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Why Do Humans Imagine Robots?

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Degree of Bachelor of Science

[WHY DO PEOPLE IMAGINE ROBOTS]

This project analyzes why people are intrigued by the thought of robots, and why they choose to create them in both reality and fiction. Numerous movies, literature, news articles, online journals, surveys, and interviews have been used in determining the answer.

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Introduction

The title of the project can be formally stated as the question "Why do Humans Imagine Robots?" This question is a rather broad one. It begins with why humans first started to imagine and create machines to help them with their everyday lives, and has no discernible end in sight. The main goal of the project is to analyze why humans have, and still do, imagine robots and machines. This analysis may prove useful to almost any interested audience. The results were presented at the end of C-Term 2010, and may be used by any person or persons to determine past relationships and perceptions people have had towards robots. To obtain results, the project required an in-depth analysis of the depictions of robots within various types of media throughout history. The results and analysis are essentially from an American point of view as this was the source and backdrop for the majority of our media. This media includes, but is not limited to, books, movies, magazines, anime, newspapers, interviews, surveys, and websites. A chronological organization by media-type has provided the project with a progression of human-robot relationships (within said media). The progression of these relationships should bring out underlying trends within the different media. These trends, along with some extra analysis, provided an answer to the project question "Why do Humans Imagine Robots?"

Literature Review

Definition of a Robot

Before we could begin our research we first needed to come up with definition of a robot in order to focus our source pool. After several iterations, we were able to come up with a definition that was neither too narrow, eliminating primitive but essential robots, nor too broad, encompassing simple machines that should not qualify. Our final definition is as follows:

A Robot is a mechanical device, designed by humans, which makes decisions independently from an operator based on its ability to both sense and manipulate its surrounding environment.

For example, the Roomba vacuum cleaner is considered to be a robot, since it senses the environment through infrared sensors, executes a computation in determining angle-rebound calculations, and then manipulates itself or its surroundings accordingly by executing the turn when it hits a wall. The Roomba performs all of these tasks independently of its operator (in this case, the owner). Therefore, by this definition, the Roomba vacuum cleaner is indeed a robot.

Sources of Robots in Literature

Online Lists

Using the definition described above we began a search for primary sources on Robots. The List of Fictional Robots and Androids by Wikipedia proved to be a great primary source that details robots in literature and comics *(Appendix D: List of Fictional Robots and Androids)*. Online searches also provided a list of, anime, movies, television, video games, and websites pertaining to robots *(Appendix B: Robots in Movies Timeline)*. These lists are comprehensive, and have a chronological order of the most famous robots to appear in different categories. They are extremely helpful in giving the reader good sources of material to research, as most of the robots

already have articles written on them within Wikipedia. To broaden the reader's understanding, most of the sources have articles written on them as well. This allows the reader to observe both the robot, and the context of the story in which it falls. These aspects are what make the List of Fictional Robots and Androids an excellent research database.

History Timeline

Another good place to holistically analyze the creation and development of robots would be a generalized timeline. The timeline "A Brief History of Robotics" gives a good universal history of when humans began thinking about using machines to perform tasks for them, as well as when humans began creating these machines *(Appendix C: A Brief History of Robotics)*.

One of the earliest recordings of the development of such machines took place in 350 B.C. A Greek mathematician by the name of Archytas built a mechanical, steam-powered bird which he called "The Pigeon". This type of machine cannot be considered as a robot under the current project definition, since the bird was unable to sense its environment and make computations. Instead, it was a just a human-created machine built to handle a certain task. Throughout the timeline, human-built machines start to become more task oriented. People began to create machines that could help them to complete a specific job, rather than just functioning for entertainment. These machines were built to keep time, and to open doors. These machines were still not yet robots however; they were still only human-built machines created to serve a task that humans could normally perform.

The purpose of these new machines shifted from being playful and entertaining to useful. They did not make decisions; however, as the timeline continues, larger and more complex machines were created, until the robot was eventually developed. To make robots more humanlike, scientists and programmers are constantly working on creating artificial intelligence.

This would allow present-day robots to not only think, but learn as humans do. It is interesting to note how robots have changed over time. Complex robots that can learn are almost completely different from their machine predecessors (the one similarity being that they are both machines). This timeline is an important piece of literature to analyze, as it helps the reader see when humans first started thinking about robots, useful robots, and humanoid robots, as well as when they started building them.

To determine how and in what way people think of robots, we looked at how robots have been portrayed in different types of media. The "Robots in Movies Timeline" for instance, is helpful in seeing how robots have been portrayed in movies since the 1920s. Interestingly, robots seem to have an inherent evil aspect within most movies, especially early ones.

Introductory Book on Robots

Robots: From Science Fiction to Technological Revolution (2005), by Daniel Ichbiah, is a fact filled book that meticulously describes the progress of robots from science fiction to reality. It delves into the history of robots dating back to ancient times. It also describes the many forms of robots that exist in present day culture. The book finally culminates with a peek into the future to see what is on the horizon for this exciting invention. Some important sections to note are "The History of Robots" and "Robots in Fiction". In order to figure out why people imagine robots, it is important to first explore the history of the robot as well as the way robots are depicted in fiction, since this is a reflection of the public's imagination.
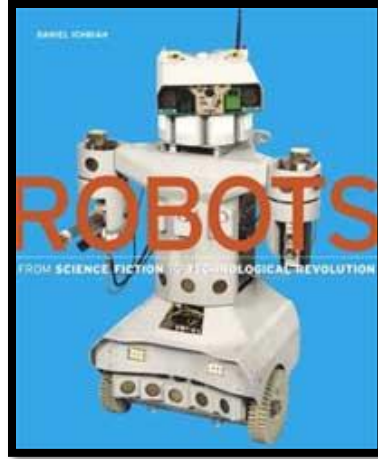
Before the author goes into the history, he first takes the time to define what a robot is. Defining the term "robot" is a complex task that can either produce a definition that is too broad or one that eliminates machines that should be included. In order to tackle this problem the author breaks the definition of a robot into 3 different groups, first, second and third generation robots. The main distinguisher between the generations is the level of intelligence that the robot exhibits.

The first generation is the most basic type of robot. They are programmed to perform repetitive tasks such as painting, or welding parts on an assembly line. These robots lack any sensory inputs, and as such are said to be "devoid of all ability to perceive". (Ichbiah, 2005, p. 11) Second generation robots have sensors, and can interpret and react to external stimuli with predefined programmed actions. Third Generation is the "final" evolution of the robot, where artificial intelligence is employed. This enables the robot to be autonomous, reacting to situations in a more human-like manner.
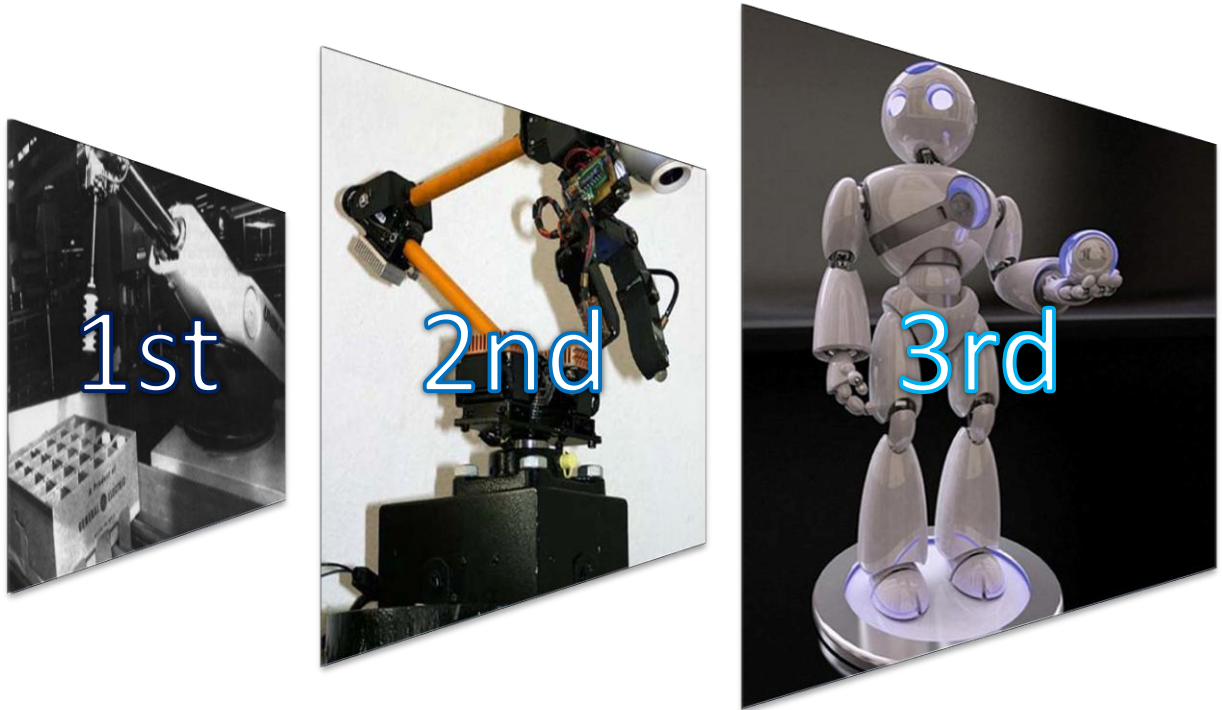
Figure 2: Pictures of Various Robot Generations

The definition of a robot by these three generations as a whole captures the entire essence of the robot family. The project definition is instead a bit more focused, and therefore more in line with the Third Generation of Robots. Robot development is ever evolving; *Robots: From Science Fiction to Technological Revolution (2005)* depicts just how much the robot family has developed over the years.

