Sound Design: Story Telling Through Sound
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Master of Arts Practice (Sound Production and Design)
Charles Sturt University
August 2010
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SOUND DESIGN: STORY TELLING THROUGH SOUND
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Introduction

From early primitive societies to contemporary musicians, sound has been an integral component to communication to convey messages, express emotion and to tell a story. Communication through the use of sound has been significant to human evolutionary development. Although the spoken language is the predominant form of sonic communication in our society, other oral and aural methods include rhythm, melody, percussion, humming, the mimicking of sounds through vocalisations and in the modern era, by the recording and creation of music and sounds through the use of technology. As Sonnenschein states, ‘[by] giving meaning to noise, sound becomes communication’ (Sonnenschein, 2001, p. xix).

In the medium of film, sound design purposefully communicates to an audience through recorded and created sounds by augmenting the onscreen visuals. Dialogue is the primary auditory component in film used to convey a story, however I will argue that sound effects are of equal importance. Through the use and creation of sound effects, the art of sound design has become an important approach to storytelling.

In this paper I will discuss my work for the sound installation Nature Man Machine with relation to my professional work in film as a sound designer. The first section of the paper will give a brief account of the history of sound on film from the first synchronised film sound of 1926 through to contemporary cinema. The second section of the paper will look at the film industry, and how sound is used in film in relation to the visuals. The concluding section of the paper will analyse my exhibition Nature Man Machine and relate its use of sound, void of images, to my industry sound design work in film.

A brief history of the development of sound in film

Dialogue and music

Even from the early era of silent films, sound has played an important role in the experience of watching a film. Although labelled ‘silent films’, these films seldom played without sound. Silent films were usually played in theatres with live organ or piano accompaniment. To this day, the Hayden Orpheum Theatre in Cremorne, Sydney, Australia, maintains an original 1925 Wurlitzer pipe organ which is still played for selected screenings. (Hayden Orpheum Cremorne, n.d.) Thus from the early years of film, sound has been an integral component of the filmmaking process.
Attempts to link sound to vision in film can be traced back to as early as 1888, when Thomas Edison first met with British photographer Eadweard Muybridge to discuss using a phonograph synchronised with the moving pictures created by Muybridge (Film Sound History, n.d). This idea by Edison never eventuated, and many experiments with synchronised sound continued until the mid 1920s. It was 1926 that the first format used for synchronised film sound is attributed to the Vitaphone (Wierzbicki, 2008, p. 91). Warner Bros had invested heavily in the Vitaphone company and were releasing all of their films with Vitasound. As a disk based system, it was recorded and played back at 33 1/3 rpm from the inside of a phonograph disk to the outside. The disk was aligned with the gate on the projector, and synchronised with the film print for the 11 minute duration of each reel of the film. Being a mechanical system, this was fraught with problems. If the disk wasn’t running at the correct speed, or if it skipped, then the remainder of the reel and the audio would be out of synchronisation. The first feature-length film with synchronized Vitaphone sound effects and musical soundtrack was the 1926 release of Don Juan, produced by Warner Bros and directed by Alan Crosland. Although the film was released with a soundtrack, it had no spoken dialogue.

The first film to include a complete soundtrack came one year later with The Jazz Singer (Crosland, 1927). It was the first film release with a recorded soundtrack and synchronous dialogue. As Wierzbicki points out, ‘audiences worldwide got from The Jazz Singer not only their money’s worth of entertainment but also a paradigm shift in cinematic possibility’ (Wierzbicki, 2008, p. 93). Having dialogue included in the soundtrack gave this film and others after it the nickname ‘talkies’. During the early development of ‘talkies’, all sound recordings had to be created at the time of shooting. This included the spoken dialogue, the music and any additional sound effects. These individual elements could not be edited or fixed if problems occurred. If a miscue or an extraneous noise occurred, the Director would have to call ‘Cut!’ and the combined visual shot and sound recording would need to be filmed and recorded again.

A solution was needed to allow the sound recording process to become independent from the visual filming processes. The Walt Disney animated film Steamboat Willy (Disney and Iwerks, 1928) was the first film to have music, sound effects and dialogue all created in post-production. Although an animation, Steamboat Willy proved that sound and vision did not need to be filmed simultaneously and in synchronisation with each other.

With a change in technology from the disk based Vitasound to 35-millimetre optical sprocket film in 1929, sound editing began to evolve. This was a far more flexible medium, as the film could literally be cut and edited or rearranged along a linear timeline. To take further advantage of this medium, rerecording was also being developed which allowed film sound edits to be combined with other layers of sound and then recombined and mixed down into a new single sound element.
It is important to note that although sound effects in these early films could be edited, the process was very cumbersome. The number of sound effects used in these early films is not comparable with the sound effects in contemporary film. These early sound films may have less than twenty sound effects in the entire film, while a contemporary film may contain hundreds of sound effects in the soundtrack.

