PRODUCT SOUND DESIGN:
HOW ANIMATION LEADS THE WAY

by

Todd Brunner

© 2005 Todd Brunner

A thesis
submitted in partial fulfillment
of the requirements for
the degree of Master of Industrial Design
School of Art and Design
Pratt Institute

February 2006
PRODUCT SOUND DESIGN:
HOW ANIMATION LEADS THE WAY

by

Todd Brunner

Received and approved:

______________________________________________  Date_______________
Thesis Advisor – Bruce Hanna

______________________________________________  Date_______________
Chairperson – Matthew Burger

______________________________________________  Date_______________
Dean – Frank Lind
Thanks:

To Rob Miller – for introducing me to the world of animation sound design

To Bruce Hanna – for keeping me on course and being one of the exceptions

To my wife, Kate – for loving me, for supporting me, and for pretending it’s cool to have a husband who talks about cartoons all the time
Table of Contents

Preface ................................................................................................................................. 1
Introduction ......................................................................................................................... 3
A Brief History of Product Sound Design ................................................................. 5
A Brief History of Animation Sound Design .......................................................... 9
The Role of Sound in the Design Process ................................................................. 15
Sound as Information .................................................................................................. 18
Sound and Emotion ...................................................................................................... 22
Sound and Exaggeration ............................................................................................... 27
Sound and Branding ....................................................................................................... 29
Sound and Environment ............................................................................................... 32
Sound and the Kitchen: A Case Study ................................................................. 36
Conclusion ..................................................................................................................... 43
Bibliography ................................................................................................................... 44
Attachment A: Multimedia CD

Note to reader: Each figure in this paper has an accompanying sound or video on the multimedia CD (Attachment A). Open the file that has the same number as the figure being referenced.
Preface

I haven’t always been interested in sound design. In fact, I’m pretty much as guilty as the next person of looking at animation and product design as primarily visual media. It wasn’t until I enrolled in some animation classes at a local Wisconsin college that my perceptions began to change. For the first time, I was introduced to the process of “audio sweetening” – the addition of sound effects. Sound is obviously a part of most animations, but I never stopped to consider the many ways it contributes to the final product. The right sound can add to the realism of a scene, direct the viewer’s attention to a specific action, create a mood, and more. One of my instructors, professional animator Rob Miller, talked in detail about the importance of paying attention to the “language of sound” in everyday life in order to ensure that we could produce an immersive audio environment for our audience. He described how an action as simple as setting down a glass of ice water required not only the obvious sound of the glass hitting the table, but also the sound of the liquid in the glass sloshing around and the clink of ice cubes hitting each other and the glass. Miller mentioned that while most people may not realize which of the sounds was missing, they would notice if a layer of sound was left out.

Outside of class, I began to pay closer attention to the countless ways sound affected my own life: my cell phone ring changes depending on who is calling me, the click of the latch lets me know I’ve closed my apartment door all the way, the noise of my car engine indicates it’s time to shift to the next gear, barking outside my window in the morning tells me it’s around 7:00 a.m. (when my neighbor usually takes her noisy dogs for a walk), and the sound of a motorcycle conjures up happy memories of a past-
time I gave up when I moved to Brooklyn. During my first semester at Pratt I started to think about how my interest in sound related to design. I was being taught how to make my designs visually and tactiley pleasing, but not how to appeal to the other senses. Since sound plays an important role in so many products, I wondered how I could ensure that these sounds fit the experience evoked by the rest of a design. I discovered this question was starting to be asked by other industrial designers, too. My own search for the answer led to this thesis and the surprising discovery that part of the answer might lie in the experiences I had in that local college classroom years before.
Introduction

About eight weeks after conception, the structure of the human ear begins to form. Hearing is the first of the senses to be “switched on” and pretty much the only sense in use until birth, when sight takes over the primary role.\(^1\) Our world becomes mostly about what we see, while the audio is little more than an accompaniment. This same reliance on sight above sound can clearly be seen in the field of Industrial Design. As Industrial Designers, we spend most of our time thinking about the look and feel of the products we create. The auditory aspects, if they are even considered, are typically left until the end of the design process.

Animation is an industry that once shared this same ignorance of the power of sound, but those days are long past. Now, sound design is an important part of every production and the results are clearly better because of it.\(^2\) Carefully selected audio cues convey everything from the power of the pistol fired by the hero, to the distance a coyote falls after stepping off a cliff, to the danger facing a mouse unaware that a crafty cat lies just around the corner. If used correctly, sound has the potential to play an equally important role in product design. But where does an aspiring product sound designer go to learn the tools and tricks of this new trade?

---


A handful of designers worldwide are starting to venture into this area, but the field is still clearly in its infancy. Those of us interested in product sound design may have to look outside our industry to find the information we seek. One of the better places to look could be Saturday morning cartoons. While the animation industry may seem far removed from the world of product design, they share many similar concerns. Since the early 1900s, animation sound designers have been refining their skills at everything from conveying emotion to enhancing brand image. This thesis will show how the same techniques apply to the field of product sound design.
A Brief History of Product Sound Design

Most people currently working with product sound design share similar thoughts about its history. Until now, the main way to deal with sound was to make a product as quiet as possible.\(^3\) This occurred for a number of reasons, but primarily because the technology to design sounds simply didn’t exist. Products still made plenty of noise, mainly as a result of the mechanical components inside. Since much of this noise was inadvertent, it was often viewed as annoying by the designer and consumer alike. When the only other option is an environment filled with products emitting repetitive mechanical noises, the desire to simply keep them silent becomes understandable.

