Evolution of Sound Design in Science-Fiction Movies.

Comparing Modern Day Practices to the Late 1970s and Early 1980s

Scientific Research Paper

On behalf of the Austrian Marshall Plan Foundation Scholarship Program

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March 2023

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Abstract

This scientific research paper analyzes the field of motion picture sound design on the specific example of science fiction movies. Considered is the timespan from the early days of sound design in the 1970s to the present day. The paper traces the development of sound design techniques and practices, the history of motion picture sonification in general, as well as the different roles present in film production sound crew. It also takes a look at several pioneers of the craft, how they passed the torch to newer generations and how this generation further developed these older principles and ideas. Centerpiece of the paper is an interview, including its analysis and interpretation. This interview was held with acclaimed sound designer Mark Mangini. He talks about his standpoint on the development in his field and the creative thought process of modern-day sound designers. The personal example he is talking about, is the 2021 science fiction film *Dune* by director Denis Villeneuve where he took on the role of supervising sound editor and sound designer.

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1 Introduction

"When I started out, it was very unusual for someone to be employed to make specific sounds for a film … Then along came George Lucas, who instructed me, 'Here, take this microphone and Nagra, take a year and go out and collect all interesting sounds you can think of' "(Whittington, 2007, p. 94)

Motion pictures have been around for an extensive period of time; be it only as small black and white silent movies, or as huge spectacles with 3D technology and extensive CGI. As important as the history behind the visual side of movies, is the development of movie sound. Movie soundtracks have evolved rapidly since the first marriage of sight and sound at the beginning of the 20th century. But it took until the end of the century for one topic to emerge, that is integral to the soundtrack of modern movies today: sound design. As sound designer Ben Burtt mentioned in the quote above, almost nobody had done what he was instructed to do for the first *Star Wars* film in 1977 by the director George Lucas. This time marked the beginning of sound design as it is still referred to today, but the world has changed a lot since then. Did sound design change as well?

This scientific research paper aims to answer this exact question, as well as several others by examining motion picture sound design, old and new alike, and comparing them to each other. To further narrow down the topic, this work will mostly focus on movie installments of the science fiction genre. The reasoning behind this lies in the highly influential nature that the genre possesses towards the technical disciplines of film production. In his 2007 book "Sound Design & Science Fiction" William Whittington describes science fiction as a genre that "offers an artistic and intellectual space to speculate about what could be or what might potentially influence the 'real world' of both the present and the future." (p. 5). Especially areas like visual effects (VFX) or computer-generated images (CGI) have been heavily pushed and progressed by the genre. The sound department falls into the same category. Another reason is the ongoing popularity of the sci-fi genre which makes a comparison between older and newer movies easier, since the sample size has not changed drastically over the past 50 years as it might be the case for other genres.

During the research preparation for this work, the opportunity presented itself to personally talk to acclaimed sound designer and re-recording mixer Mark Mangini. His work includes movies like *Mad Max: Fury Road* (Miller, 2015), *Blade Runner 2049* (Villeneuve, 2017) and most recently *Dune* (Villeneuve, 2021) for which he won his second Academy Award in the category "Best Sound". Considering this experience in the science fiction genre, the decision was made to invite him to an interview through e-mail, which he happily accepted. The questions chosen for this occasion were geared towards his work on *Dune* and sound design in a general historic context:

- Sci-Fi movies allow us to travel to distant imaginary planets, witness unknown cultures and dystopian futures. What challenges did you and your team encounter trying to convey the sounds of Arrakis, the Atreides, the Fremen and things like giant sandworms? How did you overcome them?
- In an article By Kyle Buchanan featured in the New York Times about the sound design of "Dune" you talk about how out of "the 3200 bespoke sounds created for this movie only four were made solely with electronic equipment and synthesizers." Why did you choose the

method of recording almost all of your sounds from scratch? Has it been beneficial for the overall creative process of Dune's sound design? How?
- Generally speaking, what are some advantages and disadvantages you've experienced by recording sounds yourself rather than using synthesizers and sound libraries?
- How would you say the work of sound designers overall changed in the last decades regarding the sci-fi genre?

This interview will make up the central part of the paper, preceded by a chapter about the basics of sound design. It includes a historical contextualization of motion picture sound and the science fiction genre, research about the different parts that make up a movie soundtrack and the role a sound designer plays in the sound department of a movie production. The goal is to create a basic understanding of sound design as a topic. Here, the methodology chosen to provide the required results is literature research and its review. With this knowledge, the interview will be analyzed one question at a time, followed by an interpretation of the answers provided by Mangini and put into the context of this particular research paper.

The two methods literature research and interview analysis should yield the results required to answer the following research questions selected for this work:

- What are the developments that happened in science fiction sound design in the last 50 years?
- Why did these things change?
- What are the benefits or drawbacks of old and new techniques?
- Is there a sort of renaissance of the older, more practical approaches to modern day sound design and if this is the case, what is the reasoning behind it?

