When seeing films and reading stories in Science Fiction you come across androids, robots, and cyborgs at some point. And every time they show up I think about how they are a replication of a human lifeform. And like humans they will have organs and since they are mechanical they must sound different from human organs. I originally was going to make the sounds of android organs but after looking at the definition of an android it didn’t make sense to do it for them. I chose to direct the soundscape research on cyborgs, it made better sense to switch over to that. It was hard trying to find scholarly articles and journals on something science fiction like cyborgs and their organs, it made more sense to research organs and prosthesis. I first started with a link that was posted on my proposal by Professor. Belli, it was an article by John Cage but I decided not to use it because it held not so much relevance to what I was going for, but it did help in the process. Then I went to the research librarian to help on my way of my research, we found some interesting information on bioacoustics and biophysical music. But some of that information was not exactly what I was looking for, though certain information from that I took because it helped in refining my research. I then started looking into pacemakers and found that a pacemaker is kind of cybernetic. Then I remembered Terminator Salvation had a specific scene where they describe the cyborg’s organs. With that type of information I was able to connect the Science Fiction realm with the medical and helped with the sound design I was going for in my project. Definitions for certain terms helped and the Science Fiction Encyclopedia as well. Part of a sound design involves an analysis, and I chose to analyze visuals like the cover of Women of Wonder, cover art by Cliff Nielsen.

 Science Fiction is a genre that is sometimes misunderstood but very much enjoyed by many people. What makes a certain material have the genre Science Fiction affiliated with it? Well there are countless and at the same time controversial elements to make something count as Science Fiction. But as a Science Fiction enthusiast I can definitely name a couple of things from my favorite Science Fiction materials that make it fit in the genre of Science Fiction. Something that is commonly used in the Science Fiction genre is the use of androids and cyborgs. One of my favorite novels involving androids, after reading it in the course of the class, is Do Androids Dream of Electric Sheep by Phillip K. Dick. And then there is my favorite film involving Cyborgs, and that is Terminator 2: Judgment Day. Now there is a difference between androids and cyborgs, and that is that cyborgs are a fusion of both the mechanical/robotic and the organic/human. It is half-human and half-machine, which is what makes up a cyborg in simplest form. With a human having parts of machine/robotic elements integrated to their bodies it lead me to think about what these cyborg organs sound like. We have a general idea of what our actual organs sound like, the simplest one would be the heart. But what about a cyborg’s heart, what does that sound like? With the help of modern medicine, prosthetic organs are what make up a cyborg, so the idea of what it would sound like is not so far-fetched and far beyond our understanding.

 The term Cyborg is short for Cybernetic Organism, and is described in The Encyclopedia of Science Fiction as “the product of human/machine hybridization”(Science Fiction Encyclopedia). “Hybridization is the process of combining two complementary single-stranded DNA or RNA molecules and allowing them to form a single double-stranded molecule through base pairing. In a reversal of this process, a double-stranded DNA (or RNA, or DNA/RNA) molecule can be heated to break the base pairing and separate the two strands. Hybridization is a part of many important laboratory techniques such as polymerase chain reaction and Southern blotting” (Genetics House Reference). With those definitions we start to understand what a cyborg is, a joining of the mechanical with the organic. Think of it like a person driving a car, the person has perfectly working legs but uses the car as an aid, an extension of what they have.

Breaking down the term “Cybernetic Organism” and take cybernetics to dissect the word and using the definition from Dictionary.com as it is “the study of human control functions and of mechanical and electronic systems designed to replace them, involving the application of statistical mechanics to communication engineering” (Dictionary.com). So Cyborgs are still partly human but just have replacement body parts to make them what they are, Cybernetic Organisms. Those replacement body parts are mechanical and have some organic elements to function as well, with those organs there must be a particular sound to them that is not like an organic organ. Movies may represent that sound a certain way but what would it actually sound like based on those interpretations? The idea of replacing organs or limbs with prosthetics and mechanical aids is not just an idea; it is an actual medical field that makes genre of Science Fiction feel like we live in it.

Let us start with a simple organ that most can understand, at least in terms of its characteristics, the heart. We all know what our hearts sound like, without any auditory aid except our natural hearing, it sounds like a low pitched thud with a specific rhythm to it. Sometimes the rhythm changes due to external and internal factors, but for the most part it sounds universal. A cyborg has a heart as well, but a modified prosthetic one because the cyborg replicates the human anatomy with some additions. When we think about it, it kind of resembles like a heart with a pacemaker. Although in Science Fiction the prosthetic heart is technologically advanced. But in general the pacemaker is a representation of a cybernetic heart in Science Fiction.

