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When soundtracks of fiction and non-fiction converge:

On the use of macro sounds to present the inside of bodies

ABSTRACT
This paper discusses how sound design is used to portray the microscopic world of the inside body by adding diegetic 'macro' sounds, meaning post-synchronised sound effects and/or added atmospheres that are paired with Computer-Generated Imagery (CGI) to present the world inside of us. These kinds of macro sounds are used in both fictional and non-fictional audio-visual works, showing how soundtracks of fiction and non-fiction often build on similar sets of aesthetic conventions, and thereby can be said to converge towards each other.

The discussion is based on an analysis of 100 short CGI segments that present the inside macro world of our bodies, taken from the TV series House MD *(Shore 2004), as well as fact-based TV programmes produced for broadcasters such as Discovery, BBC and National Geographic. The paper discusses the practice, the motivation and the consequences of adding diegetic 'macro' sounds to visuals simulating macro photography by the use of CGI. Towards the end, the paper includes a somewhat broader discussion on convergence between fictional and non-fictional soundtracks and includes other productions that similarly depend on the use of post-synchronised sounds – for instance portraying the cosmos, life in the deep seas, as well as historical and futurological programmes.*

KEYWORDS

macro sounds

documentary sound

computer-generated imagery

micro worlds

Introduction

For almost two decades, broadcasters such as National Geographic, Discovery and the BBC have presented documentaries portraying the inner life of the human body by using Computer-Generated Imagery (CGI) together with more traditional audio-visual recordings. One early example from the 1998 is the BBC's prize-winning, *The Human Body* (Bookbinder 1998). The same year, Discovery Channel presented a similar series called *Body Stories* (Klein 1998). Other relevant, and more recent, titles are *The Secret*

Life of the Brain (Grubin, et al. 2002), *Human Body: Pushing the Limits* (Butterworth, et al. 2008), *The Incredible Human Machine* (Binkowski, et al. 2010), *Inside the Human Body* (Hemingway, et al. 2011) and *How Sex Works* (Hopkins, et al. 2012). These types of documentaries often involve the use of *macro sounds*, that is, sounds that are paired with, for example, body parts such as cells, veins, or internal organs, and such as wise pair of sounds with phenomena such as brain activity, transportation of fluids, the flow of impulses, signals, cells and similar. These sounds are mostly linked with specific objects that can be visually identified (onscreen sound elements), but can also include atmospheric sounds that have a more tentative connection to the images (being to a larger degree off-screen diegetic sound elements).

The same combination of CGI and post-synchronised sounds are also used in fiction today, such as in the American TV series *House M.D.* (Shore 2004), programmes which have regularly portrayed the inside of bodies. The external life of doctor House, his colleagues and patients do of course dominate the narrative in the series, but quite often the audio-visual perspective also "zooms in" either to show the problems or the solutions that are unfolding inside a patient´s body.

How do diegetic macro sounds contribute to the overall presentation and experience of the inside of our bodies? What are the consequences of adding post-synchronised macro sounds to otherwise silent or near-silent images?

The aesthetics of macro sounds

Some of the conventional ways of designing sounds to depict the inside of bodies can be said to have started even before Computer-Generated Imagery was born. One early and well-known production that presented the inside of a human body, was the Swedish TV documentary from the beginning of the eighties, called *The Miracle of Life* (Erikson & Lofman 1982). The production presented an evolving pregnancy from inside the womb and presented visuals that were produced by photographer Lennard Nilsson and others. The production was considered at the time to be ground breaking and spectacular. The soundtrack was far more conventional than the visuals in the same production, and lacked to some degree synchronisation with what was being depicted. Rather it gave prominence to voice-over and music. However, there was an interesting use of atmospheric sounds in this production, by the use of "rumbling and bubbly" sounds that have similarities with listening to environments under water, and by inference also having similarities with the sounds experienced being inside the womb.