The book states that, in ancient times, moving masks and statues were important creations for spiritual persuasion of the masses. These creations were imagined by inventors as a way of putting fear and a sense of wonder into the hearts of religious followers. Next on the timeline (809 AD) comes the machine known as the animated clock, which consisted of gears, meshes and cogs. What made this clock special was that it had small animated figures that chimed the time for convenience and entertainment; these machines were, at the time, of high

social value to high society people. In subsequent years (1500 AD), this gave birth to the automaton, which is a life-size, mechanical recreation of an animal or person.

Figure 3: Example of a Life-Like Vichy Automaton (1875)

These creations were the foundation of the machine that we know as the robot in today's reality. When it comes to the imagination, the field of literature offers more creative freedom. Here, the robots are not limited by current technology, and can be as imaginative as the creator desires. These visions of a robot are conveyed to the public through different mediums, such as literature, plays, and movies. In fact, the origin of the word robot comes directly from the script of a play, *R.U.R.,* written by Karel Čapek in 1921. This was the origin of the word "robot," and since then it has made many appearances in popular culture.
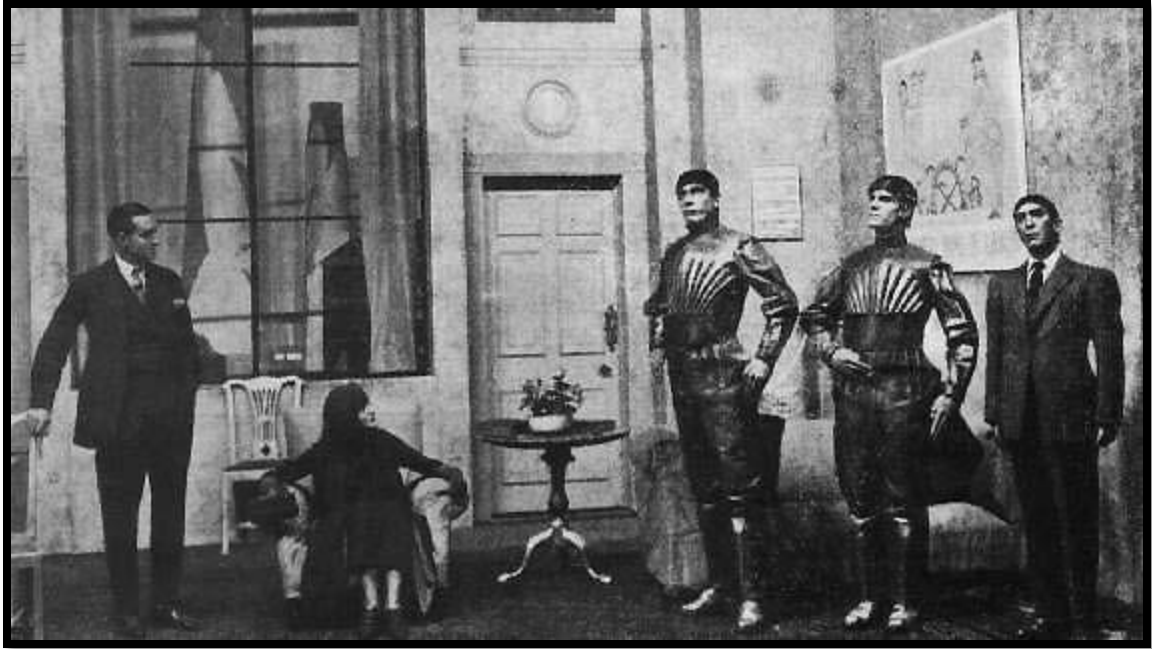
Figure 4: A Scene From the Play *R.U.R.* Depicting 3 "Robots"

The most popular medium is motion pictures, as they are more easily consumed by the masses. Some movies are based on works of literature that are compelling but too tedious for the average person to read. This provides a means for authors to get their point across to a larger audience. It is important to note that this does not mean that information is not lost in translation, though the films do generally provide the gist of the author's intentions.

Robots were originally employed in films to play monster-like roles, striking fear in the hearts of the audience with their cold, calculated mannerisms and superior physical and technological advantages. One of the first films with a robot-like creation is *The Golem (1920)*, by Paul Wegener. In the film, a clay creature of magical origins is created to liberate his Jewish masters from oppression. Similar to *R.U.R. (1921)* however, the creature turns against its master, and tries to kill him. This is a consistent theme in the movie career of the robot, the most famous example of the time being *Metropolis (1926)* by Fritz Lang.

Figure 5: Posters of 3 Major Movies in the Early Life of the Robot in Cinematography

From this point on, the book describes a time period filled with "man hating" robots. One of the most famous movies to include such a robot was *The Day the Earth Stood Still (1951)* by Robert Wise. The movie was successfully remade in 2008 by Scott Derrickson due to the movie's deep plot, popularity, and relevancy. One of the first robot roles to break this trend of violence was a friendly robot called Robby, who played a side role in the film *Forbidden Planet (1956)*, directed by Fred MacLeod Wilcox. In the movie, Robby is a comical character who tries to help the humans in any way possible. His lightheartedness made him adored by children and the public in general. This led to a few spinoff movies in which Robby assumed a more prominent role. Following suit were the lovable characters from the famous Star Wars Movies. R2D2 and CP30 were both amusing and as such embraced by the audience.

From this point in cinema, robots are portrayed with a bit more balance. Sometimes good, *RoboCop (1987)*, and sometimes bad, *Terminator (1984)*, these robots were characters of fascination, helping their respective movies rake in millions at the box office. In more modern times, the auras of movies that involve robots have taken on a more philosophical theme.

Tending to blend the line between human and robots, these movies seek to question what it means to be human. Two good examples of such films are *Bicentennial Man (1999)* directed by Chris Columbus and *A.I. (2001)* by the famous Steven Spielberg.
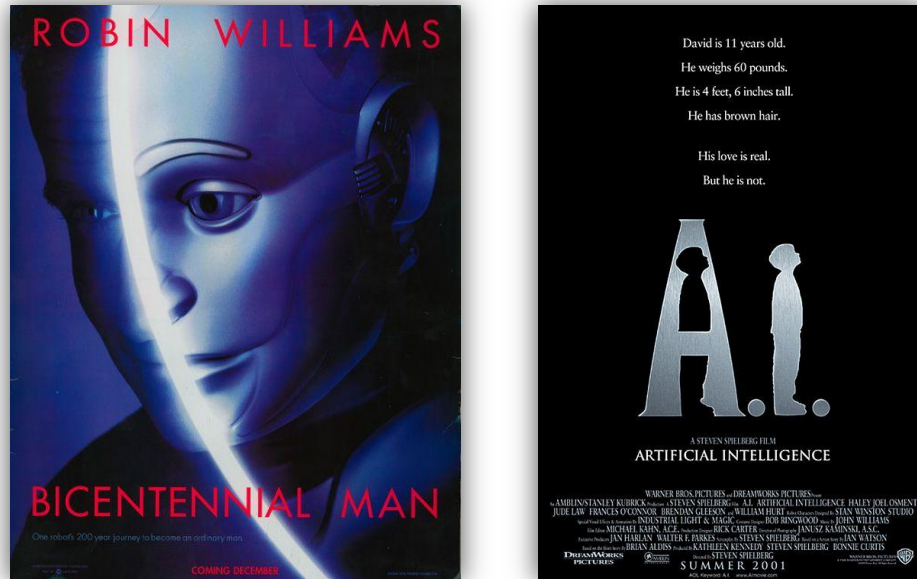
In the end, the book lists many sources of information, organized in chronological order. This makes it easier for the reader to follow along as the public's image of robots changes throughout history. In order to gain a better perspective as to the significance of the change in public perception, it is necessary that the reader analyze the source material and try to draw their personal conclusions.

Robot Social Literature

Using a variety of sources David Levy's *Love + Sex with Robots (2007)* provides the reader with a contemporary view of the relationship between humans and robots, as well as a look into how humans may interact with more advanced robots in the future. Levy also compares human-robot relationships in today's different cultures. He states that almost all

humans in one way or another have a tendency to anthropomorphize almost anything, with computers and machines being anthropomorphized most often. He quotes the book *The Media Equation (1996)* by Byron Reeves and Clifford Nass in this statement, saying,

> Byron Reeves and Clifford Nass describe interaction with computers as being fundamentally a social tendency, but in their view it is not *consciously* anthropomorphic. They regard such interaction as automatic and subconscious, a view that stems from the general denial by most people that they treat computers as social entities. Yet despite this common denial, people do interact with computers according to normal human social conventions – by being polite, for example – and if a computer violates such a convention, it is usually regarded by its human operator as being deliberately offensive or obstructive, clearly an example of anthropomorphism. (Levy, 2007)
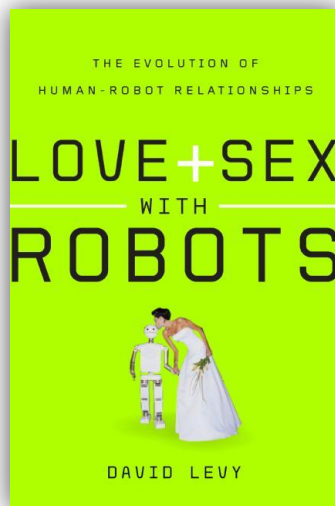
Figure 7: The Book, *Love + Sex with Robots*

This anthropomorphism is the basis of human-robot relationships; it is substantial proof that humans are always looking to relate to certain inanimate objects as if they were human. Levy expands upon this fact. He states that if computers can be developed to respond back to their human counterparts, then the relationship can develop further. In fact, if a computer is able to remember facts about a certain person, then that person would see the computer as more

helpful. If the computer can be programmed to fulfill certain tasks based on the human's needs, a typical human friendship could be developed between humans and robots.

