

# Play-A-Grill: Music to Your Teeth

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Fig.1

## ABSTRACT

This paper is an in depth exploration of the fashion object and device, the Play-A-Grill. It explains its inspirations, socio-cultural implications, technical function and operation, and other applications for this system.

## Keywords

Digital Music Players, Hip Hop, Rap, Music Fashion, Grills, Mouth Jewelry, Mouth Controllers, and Bone Conduction Hearing.

## INTRODUCTION

Play-A-Grill, shown in Fig 1., is the combination of a digital music player and the mouth piece jewelry usually associated with Hip Hop and Rap music genres known as a grill. Grills are almost always made of precious metal, most notably gold or platinum. They are completely removable, and almost used as a retainer. This piece of jewelry presents a perfect opportunity to merge an arbitrary music fashion object and reintroduce it as the music player itself. Because the grill is worn over the teeth, sound can be

transmitted using bone conduction hearing instead of outside speakers or headphones. Play-A-Grill is an iteration of a music fashion object of that becomes the music player itself.

## INCEPTION

This concept arose from an interactive installation at the Exploratorium Museum in San Francisco called Sound Bite that displayed bone vibration hearing through a rod. [8] One would cover the rod with a straw and bite it, by closing one's ears to hear any four different types of music. The clearest sound came from the Hip Hop sample, so this experience spun an ongoing conversation in my mind about bone conduction and its applications.

## Hearing through Teeth

Bone conduction hearing has been used since the 1880's in commercial products to aid hearing loss, except for instances where the loss occurs due to damage to the auditory nerve. Rhode's Audiophone (Fig.2), also known as the acoustic fan, was a popular instrument in the United States during that time.[5] It looked like a fan with a retractable convex shape that was made of vulcanite, a rare copper. This fan, acting as an eardrum, would gather the sound vibrations in the air of its surroundings and vibrate to their frequency. Once users bit the end of the fan, these vibrations would pass to the teeth, which would then vibrate the cochlea and become audible frequencies once again.

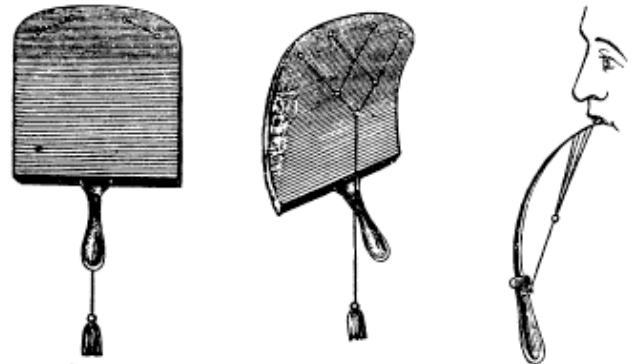


Fig.2

*LEAVE BLANK THE LAST 2.5 cm (1") OF THE LEFT  
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Hearing aids that use the bone conduction method have changed and improved substantially since then. Cochlear is the company that created the Baha the surgically implanted hearing aid in 1977. This instrument works with an audio processing system that transmits the audio to the cochlea via bone conduction through a small stainless steel screw that is implanted into the skull bone behind the ear. This system was FDA approved in 1996 as a system for conductive and mixed hearing losses.[2] Even though this system may be more effective to bone conduction because it is implanted directly on to the skull in close proximity to the cochlea other less invasive methods and systems have recently emerged in the market such as the new SoundBite by Sonitus Medical. This device uses a microphone inside the ear that transmits the sound wirelessly to a unit that goes inside of your mouth around the posterior molars. (Fig.3) This device is fairly new the earliest reviews are from 2010 and they recently were FDA approved.[9] Like the Baha, SoundBite aids single sided and conductive hearing loss.



Fig.3

Most of the examples I described above are using bone conduction hearing to aid deafness. However, other artists have also been exploring the idea of using this method for alternate applications. Collaborators James Auger and Jimmy Loizeau conceived the idea of Audio Tooth implant in late 2000. Their concept is to create a tooth that contains a receiver to be implanted in a users' mouth that would then replace their cell phone or any long-range receiver. They see it as a form of telepathy that resonates directly in the subject's consciousness.[1]

All of these devices work the same way, by replacing the speaker output of an audio system with a vibration motor. The frequency of sound is translated to motor vibrations

and passing it directly through bone conduction, instead of being amplified by a membrane that pulsates sound vibrations through the air.