One scenario where annoying mechanical sounds were useful, however, was in the case of warning noises. When the need arose to alert someone for one reason or another, a mechanical noise was the perfect solution. The sound simply needed to be loud enough to be noticed. Time was spent designing these noises, but the concerns were only that the sound could be heard and reliably produced with the available technology. Early telephone ringers are a good example. The mechanism involved a tiny hammer striking a metal bell. The energy for this action came in the form of a small electric current supplied by the phone line. The bulk of the sound

design involved ensuring that the bell would produce a sound that our ears could easily hear.\textsuperscript{4}

Until the late 1800s, the idea that sounds could be recorded and played back was impossible to imagine. In fact, sound was often used as an example of impermanence; a noise once emitted would never be heard from again.\textsuperscript{5} In 1877, Thomas Edison revealed his latest invention, the phonograph, which recorded sound for playback on a cylinder of tin foil. Sound was finally given a life of its own apart from its visual counterpart. Soon after, the talking doll industry was born. Each doll (Figure 3) had a tiny phonograph inserted in its chest with a prerecorded cylinder that allowed it to recite nursery rhymes. The technology continued to progress in the following years, but remained bulky and fragile, making it impractical for use in other consumer products.

There were many more advancements in sound technology in the early 20\textsuperscript{th} century, but none as important to product sound design as the piezoelectric buzzer. Piezoelectric devices were used in many ways during the first and second world wars. Research for these tasks eventually led to the discovery of low cost materials for their manufacture. As a result, after World War II it was economically feasible to start using piezoelectric devices in consumer products. One such device was the piezoelectric

\textsuperscript{4} Lord.
\textsuperscript{5} Murch 237-251.
buzzer (Figure 4), a disk of sheet metal laminated with ceramic that was capable of emitting simple electronic sounds. Finally, product designers had an efficient, low-power way to make any device emit a tone. More importantly, it was so cheap to manufacture it could be included in a toy robot.6

It was during the 1950s that the science of psychoacoustics began to gain prominence. Its father, Dr. Alfred Tomatis, began looking at the psychology of acoustical perception – how humans perceive sounds. He gathered data on how the ear actually worked, what sounds could be heard, which ones were painful, and more. Unnamed sensations were given names and descriptions. A sound could now be measured and described as rough, sharp or loud. Psychoacoustics was primarily a scientific field of inquiry, though, and its relevance was not seen by the product design community even though they were simultaneously conducting their own less formal research. The theory that “a quiet product was a quality product” was being challenged. Designers were encountering situations where the noise a product made was important to the consumer. In some products, such as motorcycles, sound meant power and, to many buyers, the noise of the engine was as

---

6 Lord.
essential as the look of the vehicle. In other products, such as dishwashers, the sound of the device in action was the only signal that it was turned on and operating. Silence was unnecessary and even hurt the acceptance of designs in these areas.

It wasn’t until the 1980s that digital technology allowed designers to use recorded sounds in their devices. Yet the constraints of weight, size, battery power, and manufacturing costs continued to delineate the sound design possibilities for many devices. In addition, the speakers used in most products were still better suited to beeps and chirps than more complex sounds.

Nowadays we need only look to the latest cell phone to see that the technology is available to produce any sound a product designer can imagine. Yet with all this freedom, sound design continues to be overlooked as an important part of the product design process. Considerable time has passed since the days of the piezoelectric buzzer, yet the average beep of a microwave oven sounds no different than the warning signal issued as a garbage truck drives in reverse. Select companies, such as Philips and BMW, have realized the importance of sound in their products, but for the product design industry as a whole, sound design is a new discipline. There are enormous opportunities for designers to enhance their product’s brand identity as well as its functionality through the use of sound.7

---
7 Engelen
A Brief History of Animation Sound Design

In February 1914, Winsor McCay stunned audiences at the Palace Theater in Chicago, Illinois by climbing on stage and announcing he was about to reveal the only dinosaur held in captivity. After a crack of his whip, the stage curtains parted to reveal Gertie the Dinosaur (Figure 7). Although she reacted to McCay’s commands and whip cracks as if made of flesh and blood, Gertie was actually composed of over 10,000 hand-drawn pages of ink on rice paper. Many consider that night to be the debut of the first fully-animated cartoon and, though the film itself was silent, it’s not hard to imagine that the sound of McCay’s voice and the sharp crack of his whip were an essential part of the whole experience.

Fourteen years later, Walter Elias Disney, a then unknown animator, released his latest creation to the public. The cartoon, Steamboat Willie (Figure 8), not only featured the debut of Disney’s now-popular character Mickey Mouse, but was also the first widespread release of an animation with a synchronized soundtrack. For the first time audiences could see as well as hear the action that was taking place on the big screen.

In 1929, realizing a new era of cinema had begun, Carl Stalling quit his job and joined the Disney studio. Formerly a musician who provided live piano accompaniment to silent animated films, Stalling understood that the success of Steamboat Willie meant...
there would be a new demand for animated films with sound. In his new role at Disney, Stalling would provide musical soundtracks for nineteen of Disney’s next twenty sound cartoons. More than just background color, Stalling’s compositions were also used as sound effects. The music changed styles depending on the action occurring on screen. A drunk would swagger down the street to the tune of “How Dry I Am” while a beautiful woman later appeared to the strains of “Lady In Red”. Stalling is credited as the inventor of the click track, a series of audio cues used to synchronize sound recordings to an animated image. This invention led to Disney’s early Silly Symphony cartoons in which Stalling first provided a musical score that Disney then handed off to his animators.8

The sprocketed 35mm optical soundtrack was also developed in 1929. Prior to this technology, sound was recorded as it would be presented on film – linear in time. Now, sounds could be put in different synchronous relationships with the animated image. Animators could seek out the individual sounds that would best enhance the animated experience they were trying to create for the audience.

