the involvement of the individual observers and, consequently, the individuality of their actual percepts is a constituent of particular weight. In fact, it is very often the case that the observers change, e.g., their minds and/or their behaviour, in the course of perceptual experimentation. Accordingly, what is perceived changes as well. This phenomenon can even be observed in scientifically well-controlled experiments.

In other words: Everything is in transformation (see also Heraklith's "panta rei"), a conception that is not uncommon at all - even for physicists. Yet, since in the end we deal with biological processes, this fact does not affect the scientific foundation of perceptual experiments.

## **5. Conclusions**

In conclusion we want to come back to the so-called Virtual Realities which have already been mentioned above, and to a question which this author has posed before, more or less rhetorically, namely: Is Virtual Reality really virtual or is it virtually real? In the light of

what has been derived in this article so far, this question can now clearly be answered as follows: Both is true!


In this context, please refer also the meaning of the word "virtual", which is often falsely interpreted as "fictitious". The original meaning of the word is, however ... existing in terms of its power [4], i.e., effective (lat: virtus ... energy, potency). Whether a Virtual Reality or even a "real" reality is taken as illusionary or as real does finally depend on the perception of the observer. An environment is taken as real the more the observer being exposed to it acquires a sense of immersion and presence (presence ... the sense of being there). Perceived, and thus existent, are both kinds of environments, the virtual ones as well as the real ones.

## **6. References**

- [1] Gaarder, J. (1994), *Sophies Welt (Sophie's world)*, DTV, D-München
- [2] Wachovsky, A. & L. (1999), *The Matrix, Movie*, USA
- [3] Lungwitz, H. (1933, 1956), *Lehrbuch der Psychobiologie*, (Textbook of Psychobiology) Vols. I & VIII, Walter de Gruyter, D-Berlin
- [4] Wahrig, G. (1999), *Deutsches Wörterbuch*, (German Dictionary), Bertelsmann, D-Iserlohn

## **A Case for Subjectivity – Part II**

→ see the following pages

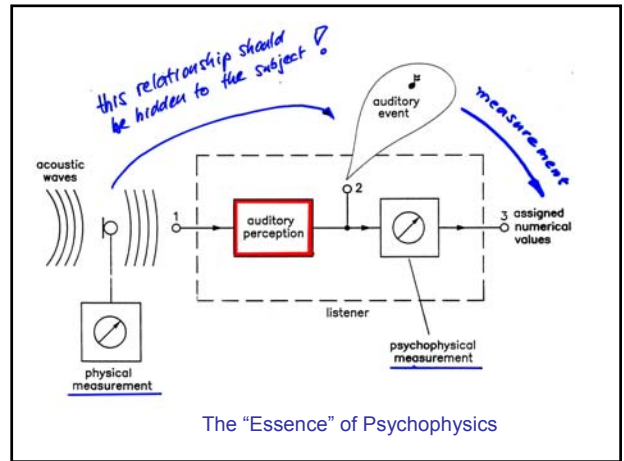



## A Case for Subjectivity

*Jens Blauert, Bochum*

### A Case for Subjectivity

- The dilemma of natural sciences vs. "exact" sciences
- Reality and virtual reality
- Subjectivity is important to consider !
- The character of sounds
- Different concepts of "sound quality"
- The character of references
- Towards a universal "sound-quality recognizer"



**Sound Character** *descriptive!*

Totality of measured values of features which are associated with the sound sample under examination

The measured values may relate to different aspects of the sound, e.g., include categories of values such as

- an acoustic profile
- an auditory profile
- (emotional-feature values)
- (semantic-feature values)