To quickly summarize the overall goal of this scientific research paper: it should shed light on an integral part of movie production and its relatively young history as well as the common techniques and practices used in it.

2 Sound Design: Basics

First, it is important to note, that the term “sound design” is not exclusive to movie sound or media in general. Product sound design plays a vital role in various industries. Since buying decisions are subconsciously influenced by the acoustic properties of the product, companies spend large sums on making them sound just the right way. One large industry for this craft is the automobile industry, where indicators click in a certain way and car doors have exact acoustic properties researched and developed by sound designers. But the sound design explored in this paper will only be related to motion pictures and media. The following chapter aims to deliver a short explanation of sound design itself, the different terms regarding motion picture sound, as well as different roles in the sound department of a movie’s production. It is crucial to know what they describe and where they come from. Historically speaking, the entire history of film sonification is a lengthy one that would extend beyond the scope of this paper. Therefore, the primary focus will be on recent history in the field of motion picture sound and sound design. Closing the chapter is a short analysis of technological tools that helped sound design to the point where it is today, as well as how those tools changed and evolved over time. (Lensing, 2009, p. 27).

2.1 What is Sound Design?

“Sounddesign…is the art of creating a coherent soundtrack that advances the story and the picture, and it demands an overarching conception of a movie’s sound…” (Tomlinson Holman, inventor of the THX-Soundsystem in Kock, 2019, p.5).

Finding a clear and straightforward definition of “sound design” is not as simple as other movie related terms. While the roles of the cinematographer or the director in a movie are arguably easy to explain, the sound designer and his or her craft are more obscure. It also does not help that the term sound design is fairly young in the greater context of motion picture history, as described in more detail in the following chapter 2.2. In her book “Sound Design for Moving Image” (2018) Kahra Scott-James describes sound design as “the capturing, generating, selecting, and shaping of the aural palette that will define the sound of a moving image project.” (Scott-James, 2018,p.vi). She then goes on about how contemporary sound design practice involves things like recording, editing, processing and of course mixing sound with the help of microphones, synthesizers, digital audio plug-ins and Digital Audio Workstations (DAWs). But what she says next is crucial: “That’s the how to do, but what about the why and when to?” (Scott-James, 2018, p.vi). From a technical standpoint sound design is not too different from the other fields of sound production in a motion picture (see Chapter 2.3.) and the work of a sound designer are similar to the ones of the sound editors, mixers and Foley artists (see Chapter 2.4.). But it is the emotional aspect sound design delivers to the audience that makes it more than just a technical discipline. Audiences usually do not consciously register what they are hearing but there is no doubt that they are feeling it subconsciously. Sound itself, and consequently sound design as well, have the ability to evoke and affect the audience, player or listener in general. Similar to how there are various ways a cinematographer conveys different feelings and emotions by the way he or she frame the shots or light them, sound designers work towards similar goals, albeit with different tools. Technology provides the means, but sound design still remains an artistic process. (Murray, 2019, pp. 186-187; Scott-James, 2018, pp. vi-vii, 63).

2.2 Historic Context

The concept of film sonification starts long before motion pictures were even invented. In classic theater, sound crews as large as 30 performers used different techniques to create a variety of sounds to go along with the acting on stage. With advancements in technology, these crews got smaller, being replaced by things like "Sound Effect Machines", which could produce multiple sounds with less people operating it, or so called "Trap Drummers", which were skilled musicians that played multiple sound effect instruments at once. Just like in theaters, sound effects and music were added live during the earliest forms of motion picture presentations. With further inventions especially in the field of audio recording, the human performances got replaced by recordings that were played simultaneously to the screening. This was still a form of asynchronous sonification that finally got replaced in the 1920s with the invention of the "Vitaphone" that made it possible to synchronize sound with picture. While the first movies only used synchronized sound effects and music, the 1927 movie *The Jazzsinger* by Alan Crosland used synchronized dialogue for the very first time. The era of the "talkies" had officially begun and slowly replaced the silent film. And yet, it took several more years for sound to fully arrive in the majorities of movies. It is also important to note that parallel to the development in the film world, radio productions also experimented with adding sound effects in their radio dramas, which were really popular in the years after the first World War and during the rise of the aforementioned "talkies". These developments later had quite the influence on modern sound design practices and techniques and should not be overlooked. (Kock, 2019, pp. 43-44; Scott-James, 2018, pp. 1-15).

One genre that greatly contributed to the importance of sound in motion picture and accelerated the development of new techniques was science fiction. Considered the very first film of this genre, *Le Voyage dans la Lune* by George Méliès in 1902 was already pushing the use of special effects at the time, but it did not include any sound effects. Jumping to the 1950s, the genre had gained widespread attention and attracted various sound artists, editors and filmmakers that experimented with new techniques in film sonification and sound effects. (Scott-James, 2018, p. 56). One of the biggest milestones in science fiction cinema was set a few years fast forward in the form of Stanley Kubrick's *2001: A Space Odyssey* (1968). While the sci-fi movies from the 1950s used classic tropes like flying saucers or atomic aliens, Kubrick shifted the focus to topics more demanding and challenging to the audience. Not only did the movie revolutionize the art of visual special effects, but it also put a huge emphasis on its soundtrack and the way music, dialogue and effects are used in unison to underline the themes in a movie. However, the term "sound design" only started to gain attention in the following decade. (Whittington, 2007, pp. 17-19).