The Beginning of Sound Design
Murray Spivak is credited as the world’s first sound designer for his work on the 1933 release of King Kong (Cooper and Schoedsack, 1933). Spivak was the first person to manipulate sound on film, rather than simply inserting a recording of ‘natural recording’. He used a lion’s roar and pitched it down one octave, and then played it back mixed in with the original unity roar. One of the film’s most challenging sounds for Spivak was to create the beating of Kong’s chest. After several attempts at creating a realistic fleshy sound, Spivak then recorded with the microphone placed behind an assistant’s back while he tapped and beat on the assistant’s chest (Boon, 1933).

Spatial Sound
In response to growing audience expectations of cinema sound, replay capabilities began to be developed to provide both higher fidelity and to increase the ‘spatialness’ of the sound image. A single speaker playing the soundtrack from behind the screen was not matching the grandeur of the image being projected. Multichannel sound was used for the first time in 1940 when Disney released their animated musical film Fantasia (Algar et al., 1940). This multichannel configuration was appropriately named ‘Fantasound’. Fantasound had Left, Centre and Right dedicated tracks, with a Left House and Right House signal being derived from these. These House signals were sent around the sides and rear of the cinema and vaguely resemble contemporary surround sound. Initially only six American cities had cinemas equipped with Fantasound installations, therefore limiting the audience able to experience spatial sound (Weis & Belton, 1985, p. 418).

Presently we are experiencing a similar phenomenon with the development of visual 3D technology; only certain cinemas are equipped to show the new films shot in this medium. Spatial sound was experimented with from 1940; however it was almost 30 years before a defined format was commercialised.

Dolby: ‘Getting surrounded’
Throughout the 1970s and 1980s Dolby Labs established themselves as the leader in film sound technologies. Dolby had developed a method of replaying a 4-channel surround soundtrack from a stereo recording. Dolby Stereo uses a patented encoding system to combine 4 channels into a stereo track (2 channels), Left, Centre, Right, Surround (mono). This format commonly known as Dolby Pro Logic continues to be used on existing contemporary stereo playback mediums including VHS video, CD, DVD, and even cassette. ‘With one exception [Apollo 13, Howard, 1995], all post 1977 Oscar winners [until time of writing, 2010] in the sound categories have used Dolby encoded soundtracks’ (Sergi, 2005, p. 11). In 1976 A Star is Born (Pierson, 1976) was
the first Dolby Stereo film release, with the first Australian film release being *Double Deal* (Kavanagh, 1981). In an interview by Gianluca Sergi, Dolby’s leading developer Ioan Allen who was instrumental in the success of Dolby stereo, mentions that it was Barbra Streisand, the producer and performer in *A Star is Born*, who wanted the film to be in surround sound as she felt that the crowds and the feeling of being a part of the crowd in the film was integral to the film itself (Sergi, 2005, p. 99).

### 5.1 surround sound
Although providing surround sound, Dolby stereo had flaws. Being a matrix encoding, the surround signal and centre signal were compromised when combined to form a stereo mix. To open up the limitation of only 4-tracks a method of replaying discrete sound channels was needed. In 1979 Dolby debuted the Dolby 70mm 5.1 surround system. The speaker configuration differs from Dolby Stereo as it allows for discrete channels of Left, Centre, Right, includes both a Left Surround and Right Surround, and has the addition of a LFE (Low Frequency Effects or commonly known as sub). This allows the sound track to contain 6-channels of discrete sound. *Apocalypse Now* (Coppola, 1979) is attributed as the first 5.1 surround sound film. When interviewed for the DVD release of the film, director Francis Ford Coppola explained that he ‘wanted the film to be very sensual with 5 track sound, quintaphonic, and shown on Imax or 3D if it were available at the time’. The sound designer Walter Murch mentions in the same interview that the movie studios and indeed the audience of that period of film making, were starting to think more about sound (Aubrey, 2006). With *Apocalypse Now* pioneering 5.1 surround sound, it is no wonder the final mix of the film took nine months from November 1978 to August 1979 to complete. This was long by Hollywood standards, being three to five times as long as most contemporary films (Zoetrope Corporation, 2006). This 5.1 release format was so effective that it is still the preferred surround sound format for contemporary cinema.

**Contemporary Sound design**
With advances in cinema sound technology, sound on film developed to be integral to the storytelling process of film making, and sound design began to be recognised as an individual specialist discipline. The late 1970s saw the emergence of three of the most well known sound designers. These were Ben Burtt, who is possibly the single most well known sound designer with many awards for his work on *Star Wars* (Lucas, 1977); Walter Murch for his work on *THX 1138* (Lucas, 1971), *Apocalypse Now* (Coppola, 1979), *The Godfather Trilogy* (Coppola, 1972); and Randy Thom for his work on *Star Wars* (Lucas, 1977), *Apocalypse Now* (Coppola, 1979) and *Forest Gump* (Zemeckis, 1994).

