Cognitive Musicology – Praised and Reproved*

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'Cognitive sciences' have conquered a vast area of the humanities in the last few decades; some of them are regarded now as a special branch of the disciplines concerned, such as 'cognitive psychology' or, in our case, 'cognitive musicology'.

Their novelty is only partial. Rather, they are a synthesis of what has already been suggested by linguistics (Chomsky's generative grammar), psychology (*Gestalt* theory), information theory as well as the latest developments of neuroscience and also musicology proper including both the revival of Schenker's elderly ideas and the recent computer-based sound research. A strange marriage of neurobiology and computer technology has been brought about, where 'neural network' is no more a biological term but belongs to the vocabulary of computer-simulated, artificial human intelligence. Finnish scholars like Kaipainen, Louhivuori, Toivíainen have played a pioneering role in these developments (Louhivuori et al. 1996; Toiviainen 1997). Kohonen's Self Organizing Map (SOM, 1995) has become an internationally acknowledged tool of artificial neural network simulation.

It should be added that 'cognitive musicology' is by far not a uniform method of research. Being a synthesis of various disciplines, several scholars go their own way utilizing only some elements of this synthesis, like McAdams concentrating on 'fusion' problems by means of sound research and *Gestalt* psychology; or Toiviainen investigating the dynamic qualities of pitch and timbre during the course of a given sound.

Anyhow, cognitive methods have done a great deal in the direction of a *holistic* approach urged nowadays in all fields of scientific research. This is why they should be praised. Why then, should they be reproved?

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Cogitare means 'to think' in Latin. Thus, it is related to *conceptual* brain activities and their *verbal* formulations. Music, on the other hand, is an aesthetical phenomenon involving our senses; the Greek word *aisthesis* originally means 'sensing' .

You may object that sensing is not necessarily opposed to thinking; on the contrary, they are interconnected. Yet, what we sense does not always become conscious; a great deal of it is distributed to other sections of our neural network.

Neurobiology drawn into musicology could open up vast new perspectives in the research of human musical behaviour – far beyond what is usually meant by the term 'neural network' today. What prevents it is the old innervations of bourgeois music culture and music psychology.

First of all, psychologists usually regard humans as *mere perceivers* of a music presented to them. This approach arises from alienated relationships, where the majority of people only appear as *consumers* of cultural goods produced by others. Secondly, this music itself narrows down, in theorists' concepts, to schemes of major-minor tonality, binary-ternary metro-rhythmics and symmetrical form structures. Worse than that, subjects are examined in *experimental* rather than really *musical* situations, sound relations being presented to them in examples similar to a lesson of *solfeggio.* Qualities beyond 'pitch' being neglected, piano sounds or even sine tones or else, in the best case, low dimensional synthetic sounds suffice. Questions like "Do you regard this tone as a C sharp or a D?" are typical.

Thus, the adjective 'cognitive' in a narrow sense is fitting here. No sensual experience beyond what is explainable by a schoolbook 'music theory' comes into play.

Actually, music should be *produced* before being perceived. More than that, any sound is the product of *vibrating bodies,* thus 'body' and 'vibration' precede all phenomena of perception and cognition, let alone the ethereal spiritual qualities often attributed to music. Even the vibrations propagated by some medium, usually the air, and thus producing various wave forms, elicit the vibration of other bodies resonating.

Music arises when the human body is brought into vibration by some elementary experience. Sound production by voice or instruments attain a musical quality when periodic vibrations at several levels are synchronized. This 'musical' synchronicity corresponds to a similar synchronicity of neuronal firings in the human body. Music perception, in an ideal case, elic-

its a similar experience in the listener, so perception is the more intensive, the more the perceiver's state becomes similar to that of the producer.

In such a way, the sensual perception of music is only partially elaborated by the mind. 'Representations' and 'pattern matching' activities can also be found at lower levels of the neural network, involving the body as a whole in musical activities.