An important person for sound design in the 1970s was Walter Murch. He worked on several movies during that time that were highly influential for motion picture sound. For example on Francis Ford Coppola's *The Conversation* (1974), as well as George Lucas' movies *THX-1138* (1971) and *American Graffiti* (1973). During that time, different sound unions in the United States demanded strict divisions of labor as well as clear hierarchies in the production crews. But directors like Lucas and Coppola did not want to adhere to these rules, since they wanted to have control over their productions; especially on the postproduction part. "If you wanted to be truly creative and experimental, you had to work outside the system", said Lucas (Whittington, 2007, p. 55). The term "sound montage" was keyed to *"*more accurately reflect the increasingly conceptional nature of soundtrack design.*"* (Scott-James, 2018, p. 59). Because Murch himself was not a member of the union, he was credited as sound montage. For Murch, it was exactly that freedom gained by the way his job was titled that allowed him to move between the positions of sound recordist, editor, and mixer all in the same production and explore sound as craft and art at the same time. It was only at the end of the decade when Murch was credited "sound designer" in Coppola's 1979 war movie *Apocalypse Now*. It was also the first time, this

specific term was used in a feature length movie. (Scott-James, 2018, pp. 59-61; Whittington, 2007,p. 55).

Another person whose influence on the field of sound design cannot be overstated is Ben Burtt. Like Murch he was a student of the University of Southern California, where he was casted by producer Gary Kurtz as a sound recorder for a small film project titled *The Star Wars* (1977) by director George Lucas. Thanks to recent developments in the field of portable audio recording devices, Burtt was able to roam the city of Los Angeles by himself, armed only with a small tape recorder, to record hundreds of sounds which he later layered and edited together to create the otherworldly soundscape that Lucas was looking for. To this day, the entire *Star Wars* saga remains one of the most important pieces of film, not only for the science fiction genre in general or the special effects department, but also for the craft of sound effects and sound design. His work on the original trilogy, among other projects, have landed Ben Burtt several awards, including two Academy Awards for Special Achievements in Sound. (IMDB, n.d.; Scott-James, p.62; Whittington, p.25, p.32)

Since sound design was put on the map back then it has slowly gathered more attention from critics and average moviegoers alike and yet, it still remains more of a niche topic. Sound designers are never as widely known as actors or directors and even other areas of film production like cinematographers, picture editors or composers. Nevertheless, the field of sound design has constantly evolved over time and while the "old guard" surrounding Murch and Burtt is moving towards retirement, new sound designers are taking their place in the limited spotlight. One of them is Mark Mangini who started out in children cartoons in the 70s and has since risen in the ranks of sound designers. He did some of the most successful sound design work in recent movies, especially when paired with Canadian director Denis Villeneuve. Their work includes representatives of the science fiction genre like *Arrival* (2016) *Blade Runner 2049* (2017), and most recently with Villeneuve's 2021 adaption of *Dune* for which Mangini received his second Academy Award after *Mad Max: Fury Road* (Miller, 2015).

2.3 Parts of the Soundtrack

Sound design, as it is known today, is just one piece of the big puzzle that is the soundtrack of a movie. The three large parts motion picture sound can be categorized as are dialogue, music, and sound effects. Dialogue and music are relatively straight forward: dialogue includes all spoken words, either on screen by actors or off screen, usually as a voice over. Music is divided into the common music score that just plays during the movie and supports the atmosphere and emotion of a scene, but also the historical, geographical, and cultural context of it, and source music, which actually originated from within the scene where the characters also experience it. This is also called "diegetic" music and an example would be a radio playing in the background of a scene. Sound effects are a bit more nuanced and, according to Scott-James in "Sound Design for Moving Image" (2018, p. 65), can be split into a total of seven smaller areas. The difficulty here is the blurring of boundaries and the overlap that these areas have with each other:

- **Sound effects (or hard effects):** usually the ones that are front and center, highlight important events and make them believable and real to the audience. These effects are often sounds that are very difficult or impractical to create with foley. An example would be the image of fake glass being broken, paired with the sound of real shattering glass.

- **Sound design effects (or elements):** differentiate themselves from normal sound effects through being mainly designed for imaginative places, objects, or creatures. Famous examples

would be the hum of a Lightsaber from *Star Wars* (Lucas, 1977) or more recently the sound of a giant sandworm in *Dune* (Villeneuve, 2021).