**Digital sound**
During the 1990s further significant sound developments took place. Linear analogue sound editing and mixing was evolving and converting to non-linear digital sound editing and mixing. Entering the profession during this era as a sound editor, I witnessed the transition first hand. Much debate took place as to which system was better, the old analogue or the new digital. The analogue proponents argued that analogue was superior in sound quality, with purer
and richer frequency responses, and they believed that digital lacked the quality of analogue ‘warmth’. The digital advocates claimed that analogue was noisy and very slow to work with, while digital was far superior with no generational loss. Personally I feel that people didn’t want to switch to digital because it meant that their analogue equipment needed to be upgraded and replaced at significant cost, and they would have to learn new ways of working. Throughout the transition, I was a firm believer in the new digital technology. Working with analogue tape was quite cumbersome, with sound effects needing to be well prepared and arranged in advance as they needed to be loaded from various reels of tape. Each edit had to be carefully planned, and any mistakes took hours to correct. However working in a non-linear digital world now enables me to load or create a sound as soon as I have an idea and I am able to compile many layers of sounds in a matter of only minutes. In addition, digital technology is relatively cheap, extremely flexible and there is no quality loss. Linear technology by comparison is very slow, expensive and subject to generational loss and noise.

Technology has played an increasingly important role in the sound replay capabilities of film in cinemas. From the original Vitasound film releases in 1926 the 1940s ‘Fantasound’, Apocalypse Now surround sound, through to contemporary Dolby Digital sound, it is apparent that there is a growing understanding of the importance of sound as a powerful communicative storytelling component to filmmaking.

The use of sound in contemporary cinema

As a specialised professional sound designer in film, my role is to interpret a director’s ideas, visions and thoughts and create a soundtrack which complements the onscreen visual storytelling as it unfolds. This is a intricate process that has to be done with skilful consideration and precision. On one hand the soundtrack can’t be underwhelming, as dramatic tensions will not be obvious and the film may play non-dynamically with a monotone aural structure. On the other hand the sound shouldn’t be overwhelming either, as the director may not want the aural focus to be on the sound effects, but rather the focus to be directed towards the dialogue unfolding onscreen. Sound done well should immerse the viewer into the visuals onscreen.

The sound designer is responsible for creating, designing and editing sound effects which are not ‘hard’ effects. Hard effects are absolute sounds and relate directly to the picture. Examples include the sound of doors, car horns, impacts and rain, and are usually sounds representing particular onscreen action and typically edited by the sound effects editor. The sound designer takes on the responsibility for the creation of new sounds, and for controlling the overall shape of the soundtrack. This may include using tones, and musical-esque elements to embellish and enhance the films story elements. This needs to be done with skill and precision, as they need to avoid any tonal clashes with the music composition.
With technological advances in digital sound editing and mixing, greater creative flexibility has resulted in the various sound roles being merged across disciplines. The role of the sound effects editor and the sound designer now includes sound mixing with most sound editors having a mixing desk at their workstations. It is often an essential component of sound effects creation to be able to blend the various sound levels of the various elements together and to place the sound(s) into the 3D (surround) environment.

**Sound effects in film**

Although the sound effects and sound design often represent the onscreen action, they can also be used to enhance a story. Off-screen sound is often as important, and in many instances more important, than those sounds for the onscreen action. Horror films employ this technique often.

Working as a sound effects editor on the feature film *Australia* (Luhrmann, 2008), my responsibilities included much of the designing of new sounds specifically for the film. In the scene where for the first time we learn of the impending attack on Darwin by the Japanese, our ears are greeted by the almost whisper of wind. The plane approach has no engine sounds, only the sounds of the wings slicing through the air. This was a brief from the director who wanted the first plane to replicate a shark surfacing with only the fin piercing through the water surface. It isn’t until the plane is revealed and peals off to the right of screen that we start to hear the sound of an actual engine, the roar of danger, the sound of an advancing Zero threat. This is an example of how sound can be used to dramatically shape anticipation in the audience. The sound does not give away the shot before we see the plane, in fact it adds to the curiosity. The sound of the wind makes the scene even more menacing as it is almost ghostlike and quite eerie. In this instance the sound has *foreshadowed* the action on an emotional level before the visuals have arrived. There is something unsettling about the sound of the unknown.

If we look at the history of cinema, advances in sound technology have given filmmakers the opportunity to take advantage of the creativity of sound and allow it to play an equally important role as the visuals in storytelling. Hollywood has made sound essential to contemporary film viewing. With this has also come the necessity to fulfil audience expectations. When we see a storm we will always hear thunder; when we are in space we can still hear dialogue and other sounds despite the fact that space is a vacuum; when we see a dog, it barks; a door will always creak; a car will always skid when stopping; mice make audible noises and lights always have a hum.

The soundtrack of a film has in fact gone from nonexistent pre 1926/1927, to being primarily dialogue with minimal sound effects, to now being a soundtrack of hyper reality. Sound in contemporary filmmaking is vitally important and if used effectively is a powerful tool for storytelling. For example the sound in the film version of *Transformers* (Bay, 2007) of the ‘Autobots’ transforming is iconic. You do not need to see a visual representation of the transformation taking place as you automatically relate the sound to the action. In *The Hurt Locker* (Bigelow, 2008) we are
intentionally taken inside the bomb disposal suit of the lead character for an intense first person perspective on bomb disposal. It is the sound which enables this to be effective. Through the careful manipulation of the sound frequencies and the short reverberation time, the sense of claustrophobia is achieved.