I mentioned the movie Terminator as an affiliation to Science Fiction and cybernetic organisms, but in the fourth installment of the saga Terminator: Salvation we get somewhat a description of what a cyborg’s organs sound like. In a specific scene called Real Flesh and Blood, “The heart is human but very powerful. The brain too but with a chip interface, it has a hybrid nervous system. One human cortex, one machine.” (Terminator Salvation). We get the idea that the cybernetic heart is strong. Something else to back that up is a medical journal about the pacemaker from the Cardiac Department of St. George’s hospital. “In some patients on artificial pacemakers we have also noticed an extra sound, always earlier, and sometimes louder, than the usual heart sounds” (Harris, 608). The cybernetic heart should represent this description of a certain patient’s pacemaker.

This artificial heart sounds like a regular human heart but strong with an extra sound. It should also be faster than a regular heartbeat, 0.20 to 0.40 seconds fast. “The time intervals in this and subsequent records, unless otherwise stated, are 0.20 and 0.04 sec” (Harris, 609). The extra sound should be around 6 m/sec “the pacemaker stimulus and the onset of the extra sound to be 6 m.sec” (Harris, 610).

The circulatory system is somewhat harder to figure out its sound, or how it would sound on a Cyborg. To me, I would think of a human’s circulatory system water pipes throughout your whole body rushing blood them fast. In an article the blood flow is described as such “a continuous and dense stream of low frequencies modulated by sudden muscle bursts” (Hypo Chrysos). So the blood flow interacts with the muscle tissue. In a cyborg the circulatory system would consist of the blood flow and any other fluids needed to aid the mechanical parts of the cyborg. In the Hypo Chrysos article the sound is being picked up by a certain instrument called the Xth  sense and outputs the sound digitally and is manipulated. “The sounds are manipulated by means of a two-stages DSP system, which consists of a stack of feedback delay lines and distortion effects (fuzz and all pass). At first, the soundscape consists of dispersed, punching low frequencies. Then, multiple sonic instances of the signal are stored, distorted, and fed back into the system. Being that the input is continuous, a wall of sound slowly emerges. A frequency band is added during each section by varying the distortion drive, and eventually, the sound spectrum becomes thick and harsh” (Hypo Chrysos).

 The sound of the blood flow sounds more Science Fiction like for a cyborg with the sound manipulation use sound effects to distort the sound and make it a hybrid of mechanical and organic. One more element to add to the blood flow is the frequency the flow is moving. In an article about ultrasound backscatter “backscatter from blood in the frequency range from 30 to 70 MHz” (Foster). This means that the bloodflow is moving at 70 million cycles per second, which is a fast flow of blood.

The cyborg is a Science Fiction being that does not exactly exist in our world. But seeing as a cyborg is a hybrid of organic and mechanical we can connect it to medical prosthesis, whether it is part of a heart like the pacemaker or the circulatory system having its sound manipulated by an instrument. These are all real life elements that we can connect to the realm of Science Fiction and the cyborg.

Works Cited

* "cybernetic." Dictionary.com Unabridged. Random House, Inc. 13 May. 2015. <Dictionary.com <http://dictionary.reference.com/browse/cybernetic>>.
* "Cyborgs." Themes : Cyborgs : SFE : Science Fiction Encyclopedia. SFE: The Science Fiction Encyclopedia, 10 Apr. 2015. Web. 14 May 2015.
<<http://www.sf-encyclopedia.com/entry/cyborgs> >.
* Foster, F.S.; Obara, H.; Bloomfield, T.; Ryan, L.K.; Lockwood, G.R., "Ultrasound backscatter from blood in the 30 to 70 MHz frequency range," *Ultrasonics Symposium, 1994. Proceedings., 1994 IEEE* , vol.3, no., pp.1599,1602 vol.3, Oct. 31 1994-Nov. 3 1994
* Harris, A. "Pacemaker 'heart Sound'." Heart 29.4 (1967): 608-15. Group.bmj.com. Web. 13 May 2015. < <http://heart.bmj.com/content/29/4/608.full.pdf> >.
(Pacemaker)
* “hybridization” GHR.NLM.NIH.gov. Genetics House Reference. 11 May, 2015
<Ghr.NLM.NIH.gov [http://ghr.nlm.nih.gov/glossary=dnahybridization](http://ghr.nlm.nih.gov/glossary%3Ddnahybridization)>
* "Hypo Chrysos: Action Art for Vexed Body, Xth Sense, and Biophysical Media." *Hypo Chrysos* (2013): n. pag. ACM. Web. 13 May 2015.
* Sargent, Pamela. Women of Wonder: The Contemporary Years: Science Fiction by Women from the 1970s to the 1990s. Vol. 2. San Diego: Harcourt Brace, 1995. Print. Revised.
* Terminator Salvation. Dir. McG. Perf. Christian Bale and Sam Worthington. Sony, 2009. DVD.