This way of creating a recognisable sonic world by using sounds that remind us of listening to environments under water has developed into one of many common strategies when designing macro sounds, and can be said to represent the sonic experience of "returning to the womb". There are a number of examples of this "under water experience" in the material discussed here, and some of these examples are presented in video number one.[1]

The use of sound that contributes to an underwater experience, builds on a set of expectations of how the inside of bodies might sound. The internal sounds of heart beats, breathing and digestion can for instance function as a common reference for both audiences and sound designers, references rooted both in audio-visuals and experiences in everyday life, and can perhaps be said to represent a return to the sonic world of being inside the womb. Walter Murch has pointed to the importance of our hearing experience in the last four and a half months within the womb, writing in his Transom manifesto:

> (..) we are pickled in a rich brine of sound that permeates and nourishes our
> developing consciousness: the intimate and varied pulses of our mother's
> heart and breath; her song and voice; the low rumbling and sudden flights
> of her intestinal trumpeting; the sudden, mysterious, alluring or frightening
> fragments of the outside world — all of these swirl ceaselessly around the
> womb-bound child, with no competition from dormant Sight, Smell, Taste
> or Touch. (2005)

At the same time, audiences (and sound designers) will in many cases lack the same kind of references when hearing sounds to macro processes in the body, such as designing sound for a firing neuron, a stream of cells in body fluids and other internal processes. And in audio-visual productions of today, the use of sound can often be very over-blown and be used to add intensity and drama to the images, irrespective of the "reality" of the sounds. One dominant example from contemporary programmes is how visuals that show firing of neurons is combined with sound effects connected to the various sounds of electricity, and especially the sounds of sparks connected to the short-circuiting of an electrical system (in everyday life mostly linked to high voltage

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[1] Video 1: https://vimeo.com/188628429

electricity). The same kinds of sounds are also used when signals run through material in a body. A number of examples of this can be found in the material that is studied here, such as exemplified in the compilation video number two,[2] that present both "normal" signal flows and signal flows connected to medical conditions.

In the last clip of this video number two depicts an early and formative example of connecting visuals of signals in the body with the sound of electricity, taken from the production *Body Stories* (Klein 1998). The filmmakers were at that time able to show the first broadcasted medical recording of a neuron´s firing (presented in slow motion), and they chose to accompany this medical recording with typical sounds from electrical bursts and sparks. This particular combination of sounds and image seems to have developed into a convention over the years, and is prominent in the material studied here.

Chion's term "materialising sound indices" is – such as in almost any film or TV production – a very relevant way of describing the use of such (macro) sounds (1994: 114-117). The added sound effects contribute to materialise the unfamiliar landscape of our inside body, and the added sounds give the audience – whether intentionally and carefully designed or not – both information on the material of the source elements - information about the actions that has produced the sound - and information about the environment in which the sound was produced. Such macro sounds can be described as more or less plausible when presenting materiality, actions and environments in many of the production examples. One can say that there are a number of borderline cases in the material, cases that challenge more "naturalistic" approaches to sound design: such as when prioritising believability when it comes to a sound´s source and causality, materiality, environments, spatial qualities and more.

One rather exaggerated example is the sounds of visuals that show growing of hair in fast motion, such as in the productions *The Incredible Human Machine* (Binkowski, et al. 2010) and *Body Stories* (Klein 1998), and how this is combined with creaking sounds – such as the sounds of stretching ropes on an old sail boat. Video compilation number 3 includes some other examples of macro sounds that are chosen because they are somewhat exaggerated compared to the more traditional use of sound effects – at least when it comes to non-fiction.[3]

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[2] Video 2: https://vimeo.com/188640600
[3] Video 3: https://vimeo.com/188632897

The adding of snapping, cracking and breaking sounds to images of muscles and body material in House M.D., can have a deep emotional impact on audiences. And macro sounds can also be said to add tactile qualities when combined with visual information. Marshall McLuhan described this sense of touch when he discussed the prosthetic qualities of TV. In *Understanding Media* he writes:

> Most technology produces an amplification that is quite explicit in its separation of the senses. Radio is an extension of the aural, high-fidelity photography of the visual. But TV is, above all, an extension of the sense of *touch*, which involves maximal interplay of all the senses. (1964: 313).

McLuhan points here to how audio-visual combinations can lead into other sensations, such as the sensation of tactile qualities, or "the sense of touch", as he describes it. And this is a very relevant description to what happens when we experience the production segments at hand. The sound makes us "feel" the materials that are portrayed in the inner body – we are not limited merely to understanding the relevant materials and processes in an intellectual way, but rather that we somehow "get in touch" with the actual body parts by these kinds of depictions. McLuhan's quote seems particularly relevant in the sense that macro sounds also contribute to our *overall* perception and cognition when watching programmes that portrays the inner body.

When no macro sounds are used, the more particular sense of materiality thereby is lost. This is the case in a contrasting example, an episode from *The Secret Life of the Brain* (Grubin, et al. 2002), broadcasted by PBS. In the more traditional segment presented in video number four there are no sounds other than music and voice-over guiding us through the scene.[4] The lack of macro sounds also slows down the narrative momentum in this sequence, and today it might be regarded as somewhat dated. This is because the use of macro sounds seems to have become more prominent generally.