**My approach to film sound design**

At the commencement of working on a film as a sound designer, one of the most important elements of preparation is to read the script or to watch a cut of the film in a continual format. What this does is allow the sound designer to have an understanding of the dramatic journey of the film. Personally I will draw a chart or a graph mapping the drama and dynamics of the film over time. This allows establishing the build up to the crescendo(s) of the film, and the use of quiet moments to increase dramatic impact. Having a graph representation of the film allows for the delicate planning of the soundtrack, which will follow and often help the onscreen narrative. Depending on the directors approach to the film, this method can also be helpful for creating juxtaposition between the onscreen drama and the aural drama.

When engaged to work on feature films, I am contracted to sound design a story through the creative manipulation and placement of sound. I have been fortunate that the majority of my films have been large budget, and have been afforded the luxury of time to craft many unique individual sounds specifically for that particular film. Lower budget films and television rarely allow for such a luxury. The bigger budget films often have a separate recording budget which allows the opportunity to spend time in a studio or in the field experimenting with various sound recordings. These recordings may include vehicles from the films, location atmosphere recordings, or the creation of new sounds through the manipulation of recordings of various props. For example, when working on *Happy Feet* (Miller, 2006), we were given a month of studio time to recreate snow and ice sounds.

Different films require differing extents of sound design. As Emma Bortignon, a contemporary Australian sound designer discusses in an interview with Rochelle Siemienowicz:

‘A good director will always have a very clear idea of how they want the film to sound. Lots of directors know that they either want a very punchy, dynamic bold-sounding film – which could involve having loud exciting sounds and pumping music. Or, alternatively, they might want a very quiet, subtle soundtrack or a combination of both.’ (Siemienowicz, June 2010)

On one hand you may work on a film which is entirely driven by dialogue with the only sound design being the selection of the right sounds for the right situation. These sounds may be ‘actual’ real location sound recordings of what is being seen on screen. An example may be an exterior scene in a paddock where the only audible sounds are:

- specific birds
- other specific animals
- wind
• grass movement

Watching a film in this instance would allow you to hear the sounds that you would expect to hear, sounds which represent real life. In contrast to this a film may need new, unheard of sounds and the creation of sounds which do not yet exist. A film set in the future would be an example. These new unheard sounds may include:
• vehicles,
• weapons
• or even creatures which the audience has never seen before.

In this occasion it may be necessary to create entirely new sounds. These sounds may start their incarnation from the recordings and combinations of sounds such as:
• obscure machinery
• broken machines
• synthesisers
• toys
• existing sound effects which have been completely transformed through the use of pitch changing, equalisation, vocoding or any number of processes

These sounds would be transformed into new sounds which deliberately may or may not resemble the original sound. However, they would still be sounds an audience would expect to hear. For example the film Daybreakers (Spierig Bros., 2008) for which I am credited as a sound designer, is a vampire film set in the future, in the year 2019. As the film is set in the future, the cars in it needed to sound distinct from contemporary vehicles, as they are not petroleum based, but are an electric hybrid technology. The sounds of the main character’s hybrid car in the film were created using a blend of dentist drill sounds and vacuum cleaner sounds, which were varied in pitch. These sounds were selected as they are recognisable as contemporary electric sounds. Some filtering and further manipulation transformed the original sound recordings and positioned the newly created blended sounds into the future.

The planet Earth in Daybreakers is devoid of life as we know it. The only animals existing in the film apart from humans are vampires, bats and creatures known as subsiders. The subsiders are humans which have turned into vampires and have not had enough human blood to sustain them as regular vampires. They degenerate physically into creatures with bat wings, claws and sharp teeth. The vocalisations of the subsider creatures were created using a combination of:
• big cat roars (lions, tigers)
• pig grunts and squeals
• bird calls
• dog sounds
• the original recorded dialogue of the subsider character
The subsider creatures are an evil form of vampire who are quite aggressive in their pursuit for human blood. The attacks carried out to obtain human blood are very violent, with the subsiders being at the top of the food chain. Sounds were chosen which when combined are aggressive, yet keep in context with the film and the images on screen. Roars of the big cats were morphed with pig squeals and then into birdcalls for the attack vocals, with the dog and pig grunts being used for subsider grunts and breaths. Where possible, the original recordings of the character dialogue are used to keep the animal sounds connected to the character. Interestingly Ben Burtt in his sound design for the 1978 remake of the film *Invasion of the Body Snatchers* (Kaufman, 1978) also used derivatives of pig squeals for embellishment to character screams (Nayman, n.d.).

The experience of working on *Happy Feet* (Miller, 2006 [including *Happy Feet 2 (3D)*]) as a sound effects editor demonstrated that director George Miller considers sound throughout the entirety of his filmmaking process. Typically sound is only considered well into production, and to have it considered in pre-production is a rarity. Having sound considered so early on allows for the sound design to help shape the images and characters, and not have the images dictate the sound. Being animated films, the characters are created from scratch. Having sound as a guide, helps the animators develop characterisation as a part of the collaborative film making process.