### MUSIC AND FASHION

The music and fashion are the most cyclical of all art and culture based Industries. Ideas and aesthetics are constantly recycled, reappearing decades later. Both of these cultural expressions are seamlessly embedded in our daily lives, and they are venues to our personal identity.[7]

Walking down most high school hallways one can see teenagers embracing different subcultures in an attempt to find their personal identities. Punks, Metal heads, Homies (Fig.4), Hippies, Ravers, Hicksters, Hipsters, Goths, etc. are among the many subcultures that have a dress code that is mainly dictated by the aesthetics of the music genre they represent. There are other subcultures that arose from poverty and struggle such as gangsters and skinheads, which are more related to socio-economic issues than cultural identity.



Fig.4[10]

These subcultures' dress codes are more prominent and radical in the youth population. It seems that as people get older, they become less interested in belonging to a

genre subculture and more into integrating into the norms of society. Some styles in Hip Hop are better suited for adults because they are centered on the display of wealth.

### Hip Hop

Hip Hop is a flexible and powerful tool of communication, given its rebellious spirit, materialistic values and aggression. Because of its adaptability in communication it has become a perfect capitalistic tool in fashion. From the late 70's to mid 1980's Hip Hop style was about promoting self-identity. Big brand names were not yet in style, but rather sporting jean jackets and hoodies with their name drawn on the back, painted baseball caps worn sideways, and enough gold chains to buy an international flight. Hip Hop always glorified the display of wealth, but it was not until the 90's when brand names began to be fashionable. Men began to wear the Gucci frames without the lenses, for pure style.[3]

Regardless of brand names, flashy expensive jewelry has always been the preferred Hip Hop fashion statement. Referred to as Bling-Bling, gold chains, diamond watches, pendants, and especially mouth jewelry pieces are Hip Hop's crown jewels and an explicit display of wealth and power. The grill, also known as front, is the most iconic Bling. Removable grills became fashionable in the 1980's by Eddie Plein, owner of Eddie's Gold Teeth in New York City, who fitted famous Flava Flav. Then later once the millennium hit Dirty South rappers spun the fashion back into a national epidemic of diamond teeth.[6] In Hip Hop slang, diamonds are referred to as ice. Rap star Nelly dedicated an entire song to grills and their fashion sense in collaboration with other rap artists, Gipp, Ali, and Paul Wall the owner of a business manufacturing grills from \$20 - \$30,000 in value. Some of the verses of their song Grillz say:

“Got 30 down at the bottom, 30 mo at the top  
All invisible set in little ice cube blocks  
If I could call it a drink, call it a smile on da rocks...”

-Nelly [4]

“I got my mouth lookin somethin like a disco ball  
I got da diamonds and da ice all hand set  
I might cause a cold front if I take a deep breath  
My teeth gleaming like I'm chewin on aluminum foil...”

Piece simply symbolize success

I got da wrist wear and neck wear dats captivatn  
But it's my smile dats got these on-lookers spectatin  
My mouth piece simply certified a total package  
Open up my mouth and you see mo carrots than a salad  
My teeth are mind blowin givin everybody chillz  
Call me George Foreman cuz I'm sellin everybody grillz.”

-Paul Wall [4]

In the history of the World teeth decoration goes deeply into our histories. The oldest record of embellishing teeth is a skull found in Mesoamerica from 2500 years ago (Fig.5). The skull has gems set on the teeth by carefully drilling

holes that did not penetrated the tooth pulp, showing the high skills of ancient dentists.[11]



Fig. 5

### UNDERTAKING

To create the Play-A-Grill there were various steps and methods beyond researching the social and technical aspects that surround the concept. These were the methods followed:

- Making a prototype of the bone conduction hearing to make sure that this is a viable concept.
- Making a mold of my mouth with alginate and casting it in plaster to be used as a guide.
- Carving a wax model of the grill fitted to the posterior top teeth.
- Casting the wax model into silver.
- Hacking an existing digital music player that has a tactile interface that does not require vision to manipulate, this way the tongue can control it.