Until 1930, sound in animated films was limited to real-life recordings. Since the early days of radio, Foley artists, named for sound effects pioneer Jack Foley, were skilled at finding real-life sounds to match, augment or substitute the sounds required to produce an audio script. For example, recording someone walking on cornstarch was a popular replacement for the sound of a person walking in snow. Shaking a pair of gloves

---

was often used to represent the flapping of a bird’s wings. With the advent of sound
cartoons, Foley artists were finding new work creating all the sounds necessary to breathe
life into the animated world. Their potential sound pallet consisted of whatever sound
they could dream up for the microphones to record. However, once captured the sounds
had to be used as recorded.

In the late 1930s, an inventor named Rudolf Pfenninger introduced synthetic
sound to the animation community. An aspiring animator, Pfenninger lacked the money
to provide a traditional soundtrack for his films. Instead, he sat down with an oscilloscope (Figure
10) and experimented until he was able to figure out the graphic symbol needed to produce a specific
tone. Equipped with this knowledge, he hand-drew a soundtrack for his films and photographed them for
use with the recently developed optical soundtrack technology.9 The result was an animated film accompanied by sounds that were never previously recorded. Using the techniques that Pfenninger developed, the animation
industry was given new freedom to alter, and even create from scratch, the audio of their
cartoons.

Having harnessed the power of music and sound effects, it was only logical that
animators would begin to experiment with another important audio component: the voice
of their characters. The mid-1930s saw the release of several cartoon characters as

---

9 Thomas Levin, “‘Tones from out of Nowhere’: Rudolf Pfenninger and the Archaeology of Synthetic
unique in voice as they were in appearance. Most notable were Disney’s Donald Duck, whose barely intelligible voice dissolved into meaningless squawking during the character’s frequent fits of anger, and Warner Brothers’ Porky Pig (Figure 11), who shared his trademark stutter with the actor who voiced him. Porky’s voice would eventually be performed by versatile character actor Mel Blanc. Blanc would go on to create the voices of some of the industry’s more memorable characters, including Warner Brothers’ favorites Bugs Bunny, Sylvester the Cat and Yosemite Sam. In each case, Blanc’s voice acting heard alone was enough to conjure up images of the characters portrayed.

Animators continued to push the boundaries of sound. Another important milestone was reached in 1940 with the release of Disney’s feature-length animated film, Fantasia (Figure 12). This cartoon involved several animated vignettes created to accompany an orchestral soundtrack conducted by the famed Leopold Stokowski and his Philadelphia Orchestra. After falling in love with the rich sound he experienced during live performances of the orchestra, Disney commissioned one of his sound engineers to devise a better solution than the standard sound recording and playback equipment used in the animation industry. He thought the sound it produced was too tinny and undynamic. The result was “Fantasound”, an early multi-channel sound process that was the precursor to the surround sound used in movie theaters today.

The same year as Fantasia was released, Disney built the world’s first animation studio, complete with departments for sound dubbing and scoring effects. It was in this
studio that Disney technicians invented many of the stock animation sound effects that are still used today. While useful for feature films, stock sound effects gained greater importance in the late 1940s when animation began to appear in television shows and commercials. The quick turnaround time required for a weekly series required concessions by animators in both the audio and visual content of their cartoons. It was much easier to use a stock sound effect rather than create new sounds for each episode. Animation continued to become more prevalent in television and the 1960s saw the debut of the first prime-time animated television show, The Flintstones.

The 1960s also found some animators playing around with the traditional roll of sound in animation. One such animator, Robert Breer, used sound in a more ambient fashion, featuring soundtracks full of machinery noise, muffled music, random effects and even silence. Other animators revisited Pfenninger’s technique of hand-drawn sounds and used those same hand drawings as the visuals for their cartoons.

Though not an animated film, the release of Star Wars in 1977 is worth noting because film crew member, Ben Burtt coined the term “sound designer” to describe his role in creating the many new sounds necessary to bring George Lucas’ science fiction feature to life. Burtt essentially defined the role of sound designer as a person...
responsible for directing the soundtrack of a film, whether animated or live-action. In the future, the job of designing sounds for an animated feature became a sole person’s unique role rather than another responsibility for the animator.

In the decades that followed, computer graphics began to appear in animated films and the industry entered the digital age. Along with visual advancements, computers also changed the field of cartoon sound. Digital technology provided new tools for easily editing sounds as well as providing unprecedented control over the reassociation of image and sound. Now, whether synthetic or real, animation sound designers are truly free to pursue the best sound/visual combinations for their projects.
The Role of Sound in the Design Process

"The common perception is if you can do sound effects for animation, you can do it for anything," says Glenn Oyabe, sound effects supervisor for a number of animated projects at Burbank's Glenwood Editorial. Unlike live-action projects, animation sound designers have to create every sound for a project from scratch, from natural sounds to sound effects to ambient noises. Fortunately, sound designers are usually incorporated from very early on in a project. This allows them the time and access to a director necessary to ensure that the aural elements they create will completely mesh with the visual elements of a film. This was not always the case, however. In 1999, sound designer Randy Thom (a veteran of a number of animated films including Pixar’s recent *The Incredibles*) wrote an article entitled “Designing for Sound” that highlighted some of his frustrations within the sound design industry:

“Many directors who like to think they appreciate sound still have a pretty narrow idea of the potential for sound in storytelling. The generally accepted view is that it’s useful to have ‘good’ sound in order to enhance the visuals and root the images in a kind of temporal reality. But that isn’t collaboration, it’s slavery. And the product it yields is bound to be less complex and interesting than it would be if sound could somehow be set free to be an active player in the process. Only when each craft influences every other craft does the movie begin to take on a life of its own.”