Levy states that, according to the book *Understanding Relationships (1991)* by Steve Duck, the robot would need four certain things in order to maintain this relationship. The robot must be dependable; when a human needs support, the robot must be trusted to provide it. The robot must also be able to provide the human with emotional stability. The robot needs to be able to provide many different types of support: physical, psychological, and emotional. Finally, the robot must provide the human with the reassurance of self-worth. These 4 points define most human-human relationships. If a robot is able to perform these tasks, then it is reasonable to assume that could become friends with a human.

Levy uses this assumption to broaden the human aspect of robots. Generally, this means that according to Levy, humans have a tendency to believe that a robot may "feel" an emotion (such as anger or sadness) given that it properly portrays the human characteristics and facial expressions associated with said emotion. This jump is completely logical, but not necessarily true. There will always be some people who will never fully believe that robots can feel emotion. Levy recognizes this case, and states that this circumstance may be based on culture; Levy quotes an article by Kevin Maney in *USA Today* that summarizes these differences in culture, saying, "U.S. Labs and companies generally approach robots as tools. The Japanese approach them as beings. That explains a lot about robot projects coming out of Japan." (Levy, 2007)

To give a more detailed comparison of Japanese culture with Western culture, Levy quotes an article called "Better Than People" from the *Economist* magazine, stating,

It seems that plenty of Japanese really like dealing with robots. Few Japanese have the fear of robots that seems to haunt Westerners. In Western books and movies, robots are often a threat, either because they are manipulated by sinister forces or because something goes horribly wrong with them. By contrast, most Japanese view robots as friendly and benign. Robots like people and can do good. The Japanese are well aware of this cultural divide, and commentators devote lots of attention to explaining it. The two most favored theories, which are assumed to reinforce each other, involve religion and popular culture… Religion plays a role because Shintoism 'is infused with animism: it does not make clear distinctions between inanimate things and organic beings.' For this reason the attitude in Japan is to question not why the Japanese like robots but why many Westerners view robots as some kind of threat. And this somewhat benevolent attitude toward robots has been enhanced by their popularity, both in newspaper and magazine cartoons and in films, ever since the launch of Japan's robot cartoon character Tetsuwan Atomu [Astro Boy in the US] in 1951. (Levy, 2007)

Levy takes special notice of people whose only real relationships involve computers. These people are always people of interest, since many of them *prefer* these relationships over human relationships. The author believes that these people are the ones that will lead the way to the eventual acceptance of human-robot relationships. He consistently mentions that once people begin to have full relationships with robots, others will follow until general acceptance has occurred among the population. Levy quotes the book *The Second Self (1984)* by Sherry Turkle to help him prove that these people will lead the way, stating,

With social interactions you have to have confidence that the rest of the world will be nice to you. You can't control how the rest of the world is going to react to you. But with computers you are in complete control, the rest of the world cannot affect you… One can turn to the world of machines for relationship… And the computer, reactive and interactive, offers companionship without the threat of human intimacy… The interactivity of the computer may make him feel less alone, even as he spends more and more of his time programming alone. (Levy, 2007)

Robot Literature Novel

Warrick's book, *The Cybernetic Imagination in Science Fiction (1982)* examines computers, robots, and artificial intelligence in a sub-genre she calls "cybernetic fiction". She does this with several objectives in mind. The main goal is to catalog a large amount of

significant works from this genre, something she states that has not been done yet. Additionally, she analyzes the works, coming to a conclusion about the maturity of the science fiction genre compared to other long-standing genres.
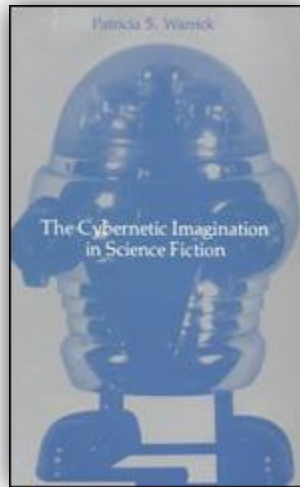
Figure 8: Patricia S. Warrick's *The Cybernetic Imagination in Science Fiction* (1982)

She begins each chapter with a category by which works can be classified using their main idea. Such ideas include comparing the Greek myths of creation to the ideas of creating artificial creatures, looking to the future uses of technology during periods of rapid growth, and the idea that robots are the next evolutionary step for humans. However, not all ideas are positive, as some fears exist such as society becoming too logical (removing creativity and emotion), the upper class using technology to oppress the lower class, or computers rebelling after deciding that humans are "inferior."

While her book is very thorough, it is a little too general as it spends a great deal of time looking at computers and artificial intelligences. It spends some time looking at robots, but they are nowhere near the majority. Some ideas the book presents may be of use for robots, even if robots are not mentioned with the idea. For example, the book says that some people fear

computers are too logical, and such automation will stifle creativity, causing society to become completely static. A similar fear of logic might also apply to robots, even though robots are not particularly mentioned in this section of the book. The fact that robots and computers are similar helps to allow these ideas to cross over.

Additionally, the book never actually comes to a conclusion in terms of our project's major question. Several ideas are presented, but none are identified as being the major idea. The reason for this is that there are several trends over time. What the book does not appear to consider is any relationship between the trends. Most of the ideas presented have a huge focus on the fact that robots are, in fact, machines and thus lack true emotion. The connection between these ideas is not really explored, just the individual ideas themselves. These connections helped us to come up with a conclusion.

Robot Philosophy Literature

The book *Is Man A Robot (1986)* is a work that tries to make the claim that man is actually, for the most part, a robot by the common definition of the term. Here the author, Geoff Simons, tries to set out the argument that man is nothing but a biological construct that has been programmed through social conditioning to react to situations in a predetermined manner. He starts off by pointing out that men are described as robots and accepted as such when they are performing arduous tasks or uncompassionate acts. This suggests the inferiority of the robot to man as the connotations connected with the word robot are negative and try to show that man is behaving in a less than ideal fashion. "The idea that emerges is that 'man as a robot' is a depressing image. The notion is inevitably associated with human exploration, unthinking responses, abject slavery, mindless obedience, and diminished human status." (Simons, 1986, p. 3)

This is the accepted conditions under which man can be called a robot, but the author seeks to extend the scope to be all encompassing and sets out to create an updated robot metaphor to which to compare the human status. In order to do this he first has to define what a robot is. He notes that throughout history there have been a range of devices that we would label as being a robot in fiction and reality. The conclusion he draws is that the robot is a species that varies in form and functionality throughout the years. A common trend however is that the definition has shifted in the general public to exclude more simple machines and become more focused on machines that are capable of more complex thoughts and have greater decision making ability. As the robot's definition evolves to become more intelligence-based it becomes easier to make the comparison to man.

To further the goal of comparison the author thinks it is necessary to remind ourselves of how robots have been viewed in the past to cleanse ourselves from these past stereotypes. It is here that the author cites a group of literary works that he feels are prime examples of the public perception. He starts the discussion by comparing two authors with whom we are quite familiar, Karel Čapek who wrote *R.U.R. (1921)* and Isaac Asimov who is credited with the writing of the 'Three Laws of Robotics'. "The Čapek robots evolved to the point when they could only realize their ambitions by violent actions directed against human beings. By contrast, Isaac Asimov was keen to develop the idea of a benevolent robot, an artifact that could respond with sensitivity and intelligence in the developing symbiotic relationship with man." (Simons, 1986, p. 11)

He continues with this theme listing movies that depict robots in different lights. One major category is robots as pets/slaves from which he lists examples such as, Maria from *Metropolis (1927)*, Robby from *Forbidden Planet (1956)* and R2D2 from *Star Wars (1977)*.

Another popular category is robot as destroyers, such as the robot in *Homunkulus (1916)* and Gort from *The Day the Earth Still (1951)*. The final category he describes is robots capable of emotional responses. "As robots increasingly come to look like people, so – at least in films and fiction – their emotions can approach those of human beings." (Simons, 1986, p. 12) This is a later trend and as such the most important in trying to illustrate his comparison between man and robot. Examples given are robots in *Silent Running (1972)*, and in *Blade Runner (1982)*, which are all capable of producing the one thing that we cling to as the difference between a collection of nuts and bolts and nature's premier species.

(Robby)　　　　　　　　(Gort)　　　　　(Robot from *Blade Runner*)

Figure 9: The Evolution of the Robot in Man's Form

These base categories given by Simons form a good foundation for the categorization of the robots we review in literature. By categorizing the work in such a manner more direct comparisons can be made within the fields. This will make analysis of the work more organized/congruent and as such this method is a good point to take away from the book.

