BRICOLEUR AND ENGINEER IN COMPUTER MUSIC

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ABSTRACT
In this paper, the terms *bricoleur* and *engineer* are used as metaphors for different aesthetic and technological approaches to computer music. Based on the musical analysis of selected works, the possibility of regarding computer music as a single cultural field is discussed.

INTRODUCTION
In the *Calls for Participation* for this conference it says, "Computer music is neither a style nor a genre" (ICMC 1999). A similar view was expressed by John R. Pierce in a 1996 CMJ article (Pierce 1996). The purpose of such a broad definition could be to avoid the exclusion of any kind of computer-facilitated music. Not excluding anybody does not, however, automatically mean that everybody is included. Music, when understood as a cultural phenomenon, usually belongs to - or is explicitly breaking out of - a particular style or genre. Leaving this perspective out of the definition raises the question of whether 'computer music' is really a cultural field and not just a particular technological emphasis on 'computers in music'. Not excluding anybody does not, however, automatically mean that everybody is included. Music, when understood as a cultural phenomenon, usually belongs to - or is explicitly breaking out of - a particular style or genre. Leaving this perspective out of the definition raises the question of whether 'computer music' is really a cultural field and not just a particular technological emphasis on 'computers in music'. This leaves the question of whether it is meaningful to have a label called "Aesthetics of Computer Music", if computer music, as such, is not culturally defined. However, computer music - in plural - still produce aesthetic artifacts. How then to study the aesthetics of these different musics? Although an all-encompassing definition is questionable, it leaves the possibility open that various computer musics, of different styles and genres, could share the same technological processes. This possibility was maintained in the study we want to present in this paper: how does the computer music composer's choice of technological tools and methods reflect his/her - declared or tacit - aesthetic goals (Okkels and Conrad 1999)?

A MUSICOCOLOGICAL APPROACH
We chose to base our study on a fragment of anthropological theory, namely the concepts of *bricoleur* and *engineer* as coined by Claude Lévi-Strauss in his 1962 monograph *La pensée sauvage* (The Savage Mind, Lévi-Strauss 1976). He used the two terms as metaphors for different modes of human creation, based on differences in the attitude towards materials, tools, and processes. This seemed well-suited to our purpose: it allowed us to initially disregard the distinctions of genre and style and to include the discussion of technological tools and processes, while still maintaining a cultural dimension. Ultimately, Lévi-Strauss' distinctions can be interpreted as various ways to create meaning and knowledge. In our context this could be translated as: how do computer composers create musical meaning through technological means? This question certainly covers our original intentions, as musical meaning ought to reflect aesthetic goals and positions.

Work analysis
As musicologists, we have used work analysis as a main approach in our study, assuming that insight into the question of the relationship between aesthetics and technology can be found by studying some of the resulting works themselves. This approach is not self-evident. Evan K. Chambers, in a 1994 ICMC paper, claims that computer music is defying objectification as 'a work of art' in the traditional western sense (Chambers 1994). However, Chambers is talking about a specific genre of computer music, namely what we have called "academic computer music" which is research oriented and closely related to academic institutions such as IRCAM and CCRMA and events such as this conference. And even here, most computer musicians offer an aesthetic output in the form of works, played at concerts, which justifies our focus on the works. We chose four works of very different genre for our study repertoire: Kaija Saariaho: *Stilleben* (Saariaho 1989), Barry Truax: *The Wings of Nike* (Truax 1991), Pizzicato Five: *Trailer Music* (Konishi 1997), and John Oswald: *Seventh* (Oswald 1989). The works were chosen to represent a width of compositional and aesthetic approaches and at the same time be of musical interest to ourselves.

Some of the composers are very outspoken about
their intentions, and this allowed us to investigate through work analysis how their aesthetic program was realized in the actual music. This was especially the case with Barry Truax, where the analysis showed how the movements of The Wings of Nike reflect his program of "composing through sound" (Truax 1990). Although the three movements share the same two sampled phonemes as their material, they are shaped into very different musical forms. The piece is realized by means of Truax' self-developed GSAMX composition program, and the development and use of this system is an integral part of his composition process. In this piece, Truax used the computer technology to articulate aspects of the micro-timbral qualities of the human voice in an artistic form.

Kaija Saariaho's piece is conceived for radio and draws on various sound sources and - being close in genre to radio theatre - narrative strategies. Clips from the recording of an earlier work are mixed with soprano, flute, choir, concrete sounds and readings of poems by Kafka, Kandinsky, and Eluard in three languages to form a story about separation and the difficulties of communication. Another main theme is the exploration of how we move between different levels of consciousness, an exploration which is paralleled on the technological level by the morphing of one sound into another, using spectro-morphological techniques. In making the piece, Saariaho used specialized software for spectral analysis and morphing.