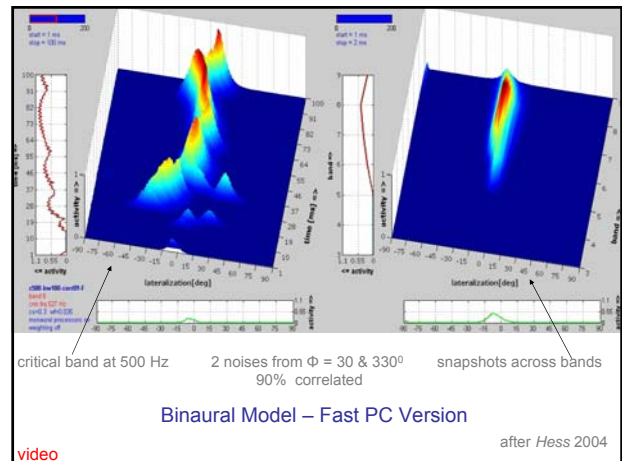
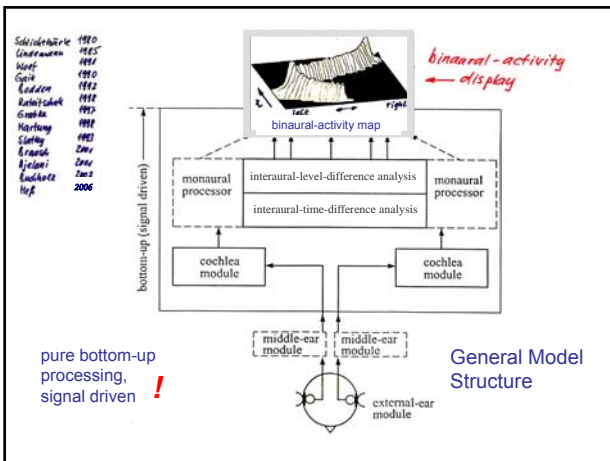
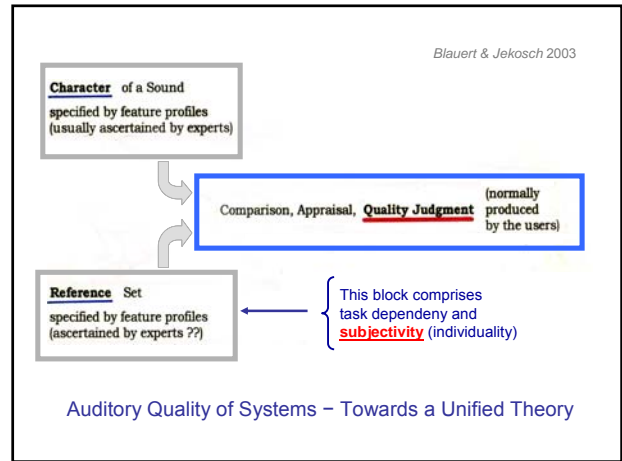
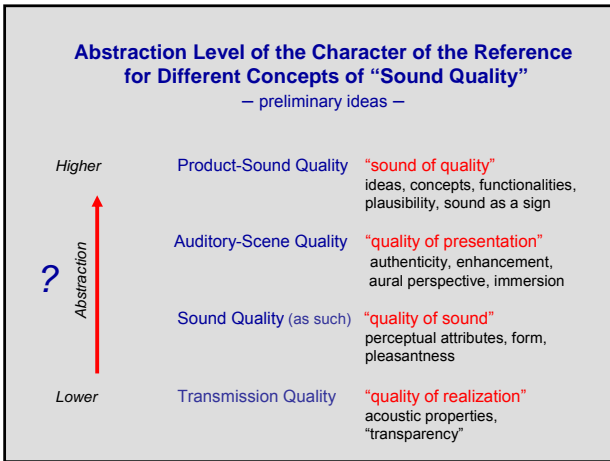
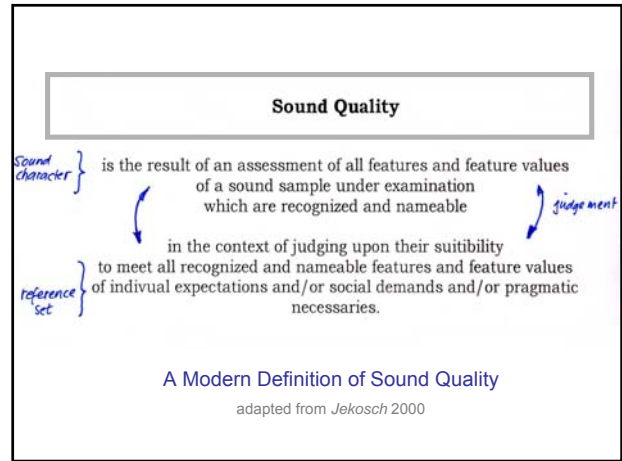
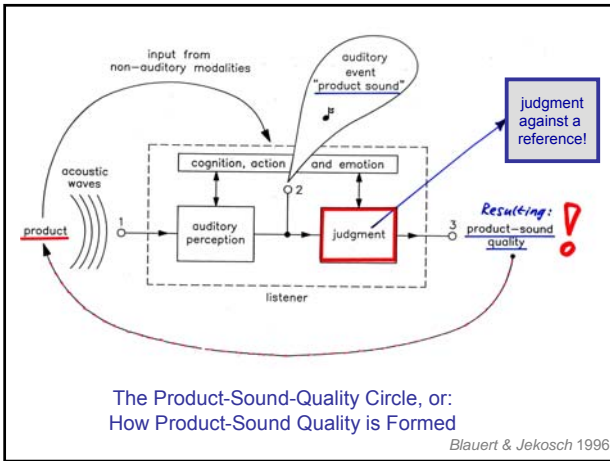
usually assessed by experts