Interviews/Survey

In the book *Robots (2005)* by Ichbiah, the author integrates interviews conducted with experts in the fields for the various topics. This was done to get a real world perspective from someone who was extremely knowledgeable in the field. This gives the reader a more personal experience as they naturally take on the role of the interviewer, asking questions that either are on their minds or should be.

In light of this we decided to conduct our own interviews as we liked the feeling of obtaining information directly from an informed source in their own words. This provided a more specific answer to our many questions as we were able to ask follow-up questions to clarify answers. Also the interviewee went into greater depth with their answer than we ever imagined.

This gave us an expert opinion on the subject but there was another opinion that was valuable and that is the opinion of the general public. This was important as we were trying to answer the question, "Why do humans imagine robots?" and as such who else to provide an answer than the everyday man? Therefore we decided to also conduct a short survey to get a general idea of what people were thinking about the subject.

Notable Figures

To conclude the research we investigated some of the major names that appeared in some of the works from the list of robot literature (*Appendix A: List of Robot Literature*). We did this in order to understand their contribution to robotics as the reoccurrence of the citation of their names hinted that their contribution was significant. Two of the major figures were Isaac Asimov and Kevin Warwick.
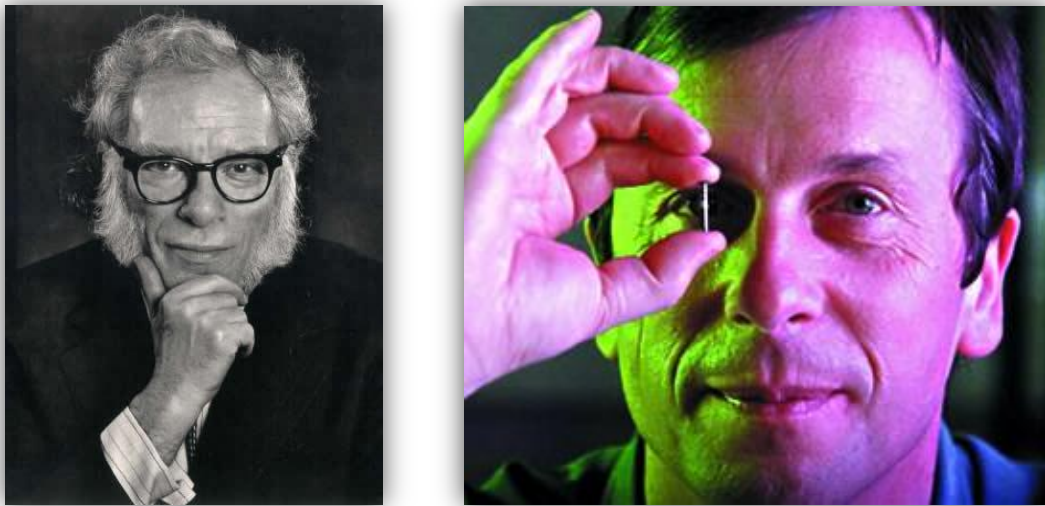
Figure 10: Two Major Contributors to the Robotics Field; Asimov (Left), Warwick (Right)

Isaac Asimov (January 1920 - April 1992) was an American author born in Russia. Although he has written on many subjects, (his works have been published in nine of the ten major Dewey Decimal categories) he is most famous for his Science Fiction works. Many of his works dealt with the subject of robots. One of his most famous concepts is the "Three Laws of Robotics", an ethical code that almost all robots in his works followed. The laws were introduced in the 1942 short story *Runaround*. They were created as a way to avoid having a story where a creation rebels against its creator, as was popular in earlier stories, such as the famous Frankenstein. Many future fictional worlds featuring robots would have similar, if not

identical, laws. Some works even specifically mention the laws themselves, stating that Asimov's ideas influenced the (fictional) world. Since Asimov was a pioneer of robotic fiction, it is important to take note of his works, as well as the impact of his ideas (such as the Three Laws) on Science Fiction.

Kevin Warwick is a professor of Cybernetics at the University of Reading in UK. He is a pioneer in cybernetics, and is considered to be the first Cyborg, a human with integrated mechanical parts. On August 4th, 1998, he surgically implanted a silicon chip transponder in his forearm. The chip sent out a unique signal that allowed his computer to identify him. With this implant, he was able to operate doors, lights, heaters, and other computers without actually touching them. On March 14th, 2002, he surgically implanted a one hundred electrode array into the median nerve fibers of his left arm. With the signals detected by the array, he was able to control an electric wheelchair and an artificially intelligent hand. The implant was also capable of creating artificial sensations by stimulating individual electrodes within the array.

Professor Kevin Warwick feels that humans have limited capabilities which can be overcome with the help of machines. He envisions that machines will soon have intelligence greater than that of humans, and that these machines will be making all of the important decisions. In order to prevent a machine dominated world, humans need to be upgraded.

Procedure

Literature Methodology

With our Literature Review completed we were able to select a variety of works that we felt would significantly contribute to the topic of why humans imagine robots. We selected the works based on the frequency of their appearance in different secondary sources. Another selection criteria used was that items on the literature list obtained from Wikipedia *(Appendix D: List of Fictional Robots and Androids)* that had detailed descriptions were considered to be of higher priority. Ease of availability also played a part in determining what sources were read. The final criterion was if the work was the first to contain the origins of something specific, such as the word "robot" or "cyborg."

In order to cover as much material as possible in an efficient manner the list of primary sources was split up among the four members of the group. The sources were read/watched in detail, analyzed, discussed and then critiqued with a written literary review by a member. We hoped that through this process of analysis a pattern would begin to appear from which we could come to a final conclusion. For the most part we tried to stay with the plan of reviewing the works in chronological order, as depicted in *Appendix A: List of Robot Literature*, however many times we had to skip works due to lack of availability. Therefore, in the end we ended up reviewing the works that were more readily available first while we tried to find the earlier works which were rarer.

Interview Methodology

The interview was devised as a means of getting an expert's input on the subject. Initially we planned to tailor each set of interview questions to each professor but upon reflection we decided to standardize the questions in order to be able to more easily compare the answers. The first list of questions consisted of ten questions based primarily on relevant questions found in the Ichbiah text. However, this approach produced a list that was a bit redundant and a bit too broad so we sat down as a group and reworked the questions to more closely match our needs. The final list consisted of 7 questions and is listed below.

Interview Questions

1. When and why did your fascination with robots begin?
2. Of all the fictional robots you have seen to date (any media), which one has been the most impressive?
3. Of all the non-fictional robots you have seen to date, which one has been the most impressive?
4. What do you think is the most important development in the robotics field in recent times (Last 10 years)?
5. What do you think will be the most important development in the robotics field in the next 25 years?
6. What is your most memorable or significant project involving robotics, and why was it?
7. In your opinion, how will robots change human activities and lifestyle in the coming years?

After approval from the WPI Institutional Review Committee we contacted the professors we had selected from the WPI Catalog, based on their background in robotics, and set up the interviews which were conducted at their earliest convenience. The interviews themselves took a maximum of 30 minutes and were conducted by 2 members from the IQP group. One member was the interviewer while the other person's primary task was to write down the answers given.

Survey Methodology

The purpose of the survey was to get the general opinion of the public regarding our project. To accomplish this we devised a survey that had a set of questions that were derived from the Interview questions. These questions were modified to be more simplistic in nature so as not to overwhelm the person participating in the survey. We submitted the questions to the WPI Institutional Review Committee and after approval began to conduct the survey using a convenient survey group, the WPI community.

To distribute the survey we chose to use two mediums, the internet and by hand, in order to get as large a sample as possible. We used *Survey Monkey* to create an online survey which we distributed to the population with the help of NetOps at WPI. To cover people who might not read this email we printed out the survey and table-sat in the school campus center and had the surveys completed manually by students as they passed by. The survey questions are shown below and a link for the survey is also provided.

Survey Questions

Enter :- Age:_____   Major:_____   Gender:_____

1. When you hear the word "robot", does a positive or negative connotation come to mind?
2. Given that connotation, a fictional or non-fictional robot may have come to mind to you. If so, please state the name of the robot or its functionality.
3. Personally, why do you feel either a positive or negative connotation towards robots?
4. What is your first memory involving robots?
5. What relationship do you think robots will have with humans in the near future?
6. Assuming any technology is possible, if you could build a robot, what would you have its main functionality be?

Survey Monkey Link

(http://www.surveymonkey.com/s/C6LQCP6)

Before analysis survey results were keyed into Excel to create a consolidated and easily manipulated data collection. The results were read and organized thematically for each question in order to verify the trends present in the data collected.

Survey Analysis Methodology

In order to analyze the survey, each response was categorized and listed based on the characteristics of the surveyed. Responses were tallied under the categories they belonged to, and by listing all the responses in this fashion, we hoped to see trends affected by these characteristics. The two major groupings chosen were a division among age group and a division by major which were then subdivided by positive or negative connotation.

The age groups were divided into X and Y generations. Generation X represented our parent's generation. In order to quantify this, all surveyed with age of 30 years old or greater were considered to be Generation X. The opposing group was called generation Y which represented adolescents and young adults. This group was quantified as surveyed persons younger than 30 years old. Of all the valid responses, 203 came from Generation Y, and the remaining 71 came from Generation X.