### Bone Conduction Prototype

In order to test bone conduction I used a small vibration motor and connected the leads to a headphone jack cable. Then plugged it into an mp3 player and the results were positive (Fig.6). Prototyping subject #1 was able to hear the sound through his teeth. Obviously the larger amplification range the audio device has, the louder one can hear the music from one's teeth. If the music is loud enough the concave shape of the palate make the vibrations of bone conduction resonate, resulting in a mouth speaker. This way people can hear the music coming from the mouth of the subject whose teeth are vibrating. The idea of vibrating teeth sound dangerous, and like grills, it is not recommended to wear the Play-A-Grill for extended periods of time. Also, it is better to use less sound amplification, and instead covering the ears to better hear the sound from bone conduction, making it a more personal and private experience. Usually one cannot feel the vibrations that are coming through the motor, other than perceiving their audibility.



Fig.6

### Mold Making and Wax Casting

At first, I made a mold of my mouth using play-dough, and it was not very effective. The second method was making a mold with alginate. This is the material that dentists use to make bite molds, and it works perfectly. The material sets very fast, and because it is made of algae it also dries very quickly, which means that the plaster casting needs to be poured immediately. Once the cast has set overnight it is ready to be used as a guide for the grill model. To create the grill model, I used metal casting grade wax. I made the wax wrap around the 4 posterior top teeth and attached the letters spelling ICEN over the wrap. I chose ICEN because “ice” is a play on the slang term for diamonds in Hip Hop culture, and it is also phonetic play on my name. Also resonating on the early years of Hip Hop when promoting one’s name was more important than sporting brand names. Once the wax model was finished, Quality Mold Making in New York City casted it to silver. When I picked up the cast the first thing I did was put it in my mouth to see how it fit. The jeweler yelled at me “No don’t do that! I clean it in cyanide after it is cast.” I am very glad I did this in front of him and not on my way back home on the train.

### Hacking the Player

Finding the right music player was crucial for this project. There were many qualities that were imperative for the prototype to function the right way. First it needed to be

small enough to fit in the mouth of a user. Secondly it had to have controllers that were apt for a tongue to use. And thirdly it had to be inexpensive, since it would be subjected to hackery and surgery, and I would most likely use more than one. Indeed, I used two. The digital mp3 player I used was a knock-off brand copying an older version of the Ipod Shuffle. This was a perfect device because it met the tactile controls for the tongue, the size requirements, and since it was a knock-off it was inexpensive. The first step to the surgery of the player was to break the enclosure, then desoldering the headphone input and soldering a motor. This was an easy hack and there was not much to it, until I found that the quality of the sound was too faint. To solve this problem I added an Op Amp break out board to amplify the vibrations of the motor. I connected the two leads of the motor to the amp and then to the output of the device, and two other leads that shared the power supply of the amp and the device. During this operation, I soldered off the power connections on the circuit board and had to start fresh with a new mp3 player. Once the operation was repeated and successfully completed, I organized all the components and the grill together on the mouth mold and set them with a combination of silicones. See Fig.7



Fig.7

## CONCLUSION

The Play-A-Grill is a device that merges the arbitrary music fashion object and empowers its function by making it the music player itself. The grill is the perfect music related jewelry piece to serve this function because it allows for alternate technologies to emerge, such as bone conduction hearing. This idea, as a digital player in the mouth has a lot more potential of embodying different forms. For example audio players that can also be recorders and serve a short memory function, allowing the user to record their conversations. Another application can be to apply receivers and transmitters such as the Audio Tooth Implant concept, but instead using radio transmission, so the devices can operate as walkie-talkies. There is a lot more exploration to be done for tongue controllers. The Play-A-Grill is an attempt to provide an unusual display and interface in comparison to typical audio/visual stimulation and digit based control panel.



Fig. 8

## ACKNOWLEDGMENTS

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