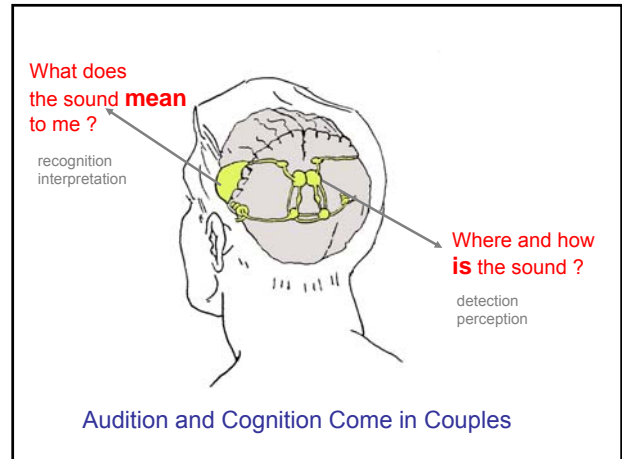
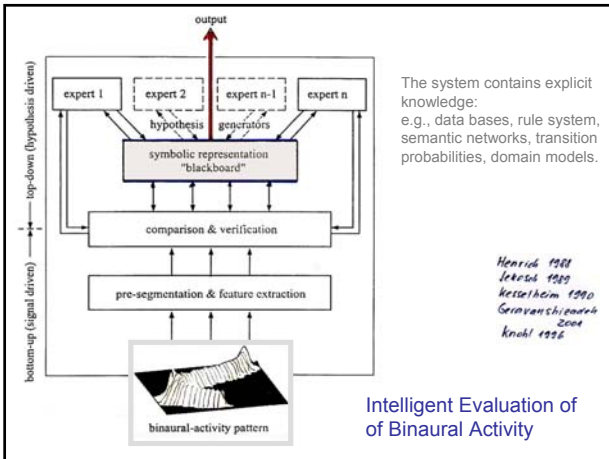
**Product-Sound Quality**  
is a descriptor of the *suitability*<sup>\*)</sup> of the sound attached to a product.

It results from judgements upon the totality of auditory characteristics of the said sound

- the judgements being performed with reference to the set of those desired features of the product which are apparent to the users in their actual cognitive, actional and emotional situation.

\*) in German: Eignung after Blauert & Jekosch 1996





**Thank You**

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14 review papers

**Communication Acoustics**  
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