This method of working was similar to that of Walter Murch when he was working with director Francis Ford Coppola on *Apocalypse Now* (Coppola, 1978) and for Bun Burtt when he was designing sounds on both *Star Wars* (Lucas, 1975) and *Wall-E* (Stanton, 2008). Each of these films that embraced sound early in the production process, including *Happy Feet* (Miller, 2006) went on to win Oscars. Having this collaboration from the pre-production stage is of benefit to everyone in the film making process. Any ‘holes’ in the film which traditionally were fixed during the post-production process can be avoided. This however is something which doesn’t happen enough. As noted by the eminent sound designer Randy Thom, ‘Many directors who like to think they appreciate sound still have a pretty narrow idea of the potential for sound in storytelling’ (Thom, n.d.). Many directors also continue to make films with the visuals being the first priority, and sound only being considered after the picture edit is well underway.

**3D films = 3D sound**

Currently I am engaged on Australia’s next two animated feature films to be released. What makes these films unique is that they will be the *first Australian produced 3D films*. The approach to the sound design on these films is quite different to any other contemporary film that I have worked on previously. With 3D bringing the visuals quite literally out of the screen, the sound can also be treated with greater creativity. 3D films now allow the sound designer to be far less conservative with the panning, placement and movement of sounds within the 3D cinema space. Prior to 3D, sound for film was mixed front speaker heavy, as this is where the primary action takes
place, as the audience is directed ahead at the screen. In 3D you are immersed inside the visual action, and the sound placement needs to complement this.

As films evolve visually with 3D technology, sound will continue to evolve as with the audience immersive experience. These techniques used for 3D film are the same as used for the installation *Nature Man Machine*.

**Nature Man Machine: 5.1 Surround Sound Installation**

*Nature Man Machine* is a sound installation which uses techniques, both creative and technical drawn from my industry experience. As a sound designer in film, my role is to convey a story through the recording, selection, creation, and placement of sounds that complement the script, characters and intention of the director. *Nature Man Machine* differs from cinema, as it does not rely on any visuals to help portray a story. However, when compared to cinema the installation has many parallels (Appendix A).

Film is almost always shot to a storyboarded script. My sound work was directed by graphically mapping out the movements and drama of the piece over a predetermined timeline. The way in which I recorded, edited and created sounds, mixed and replayed the final 5.1 audio uses the same techniques as those in contemporary cinema. The objective of the installation, as with film, was to immerse an audience into a story. The exception was that by not having visuals, the minds of the audience would create the images. The execution of the soundtrack was extremely vital as it had to represent both the sound and the image.

Scientists are challenged with an inconclusive understanding of the functions of the human brain. One discovery made is the way in which sound infiltrates our bodies from as early as about four and a half months after conception. Hearing is the first of all of our senses to be switched on, and exposes us to sounds not only contained by the mothers body, but additional sounds outside the body in the outside world. The mother's fluids, heartbeat and voice are amongst some of the earliest sounds heard and some of the first senses which are experienced and discovered. Exterior sounds, such as the fathers voice and music also infiltrate the body in utero as early developing beings. As we begin life as hearing beings Murch states ‘[that] from the moment of birth onward, hearing seems to recede into the background of our consciousness and function more as an accompaniment to what we see’ (Murch, n.d.).

It isn’t until after birth that the sense of sight is first experienced. What I find interesting is that people have a far greater understanding about visuals, than they do sounds. We have vocabularies for vision, including colours, shapes, and sizes but for sound we don’t. Music has a vocabulary as it is a language, but if we observe ‘sound’ as a whole, with music but one small component, we find that a vocabulary does not exist. How do we describe the sound of the coconuts in *Monty Python's Holy Grail* (Gilliam and Jones, 1975)? How do we
describe and distinguish the difference between the sound of coconuts and horse hooves? How do we describe the sound of a ‘Lightsabre’ from *Star Wars* (Lucas, 1975), or the sound of the ‘Autobots ‘transforming in *Transformers* (Bay, 2007)? We can try and vocalise and mimic these sounds using our mouths or props, however a vocabulary does not exist.

**Sound and the image**

A photograph is a single still image that captures a single moment in time. Not being accompanied by sound, a photograph conveys a story solely through the visual senses, in contrast with sound design. With sound you are given no visual cues, yet by hearing, the sound stimulates the imagination. In film making, sound is used as a powerful emotional tool. ‘We interpret sound with our emotions, not our intellect’ (Thom, n.d.). With sound we can’t see, we can only ‘visualise’, and as a result we give an emotional attachment to what we hear. Music is a perfect example of how sound is interpreted by emotion. By timing the placement of sound effects and using volume dynamics, sound design can become quite musical, and thus stimulate emotion.