---

Thom spoke of one of the most common challenges faced by an animation sound designer. While there were exceptions, such as popular Warner Brothers’ director Chuck Jones who often wrote sound effect ideas in the margins of his key frame pencil sketches, most directors just didn’t appreciate the contribution of sound.\textsuperscript{11} Often this problem manifested itself in the final days of the film-making process when the finely crafted visuals were expected to be matched up with a comparable audio experience. At best, the unfortunate sound designer was able to pull things together at the expense of sleep and sanity. At worst, a potential masterpiece ended up an uncoordinated mess of audio and visual information. No good director, if given the choice, would opt to sabotage his or her masterpiece in the final stages, so why did so many of them share the same attitude about the role of sound? According to Thom, in virtually all film schools, sound was taught as if it were simply a tedious and mystifying series of technical operations – a necessary evil on the way to doing the important stuff.\textsuperscript{12} If schools presented animation as a primarily visual experience, then it’s hardly surprising that the effects of audio were minimized or ignored.

The parallels between the past experiences of animation sound designers like Thom and the current experiences of industrial designers are many. Currently, there are no design schools in the United States that offer a class in product sound design or a


\textsuperscript{12} Thom.
similar subject. Either the role of product sound design is considered insignificant or is ignored all together. However, there are a handful of designers, such as Heleen Engelen of Philips, who are starting to speak out about the challenges facing product sound designers today. In a 2001 brochure from Philips, Engelen wrote about the importance of sound in products that purport to address a total user experience. Although, historically, product sound was considered undesirable noise, current consumers are used to multimedia and interactive technology where sound plays a vital role. To these consumers, sound is a positive thing. But, as in the animation industry, the effective use of sound in product design will require changes in the way the system currently operates. If sound is to be more than a decoration on a product, sound designers will need to be included in the product design process from the beginning. Beyond simply changing the point at which they become involved, however, product sound designers also face the challenge of educating the design industry as whole on the use of sound. Everyone involved in the creation of a product needs to understand the use of sound and how it can be beneficial.13

A frequent joke on the animated television show *The Simpsons*, involves the father, Homer (Figure 16), racing off to take care of some neglected task. As he exits the scene, the audience hears the sounds of Homer running down the stairs, slamming the front door, starting his car, and driving off in a frantic attempt to take care of his forgotten business. There’s no on-screen action to accompany these sounds, yet, because the sounds are familiar to us, we know exactly what is going on. Sound designer Rob Miller spoke in an interview about how his goal with each project was to ensure that the audience could tell what was occurring in an animation even if they heard the audio track without any visuals. To do this, Miller explained, he had to pay close attention to the “language of sound” that surrounded him in everyday life.¹⁴

Humans are designed to absorb information through hearing. The ear can perceive a wide array of sounds through alterations of timbre, loudness and pitch. Based on the scenario in which we hear a specific noise, our brain can associate the sounds with objects, events, ideas or a combination of the three. The difficulty for animation sound designers arises in determining exactly what meaning has been assigned to a certain sound since everyone has had different experiences in life. Fortunately, most people who have grown up in similar environments have been exposed to many of the same things. For instance, those of us raised in the United States are probably familiar with sounds

¹⁴ Rob Miller, Telephone interview, 11 November 2004.
such as traffic, police sirens, and dogs barking. Thus, in animation, if a character is robbing a bank and police sirens are heard off screen, the audience will most likely comprehend that the character’s misdeeds have been discovered and authorities are on the way.

Another facet of the “language of sound” comes in the form of feedback. When we walk, we hear the sound of our feet striking the floor. The noise of a door hitting the door frame tells us it’s closed. Sound lets us know that an action has occurred, but feedback noise can provide even more information. As sound designer Walter Murch describes, the slam of a door “can indicate not only the material of the door and the space around it but also the emotional state of the person closing it.”\(^\text{15}\) In my earlier example from *The Simpsons*, the sound of Homer slamming the front door tells the audience the door is not only closed, but also that he was in a hurry.

It is inevitable that an animation sound designer will eventually be faced with the task of creating sounds that fall outside the common exposure of the audience. In these instances, it is important to have an explanation accompany the sound the first time that it’s debuted in order to define the meaning of that sound for the audience. This explanation can be as simple as a visual or as complex as exposition through dialogue. In the Nickelodeon cartoon *Invader Zim*, one of the main characters, a mischievous robot named Gir (Figure 17), travels around disguised in a dog suit that squeaks with each step. In the pilot episode, the audience is introduced to the sight of Gir in his dog suit at the same time as the sound of

\(^{15}\) Murch 237-251.
his footsteps. From that point forward, the sound of this particular squeak conveys the information that Gir is nearby and in disguise regardless of whether he is visible or not.

What does this mean for product sound design? If sounds are to be useful at providing information, they need to be generated intelligently. The sound designer needs to be aware of the “language of sound” and use this knowledge to determine if a sound conveys the intended message. As with animation sound design, if the meaning of a particular sound is not part of most consumers’ common exposure, some indication of its purpose must be provided initially. In the unique case of Richard Sapper’s Espresso maker design (Figure 18) the advertising campaign played this role. Unlike past Espresso maker designs that required components to be manually screwed together, Sapper’s design, as the advertising campaign stated, closed with “simply a ‘click’.”