Why is it possible to prioritise tactile qualities over actuality in sound design?
There are several reasons why the adding of such sound effects are generally accepted by film producers and audiences. Some of the important reasons for this are connected

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[4] Video 4: https://vimeo.com/188642154

to pragmatism, an audio-visual contract and artistic licence, as described by Chion (1994) and others. The unfamiliar world of these internal environments allow sound designers to add sounds that sounds familiar, or that reflect some kind of associational logic, and therefore can be said to be plausible, if imprecise. Contextual sound elements, such as music and voice-overs, can also contribute to mask the impreciseness of macro sounds.

Synchresis, the term used by Michel Chion to describe how we almost automatically synthesise a synchronised audio-visual event, is an aspect of this pragmatism. And this pragmatism can be further stretched in many ways. One important point is that audiences might think of macro sounds as illustrative – and understand such sounds as having other qualities when combined with CGI, rather than paired with traditional recordings. Leo Murray writes:

> When we talk about realism in drama and documentary or realism in the soundtrack, we need to make a distinction between realism and reality. Realism often means "the illusion of reality" – realism as a representation, without limiting the representation to truthfulness or authenticity. It is merely a representation of real life, which can *stand in for* real life. Reality on the other hand *is* real life – actuality – as we experience it. (2010: 132)

Most soundtracks can similarly be said to depend on believability, rather to depend on precision.

Another important point is that the desire for narrative momentum is shared by filmmakers as well as audiences, and it is important to note that macro sounds contribute to making fact-based information more entertaining and emotionally appealing as well as contributing to momentum and dramatic dynamism. Yet another very important aspect is the audio context, such as for instance how it sometimes can be hard to know whether a post-synchronised sound is to be understood as a diegetic sound effect or a non-diegetic musical element that happens to be placed in synchrony with a particular visual change. The same kind of vagueness is further enforced when the musical sound elements resemble to the materiality of sound effects that are experienced as relevant to the imagery.

Many of the CGI segments in the material studied here further starts and ends with sound effects linked to camera movements, digital zooms or similar rapid visual

changes, and this can contribute to bridge the transition from the external worlds to the more illustrated insides of our bodies. Examples of this are presented in video number five.[5] Some of the productions also include the same kinds of transitional sounds within the CGI segments, by pairing sound effects with colour flashes and other aspects of visual changes and transitions. These kinds of sonic contexts may also contribute to pragmatism when it comes to experiencing macro sounds, by combining macro sounds with sounds that enhances "transitional" effects – as well as using voice over and music. Sounds that enhance such visual changes are very often used in movie trailers (Høier 2010), but can also be found in CGI sequences, TV series and documentaries today.

Even if the macro sounds we hear have no intuitive causal link to the visuals, one can at least recognise the metaphorical and associative qualities between what we see and the sounds we hear. The combination can therefore be experienced as plausible, and somehow reflect conventional associations. For example using an underwater sound to represent a microscopic landscape within a muscle is in many ways far fetched. Yet even so, the sound might also work – and maybe we will accept this combination because we are hearing a bubbly sound where high frequencies are reduced, as if hearing through dense materials - pragmatically "like being inside a body". One can say that associations and familiarity can help to anchor a sound to curtain imagery, even if the direct causal link is weak.

Why not?
CGI is used in various productions today, and included in productions covering everything from microscopic objects to depicting gigantic planets. The use of CGI is very often rooted in scientific knowledge and will similarly result in some kind of learning (about dinosaurs, the universe, historical events and so on). The material discussed in this article is also interesting in this respect, because it is clearly rooted in medical knowledge – using sound and visuals to present the nature of our inner bodies.

The problem with adding macro sounds as described above, can be said to be connected to expectations of sound effects as carriers of information, especially combined with factually based visuals. There is no doubt that macro sounds contribute on an emotional level, and do create interest, focus, drama, and momentum – thereby

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[5] Video 5: http://vimeo.com/188709755

also contributing to involvement and learning, but such sounds are still imprecise when thought of as carriers of information.

In fact, the use of such sounds can lead to a misrepresentation of materiality – how actions and spatial characteristics are portrayed within the human body. There are no high voltage sparks in the inner body, nor do actual sounds when made at all sound as if created in an acoustically perfect space. So when the adding of macro sounds could aid general understanding of the inner body, it may also end up with giving the wrong impressions of material qualities, processes, scale or proportion.