- **Foley:** formerly known as "post synch effects" and named after sound effect artist Jack Foley, it describes the technique of recording "acted" sounds. The sounds of footsteps, clothes rustling or the noise of handling a weapon are not recorded on set, since the actors' dialogue is prioritized. They get added later on in the production process and are often created by the Foley artist just for this one movie since they have to perfectly fit the scene and to the characters movement. Using separate sound effects from a library would be impractical and too time consuming.

- **Atmosphere (or Ambience):** are the sounds of the location where a scene takes place. They signify time to the viewer as well and are sounds of environments and spaces. Atmospheric sounds provide immersion and are usually exterior in nature but can sometimes be interior too. Through the use of "atmo" and the abrupt change of it, a location or time change can be easier conveyed to the audience.

- **Room tone:** similar to Atmosphere, Room tone plays a vital role in providing information about the shown location. While atmo is most of the time the sound of outdoor locations, room tone is usually inside. Depending on the size, shape, and the material they are built of no two rooms usually sound the same which is what room tones are imitating.

- **Walla:** describing the murmuring of human conversations in the background, it adds another layer of realism to the soundscape and also helps, to make scenes feel bigger, more populated and more realistic in general. In the past it was common to record groups of people saying the word "walla" over and over again because it sounded like actual chatter of people in the background. This is also where the name originated. Today, even background chatter is made out of real dialogue and conversations.

- **Silence:** total silence is rarely used in the soundtrack of a movie even tough is a very powerful tool to make scenes more dramatic and to make other sounds stand out more. Since silence is categorized as total absence of sound a more common practice is the addition of "eerie silence" or near silence.

(Scott-James, 2018, pp. 66-68, Lensing, 2009, pp. 48-49).

Now, when observed in more detail, these definitions become less clear cut; oftentimes they intersect with each other and can be very subjective or even interchangeable. Scott-James acknowledges in her book, "voices and music can function as sound effects or become sound design effects and sound design can function as voice and music." (Scott-James, 2018, p.63). Some more concrete examples for this problem of defining sound effects could be:

- Characters sometimes communicate in fictitious ways of speaking or in alien languages. The sounds they produce are designed by a sound designer but are treated as dialogue. Famous examples in science fiction would be the characters *Chewbacca* and *R2-D2* from *Star Wars*.
- Sound effects can be used to design an entirely new sound. Therefore, these hard effects can become sound design, depending on the way they are used. E.g.: Since there are no real laser guns for example, it cannot be recorded. So, it gets designed by using the sound effects of a real gun, layered, pitched and processed.

- As mentioned, foley sound is created to save time and money. But some of the sounds created might be reused for a different production at a later stage. Would that still be foley, or is it already a hard sound effect? And if it is designed by mixing it together with several other sounds, does it become sound design, or does it remain a foley sound?
- Scott-James notes that Walla today is sometimes treated as dialog, depending on its prevalence in the mix.

2.4 Parts of the Sound Crew

Next, it is important to understand the different roles and jobs present in the sound department of motion picture production. The size of sound departments directly correlates with the size and budget of the production in question. For the sake of this paper the focus shall only lie on large scale productions that include all the roles. Furthermore, the role of production sound, the recordings that are made on the set while filming, is usually separated from postproduction sound and therefore disregarded here.

Supervising Sound Editor:

They are the backbone of the postproduction sound and work with the director, producer, and editor of the movie. As the head of the department, they coordinate the rest of the editors, designers and artist as well as doing administrative work regarding the budget or the overall workflow of the department.

Sound Editor:

Originating in the early days of sound motion picture and the era of the “talkies”, it is nowadays more interchangeable with the role of the sound designer since there is design in both roles. In bigger productions, the sound editor might specialize on one particular area like dialogue or music editing. Generally speaking though, they might be responsible for anything from those two mentioned, but also ADR (Automated Dialogue Replacement), Foley and Effects. Regarding Foley, those editors often get separately mentioned as Foley Artists.

Sound Designer:

As mentioned above, the lines between roles can be blurry when it comes to Sound Editor and Designer, and it depends on size and type of production. The Sound Designer can be compared to the role of the Production Designer. While the Production Designer is concerned about how a film looks, how the emotional and psychological themes of a script can be portrayed, the Sound Designer worries about the same thing, but regarding sound.

Re-recording Mixer:

The final stop a movie gets handed to before release traditionally is the one of the Re-recording Mixer, who creates the final version of a movies soundtrack by taking all the different parts that the editors, designers, engineers and the composer have built, and putting them all together, keeping the overall aesthetical and technological requirements in mind.

Of course, one person can occupy multiple positions if it is required. At the same time, it is common for the roles of the sound editor, designer and re-recording mixer to be manned by small teams or at least duos that work together. Only the supervising sound editor is commonly a one man/woman job.

(Scott-James, 2018, pp. 69- 70).

2.5 Techniques

Crucial to the rise of sound design in the 1970s were technological advancements in the field of sound recording. Tape recorders became more affordable and more portable than before which enabled people like Ben Burtt to work all by himself without huge crews accompanying him. Since then, the technical advancements have not stopped, with digitalization being the most prominent factor in all developments to the field of sound design. Digital recording, smaller devices and microphones and huge digital sound libraries make the work of today's sound designers more convenient than ever before. But did it really change that much?