Pizzicato Five is a Japanese pop-duo with a DJ rather than a musician background. Their music is made entirely by computers and comes close to techno and easy listening in style. In Trailer music they use sampling and editing methods, closely related to the DJ's practice, to make a short piece, containing references to at least five popular music styles from the last 50 years. Without revealing the exact identity of the originals - maybe they don't exist? - the eclecticism of this music comes close to the post-modern simulacrum. The piece was made using standard MIDI and sampling technology.

John Oswald uses recorded material as basis for his plunderphonics style in which he edits and manipulates a large number of samples into new music (Oswald 1986). In Seventh, the source is a symphony movement from Beethoven, and although he leaves almost all thematic material out, the music remains 'Beethovenish' in character. Music analysts have shown that the essential quality in the Beethoven piece is created by small rhythmic cells (Riethmüller 1994), and these are reflected in Oswald's loops of accompanying figures. Oswald's pieces are made by computer editing of a large number of samples, combined with certain - supposedly partially self-developed - DSP techniques.

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Tools, materials and methods
The term bricoleur is used by Lévi-Strauss to exemplify the "mythical thinking" that he found among "native" people such as the West-coast Indians in North America. This kind of thinking interprets new phenomena as transformations of existing social and cultural structures. The bricoleur is described as a dabbler; he will use whatever materials and tools are at hand for his projects. He starts by looking back at the already existing set of tools and materials, and involves in a dialogue with his "treasure" to discover what each element could possibly signify in the context of the new project.

The engineer is seen by Lévi-Strauss as an example of the Western scientific thinking. His projects are not limited by a closed collection of cultural artifacts, but are open to extensions of existing knowledge, tools, materials, and methods. He starts by looking forward rather than backward: he is projecting his idea beyond the existing knowledge and he is able to construct new materials and new tools to realize his project.

Signs and concepts
The tools and materials used by the bricoleur are already part of culture. They are not abstract materials, but already signify something before being used in the new project. Although the bricoleur will re-arrange everything into something new, the parts will retain a reference to their old meaning, even as they appear in the context of the new project. Meaning, in terms of bricolage, is created by restructuring of existing events. Opposed to this, the engineer is able to use abstract concepts which are, in Lévi-Strauss' terms, transparent to reality. He can create tools and materials specifically for his new project, with no reference to past events. His process is not so much constrained by culture as by nature itself, and only the final result takes its place as a cultural event. Meaning is created by the engineer as a result of the occupation with abstract structures.

Musical bricolage
Musical bricolage could be seen as an extension of a reception aesthetics, which claims that musical meaning is created in the mind of the listener as much as by the composer/interpreter: the work of art is happening in the moment of listening. Translated to a compositional method, the
composer takes his starting point in his own listening to other music and transforms his impressions to new music. The initial perspective is directed towards music which is already there. In the context of computer music, the bricoleur composer especially relies on digital sampling and editing, combined to some extent with DSP techniques. Unlike composers from earlier days, such as Charles Ives who worked according to similar principles, he is not limited to composing on paper, but can use recorded sounds and music directly in creating new music. This allows for the incorporation of *timbre*, which has been an important factor in 20th century music in the West, as a referent to other music. Re-interpretations of musical instruments have been known since John Cage first used radios and record players in some of his early works. The use of reproduction equipment for production purposes is embodied in the digital sampler which allows for recording as well as for digital manipulation and playback of pre-recorded material. The sampler, with its various sound manipulation facilities, could be seen as the bricoleur instrument *par excellence*. When considering style and genre, bricolage can be most obviously related to *experimental music*, such as that of John Cage and his followers, and to a crossing of electronic music with performance and installation art. The DJ scene and its techno music which relies heavily on the use of recorded material, could also be a candidate for inclusion in the bricoleur category.