Once neuroscience comes to the aid of musicology, it can do more than suggest a 'cognitive' approach in the usual sense. It paves the way for a holistic method, where *music as a whole* is related to the *body as a whole.* True, some cognitivists come near to such a conception. I mean, for instance, connectionism or the idea of 'subsymbolic' representations. The *active-kinetic* aspect of perception was recently emphasised by Kaipainen (1994, 50–51) stating that "perception and cognition tend to involve aspects of motor performance, even tacitly when no performance actually takes place".

I think, however, that neurobiology can lead us still farther. The French ear-nose-throat specialist A. Tomatis (1981) had realised, in his medical practice, the close connection between sounds *heard* and *produced,* furthermore the participation of the *whole body* in the acoustic communication. Thus, "memory need not necessarily be localised in the brain but is distributed, by means of the many circuit switches described, over the whole body". (Germ. ed. 163)

The American neurobiologist Oliver Sacks (1995) studying the case of Greg, "The Last Hippie" having become blind and "gravely disabled neurologically and mentally" because of an enormous brain tumor (41–42), reported in

> a March 1979 note about Greg … that 'games, songs, verses, converse, etc. hold him together completely , … because they have an organic stream, a flowing of being, which carries and holds him.' I was strongly reminded here of what I had seen with my amnesiac patient Jimmie, how he seemed held together when he attended Mass, by his relationship to and participation in an act of meaning, an organic unity, which overrode and bypassed the disconnections of his amnesia. And what I observed with a patient in England, a musicologist with profound amnesia from a temporal lobe encephalitis, unable to remember events and facts for more than a few seconds, but able to remember, and indeed to learn, elaborate musical pieces, to conduct them, to perform them, and even to improvise at the organ (61).

The other way round, the music pedagogue Emile Jaques-Dalcroze had attained marvellous results by connecting musical activity with body movements. This is how he summarized his experiences:

> I came to the conclusion, that the motive and dynamic element in music depends not only on the hearing, but also on another sense … musical sensations of a rhythmic nature call for a muscular and nervous response to the whole organism. (1921, XIII)

No doubt, the most monumental and comprehensive book ever written on the neurobiological aspects of music is Nils L. Wallin's *Biomusicology* (1991). It is all the more curious that *cognitivists* have taken no *cognizance* of this capital work.

According to Wallin, music-making and music perception elicit a kind of 'relative synchronization' in neuronal activity, where an increasing amount of EEG potentials are correlated with a greater amount of synchronized neurons with increased discharge frequency and spike clustering; and resonance phenomena "appear through space-time coded excitations" (224).

Thus, music as an intensive experience (*Erlebnis* in German, for which the English language has no adequate word) triggers rhythmically synchronized discharges in the neural network, mobilizing, through the limbic system and the reticular formation, body as a whole.

If music psychologists wish to study such a holistic experience, they should not put up with examining auditory procedures in laboratory situations. Rather, music as a whole and its relationships to body as a whole should be taken in to consideration.

Difficult as such a task is, there are some pioneering researches in this direction. I mean, first of all, the team of scholars from various subject fields, whose activity has been supported by the Karajan Foundation in Salzburg. So G. Harrer and others (1982) have developed a so-called 'polygraphic' method, where simultaneous recordings of the activity of the brain (EEG), the heart (EKG), muscle tension (EMG), breathing, finger oscillogramme and galvanic skin response (GSR) while listening to music were produced.

Such bodily responses cannot merely show that the musician or listener is 'excited' but also characterize the type of musical gestures eliciting a given behaviour. A tool measuring this is Clynes' (1982) 'sentograph', where the quality and intensity of the listener's finger pressures accompanying music and displayed on a screen can, for example, distinguish Mozart's style from Beethoven's.

This all should already lead to researches into the relationships between human and musical *gestures* and, in general, to human and musical *behaviour patterns.* Not the least component of them both is the character of *sound*

productions, by voice or instruments alike, analysable by sound spectography as utilized by Foedermayr or Rapoport. Some results in this direction have also been attained at our Institute for Musicology.

This is, however, a subject demanding separate attention.

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