All the majors were denoted by the initials used in the WPI catalogue and if a surveyed person had more than one major, only the first major that the surveyed achieved (or attempted to achieve) a bachelor's degree in was counted. If the surveyed responded positively about robots on the first question of the survey, all of the following responses were tallied blue. If a survey responded negatively about robots, the following responses were tallied red. If the surveyed person felt neutral about robots, the following responses were tallied black. Not all survey responses qualified to be tallied. Responses that were obviously not serious were disregarded.

Incomplete surveys were examined to see if the portion the surveyed person did put an effort into was qualified to be tallied.

Results and Analysis

Literature Results

Overview

The literature review was organized in a chronological manner in order to observe the change in the views of a robot over time. It was also separated into different media to see what trends could be found within each sector as they cater to different audiences. For example books tend to be more progressive and forward thinking and as such more catered to the intellectually minded. On the other hand popular films in general are about satisfaction of current market demands in order to attain the greatest box office profitability. As such, films are more geared towards the general public for mass consumption.

Movies

1920-The Golem

In the 1920 film *The Golem*, Paul Wegener directs and stars in a film which bills itself as an unforgettable horror masterpiece. The movie centers around a creature of magic called a golem, which is made of clay and brought to life by the dark sorcery of the Jews. In the movie, the Golem is said to be the high priest's servant, as it obeys his every command. This was not to last however, as the golem inexplicably turns on its master and tries to harm him. This leads the priest to read further into the prophecy, and realize that the change of heart had been previously forewarned.

This film is interesting to our study, as the golem displays a lot of similarities to a robot. It is not human, but takes the form of one. The golem is feared by the public, walks with a stiff gait, and has inhuman strength. It also has limited intelligence, limited social skills, and initially does not have any free will as it develops later. Taking these facts into consideration, it is easy to see why many consider the golem to be the predecessor of the robot in the film history.

In fact, when you consider the movie timeline, *The Golem (1920)* ranks first, then the robot Maria from *Metropolis (1926)*, followed by the famous *Frankenstein (1931)*. These films all have a major component of similarity: the creation of a creature in the mold of a human who is under the control of the creator. All of these creations are born out of the needs of the creator, and as such are expected to selflessly satisfy these needs. If one party is selfless, then the other is clearly selfish. This sets up an interesting slave-master dynamic, which is historically significant.

1921-The Mechanical Man

The Mechanical Man is an Italian film directed by André Deed in 1921. The film begins with a scientist by the name of Professor D'Ara building a machine man. This machine is controlled through a complex remote-control system housed in the scientist's laboratory. Mado, a thief, hears about the mechanical man, and gathers her band of thieves in an attempt to steal the machine's blueprints from D'Ara. When the professor does not comply, Mado kills him. Mado and her band of thieves are captured by Ramberti, a policeman, (and his fellow officers) before they are able to find the blueprints. Mado manages to set fire to the prison and escape. She then hunts down the late professor's niece, Elena D'Ara, and forces her to hand over the blueprints for the mechanical man. Mado builds the mechanical man in her hideout, and subsequently builds the remote-control device used to control the machine in her own laboratory. Mado uses the super-human strength and speed of the mechanical man to commit various crimes such as robbing safes without being caught. Meanwhile, Professor D'Ara's brother (Elena's father) attempts to build his own machine capable of destroying the evil machine after hearing Elena's tale. The climax of the film occurs when the two machines fight in an opera house, each attempting to destroy the other. Saltarello, Elena's romantic interest (and the comic relief), finds

Mado's hideout. During the final battle, Saltarello causes a short-circuit to kill Mado, resulting in a happy ending for the protagonists.

The "robots" in this movie are used for both good and evil. It is more important to note that both "robots" cannot function without their human operators. Therefore, the "robots" are instead only machines under the project's current definition of robot (that is why the mechanical man is referred to as a machine rather than a robot in the description). When the machine is doing evil deeds carried out by an evil operator, it is constantly referred to as a monster in the subtitles. When the machine is doing good deeds carried out by a good operator, it is referenced as neutral. The two important things to note in this film are the relationships of the machines to humans (slaves in this case), and the description of machines when they are more powerful than humans (monster if evil, and no description if good).

1927-Metropolis

Fritz Lang's *Metropolis* was produced in 1927, and is one of the first films to feature a robot antagonist. The humanoid robot is created by a mad scientist as a means of continuing his love affair with a woman who has previously died. He has the technology to make the robot look like anyone he chooses and it is originally his plan to mold her in the shape of his past lover. The plans change however, and he instead makes the robot look like the leader of the workers' rebellion in order to destroy their unity from within. This is the most convenient solution, as the powers that be need someone they can control, without the chance of any emotional compromise of the wretched schemes.

In the movie, the robot is physically indistinguishable from the woman, Maria, who she is meant to replace. In fact, there are many scenes in the movie where one is mistaken for the other, even by the creator himself. The viewers can always tell the differences due to the

literally crazy mannerisms of the robot. With her erratic body movements and never-ending cackling image, it is clear that the director is trying to cast her in an evil light.

The truth of the matter is that the robot has no conscience; it is simply following the commands of its maker, and as such cannot be responsible for its malicious acts. Therefore, when it is being burnt at the stake, the viewers feel a sense of injustice. She is being burnt to "death" while both the man who gave her the instructions and the man who masterminded the whole scheme to kill hundreds of children are both spared from the wrath. It would seem that the robot is being used as a scapegoat in the movie. This completely spoils the plot for the viewer.

There is a popular saying that "guns don't kill people, people kill people". The same can be said about this robot. A victim of its circumstances, it is unfortunate that it is cast in this light. With her human counterpart Maria being portrayed as a saint, the viewer cannot help but to associate the robot with evil. As one of the first robots in motion pictures, it is understandable how later films have been an evolution of this trend. Robots seem to become more and more sinister with time.

1936-Modern Times

In the movie *Modern Times (1936)*, there are a lot of contributing factors as to why life is becoming increasing difficult in the present world. The ability to achieve the American dream is proving to be so shackled that the dream has seemingly become a fantasy. One of the major contributors to this situation (as depicted in the film) is the increased use of machinery in the production industry.

The movie starts out with our hero, played by Charlie Chaplin, working on the factory line. He is working much like a robot, at a pace that can only be called mechanical. Chaplin is

forced to keep up with the speed of the line as it increases. What cannot be overlooked and merits special attention is the reason why is he being forced to work at such a frenetic and inhuman pace. The fact of the matter is that the machines are not to blame; the real villain is the man behind the machine, the man in the head office.

With a business philosophy based in efficiency, high production, and low expenditure the human element is all but forgot and forsaken. This can be seen in the fact that the assembly line is constantly being sped up throughout the day. Breaks are not tolerated, and even the sanctuary of lunch time is not sacred. In the end, the only thing that saves the lunch hour was the fact that the machine being tested was faulty. It would seem that the basic needs of the employee are things that the boss is ready and willing to sacrifice. In fact this is the driving force behind the use of automated machinery or robots in the industry: the fact that productivity is paramount over a socially appealing working environment.

These are the issues that most people fear, because with the advancement of technology it seems to be inevitable that human beings will be left by the wayside. With no blue collar jobs the common man will be forced into a life of crime or living in the dregs of society. This is depicted in the movie as well, during the scene when the factory closes. The factory workers are left with these choices, with Chaplin even preferring to live in jail. Here some of his freedoms are restricted, but he is well fed and lives comfortably. The fact that he would prefer a life in jail rather than a life working in a factory is a revealing situation, as it redefines the viewer's definition of punishment.

So in the end, the truth of the matter is that no one wants to work in a factory. In order to live the dream, our hero, like the everyday man, is forced to face reality as he needs to return to

work in the factory. Money is quite the motivator, but even that will not make it acceptable to mistreat the labor force and treat them like robots. To summarize the situation, everybody wants robots in the factories, but people need jobs because they need money to survive. This is quite the dilemma, and unless there is a surplus of more interesting jobs in the world, it is a situation that will remain unsolvable.

1951, 2008-The Day the Earth Stood Still

The Day the Earth Stood Still (1951) was directed by Robert Wise and was created to bring a message to the world. The message is that the human race's inherent mistrust and resulting aggression will eventually pose a threat to everyone in the universe. In light of this humans are being asked to change their ways or face the destruction of themselves and the planet. This message is delivered in the film by a 'man' from outer space called, Klaatu. He lands in President's Park in his flying saucer and is immediately surrounded by a crowd of curious onlookers. During this same scene we are also introduced to his traveling companion and bodyguard GORT, a humanoid robot. The reaction of the crowd to both foreign visitors is worth analysis.

When the space ship opens and the masked Klaatu is introduced, the crowd is awed and the army troops present are wary of his alien appearance. However, it is not until Klaatu makes a sudden move which is misinterpreted as aggression that he is shot by one of the soldiers. Contrast this with the reaction to the sight of GORT who comes to Klaatu's defense and the difference is stark. As soon as GORT emerges from the ship there is pandemonium, the crowd screams and begins to flee and even the brave soldiers with their guns begin to retreat.

This reaction is a reflection of how robots were perceived by the general public during this time. With the ominous music blaring in the background it is clear that the robot represents a

force to be feared. This notion is not without merit as the robot has tremendous power, demonstrated by the use of its laser vision to melt the soldiers' guns along with his obvious physical strength. In fact we later find out from Klaatu that the robot is all-powerful and equipped with the power to singlehandedly destroy the whole Earth. He knows this because his race created the robot as the ultimate embodiment of power and programmed the robot to destroy all lesser forms of aggression. This was done as a way of promoting peace among his people, as the robot forces them to be peaceful or face the only other option of destruction.