*Nature Man Machine* is a soundtrack produced entirely without the accompaniment of vision. Having complete sonic control allowed me to create a story and convey emotion through hearing and the imagination. In film, you have an advantage of the image dictating the sound, however with *Nature Man Machine* this is not the case. Sonnenschein makes the observation that if hearing was our only functioning sense, ‘our mental processes not only continue operating, but generate internal imagery and imagery sensations to compensate for the lack of external information and change’ (Sonnenschein, 2001, p. 54). As a sound designer, I need to absorb the audience into the artwork and aurally take them on a journey of imagination. As the entire story rides on this aural rollercoaster, the sound design is of utmost importance. The purpose of this is to expose the audience to the same dynamic capacity as that of film. It is quite confrontational and awkward for an audience to only ‘hear’ a film. With the visuals often telling the audience what to think, sound is often far more ambiguous, and leads the audience to think for themselves. If a director is ‘sound conscious’ they can manipulate the cinematography and onscreen visuals, knowing that the sound can challenge the audience. Randy Thom suggests that ‘starving the eye will inevitably bring the ear, and therefore the imagination, more into play’ (Thom, n.d.). Having thirteen years of professional sound design and music experience, my understanding of how to manipulate timing, pitch, volume and placement within a 3D space of sounds is demonstrated. As much time goes into the recording and creation of the individual sounds as also goes into manipulating the soundtrack for dramatic and emotional storytelling. Creating tension, building to a climax and then allowing for a release are all necessary skills of sound design.

**Creating new sounds**

As a sound designer my interests include capturing new and unique sounds, and creating new sounds which do not exist in the real world. Working on a film, I endeavour to create unique and new sounds which give an audience an original aural experience. The audience are seeing the visuals for the first
time, so I allow them the experience to hear sounds for the first time. *Nature Man Machine* did not have to complement visuals therefore my creative freedom was not limited to contemporary cinema expectations. This freedom allowed me the opportunity to use created sounds that could meld together sonically without visual expectations. Panning and placing these sounds within a 3D space allowed my experience to resemble the sound design for a 3D film as opposed to a 2D film. 2D typically is conservative with the placement of sounds in the surround speakers, however *Nature Man Machine* and 3D films utilise these speakers far more dynamically.

For many years I have had an interest in electronics and how musical instruments and sounds interface with computers. This has recently advanced to the research and build of my first synthesiser. Through my research I have learned of a form of physical electronic manipulation known as circuit bending. Circuit bending is the electronic art of rewiring and short-circuiting low voltage electronic toys and gadgets in order to produce unique, weird and previously unheard sounds. As a sound designer this is of particular interest.

For *Nature Man Machine* I wanted to source unique sounds that could be used for the machines within the work. I began experimenting by circuit bending several children’s toys and a drum machine, with the most rewarding of these being a ‘Speak and Read’ by Texas Instruments (Appendix B). What made this of particular interest was it’s excellent synthesised voice. With these particular educational toys being built in the late 1970s and early 1980s, acquiring one proved difficult. The ‘Speak and Read’ was modified to include pitch, loop and glitch controls. For *Nature Man Machine* I recorded 20 minutes of recordings directly to my computer using industry standard software, ProTools. These recorded sounds were edited into very small sections and incorporated into the work. Recording these digitally allowed for further manipulation and permutations resulting in the further creation of new sounds. Such transformations included extreme changes to pitch, looping a few milliseconds of sound and distorting these with additional effects such as delays and reverbs. What was of particular interest in using the ‘Speak and Read’ was that the initial playing and recording of it was a performance, and then the editing and manipulation of the recorded sample sounds was a second performance.

The ending of *Nature Man Machine* contains many sounds originally recorded from the ‘Speak and Read’. Within a large reverberant room such as a gallery, the high frequencies of the manipulated ‘Speak and Read’ samples gives the illusion that the sounds are originating from the individual speakers themselves. The source recordings of these are very clean, with no background noise. A clean recording contains untainted frequencies and has many advantages including the ability to be accurately manipulated, resulting in greater creative options. When working with sounds that don’t originate from clean recordings, manipulation of the sound is difficult. Initially noise reduction may be introduced, however with each level of noise reduction comes the chance that the process will remove some of the desired portions of
the sound. Without the use of noise reduction, the chances of amplifying the noise are greatly increased.

It is extremely rare that within my work I will record and use a sound without any form of modifications. I believe that no single sound is the perfect sound, and some form of modification or editing will be essential to the creation process. Sounds heard with the human ear as they appear in the world around us will always sound different when recorded and played back. No microphone is capable of being as sensitive and responsive in capturing sounds as the human ear, and no speaker or headphones as capable of playing back a sound with the same dimension, perspective and space, as the original sound source.

**Recording sounds**
Recording the winds for *Nature Man Machine* was difficult as I was faced with several problems. A major problem included noise pollution such as background noises of traffic, birds, and human voices. Recording wind is fraught with technical challenges as the wind pressure can distort the microphone capsule. This makes winds sound as if they are buffeting and are not a true representation of the high frequencies and definition within the actual sounds of wind. After capturing the winds, editing of the sounds would include removing background noise pollution and filtering the frequencies within the winds. This filtering technically eliminates unwanted frequencies while creatively is used to provide the winds movement and dynamic characteristics for storytelling.