**The musical engineer**

The musical engineer could be said to represent a centuries- if not millennia-old tradition in Western music. The skilful, almost obsessive, use of abstract constructive elements, which cannot be perceived by the listener, was conspicuous already in 15th century composers such as Ockeghem and Obrecht. This tradition has continued in different guises up until the present day. Recently, it was prominent in the total serialism of the 1950's and 1960's in which the pre-compositional construction of all the musical 'parameters' according to series of numbers played an important part of the compositional process. However, the tradition of emphasizing mathematical relations behind the sonorous music can be traced back to antiquity, as in Pythagoras' concept of 'music of the spheres'. In this philosophical tradition, musical sound is understood as a sensuous representation of some larger universal harmony. The perceptive phenomena are subordinate to their assumed cosmological implications. It should not be forgotten that through the Middle Ages and the Renaissance, music was considered part of the "quadrivium" of natural sciences, and musical philosophy was still based on these antique concepts. Even today, in computer music, this philosophy has its advocates, e.g. Xenakis who evokes the "ancient civilizations" in his descriptions of a new "sonic art" (Xenakis 1971:178). The importance of numbers in music has once again come to the fore in the guise of digital representation. No doubt this ancient philosophy is an undercurrent in the dominance of technological and mathematical perspective in journals such as Computer Music Journal and conferences such as this one.

The musical engineer bases his work on the tradition of emphasizing numbers and abstract structure in Western art music history. Computer music composers in the engineer category are eager to devise new technological tools to facilitate the formation of new kinds of sound material. In this respect, the composition process becomes a research process as well, a research into the nature of digital sounds, of instruments, of spatialization and so on. An 'engineer composer' in computer music works with sound as an abstract physical entity rather than a cultural artifact, and he will often want to create *nie erhörte Klänge* using sophisticated synthesis methods.

**CONCLUSION**

We would like to emphasize that the attempt to evaluate the analytical material in terms of the bricoleur/engineer construction should by no means be understood as an absolute categorization, but only serve to clarify the aesthetic differences we have been discussing. Like Lévi-Strauss, who uses the terms bricoleur and engineer as equally valid creative modes, we do not imply any preference of the one to the other. When considering our analytical examples, it was clear that the pieces by Saariaho and Truax came closer to the engineer end of the spectrum, whereas the pieces by Pizzicato Five and Oswald were leaning towards the bricoleur end. Both Saariaho and Truax used specialized software to explore the sound, putting it under a 'timbral microscope'. In both cases, this exploration into the micro-structure of the timbre was an important key to the composition. Saariaho adds an external story, while Truax sets out to investigate how to use timbre to determine the musical form. Although they both incorporate concrete sound material, the pieces remain largely abstract in nature. The two composers' development and use of specialized software in the exploration of material and method justifies the
placement in the engineer category.
At the other end of the spectrum, particularly Oswald is using recorded material with very clear references. It is part of his music that the listener should be able to recognize the source. In Pizzicato Five's case, the reference is not clear, but becomes a more unspecified index to certain musical styles or TV series of the past. None of these musicians are concerned with speculations about the physical properties of sound or abstract composition methods. They regard their material as sound in a cultural sense: recorded music. The musical meaning of their pieces is created to a large extent by the interplay between the audible events and their references to existing music and musical styles.
If we try to place these four works into normal style and genre categories, we would place Saariaho and Truax in the stream of Western art music, Oswald in the American tradition of experimental music as described above, and Pizzicato Five as international pop music. Whereas we could expect to meet Saariaho and Truax at a conference like the ICMC, this is unlikely with Oswald or Pizzicato Five, even if their music clearly qualifies, according to the open definition discussed in the introduction. Our study does not confirm that computer music constitutes some substantially new cultural formation which goes beyond existing style and genre demarcations. This might be due to our limited material, which can not be said to be representative.
But we rather think that it is a sign that the computer music discourse addressed in the definition for the ICMC 2000 and discussed in Chambers' 1994 paper, is itself a part of the 'engineer culture' as described above. The lack of cultural focus when discussing computer music in favour of mathematically-oriented research is in total compliance with the 'engineer tradition' of Western art music as we have described above.
It adds to the impression that the amount of learning required to be able to work professionally with computer composition software is not small, even for a trained musician. Programming skills are needed in order to work out your ideas, and in most cases translation of musical ideas into mathematical algorithms is necessary to a degree that would be unacceptable in most other professions.
It is our claim that this increased willingness on the part of some computer music composers is not incidental, but an affirmation of the engineer tradition. The price to be paid for this is that computer music, the 'engineer way', is extending the serial music's compartmentalization as expert culture.

Adding an aesthetic dimension to a field like this is a little bit like inviting a stranger in. A true interdisciplinary approach, comprising a wider cultural perspective on computer-created music has a long way to go, not the least in creating a theoretical foundation. We understand the emphasis on the creative aspect as a theme of this conference as a sign of willingness to enter this process, and we hope to have shown through our study that musicology has a positive role to play.

REFERENCES