For his first *Star Wars* (1977) movie director George Lucas and producer Gary Kurtz gave Ben Burtt the freedom of a full year to roam Los Angeles to record sound effects. Burtt's "weapon of choice" was the Swiss made "Nagra IV-S" recorder that used a ¼ inch magnetic tape. Undeniably bulky by today's standards (weighing 5 kilos or about 11 pounds without batteries and being roughly the length and width of a 13" laptop), it was a groundbreaking tool that freed up Burtt and other designers on their hunt for sounds. At a price of about 10.000 USD, it was simultaneously pretty affordable in the grand scheme of big budget productions. Burtt himself goes so far as to making the *Nagra*, together with smaller mixing boards and processors at the time, responsible for the rediscovery and reinvention of film sound in that new era. Thanks to their reliable, sturdy, and repairable nature Digital Audio Tape recorders (DAT-recorders) like the *Nagra* have stood the test of time and were used on modern film sets until at least the late 2000s, either as back up recorders or even as the main source. (Lensing, 2009, pp. 70-71, Whittington, 2007, pp. 31-32).

Figure 1: Nagra IV-S Recorder (Nagra Audio Official Website, n.d.)

But the drive to create something new and extraordinary was probably the most important tool the sound designers had at their disposal during that time. The classic rules of sound recording and editing had been established up to this point were almost thrown out of the window by the young and eager designers that just started to experiment with the new technology available to them. Burtt recalls: "I stuck a microphone out of the window of a moving car and the wind totally distorted the recording. " (Sonnenschein, 2001,p. 60). After running it through a subwoofer and removing all the high frequencies it ended up sounding more like the real life equivalent of the space shuttle he was trying to recreate for this particular job. "I can't explain that, but sometimes you have to experiment to get the best effect."(Sonnenschein).

A crucial part of sound design, old and new alike, are sound libraries, extensive collections that hold thousands or even millions of sound effects. These libraries are nothing new, already being set up during the classical Hollywood period (about 1930-1960). But with the collapse of the Hollywood studio system closely related to the "Paramount Case" in 1948 some of these libraries were discontinued and sold or donated, like the sound library of Columbia Studios that was given to the University of Southern California. Responsible for the process of cataloging it was none other than graduate student Ben Burtt who used the knowledge gained through that work later on when he created and maintained the sound library for *Star Wars*. (Whittington, pp- 27-28).

Sound design, as already mentioned, took huge leaps with the ever-advancing digitalization. Storage became bigger and cheaper. What started as Burtt's sound library for a couple movies grew over time, incorporating more and more projects from Lucasfilm and other studios and becoming the sound library of Skywalker Sound. According to their website it holds 5.67 terabytes of sounds. But that does not mean that movie productions today solely rely on libraries for their sound effects and design. For the movie *Dune* (2021) director Denis Villeneuve tasked Mark Mangini and his team with designing the otherworldly sounds of the desert planet Arrakis. As explored in more detail in Chapter 3, Mangini did not turn towards digital sound libraries but decided to record all but four of the 3200 sounds himself, giving the soundtrack his own unique stamp. This might not be the case for every production, since it is the more expensive way to go, but it shows that the practices from the past have not yet died out and that sound designers keep innovating the craft, similar to how visual effects (VFX) in movies become more and more elaborate. (Skywalker Sound, n.d.; Buchanan, 2021; M. Mangini, personal communication, October 6, 2022).

Different sound designers and editors have different approaches to their craft which are seldom documented in detail. It is therefore difficult to draw extensive comparisons between different examples. Fact is, that every generation of sound designers draws from those who came before them, while also adding their own techniques to it. Technological advancements like those mentioned in this chapter are helpful tools for the sound design of today, just like the new tape recorders were to Burtt and his contemporaries. However, in the end, it still comes down to the individual skill of the designers which is something no library or field recorder can replace.

3 Interview Analysis

"The intelligent sound designer has mastered the ability to create a sonic narrative that supports the spoken one in ways that can be far more potent than the screenplay imagined." (Mangini, M. in Scott-Lang, 2018, p.vii).

As practical research methodology an interview was conducted for this paper, originating from an attendance at the event "Mix: Sound for Film & TV" where sound designer Mark Mangini was part of a panel about the sound of *Dune* (Villeneuve, 2021). After a personal conversation, he agreed to a short interview for this research paper that was held via email. The questions asked were prepared in advance and surrounded the topic of Dune's sound design, the process behind it and science fiction sound design in general.