Macro sounds are often recordings that are re-placed – and sometimes misplaced – into a new context, containing what can be described as illustrative qualities, in the same was as figures and graphs in texts, dramatisations of events in documentaries, simulation of processes and similar illustrative techniques. One can also say, and that is connected to the main point in this text, that such sound elements represent a "grey area" that challenges a more traditional way of thinking, that of separating non-fiction from fiction soundtracks – and are examples of an ongoing convergence in genre practices and soundtracks. A pragmatic way of thinking about these kinds of macro sounds when used in non-fiction, is to describe them as a part of the creative *illustration* of actuality, extending the more traditional focus on the creative *treatment* of actuality within documentary films.

Convergence as a broader phenomenon

The use of CGI is ubiquitous, and is typically found in productions that present worlds beyond the human experience – both in fiction and non-fiction. CGI is used not only for presenting microscopic worlds, but also for presenting historical pasts and possible futures. CGI is often used to present popular science, such as simulating disasters and other physical phenomena or processes, chemistry, mechanics, surgery, buildings and landscapes, archaeological findings etc. When designing sounds of, say, a dinosaur or a catastrophic process in nature, it is very plausible that the sound strategies have great similarities in fictional and non-fictional productions. The roar of a dinosaur will in most cases be based on scientific, physiological and biological knowledge and so on, but will at the same time also involve the creative design of a "sound illustration" of a lost roar from a lost world – a sound that the audience has no direct reference to. The status of the sound of a dinosaur roaring can thereby be said to have similarities with the status of macro sounds discussed here – it is unclear.

When NASA have presented the planet Mars in various videos today, they often depend on CGI. CGI is used both to visualise the landscape on Mars, the Curiosity rover, Opportunity, space crafts and like. What is interesting in the context here is that NASA sometimes adds sound effects to their presentations, together with voice-overs and music, to aurally present their efforts of exploring Mars. One out of many interesting use of sounds in NASA material can be found in *50 Years of Mars Exploration* (2015).[6] This video presents some examples of how sounds are connected to movements of mass, moving mechanics, landings and more, and are reminders of how scientific knowledge meets artistic licence when designing sound for popular science of today, and is similar an example of how the soundtrack of fiction and non-fiction sometimes can converge – also when it comes to NASA.

Further, there are a number of production situations where sound recording is either impossible or not prioritised, and situations where the sound designer is left with adding post-synchronised sounds as the only alternative. This can be the case because of distance to the filmed object, like using extreme long shots presenting nature or sports, or when the environments is very noisy, such as when filming from helicopters or drones. The same dependence on post-synchronised sounds will be the case when using silent footage, such as using surveillance footage, recordings from space or deep sea, together with the use of archive material that lacks sound.

Audio-visuals about World War I and II are another examples of post-synchronised sounds that are unclear as to source. For instance, a TV series that use silent material from WW1 or WW2 might add post-synchronised sound effects and atmospheres, together with music and voice-overs. This is the case in a the TV mini-series, *Apocalypse – World War 1* (Clarke & Costelle 2014), that depends on the use of archive material in combination with post-synchronised sounds to present the sounds of war, like presented in the trailer for the series.[7]

The producers of this series have prioritised to add sounds to some, but not all, of the visual elements in the film. The soundtrack typically combines voice-over and music with some carefully selected and prominent sound effects (often a firing of a gun, a tanks driving by, the whistling sound of a falling bomb and similar sounds of the horrors of war). What is the status of such an added sound? At one hand the use of such sounds is based on research and historical knowledge, on the other hand it is still a

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[6] NASA video: http://mars.nasa.gov/multimedia/videos/index.cfm?v=289
[7] Apocalypse trailer: https://www.youtube.com/watch?v=n3Prv6HJxxc

creative illustration of actuality. And this can be said not only about the more obvious cases of fictional presentations, but is also a very relevant question in many non-fictional presentations of WW1 and WW2.

Concluding remarks

Do audiences expect a special kind of audio-visual contract for non-fictional audio-visual productions compared to fictional productions? Or is it more reasonable to talk about only one common form of a very loose audio-visual contract for all audio-visuals today?

Historically, the use of non-diegetic narrators and music has not offered any help to distinguish the documentary soundtrack from the fictional, and today's creative use of atmospheric sounds and sound effects has made it increasingly harder to separate the two. It seems gradually less reasonable to expect two special kinds of audio-visual contracts today, separating the non-fictional from the fictional. Aesthetics seem to be converging, and so is the practise among sound designers. It is now debatable whether today's documentary soundtrack has qualities different from fiction.

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