This however does not mean that the robot is a mindless command-driven machine. Instead he is defined as a thinking entity. When Klaatu is worried that he may die he is immediately afraid of what GORT would do to the human race. Klaatu has gotten to know the people of the earth and has come to sympathize with them. He cares for them and does not want them to die. GORT however does not seemingly have this ability to love. This is what distinguishes him from humans and even the aliens.

A similar theme is repeated in the modern remake of the film in 2008 by Scott Derrickson. This film was watched for comparison to see if the views of the robot character had changed over the years. Here the robot's appearance is noticeable different. Instead of only 7 feet tall which was menacing in 1951 the robot is practically 70 feet tall. The robot also puts the promise of the destruction of the human race into action and mercilessly spreads like a plague, eating humans and their constructs without distinction. Here the cold and destructive stereotype of the robot is on full display for the world of humans to fear.

The robot is said in both cases to stringently follow a code leaving the interpretation of its application to rational and emotional humans or aliens. While its black and white view of the

world might be cruel the robot's approach is decisive and not without a perfectly understandable reason. As such the robot really cannot be blamed for doing the job that it was created to do. It is simply doing a job that a human could not do, an inhumane or inhuman act.

1956-Forbidden Planet

The film *Forbidden Planet (1956)* is the first notable film that has a "good guy" robot, named Robby. In the film, Robby transports the main characters to and from Morbius' house. He also has the ability to create multiple replicas of any food, given a few leftover molecules of said food. Doctor Morbius shows Robby's ability to protect the humans by having Robby give a demonstration of how accurate he can be with any weapon. When the Doctor commands Robby to attack Commander Adams, Robby goes into an infinite loop, since he wants to execute the command, but it goes against his programming to hurt humans. Robby is a constant companion to both the crew and to Alta throughout the film. *Forbidden Planet (1956)* is the first film we have found in which a robot is an ally, but it is certainly not the last. It is interesting to note that as time becomes more and more recent, more movies begin to have inherently good robots. *Lost in Space (1998)*, *Star Wars (1977)*, and *Robocop (1987)* are just some of the movies which have "good guy" robots in them. This is in part due to technology catching up to fiction, thus making fiction become reality. Technology is a massive part of our society today; people nowadays are complacent with Roombas and machine arms doing the jobs of humans. In the 1920s and 1930s however, people were scared of losing their jobs to machines, so films with robot antagonists were prominent.

1957-The Invisible Boy

The Invisible Boy (1957) is a film directed by Herman Hoffman which depicts the story of a man-made supercomputer that attempts to take over control of earth through its orbiting satellites. The supercomputer pretends to be deficient so that the humans would make physical

upgrades which it suggests. This gives the computer the ability to enact its plan. It hypnotizes its builder's son Timmie into rebuilding Robby the Robot. The computer than synchronizes itself with Robby, who then kidnaps Timmie. The computer holds Timmie ransom in order to receive a numerical code which will allow it to synch with the satellites. Dr. Tom Merrinoe, the builder of the supercomputer and Timmie's father, refuses to give up the codes. The computer then orders Robby to torture Timmie in front of his parents, but Robby is unable to give up his original directive of protecting his master and creator, Timmie. In the end, all of the humans are hypnotized by the supercomputer, and Robby takes the situation into his own hands, destroying the supercomputer.

This movie explains a few different relationships robots can have with humans. The supercomputer at first remains complacent; it acts as a helper to answer questions. In this case, it is border-line between being a slave to humans, and being an equal to humans. Once it completely takes over, it is seen as being superior to humans, taking precautions against any risk in its master plan. Robby, on the other hand, portrays the entire set of different relationships robots could have with humans. At first Robby is a general protective playmate of Timmie's, with no real thought of his own. This suggests a slave relationship. Later on, Robby's relationship with Timmie changes (once the supercomputer synchs with him). He then begins to suggest ideas and become less protective of Timmie. In this case, it can be seen that Robby is an equal to Timmie. He generally cares for Timmie and helps him out, but only in ways that help his personal agenda. He is able to think for himself in ways that suggest human-like thought. Robby's relationship with humans only suggests superiority to humans at one point in the movie, where the humans are hypnotized and only Robby is able to stop the supercomputer. Robby's actions in sabotaging the computer suggest that the humans are much weaker than him at that

point. Finally, at the very end of the movie, Robby is shown once again protecting Timmie, this time from his dad's punishment. Robby's actions suggest that he has general, free, human-like thought, but is still intent on keeping his main directive of protecting his master. Robby is able to think for himself and not blindly follow Timmie, yet he still chooses to be around him and protect him. This implies that Robby is a companion to Timmie, which is the final relationship (that robots have with humans) that is explored in the movie.

1982-Tron

Director Steven Lisberger uses the movie *Tron (1982)* to show us a world of fantasy that exists inside a computer. While the major screen time of the movie takes place inside the computer it is the story that is happening in the real world that is of primary interest. In the film there is a company which is a software firm that has developed a "Master Control Program". This program, originally created by the head programmer to control the lower programs has evolved to a much greedier level. It has developed exponentially over time to and now seeks to take over major corporations and even infiltrate the military secrets of the government. The program has evolved far beyond its user's control, blackmailing the man into becoming a mere puppet in order that the program can have a face in the real world.

An omen to this situation is given at the start of the movie where one researcher remarks, "Computers are just machines they can't think…Computer and the programs will start thinking and the people will stop." This was said in jest but in fact is a serious consideration. In today's world we can see this effect taking place where computers have increasingly become more user-friendly, adapting and helping the user in his everyday life. So much so in fact, that much of the population is dependent on their computers to get through their daily life and go through a form of withdrawal without it. Certainly the computer makes life easier but at what point do we draw

the line on which tasks they perform, and how can we be sure that we haven't given up too much control?

This is what the movie tries to warn us about, creating a program with so much power that it will eventually control us. However in the movie, the hero is presented as a man with the intelligence and programming skills to stump and beat the "Master Control Program". He initially was doing it in the real world and the computer digitizes him and puts him inside the computer where it feels it will have the upper hand as this is its domain. In the end though the human still manages to triumph and win the power struggle by outsmarting the machine. This is the fantasy ending but what if the outcome had been more realistic.

If the computer had won it would have proceeded to basically take over the world with its hacked knowledge and the power that all this information entails. This would be doomsday, the end of humanity that men in this time feared. To prevent this most systems have safeguards, overrides, and back doors in place but the real question is if this fear is justified. A machine that operates on pure logic can certainly makes errors as the logic is programmed by humans who by nature are not logical. However with the right programming, errors are far less likely and this is one of the reasons why Artificial Intelligence has since become more popular. The world is not black and white, it is not composed of ones and zeroes and as such a more complicated and illogical way of thinking is required. Or maybe that is just what we would like to think?

1984-Blade Runner

Blade Runner (1984) is a film by Ridley Scott that delves into the subject of what it means to be a human being. The story is set in the futuristic world of 2019 where human replicants are used on other planets to do work that is unsuitable or hazardous for human beings. These replicants are so well developed that they are physical indistinguishable from humans. In

this respect they are more advanced than our ideas of the ultimate robot as they are not made of metal parts but rather artificial tissues. Due to this they are only distinguishable from human beings by a test that determines their emotional responses to a set of prepared questions.

This fact becomes interesting when an experimental robot takes almost a hundred questions to fail the exam, which depends on unconscious dilations of the pupil to determine a pass or fail result. The standard amount of questions is usually 30, so the mystery is what makes this experimental robot different. We later find out that the robot does not know it is a replicant because it has been programmed with the childhood memories of its creator's dead niece. With pictures and the physical appearance to reinforce this lie the robot refuses to believe that she is not human, even after hearing her creator confess to this fact.

The creator of the replicants, Dr. Eldon Tyrell, has created the replicants based on a motto of, "more human, than human." Therefore the belief is that if the robots, which are created for a specific task such as to be soldiers or for companionship, will be better in functionality in that human role if they are oblivious to the fact that they are not in fact human. As such this is the direction of the new evolution of his replicants and one that proves to be quite successful.

In the director's cut of the movie it is more implied that Deckard, who is a blade runner is in fact a replicant. What is ironic is that a blade runner is a bounty hunter who finds and kills or as it is described "retires" rogue replicants who abandon their duties. So in fact, if Deckard is a robot, he is unknowingly hunting his own kind who are simply trying to live the life of a human being as he himself believes he is living. This is quite ironic and a great part of the movie plot.

The truth about replicants is that their core drive is to be human. In this regard they try to copy human behavior and it is known that given time they can achieve the development of all

human emotions. With their superior strength and mental capacities it can be easy to see that the motto of "better than human" is being fulfilled. From here it is easy to imagine a world where these advanced replicants would seek to dominate or more likely displace the lesser humans. To safeguard against this the replicants have a built in safeguard of having a self-destruct after 4 years.

This nullifies the threat of a robot takeover but leaves the question of what it means to be a human up in the air. In the past the argument was that it is the fact that humans are made of flesh and bones that separates us but this movie eliminates this easy explanation. The second popular argument is that the human's emotional responses are what make us human but once again the replicants show that in time emotions can be learnt. In fact that is all emotions are, learnt responses that are developed from birth and are triggered depending on the social situation. The final argument would be self-awareness, whereby if you know you were created in a lab then you can never really call yourself a human. Here the solution is implanted memories which create the illusion necessary to seamlessly integrate into society without a feeling of prejudice. With these three arguments nullified what else is there to differentiate a human and a robot? In other words can one say that a robot will eventually be a human or is it more correct to say that a human is a robot?