3.1 Methodology

Since the interview was held with just one interviewee and the questions were prepared in advance, it could be categorized as a structured interview, but this would also include only closed-ended questions that the interviewee can answer simply with "yes" or "no", which was not the case here. Another categorization could be an unstructured interview or informal interview. While this might suit the situation better, the chosen communication method was email which made additional questions during the interview impossible. Therefore, this interview is hard to simply characterize with one method alone. Mangini answered the questions in full length and gave detailed descriptions of the thought process behind the sound design and its creation. (National Library of Medicine, 2014)

3.2 Analysis

The first question was about the challenges of designing sound for science fiction on the example of Dune. Since the movie features alien planets, cultures, and creatures, finding suitable sounds for something that has no direct real-world equivalent seems particularly difficult. Mangini explained that, just because the audience sees things they have never seen before, does not mean that these things should sound entirely foreign to the viewer. The aim of Mangini and his crew was to give the movie more of a documentary feeling, "as if a documentary film crew has landed and captured this story" (M. Mangini, personal communication, October 6, 2022), something that director Denis Villeneuve was aiming for with the entire movie. Since science fiction is all about the unknown, most sound designers want to incorporate things like electronic and synthetic sounds because they are not very common in our real world. But these sounds lack the aural cues that trigger the ear and subsequently the brain whereas real world sounds have acoustic properties that make them so memorable to us. He also shared, him and his crew were dedicated to not reuse sounds or even techniques. "We eschewed the use of any kind of science fiction aural tropes." The example he provided where the protective "shields" envisioned by the author of the source novel, Frank Herbert. While other science fiction movies indicate the use of a protective barrier with a constant hum or buzz, Dune's shields were only visible when they were being pierced or breached by a weapon and therefore, they only produced sound cues in these instances.

As described in Chapter 2.5., only four out of 3200 sounds created for Dune were solely made using electronic equipment and synthesizers whereas the rest were recordings of real-life sounds that were made specifically for the movie and then layered, distorted, re-pitched etc. When asked about this, Mangini gave a similar answer like to the previous question: the sounds should sound organic and real and not like other science fiction movies. The acoustic markers contained in these sounds helps the sound designer to achieve a greater "suspension of disbelief", an important concept in fictional stories where the audience will get emotionally involved in a narrative if the world and the characters in it are perceived as real. The sounds "trick the brain into believing it is hearing something it CAN believe because it contains those markers."

Regarding the question about what the advantages and disadvantages were when recording sounds specifically for a movie rather than using already existing libraries, Mangini noted several; beginning with the uniqueness it gives to his soundtrack. Recording every sound himself, he is able to put his own stamp on it, making it bespoke and original which he thinks should be the goal of every sound designer. He then further compares the use of sound libraries to the use of canned peas in a dish by a famous chef. Similar to good food, sound needs the freshest ingredients to fully develop all its flavors and notes. He therefore aspires to record most of his sounds fresh, something that does not always work out. In these cases, he makes use of his large personal sound library. Another reason for the use of original sound recordings is the recontextualization of sounds as storytelling tools. Mangini can add extra value to his sounds by one recorded organic sound and using it for something it is not. The audience has heard this sound before in a different context and not in the way Mangini's sound design is presenting it.

To close the interview, the last question was about how the work of sound designers overall changed throughout the last decades; specifically when it comes to the genre of science fiction. Since the visual quality of movies, and sci-fi movies in particular, have become more and more elaborate in their visual design over the past two decades, the sound design has to match these pictures. To achieve this, the designers have to be more and more crafty, as Mangini puts it, in the way they accompany the movies with fitting sounds. This puts the modern sound designer into a vital role in the production of science fiction movies. This symbiosis between visual effects and sound design can go very far. Mangini recalls several occasions on the production of *Dune* where the sound department has created sounds for the VFX department even before they even finished creating the imagery for the scene in question. The conventual workflow on a normal movie production would be the other way around, but with *Dune* Mangini's sound were the inspiration for the images. To him, this symbolizes a great prospect for the future of movie making.

3.3 Interpretation

Mark Mangini stands at the very top of the sound design world. The practice of recording everything completely new and fresh is a luxury that he might have on huge productions like *Dune*, but it is not the norm for most movie productions. Issues like lack of funding or time play a big role in it and in a lot of movies, sound is still treated as an afterthought. That is why his closing statement gives hope. At least in the top tier of Hollywood, big blockbusters have to put a lot of effort into their sound department to be competitive and with directors like Denis Villeneuve, Edgar Wright (*Baby Driver,* 2017) or Matt Reeves (*The Batman,* 2022) setting new standards when it comes to the sonification of their movies, the bar for future productions, the directors and their sound departments gets raised continuously. The insights Mangini gives into his techniques and especially the reasoning behind them is very interesting in the context of sound design history and its development over the past decades.

As explored in chapter 2, designers like Ben Burtt kickstarted the concept of sound design as we know it today through recording a ton of sounds themselves, despite already existing sound effect libraries. They acted as pioneers in their field, exploring new ways of recording and especially manipulating sounds to create something the audience today takes for granted. A lot of these principles continue to shape movie soundtracks to this day. When Mangini's work is observed, the influence from these pioneers is apparent; blended together with the modern tools like small recording devices and microphones. Digital sound libraries might look very handy and one could think they already include every sound effect imaginable, but Mangini shows that there is still so much more to record. While he does not want to take any credit away from libraries as he owns an extensive one as he claims himself, his approach resembles the essence that makes up modern sound design: old and new techniques blended into one cohesive soundscape.