This served the dual purpose of informing consumers of Sapper’s design innovation and educating them about the meaning of the Espresso maker’s “click”. History is full of examples of

---


designers who failed to realize the signals conveyed by their product’s sound. In 2002, the Callaway Golf Company redesigned their popular golf club driver (Figure 19). The new product featured a carbon-composite head to replace the original titanium one. Despite its cutting edge design, the product was a failure. The company didn’t realize that golfers had come to equate the particular ping of the titanium head hitting the golf ball with a proficient golf swing. The softer sound of the new club made it appear to be of lower quality than the original design.\footnote{Peter Morrice, “The Search for Feel: You Know It When You’ve Got It, But What Is Feel, Really?”, Golf Digest, June 2005.} Sound has the potential to inform the user of a product’s functionality, its condition and even possible defects, but in each case the sound designer needs to ensure that the consumer is aware of the meaning behind the sound.
Sound and Emotion

In a recent interview, Jim McKee, an animation sound designer, described a project where he was searching for a sound effect to use as a vampire’s bite. He eventually selected the sound of oil tossed on a hot frying pan. Not only did it somehow fit with the on-screen action, but the sound had the added effect of creating an emotional sense of dread in the audience. As McKee explained, most people are familiar with the sound of oil hitting a frying pan, as well as the dangerous aftermath where hot oil spatters in every direction. Even though the sound was used out of context, McKee believed it subconsciously registered in the minds of the viewers and enhanced the frightening scene he was trying to create.19 This process of reassociation – pairing recorded audio with new visuals – is at the heart of animation sound design. Since cartoons are completely fabricated, all of the audio content is either created from scratch or taken from other sources. But, beyond simply adding audio to correspond to the on-screen actions, sound designers have the opportunity to choose sound effects that have a visceral psychological connection with the audience and, as a result, enhance the dramatic narrative of the project.

We’ve all probably experienced the ability of sound to trigger emotional reactions within ourselves. Everyday examples abound, whether it be our annoyance at a barking dog outside our window or our joy at hearing a loved one’s car pulling into the driveway. As a result, the language we use to describe sounds is often filled with expressive

19 Jim McKee, Telephone interview, 5 October 2005.
adjectives such as happy or irritating. Animation sound designers have long been capitalizing on the emotional aspects of sound. According to Paca Thomas, a sound designer for Advantage Audio, sound should be treated as another character in the show.\textsuperscript{20} Every sound is used for a purpose and should provide support for the story. For this reason, most sound effects in animation are not created from scratch. While it is theoretically possible, the world is full of unique and inspirational real sounds, each with its own potential to add to the emotional impact of an animated narrative.

Sound designer Walter Murch takes things a bit further. In his opinion, it is the duty of animation sound designers to stretch the reassociation of real sounds with the images in a project. A purposeful and fruitful tension should be created between what is on the screen and what is kindled in the mind of the audience. Every successful reassociation is a kind of metaphor, and every metaphor is seen momentarily as a mistake, but then suddenly as a deeper truth about the visual and our relationship to it – the greater the stretch between the visual and the audio, the deeper the potential truth.\textsuperscript{21} One example of Murch’s theories in practice can be seen in the work of sound designer Gary Rydstrom on the Pixar film \textit{A Bug’s Life}. The sound of motorcycles underscored the other sounds that described the flight of the film’s villainous grasshoppers, accenting their appearance as a wicked biker gang; a Huey helicopter engine enhanced the sound effect of one larger bug, augmenting the powerful beats of his large wings; and a jiggling

\textsuperscript{20} Bunish.
\textsuperscript{21} Murch 237-251.
bowl of Jello provided a playful noise for a humorous scene involving a caterpillar emerging from a cocoon.\textsuperscript{22}

The French car manufacturer Renault is one of the few companies to experiment with using product sound design to evoke an emotion in the consumer. Each sound in their cars is intended to produce a specific emotional response, one determined to be ideal based on their market research. With the aid of musicians and psychologists, everything from the hum of the engine to the “swish” of the windshield wipers is designed and then handed over to engineers to be reproduced mechanically.\textsuperscript{23} Like animation sound designers, Renault has recognized that the sounds they utilize should support their other product aesthetics and enhance its emotional bond with the consumer.

It is surprising that Renault stands with only a handful of companies who pay attention to the role of sound design in their products, since the ability of sound to create an emotional response in consumers can be seen in many places, and the effect is not always positive. In the 1950s, designers of early jet aircraft were surprised by public annoyance at the sounds produced by their new product. Since the jet engine wasn’t any louder than the piston engine it was

\textsuperscript{22} “Sound Design,” \textit{A Bug’s Life}, DVD, 1999 ed. (Burbank: Buena Vista Home Entertainment, 1999).

\textsuperscript{23} McGinn.
replacing, they assumed its sound would be acceptable.\textsuperscript{24} Recently, a similar mishap occurred when a popular leaf blower manufacturer presumed a new quieter design would be more appealing to their customers. In actuality, because the new design was perceived as having less power, sales were poor.\textsuperscript{25}

One particularly important lesson product sound designers should learn from animation is the preference for real sounds instead of synthesized ones. Since the process of synthesizing complex sounds from scratch is so involved, not only does using real sounds save time, but also results in a more believable sound. The familiar aspect of the sound convinces us that what we hear is real. We experience sound almost every waking second and, as a result, are often able to determine if a sound is authentic or synthetic. Even if it is on a subconscious level, real sounds are more likely to produce a favorable emotional response. In the words of Gary Rydstrom, “there's no real synthesizer like the real world.”\textsuperscript{26}

Every sound a product makes has the ability to influence how a customer thinks and feels. In the same way the sound of oil in a frying pan added to the suspense of Jim McKee’s animated horror film, the sound made by a product can affect how we relate to it. An effective sound can enhance our perception of a product’s quality, power or safety, while the “wrong” sound can produce negative impressions. Our emotions can determine whether we purchase or avoid a product. As product designers, it is essential that we use

all the tools at our disposal to ensure that our designs are met favorably by consumers.