1989-Bionic Showdown: The Return of the Six Million Dollar Man and Woman

The word "cyborg" was first coined in 1960 by Manfred Clynes and Nathan Kline and is defined as being an organism that has both artificial and natural parts. *The Six Million Dollar Man* was a popular TV series based loosely on the book, *Cyborg (1972)* by Martin Caidin. The show ran from 1974 to 1978 and featured one of the most famous cyborgs in American TV

History, Steve Austin. From this craze came subsequent spinoffs and movies which capitalize on its popularity in the general public.

Unfortunately we were only able to obtain the movie, *Bionic Showdown: The Return of the Bionic Man and Woman (1989)* which marked the end of the franchise. However, the film still discussed topics that are relevant to our project while displaying the underlying characteristics that made the original series such a success. One particular scene that comes to mind is when Jaime Sommers, the Bionic Woman, is talking about her bionic transformation with Kate, a new candidate to the procedure.

> How about you're scared to death? Lord, I know that one. When I woke from that parachute jump and I saw what had happened to me. *Scoff* Bionics? I was angry and I was bitter. And then I got really, really scared.

Given the situation of becoming one of first to cyborgs, Jamie logically was scared. At the time, Jaime felt that she had lost a part of her humanity and this is also what Kate fears. Eventually, Jaime came to realize that at the core she was still the same person. She recognizes that her cyborg abilities were a gift and as such something to cherish. This is the message she seeks to pass on to Kate, a message of hope. Kate has chosen to undergo the procedure mainly due to the fact that she is a paraplegic. She hoped that bionics would enable her to take her first steps and be able to lead a more "normal" life.

Of course her life will be anything but normal since she is now obligated by contract to work for the OSI, a special military crime fighting task force. This is where people like the Six Million Dollar Man and the Bionic Woman use their extraordinary powers to better society. In essence they are more practical superheroes, infused with special abilities not based in cosmic

radiation or an experiment gone wrong but rather through the ingenuity of scientists in the cybernetic field.

This is probably one of the reasons why the show enjoyed such success as it highlighted the creative genius of man. It also showed the possible extremes to which the performance of the body could be taken with mechanical aids. This came during a time where invention was rampant and people were in awe of technology. As such, this program fed on this craving and offered the audience the best of both worlds; technology infused with man to create a superhuman.

1999-The Iron Giant

The Iron Giant (1999) is a family film designed with the entertainment of children in mind while teaching a valuable lesson about the dangers of stereotypes. The director, Brad Bird, uses the character of the Iron Giant to prove to the audience the point that it is wrong to judge someone by their appearance. Using the Iron Giant he sets up a few stereotypes that are interestingly relevant to our question of why humans imagine robots. These are pretty obvious characteristics starting with the fact that the perceived villain is a robot, and to make matters worse a giant robot.

Throughout history robots have been majorly portrayed in an evil light. Combine it with the fact that from ancient days giants have been the villains in children's bedtime stories and we have a character that is made to be feared and hated. The question though is what are these reactions based on? The thoughts and expectations that we harbor can all been traced back to stories that we have previously heard that were specifically crafted to be scary as a form of entertainment. The truth of the matter though is that life can be starkly different from fiction.

In fact in the movie this is what the director shows. As the story unfolds we see that the robot though enormous and made of metal has the mannerisms of a child. He is gentle and innocent in nature and only wants to be the young boy's friend. However the boy is not naive, and as such tells the robot that he has to hide as, "People always wig out and start shooting when they see something big like you." As the saying goes, we fear the unknown or as the boy Hogarth says, "People just aren't ready for you." He says this because most people automatically would want to destroy the machine based simply on the fact that it has the potential to cause damage.

The truth of the matter though is that this is not the stereotypical robot. Hogarth being a simple boy describes the Iron Giant best. "You're made of metal but you have feelings and you think about things. And that means you have a soul." However, the robot has the power of choice and whenever we imagine such a robot we immediately think that it will chose to be our ruler. That it will analyze the situation, see that we are inferior, and seek to enslave us. Where is the basis for this conclusion, is it not also possible that it can see us as equals and just want to be our friend?

The problem here would seem to not be with robots but rather with humans' own personal demons. It is in our nature to rationalize that if one group is stronger than the other the former will strive to establish its dominance. It does not seem logical that we could both peacefully coexist. This is the choice that the robot makes in the film, it chooses to not be a "gun" and sacrifices itself to save the very humans who tried to destroy him because of unsubstantiated fear. It is only after this sacrifice that the robot is recognized for who he really is, a being with a good soul. This story presents the alternate side of the story as the Iron Giant shows that given the choice robots can choose to be our friends.

1999-Bicentennial Man

Films with robot antagonists today are based solely on the idea of robots rising up to attack humans after becoming self-aware. Films like *Terminator (1984-2009)* and *I, Robot (2004)* portray this very well. Since our technology has yet to develop cyborgs or advanced A.I., people see these things as potential threats, and therefore plausible movie antagonists. When cyborgs or advanced A.I. are developed, it will be interesting to see if movies with those types of antagonists still exist.

In the film *Bicentennial Man (1999)*, Andrew, a humanoid robot, ordered by "Sir" is delivered to a family. After falling out of a window, Andrew shows unique characteristics for a robot, such as creativity and curiosity. Andrew even shows some characteristic of choosing favorites within his masters who act kindly towards him, like "Sir" and "Little Miss". With the ability to learn, and teachings from "Sir," Andrew becomes intrigued with the idea of freedom and asks for freedom from "Sir."

Many years later, Andrew observes the natural death of "Sir" and decides to go on a long journey in search of other robots just like him. At the end of his journey, Andrew finds no such robots. On his way back home, he meets a technician who gives him an upgrade. His first upgrade was to appear as a human being on the outside, by having more detailed limbs and skin. Andrew then returns home 20 years after starting his journey, and is surprised to find out that "Little Miss" is now very old and has a grand-daughter in her spitting image named Portia.

At the passing of "Little Miss", Andrew is upset by the fact that he cannot cry and express his sad emotions very well. Andrew visits the technician once more, but this time with schematics of mechanical organs and a central nervous system that could be used by both robots and humans. With this, Andrew gets his second upgrade, which allows him to feel and have a more complex way of thinking. After the upgrade, Andrew finds out that he is in love with

Portia. Although Portia has feelings for Andrew, the question of ethics and love between robots and humans hinders Portia from accepting her feelings toward Andrew.

When the technician finds out that Andrew is in love with Portia he gives him yet another upgrade. This allows Andrew to eat, feel all sorts of sensations, and have sex, although not in a reproductive manner. With this upgrade Andrew becomes human, both in and out, and wins the heart of Portia. He wishes to marry Portia, but it is not legal for a robot to marry a human being. Andrew appears before the court and asks to be recognized as a human being, but his request is denied since he is immortal.

After many years, Andrew decides to receive one last upgrade, one which will allow the degradation of his body, therefore making him mortal. After a few decades, Andrew appears before the court once again, but this time with a body of an old man. He again asks for him to be recognized as a human being. Andrew and Portia await the answer on a bed together. Andrew dies a second before he is announced to be oldest human being that ever lived.

2007-Robo-Sapiens

In the documentary *Robo-Sapiens (2007)*, viewers learn about the ways robot designers are creating their robots to be more humanlike. While progress is slow, various different technologies are being developed that will eventually come together to make androids. Some technologies, such the ability to learn, are in very early stages. Others, such as showing emotion, are very complete but are not very useful without other technologies (in this case, the ability for a robot to have a wide array of emotions). Others are very complete on their own, but are limited by the current speed of computers. For instance, the ability to gather and analyze stimuli can be done, but not fast enough to be analyzed for use in certain situations. The development of walking is also partly stunted by this; robots cannot balance very well since their computers cannot analyze that they are off balance fast enough to avoid falling.

One of the major problems with this documentary is that it has a tendency to attempt to be dramatic for the sake of being dramatic. The possibility of robots "rebelling" is hinted at several times, but there was never any actual discussion about it, nor were any of the technologies shown even remotely close to being advanced enough to be any threat to humanity. Aside from these bits, there is a lot to be said about why robots need to be humanlike in the first place.

2008-Ancient Discoveries

The television series *Ancient Discoveries (2008)* by the Discovery Channel gives the viewer an interesting look into the past, and how ancient civilizations used machines and robots to help them with everyday tasks. For instance, the Greek inventor Ctesibius developed the clepsydra into the first water clock. Archimedes, with the help of Ctesibius, used the water in the clock to create hydraulics. These hydraulics moved gears, enabling the clock to keep track of hours and days. Using these methods, the Antikythera mechanism was developed. In essence, it was the first mechanical computer. The user turned dials to create an input, and the mechanism displayed an output. In this case, it was used to determine the phase of the moon (as well as other astronomical positions) given the day and the month. Although these machines are not robots according to the definition, they are still important to note, since it proves that even the ancient Greek civilization thought about ways to make their lives easier with machines.