Through statements given by Mangini in other sources and comparing them with the communication here, it becomes apparent that he aims to be as important to a movie as its cinematographer, production designer and composer. Giving the sound an individual aesthetic helps to lead the audience in ways where they do not realize they are being led, Mangini claims.

Cinematography is a great example of how a discipline which is extremely technological in nature was able to make its transition to having a in public reputation as an artistic and creative field. This is different for sound design. At the Academy Awards 2022, eight out of the 23 categories presented were taken out of the main ceremony and handed out one hour prior, while still shown as video ingests during the actual live broadcast later in the evening. Among these "left out" categories were Film Editing and Production Design as well as Best Sound. Best Cinematography on the other hand was still handed out at the actual broadcast. If treated accordingly by filmmakers in the future, sound and its design could be elevated onto that same level. An aspect that might help this process along is quite apparent in the way Mangini presents himself and his craft. Unlike some of his peers and predecessors, Mangini does not shy away from opportunities to talk about his work. This makes sound design more accessible for the average viewer which, in turn, could help to demystify it. (Hammond, 2022; Murray, 2019, pp. 186-187).

4 Conclusion

Analyzing sound design is not as clear cut and simple as it might seem. Because of their nature behind the scenes of the production of the movie, the secrets of sound designers are not easy to be revealed simply through watching the film. During the research for this paper, it became apparent that especially the sound design in modern movies of the 21st century is not as well publicly documented as one might think. Since it is relatively common academic publications lag behind at the actual state of knowledge, in depth analysis of science fiction movies and their production released in the 2010s and 2020s proved rather difficult. The personal communication with Mark Mangini in form of the interview gave important insights. However, it could have been more extensive to achieve an even bigger insight. Keeping the scope of the work in mind, an in-depth analysis of sound design in relation to the genre of science fiction in more detail was not possible. Despite these smaller shortcomings, an overview of the topic was still achieved through the contextualization of movie sound and sound design history, the explanation of some important terminology in those fields as well as the roles of the different sound crew members.

The original concept was to include a detailed comparison between two selected science fiction movies, as well as analysis of different scenes from said movies. This was not implemented in the final paper due to time constraints for this work.

The research questions that were set up prior to the writing process can be summarized in the following way:

- Which developments happened in science fiction sound design in the last 50 years?

  From the first official sound design credit, over the changes through the wake of digitalization, all the way to the sound design of the 2020s, both Chapter 2.2. and 3. covered an extensive timespan. While the most important developments have been analyzed, only the surface of the topic has been scratched and there is still a lot to dive into in this regard.

- What drove these changes?

  While the reasoning behind the developments since the 1970s have been examined with the background of the technological advancements, an in-depth analysis of other factors was not achieved. Especially cultural and sociological influences on the world of cinema have been left out despite the significant role they play.

- What are the benefits and drawbacks of old and new techniques?

  With the help of the interview with Mark Mangini, one can explore both the positive and negative sides of new techniques and tools. The positive sides include practicability when it comes to equipment, storage and editing software. Compared to 50 years ago, equipment has become more accessible to a wider audience due to the reduction in cost. Storage space has increased manifold and naturally digitalization plays the most important part in all of this. The negative sides in this are not as apparent. Mangini regards bespoke and original recordings for movies as more desirable, maybe even superior to reusing sounds from other sources. Now, this might be the concern of high-level sound designers but for smaller productions and up and coming designers this is probably not something they have the luxury to worry about. The modern tools are a huge help for the professionals today, but they are just that. Tools. They show their full potential when paired with a lot of experience with the practical approaches and techniques, that were contrived in the past. Looking at the time of the dawn of sound design in the 1970s and comparing it to

today, it is apparent that the tools were way more complex, impractical and bulky (e.g., the *Nagra* recorder). But the sound designers of the time were able to balance out these drawbacks with their own skills and apart from the audio quality, most science fiction movies of the past can still hold up today.

- Is there a sort of renaissance of the older, more practical approaches to modern day sound design and if this is the case, what is the reasoning behind it?

It might be a little bit too farfetched to call it a full-on renaissance since there is not enough data to back this claim. The example of Denis Villeneuve's *Dune* might just be one of not too many recent movie productions where the emphasis in its soundtrack was put on original, bespoke and real-life sound recordings. The scale and timeframe of this work did not allow for fully detailed analysis of movies released in between 1990 and 2010. It would be interesting to expand on this aspect and to further directly compare the three periods of 1970 - 1990, 1990 - 2010 and 2010 to present day. As mentioned, it might be difficult to find good sources for the latter period, but at least the period around the turn of the millennium should yield better results. In this case the *Star Wars* Saga could be a promising subject, as it saw three major releases in all three periods respectively.