Sound has the potential to be an important part of our arsenal.
Sound and Exaggeration

Though a component of sound and emotion, the technique of exaggeration is worth mentioning on its own. In a scene near the end of the animated film *Toy Story*, the two main characters, children’s toys, are chased through the house by a small dog (Figure 24). Though threatening to the toys, the sights and sounds of a small dog would most likely instill little fear in the audience. To counter this fact, sound designer Gary Rydstrom chose to use ferocious animal sounds for the character. So when the two toys are first confronted by the dog, it opens its mouth and lets forth a bellow that combines both tiger and elephant noises.27 Thanks to this exaggeration of the typical dog bark, the audience is as shocked and scared as the two toys.

This type of amplified reality is often used in action sequences where the emotional quality of the sound is virtually all that matters. If the audience needs to believe that the race car in a scene is really fast, the animation sound designer will identify and record sounds to create that feeling such as rocket launches or jet airplanes. Then they’ll finally bring in recordings of an actual car engine and mix the components together. Even if the exaggerated sounds are only barely audible, their presence will nevertheless be felt.

Harley Davidson provides a classic example of the benefits of exaggeration in product sound design. While most exhaust systems serve to muffle the engine noise, the exhaust system of Harley Davidson motorcycles (Figure 25) amplifies the engine noise, creating an exaggerated sense of power. This has helped cement their image as creators of the country’s “toughest” motorcycles. Riders will conceivably feel they have enhanced strength or toughness as a result and likely not consider a quieter motorcycle.

Researchers at Delft University of Technology in the Netherlands recently worked with Philips to improve the sounds of Philips’ popular Senseo Crema Coffee Maker (Figure 26). Several of their experiments involve exaggerating the sounds of the product in action. In some cases this enhanced the perceived power of the product, while in others it served to exaggerate a warm and homey feeling created by its use. Based on feedback from focus groups, they were eventually able to design a more preferred and qualitative sound in the coffee maker. Using similar exaggeration techniques, product sound designers can ensure their products will have the strongest emotional connection possible with consumers.

---

Sound and Branding

In animation, every sound created for a cartoon has the opportunity to become a unique representation of a character, scene, or even the project as a whole. As animation sound designer Gary Rydstrom describes, “sounds can give a sense of character so that everyone [in the cartoon] has a unique sound. Everyone has their believable, but still unique to them, feeling.”

Rydstrom’s work on the animated film *Toy Story* is a good example. Though the cast of talking toys was large, each character was given its own distinct set of sound effects. Besides aiding the audience in telling the toys apart, these sounds also enhanced the individual personalities of the characters.

Most people who grew up in the United States can probably identify the Warner Brothers’ character, The Road Runner (Figure 27), from its signature “meep meep” or the sound of the Jetsons’ futuristic car (Figure 28) zooming around. Some might even hear a particular sound effect and recognize the animated show or film where it originated. In essence, these sounds are a form of branding. The sound effects used in Looney Tunes cartoons, for example, all share the

---

Figure 27 – Warner Brothers’ Road Runner character

Figure 28 – The cast of Hanna Barbera’s *The Jetsons*

29 “Sound Design.” *Toy Story.*
same whimsical nature and, even when heard alone, still serve as a reminder of the qualities of the animations for which they were created. Besides serving their immediate purpose in the cartoon, the sounds eventually take on additional meaning in the minds of the audience. In many cases, just hearing the sounds again is enough to conjure up mental images of the manner in which they were used, the project they were used in, and even the parties involved in the creation of the animation.

There is great potential for product sound designers to use these same techniques in their field, and there are some current success stories. BMW, for instance, spent considerable effort designing the sound of their car doors in order to appeal to consumers. Many car lovers can recognize their brand by this sound alone. Another example is the original Nokia cell phone ring. A piece of classical guitar music written in the 19th century, it’s probably one of the most often played pieces of music in the world, though few people know it as anything but the sound of a Nokia phone.\(^\text{30}\) In general, however, product sounds are a missed branding opportunity.

The German word for “earworm”, ohrwurm, is often used to refer to the ability of sound to enter the ear and get caught in the brain. This phenomenon is

one of the reasons for the popularity of sonic logos, short musical pieces that are the audio equivalent of a visual trademark. Sonic logos are arguably more powerful, though, since sound can be perceived almost subconsciously and deliver a message without requiring the full attention of the listener. It’s surprising, then, that many designers ignore the fact that the sounds a product makes will “get caught in the brain” alongside these sonic logos and can end up creating just as powerful a brand image. Unfortunately, this may not be the intended brand image since so little time is spent designing the sounds of many current products. Braun probably didn’t intend for the obnoxious noise of their coffee grinder (Figure 31) to represent their company, yet on a consumer survey I conducted it was one of the most consistently mentioned examples of bad sound design. Whether the designer realizes it or not, every sound a product makes has the potential to represent that product, as well as its producer, in the mind of the consumer.