Other examples of source sound recordings used in *Nature Man Machine* include:

- cave recordings
- power boats
- electric power drill
- vocal breaths
- synthesiser sub dives
- various birds
- stressed wood creaks

All of these sounds have been manipulated and repurposed in one form or another, and in many cases sound deliberately unrecognisable from the original source recordings. This may be as simple as editing and placing the stressed wood within a 3D environment with reverberation to give the perception that you are sitting inside a wooden shack, or it could be as complex as heavily manipulating powerboats, or even breaths, to sound like tonal drones after being pitched, delayed and heavily reverberated multiple times.

**Composing sound effects**
*Nature Man Machine* contains no music, however as a soundscape, it does contain many elements of musicality. Using the bass and sub harmonic frequencies of the sounds I establish the various tempos within the work. This
allows the ability to alter the pace, the dramatic dynamics and the anticipation of the movements within the work. The creation and timing of these low frequencies represent the rhythm. In the final movement, the high frequencies of the ‘Speak and Read’ are edited, manipulated and then paced to add an additional dimension to the rhythm. Various other sound effects are intertwined and choreographed to evoke the ever-evolving melody. At specific moments the creation and placement of tones as musical elements add to embellish and evoke tension. Such tonal elements include bowed guitar strings, sailing halyards and even human breaths. By manipulating the pitch, stretching and compressing the sound durations and modifying the sounds through various reverb and modulation parameters, the sound effects within the soundtrack resemble a musical composition.

When working with sound effects it is of utmost importance to consider the frequencies of the individual sounds which make up the overall sound for a sequence. For example after the winds at the beginning of the piece we are first introduced to the sound of an avalanche or earth movement as a transition into the following movement. If we imagine what the sound of an avalanche is we envisage a sound predominantly of rumbling low frequencies. For this particular earth move I created a sound using not only low frequencies, but also many high frequencies. These take the form of debris and wind. By using sounds containing these high frequencies I am able to make the overall sound appear to approach from the front of the room. A problem with low frequencies when exhibiting is that they tend to not be directional and you are unable to pan them around a room. It is difficult to hear where the sound is emanating from, as the waveforms are long and you primarily only feel them. By introducing high frequencies, I can introduce direction to the sound as I am able to pan these elements through the various speakers including the surrounds, something that the low frequencies are unable to do.

**Calibration**

*Nature Man Machine* not only considers the various individual sound elements which are carefully composed within the sound design itself, but also the reproduction and replay capabilities of the installation within a physical space. Drawing a comparison to film sound design, I wanted to exhibit *Nature Man Machine* in a manner that emulated the way in which sound is heard while viewing a film at the cinemas.

Exhibiting *Nature Man Machine* with consideration to cinema meant the importance of the playback setup was crucial. Speaker placement and speaker calibration was as much of a consideration as the sound creation itself. To counter the impurities of a gallery setup, each speaker was individually calibrated to 85db with test tones and a SPL (Sound Pressure Level) meter. This calibration method used is the same technique used in contemporary cinema. This sound installation setup allows the audience, when sitting in the centre of the room (the sweet spot), to be surrounded by a uniform 360° sphere of sound (Appendix C).
Just as 3D films are delivering a new dimension to the film viewing experience, I wanted my soundtrack to utilise the 3D space of the gallery by using a 5.1 surround sound setup. Contemporary cinema uses 5.1 surround sound as the standard for films, so it was of utmost importance that Nature Man Machine be created and exhibited using the same technique. As a sound designer this demonstrates a parallel between my work in contemporary cinema and the installation of Nature Man Machine. Creating sounds and then placing these within a 3D space puts the audience amongst the sound as a participant, not just a passive listener, listening to a soundtrack that is literally only in front of them. For this to be effective the size of the room, speaker placement, room acoustics and replay equipment were all considerations.

Continuing a parallel with cinema I wanted to run the soundscape to a strict schedule. I resisted having the piece play on continuous loop as it was important that like film, the audience would experience a defined beginning and end. With the soundscape being 23 minutes in duration, I chose specifically to have it play every second hour: 10am, 12pm, 2pm and 4pm. This gave the audience an opportunity to plan a time to hear the experience, the same way in which they would plan to ‘go and see’ a film at the cinema.

**Challenges**
Throughout the process of creating and exhibiting Nature Man Machine several challenges arose. Capturing clean recordings at times proved difficult as you don’t always have control of your environment. In particular the winds proved to be difficult due to background noise pollution. To overcome these problems many takes needed to be edited and filtered to remove all unwanted noise. Most noise came from distant cars, however this was resolved by filtering out low frequencies as this is where the sounds are generally located. Acquiring the ‘Speak and Read’ proved difficult. Once circuit bent, getting predictable outcomes of sound took some time to master. The glitch switches, although enabling new sounds to be generated are extremely random with their output. This meant that I had to practice the timing of the switching of the parameters in order to record the desired sound results.