What the research for this paper has shown is the way how the award winning sound design of today achieves its high-level through practical and hands-on approaches. As for the reasoning the conclusion drawn from Mangini's descriptions is yet again insightful: uniqueness and overall quality in the soundtrack elevate the entire movie.

Some of the answers create new questions which would be interesting to be follow up on. This work focused only on big budget Hollywood productions, but movies outside of this sphere do, of course, exist and the development of sound design and its techniques might have been different to what was observed here. Moving past the present day, the last 50 years of sound design have already been eventful. But how might the future of it and movie sound look like? How will the role of the sound designer change inside a movie's sound department? Is the term "sound design" here to stay or will it undergo some more changes, like it happened in the past with the "sound montage"?

5 References

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7 Appendix/Annex

7.1 Figures

Nagra Audio. (n.d.). [Photograph of Nagra IV-S Tape Recorder]. https://www.nagraaudio.com/product/nagra-iv-s/

7.2 Interview Mark A. Mangini

Question:

Sci-Fi movies allow us to travel to distant imaginary planets, witness unknown cultures and dystopian futures. What challenges did you and your team encounter trying to convey the sounds of Arrakis, the Atreides, the Fremen and things like giant sandworms? How did you overcome them?

Mangini:

We conveyed these sounds by following a few simple rules:

a) It is presumed that, because we are seeing things in science fiction that we've never seen before, we should also hear things we've never heard before. That leads many sound designers down a path that incorporates electronic and synthetic sound. Sound that appears "foreign" and unusual to the ear because the world we live in generally doesn't contain synthetic sound. While using sounds that the ear isn't accustomed to is a useful approach for some things, we felt it hurt our film by disengaging the audience from feeling like they were witnessing something real, like a documentary film. That they were actually on Arrakis, as if a documentary film crew had landed and capture that story. Electronic and synthetic sound lacks the aural cues that trigger the ear and brain into fully believing something is real because the sound itself is not…it has no acoustic properties that accompanies the thousands of sounds we hear our entire waking lives.

b) If we thought we had heard a sound or an approach before, we dedicated ourselves to not using those sounds or techniques. In other words, we eschewed the use of any kind of science fiction aural tropes. The most blatant one was the protective "shields" in our film and described by Frank Herbert. For decades any kind of force field or shield in a science fiction film has been accompanied by a low droning constant hum or buzz to indicate "energy". We wanted to defy this convention by only indicating a force field was working or active when it was breached or challenged. This is most obvious in Dune in there Training Montage with Gurney Haleck.

Question:

This article by the New York Times about the sound design of "Dune" talks about how out of "the 3200 bespoke sounds created for this movie only four were made solely with electronic equipment and synthesizers." Why did you choose the method of recording almost all of your sounds from scratch? Has it been beneficial for the overall creative process of Dune's sound design? How?

Mangini:

We chose to use mostly organic and acoustic sounds for the reasons stated above: to make it sound organic and real and to insure that it didn't sound like other science fiction films. There is a biological reason as well. All sound contains clues to its origins. Acoustic sound (real sound) contains markers that aren't consciously observed but interpreted by the brain to tell it many things about a sound including its location, distance, speed and size. These acoustic markers are not contained in electronic sound or synthesized sound. They can be enhanced electronically but they are not as complex as acoustic sound. What this does for our film is trick the brain into believing it is hearing something it CAN believe because it contains those markers. This allows us to achieve a greater "suspension of disbelief", an essential asset for all fiction and narrative films.

Question:

Generally speaking, what are some advantages and disadvantages you've experienced by recording sounds yourself rather than using synthesizers and sound libraries?

Mangini:

The advantages of recording sound myself are manifold. First, it insures that my track will be unique, bespoke and original. It should be every sound designers' goal to be original and put their stamp on a soundtrack, as much as is possible. I would no more put a library or canned sound in my movies than a famous chef would put canned peas in one of his or her dishes. Just like good food, sound is appreciated and annoyed most when it has the freshest ingredients. I am not discounting the value of sound libraries. I have a large one. I cannot record everything or even most things fresh for my films, but I aspire to that and do the best I can. Second, it allows me to use semiotic sound and recontextualization as a story telling tool. By taking one organic sound I record and using for something it's not, I get extra value because you've heard this sound, maybe, but not in the way I'm presenting it.

Question:

How would you say the work of sound designers overall changed in the last decades regarding the sci-fi genre?

Mangini:

Sound Designers are becoming more and more essential as Science Fiction becomes more and more elaborate, replete with incredible visuals that need equally incredible sound. As those visual barriers continue to be crossed in VFX, so too must sound designers become more and more crafty in the way they design the sounds that accompany them. On Dune, we found that on a few occasions, we made sounds for new things in VFX before VFX made the imagery. Our sounds were the inspiration for the images…and not the other way around. This is a sea-change in how movies might get made in the future.