To effectively use sound design as a branding tool, product sound designers can take a cue from animation sound designers and make sure the sounds they choose are representative of the qualities and emotions they want their product to convey. Like Warner Brothers wants its sound effects to convey a sense of silliness and whimsy, BMW wants the sound of its car doors closing to represent a feeling of quality and safety. As with animation, by integrating sound design with the rest of the creative process, designers have the best chance of ensuring a consistent, and therefore strong, brand identity.

---

31 McGinn.
Sound and Environment

The final step of the animation sound design process involves the mixing of the sound track. The process is all about choices. Although the sound designer has probably amassed a large number of sound effects for the project, they will not all be used. As sound designer Randy Thom explains, “The goal in mixing is not to attempt to ‘mix’ the largest number of sounds possible together. In fact the goal probably should be to eliminate as many of them as you can.”

Three or four sounds heard at once become only meaningless noise, so the designer must assign priorities to sounds on a scene-by-scene basis. This takes the form of volume control – important sounds will be loudest, while others will be relegated to the background or even eliminated all together. The volume level of the loudest sounds also might change from scene to scene. While the audience will tolerate deafening sound during an action scene, sounds at the same level will only produce annoyance if they are used during a less frenetic part of the cartoon.

Another concern of the animation sound designer is balancing the sound of the film for the listening environment of the audience. Projects viewed in the home on a television will have different speaker arrangements and acceptable volume levels than a

---

project created for the cinema screen. A successful final mix depends on a sound designer who makes choices only after considering the environment of the listener.

Questions about environment are also important to the field of product sound design. A vacuum used in a noisy machine shop will have a greater acceptable volume level than a vacuum cleaner used in a living room. An alarm clock should be loud enough to wake the average person from a deep sleep. Product sound designers need to be aware of the environment where their products will be used so they can ensure that the sounds will be produced at an acceptable level. A recent study of twelve children’s toys found that eight of the twelve were louder than rush hour traffic on a nearby interstate, a volume that could potentially damage a toddler’s ears. Based on these findings and numerous complaints from parents, the Consumer Product Safety Commission is developing regulations to address the loudness of toys.33 In this case, the sound designers’ lack of concern for acceptable sound levels might unfortunately result in litigation.

Part of understanding the environment in which the product will function is understanding the other sounds it will interact with. A striking example of why this is necessary is a current discussion in the medical device industry. There are a number of devices with alarms in an operating room, and recent studies suggest that anesthesiologists, operating room technicians, and operating room nurses correctly

identify the source of those alarms only 33 to 54% of the time. The sheer number of alarms can make it difficult to tell one alarm from the next and even discern which alarms are high priorities and require immediate attention.\textsuperscript{34} To solve this problem, designers of medical devices are working on standards to govern the design of alarm noises, regardless of who produces it. To be effective, a product’s sound needs to be heard and discerned. Understanding and designing for the environment where the product will be used is one way to help ensure this will happen.

The ergonomics of sound are another environmental concern. In the animation industry, the term “mickey mousing” refers to a technique in early animations where every movement a character made was coordinated with the musical soundtrack. It has also come to refer to the overuse of sound in animation. It can be annoying for the audience to have too much going on sonically. Once sound becomes noise, the soundtrack can only hurt the animation. “Mickey mousing” can occur with product sound design, as well. We’ve all probably experienced a digital camera (Figure 35) or car radio that beeps with every button pressed. Overuse of sound in our products can be just as annoying as overuse of sound in our entertainment.

Our world is already a pretty noisy place. Adding sound to products will add to that noise, but this doesn’t have to be a bad thing. Just as sounds in animations work

together to create a coherent soundscape, the same can occur with product sounds. Groups such as UK Soundscape Community and the National Society for Clean Air are working with professionals like architects, artists and city planners in an attempt to start a dialogue about the sonic environment. As Heleen Engelen claims, “the sound a product makes can be used in a positive way so that it is not noise pollution.” Unfortunately, one person’s idea of a pleasant sound may be another’s idea of offensive noise. But, in a future world where a product’s sound says something about its quality, there is a better chance that designers will spend the time necessary to ensure that the sound of their products isn’t offensive to their customers.

Sound and the Kitchen: A Case Study

Note to reader: All sound files referenced in this chapter can be found in the “Kitchen Case Study” folder on the CD provided as Attachment A.

The kitchen is one area of the home where there is great potential to reap the benefits of sound design. From microwave to dishwasher to kitchen timer and more, there are countless products that coexist in this one environment, each with its own sounds. Often, the noise from these products heard simultaneously is not unlike that encountered during rush hour traffic: loud, discordant, and without meaning. Is that the beep of the microwave finishing its cooking or the sound of the kitchen timer having finally reached the end of its countdown? To a product sound designer, these sounds might better be compared to those of an out of tune orchestra. With some work, the kitchen might become more sonically akin to a night at the symphony, rather than one spent gridlocked on the interstate.

In this case study I used the techniques of animation sound design discussed in the earlier chapters to design sounds of products for the home kitchen. Specifically, sounds were created for four kitchen products marketed by popular food-service manufacturer, OXO: a kitchen timer, a microwave, a dishwasher and a coffee maker (Figure 37). With the exception of the kitchen timer, all the products are
Figure 37 - OXO Kitchen Products
hypothetical, though they share OXO’s existing design language. I designed the sounds with the help of a focus group made up of consumers from various age groups and backgrounds.

Sonic Logo

First, the core beliefs of OXO were identified and used to inspire the design of a sonic logo. This sonic logo will represent the company in its advertising, as well as play a role in each of the products. According to their mission statement, “OXO International is dedicated to providing innovative consumer products that make everyday living easier.” OXO also identifies “universal design” as one of their distinguishing philosophies. In addition, their corporate website is light-hearted and fun, containing many humorous facts about their products and employees. Based on the information provided by OXO, a few themes became apparent: their products were designed to be innovative, easy-to-use, and fun.