**Playing back the soundscape**
With my intention to exhibit the installation as 5.1 surround sound, one of my initial problems was working out a reliable replay system. If I chose a domestic setup I could have used the DVD format as it is capable of 5.1 sound. Initially this was my preferred setup as I could place the 23 minute work within a 2 hour duration file, and have it loop on a DVD player every second hour. Finding a suitable DVD authoring software package proved difficult. Some software would allow audio only DVD’s whereas others also needed a video component (albeit blank). An initial issue arose in the encoding of the 5.1 surround audio track, as the DVD authoring software would convert the 5.1 audio into a stereo audio encoding. After sourcing two further software applications capable of authoring 5.1 audio, I was confronted with continued
problems with audio compression codecs. (The audio compression codecs are software that translate the raw audio file and reformat it to be a fraction of the original file size so that it will fit onto a DVD) This data compression was severe and resulted in obvious audible degradation of my work. The uncompressed audio for *Nature Man Machine* was over 1.2 gigabytes in data size and once compressed using AC3 compression (DVD Audio codec), the file size reduced to only 36 megabytes of data (approx. 1/30th of the original file size). The audio quality suffered severely with all of the high frequencies being lost, the LFE (sub woofer) becoming distorted, and all of the dynamics within the mix becoming flat.

The problem could have been resolved at great expense should I have sent the files to a commercial DVD authoring studio, however there would be no guarantees that the audible compression problems would not recur. Not wanting to compromise on the quality of my work I decided to replay my sound completely uncompressed. This is by far the ultimate method, and I was afforded this luxury by running the 5.1 sound mix natively from Avid ProTools. The uncompressed 48kHz, 24bit 6 track master tracks of audio were routed directly from the discrete outputs of the interface (Left, Centre, Right, Left Surround, Right Surround and Sub) to professional studio quality speakers. The quality of the speakers installed for the exhibition allowed a greater frequency response than those used in contemporary cinemas. This meant that the sound quality of *Nature Man Machine* was replayed with the sound not being compromised in any aspect of production or playback. Using this method of replay however, does make the installation difficult to tour as it uses powered speakers, a computerised replay system and additional specialised volume calibrating hardware.

**Conclusion**

*Nature Man Machine* is a sound installation that demonstrates the ability of sound design to be effective as a medium for storytelling. Although using cinema sound techniques as a comparison, the installation offers no visuals for the audience. Through hearing, the audience's visualises it's own imagery. From the early era of silent films, sound has played an increasingly important role in film storytelling. Film production companies have invested heavily in sound technologies including the expansion from monaural sound to contemporary surround sound formats. Throughout the entire process of creating *Nature Man Machine*, the recording, designing, editing, mixing and final playback experience of the soundscape was a consideration. I wanted the creation and presentation of the work to be of a quality level equal to that of a Hollywood film.
Bibliography


Film Sound History: Pre-20's. (n.d.). Retrieved from http://frank.mtsu.edu/~smpte/pre20s.html


Appendix A: Exhibition Text

**Nature Man Machine**

5.1 Surround sound installation

**Hearing is believing**

*The sound of traffic/planes is the sound of speedboats pitched low*
*The sound of violins is the sound of a bowed electric guitar*
*The music under the sailing halyards is the same recording of sailing halyards processed through an extreme convolution reverb*

Having a background in film sound design, my job is often to interpret a director's story through the use of sound. Part of my story-telling role is to interpret the onscreen action and drama, and highlight, correct, embellish, exaggerate and anticipate not just the on-screen action, but also the off-screen action. Often, my role entails helping to solve script and story issues through the use of sounds.

No matter what film I am working on, and no matter how autonomous my role, I am always following and enhancing a pre conceived story from a third party. I mostly work unsupervised with the director often hearing my work for the first time in the final audio mix. Nevertheless, I am not only second guessing what it is the director wishes to hear, I am hoping to provide a soundtrack with exceeds both his expectations of the soundtrack, and the story-telling ability of my sound work.

The sounds used in my film work are a combination of original recorded and created sounds.

*Nature Man Machine* is a sound piece which best represents me and my sound work in film. The piece is structured into three morphing acts representing nature, man and the machine. The work starts off with only natural sound recordings of winds, most of which were recorded here in Wagga Wagga. As the piece unfolds, more and more created sounds are introduced up until the point where the machines take over. At this point all sounds are fabricated. It isn't until the destruction of the machines that we are returned back to the original sounds of nature.

Sounds of interest:

- **Winds** - Recordings from South Lake Albert (Pencil Pines)
- - Recordings from farm on Plumpton Rd (Sth Wagga)
- **Machines** - Circuit Bent Speak and Read
- **Water drips** - Yarrongobilly Caves
- **Door creaks** - My office door
- **Vocal swirls** - Green grocery bag being flapped and processed
- **Servos** - Electric Drill
Appendix B: Circuit Bent Speak and Read
Appendix C: Gallery Speaker Setup