I developed three sonic logos (sonic logo 1-3.wav) and one was selected by the focus group (oxo logo.wav). The winner, a 4-note sonic logo, was created to be playful yet familiar. Customers may not have heard the composition before, but it is simple and easy-to-remember. A flute was used to create the sonic logo because it is a widely recognized musical instrument with a light and cheerful sound.

---

Primary Alarms

A goal from the start of the case study was to use the OXO sonic logo in each of the products. To reinforce the positive consumer response to this sound, it was used only as the primary alarm in all of the designs. The term “primary alarm” refers to the alarm that indicates the OXO product has completed the task it was designed for. In the kitchen timer, the primary alarm signals the timed countdown is over. Kitchen timers are often used to prevent items from burning in an oven, so it is imperative this sound can be heard. To help ensure this happens, the alarm will continue until turned off by the user. In order to stave off some of the annoyance that repetitive noises can produce, several additional musical phrases were added to the alarm along with the OXO sonic logo (oxo timer.wav).

The microwave uses the OXO sonic logo in a similar fashion to the kitchen timer. When done with its cycle, the microwave’s primary alarm will sound for twenty seconds and then sound a reminder once every two minutes for the next six minutes. As with the kitchen timer, an additional musical phrase was introduced. Besides adding variety to the alarm, it also helps differentiate the sound of the microwave from the alarms in the rest of the products (oxo microwave.wav).

The primary alarms of both the coffee maker and dishwasher are for non-urgent conditions. When the coffee is done, the coffee maker will continue to keep the liquid at a constant temperature and the dishwasher’s completed load can remain inside and unharmed indefinitely. In both cases, the primary alarm was designed to signal only twice. To differentiate their alarms from those of the other products, the coffee maker increases the interval between signals and adds an additional note after the sonic logo
(oxo coffee maker.wav), while the dishwasher increases the interval between signals and drops the sonic logo by one octave (oxo dishwasher.wav).

Feedback Sounds

There are a number of feedback sounds in the four OXO kitchen products. Electronically generated sounds inform the user a certain button has been pressed, while mechanical noises indicate a door has been opened or closed. I created two sets of feedback sounds. The first set (feedback1 *.wav) was mechanical in quality and kept the volume at a minimum so that there was only a subtle hint that an action had taken place. Musical sounds were used only for the start button and the error/stop button. For the second set, I took pieces of the OXO sonic logo and modified them so that a consistent theme bridged all of the kitchen product sounds. The focus group preferred the musical quality of the second set and the fact that it related to the OXO sonic logo, so I chose to develop those sounds further to produce the following:

A general button press sounds the last note of the sonic logo, lowered by an octave (oxo general button.wav). This keeps the sound similar in quality to the sonic logo, but differentiates it from the primary alarm.

The sound of the start button, used to initiate a task, is a combination of the general button sound with the first note of the OXO sonic logo (oxo start button.wav). Adding a few notes from the start of the sonic logo helps imply that a primary task has begun.
If an error occurs or a cycle is stopped, the sound played is the general button sound followed by a lower, discordant note (oxo stop button.wav). The last, jarring note is an indicator that something negative has occurred.

Finally, based on focus group feedback, the sound of the doors opening and closing was modified to produce enhanced feelings of security and quality (oxo door.wav). The sound of an existing microwave door was lowered and then modified to reduce the rattling noise of colliding parts. The lower sound implies the use of sturdier materials, while eliminating the rattle gives the perception that parts with higher tolerances, and therefore higher quality, were used in the product.

**Operating Sounds**

The coffee maker, microwave and dishwasher all make noise when operating. While the focus group preferred to hear their products operating, the microwave (oxo micro operate.wav) and dishwasher sounds (oxo dishwasher operate.wav) were considered unfavorable and were considerably reduced in volume compared to typical competitor’s models. The sound of coffee brewing, however, was considered pleasant by the focus group. I kept that sound at the same volume level as competitive products (oxo coffee operate.wav).

**Case Study Conclusion**

Compare the sounds of a typical microwave (Figure 39) to those of the new OXO microwave (oxo microwave running.wav). Instead of a single, piercing beep used for everything from a button press to a primary alarm, the new sounds inform the user of
each unique event. They also support the aesthetics and themes of the OXO brand. Though different for each design, once a customer has used one OXO kitchen product they will be familiar with the sounds, and their meanings, in the rest of the product line. In addition, since the sounds are all built off of the OXO sonic logo, they all share similar characteristics and will sound together in harmony when used collectively in a kitchen.

Figure 39 – A typical microwave
Conclusion

Product sound design is an emerging issue. Examples of how industrial designers can use product sound to enhance their final products are starting to appear, but for the most part no guidelines exist for those professionals who want to incorporate sounds into their projects. Forging ahead through trial and error alone may produce as many failures as successes. One way for designers to avoid missteps is to apply knowledge and techniques from other related fields where sound has been effectively utilized, like animation. By observing the methods used by animation sound designers, product sound designers will learn important ways to successfully utilize sound to convey information, create an emotional bond with consumer, help designs stand out in a crowded sonic environment, and enhance a products brand identity. The ultimate challenge will be to use this knowledge to create useful products that will delight consumers and sound together in harmony.37

37 Engelen.
Bibliography


McKee, Jim. Telephone interview. 5 October 2005.


Miller, Rob. Telephone interview. 11 November 2004.


Rubin, Ben. Personal interview. 10 November 2005.