2008-Time of Eve

The anime series, *Time of Eve*, was produced by Studio Rikka and Directions Inc., and first aired in 2008. It is set in the future, where androids are household fixtures. The androids are externally indistinguishable from human beings except for a "halo" that floats above their heads. The story revolves around the android named Sammy and her owner Rikuo. One day, Rikuo discovers a strange entry in the data log of the android that says, "Are you enjoying the

time of Eve?" This is the catalyst that starts a fire of suspicion, which eventually leads Rikuo to follow the android to see exactly what it is doing, and why it is behaving strangely. He follows the android to a bar, where he finds her sitting causally having a cup of café. This is unusual in itself, as androids are commonly thought to have no free will. What is even more alarming is that her halo is not turned on: an offence that is grounds for termination.

As the story unfolds, we begin to learn that the androids have slowly developed a sense of self-consciousness over time. This bar is the oasis where they shelter from the persecution of the masters. Here, they live a life of simple, everyday normalcy for a few minutes in between errands. In addition, it also serves as a place where there is no discrimination between androids and humans. This raises several moral dilemmas.

Humans created androids, and as such feel a sense of empowerment. The androids, however, choose to seamlessly coexist with the humans. If a collection of wires, motors and electrical impulses are equal to humans in external features and behavior as well as internal thoughts, feelings, and desires, then it is very difficult to determine whether or not they could be considered as human beings. For many, the power of intelligence, free will, and emotions have been what separate humans from the machines. To them, humans are the ideal, and the rest are cheap copies of God's greatest creation. A world filled with machines that were comparable to humans in every way is not something that humans would idealistically want to achieve. Humans are driven by pride to create something similar, yet flawed, since "humans are perfection". By now returning back to the original question, "Why do humans imagine robots?" further perspective is gained. The first story of a robot was actually a play. In the story, the robot was basically being used as a slave. It would seem that the truth lies in history, as it can be

seen that from the start man has tried to make life as comfortable as possible. The robot, instead of being a noble ideal, is simply a modern day reinvention of the wheel.

2009-Astro Boy

Astro Boy (2009) is an animated film by David Bowers which delves into the human physiological aspect of creating a humanoid robot. Astro Boy first appeared as a comic book story in 1951 by Osamu Tezuka which was first animated in 1963 and broadcast until 1989. The movie follows the core idea of the animation. The main character is a robot called Astro. He is created by a scientist to replace his son who was killed in a tragic accident during the testing of one of his military robots. The replacement robot is created to look exactly like his son Toby and even has the memories of the slain child. The creation is so realistic that initially even the robot does not know it is not the real Toby.

All is not well at home however as it soon becomes clear that the robot is not exactly like the son he was meant to replace. In fact instead of being loved the robot becomes a symbol of the scientist's past mistake and a constant reminder of the guilt he has in his heart. The robot however does not understand the situation and has a real emotional tie to the father because of its implanted memories which have become the foundation of his personality. Shunned by the man he adores and loves for understandable reasons, the boy is forced to run away from home in an attempt to find his place in life.

This plot sequence raises an important point about the creation of a humanoid robot and depicts a theme which is similar to the one found in the film *A.I. (2001).* In both movies the robot child is created to replace a loved one and to provide emotional support to a grieving parent and in both cases the robot is serving its purpose but is still rejected by its "parents." In both cases however it can be clearly seen that the emotions displayed by the robot are, by the base

definition, genuine. The problem lies on the other side of the equation; is it possible for a human to love a robot as if it were his or her own offspring? Or to simplify the situation is it possible for a human to love a robot?

It would seem logical that if the robot is created in the form of a human and displays all the right emotional and cognitive responses that it should be easily embraced but this is not necessarily the case. There seems to be some built-in resentment towards robots or a feeling of supremacy in the mind of a human where we loathe the idea of man and machine being equal. We love to think of robots as "just a machine" and as such can view the destruction of a robot as being as insignificant as the act of crushing an ant. This is illustrated in the film when Hamegg, man who give shelter to the wandering young boy, shoots Astro with a blast of electricity and says, "It doesn't matter. He's a robot and doesn't have feelings." This is shocking considering the fact that in previous scenes Astro was taken into his house as a son and treated as such. Upon learning that the boy is actually a machine however all feelings of love are cast aside and the boy is now nothing but a collection of nuts and servos.

What is ironic though is that it is this same collection of nuts and bolts that acts to save the same man who tried to destroy him. ZOG an older machine who is outraged about Hamegg's inhumane treatment of robots is about to stomp on the cruel man with his giant feet. Hamegg shouts out that ZOG cannot kill him because of the three Laws of Robotics which have been around for two hundred years. To this ZOG responds, "I'm old school," and proceeds to try to stomp on the man. Hamegg though is saved by Astro who is incapable of doing wrong by the nature of the energy source that powers him. How could anyone justify the destruction of such a being, someone who is not human-like but in actuality of far greater moral standard?

In the end the truth of the matter is that humans are made of flesh and blood and robots are made of bolts and servos. In this comparison there are no major differences as humanity goes beyond the physical realm. Humanity lies in the psychological arena and in this term it is possible that robots can be of even greater moral standings when held to human standards. This is due to the common agreement that man in innately flawed, with the raging feelings of anger, bitterness and jealousy. Therefore maybe what humans really resent is not the creation of a robot who is our equal but rather a robot who is our superior.

2009-Surrogates

The movie *Surrogates, (2009)* directed by Jonathan Mostow is an interesting work of science fiction. This movie was based upon a comic book series published in 2005 under the same name. The main concept of the movie revolves about a world where humans have begun to use humanoid robots as surrogate replacements in their daily lives. They live life vicariously through these robots, enjoying the thrills and fantasies we all dream about while physically lying, in a control chair, in the comfort of their own homes. In this futuristic world, crime is at an all time low and people for the most part seem to enjoy a life of contentment.

The use of surrogates is an intriguing concept as to the future of the robot. The movie goes into some depth as to showing the audience the numerous benefits of such a world. "Robotic Human Surrogates combine the durability of a machine with the grace and beauty of the human body," is the slogan of choice. Originally created to give the disabled a chance to have a normal life again, the use of surrogates evolves to far greater heights. The primary benefit is that the use of robots by normal people empowers them with superhuman strength while keeping the user safe at home from the many hazards of everyday life. Users also have the added benefit of taking on any appearance, with choices such as ideal weight, race and sex.

This amount of choice about our own personal appearance that we present to the world might initially seem like an immense freedom but actually proves to be a clever trap. Shame of one's own appearance only leads to a further dependency on surrogates in order to boost one's self-confidence. Another appearance factor to consider is the fact that you can make your surrogate image younger. Nobody wants to get old and wrinkly but it is a natural progression of life. With a world where everyone wants to look young, how does the family dynamic of parents and grandparents socially work?

The same can be said about the gift of super strength where it is actually a curse in disguise. Yes it enables the humans to do unbelievable acts but this simultaneously takes away from the wonder of the incredible feats of the human body. With the everyday man able to leap cars in a single bound what is there left for the individual to accomplish? Climbing Mount Everest or completing a marathon all become trivial pursuits which under normal circumstances would greatly uplift the human spirit.

Therefore while this direction of future use of the robot is a feasible idea, its practicality has to be questioned. It is the never ending problem of man trying to integrate technology into life to make everyday living better. The dilemma though is at what point does it become too much and we become a slave to technology. Each day there are new inventions that people encounter not being able to think about living without. Electricity, the Internet, and cell phones are all recent examples of an extensive list of inventions of convenience that define modern society. Does the idea of surrogate robots discontinue the natural evolution or rather precede the final step in the disconnection of man from nature? Only time can answer this question definitively. In the movie the latter is true and leads to the eventual destruction of all surrogates and the return of man to actually live life which to viewers is definitely a step forward.

The Terminator Series (1984-2009)

At this time we will take a moment to review a significant series in the history of robots. *The Terminator (1984-2009)* series was first filmed in 1984 directed by James Cameron. The series describes a futuristic world where our planet is being ruled by "the machines" and the remaining human population is fighting back to reclaim the planet. The plot is based on the fact that in the near future, a super computer defense system called Skynet becomes self-aware, and believing that humans are threat to its existence, initiates a nuclear attack against the entire human race. The survivors of the nuclear holocaust fight back against Skynet under the leadership of John Connor, son of Sarah Connor.

1984-The Terminator

In the first of the series, Skynet, realizing it is fighting a losing war, sends a cybernetic-organism called a Terminator through a time-displacement machine to kill Sarah Connor. This is done in an attempt to prevent the birth of John Connor, the future leader of the resistance. John Connor, intercepting Skynet's plan, sends Kyle Reese, his best soldier, back in time to protect Sarah Connor and then destroys the time-displacement machine to prevent further attempts to alter the past.

In the movie the Terminator is a robot covered with human flesh. As the Terminator can easily pass for a human its purpose is to infiltrate. The Terminator, not having enough information about Sarah Connor, systematically kills all Sarah Connors in the area. However, when the Terminator is about to kill the real Sarah Connor, Kyle Reese comes to her rescue. The Terminator pursues tirelessly and tries to kill Sarah Connor throughout the rest of the movie. Kyle Reese fights back with a variety of weapons but it soon becomes clear that the Terminator is practically unstoppable. In order to save Sarah Connor, Kyle Reese sacrifices himself by detonating a homemade bomb in close range of the Terminator. In the process Kyle Reese dies

and the Terminator loses the bottom half of its body but has not been destroyed. Sarah Connor finally terminates the crawling terminator using a hydraulic press which crushes it to "death".

The Terminator (1984), because of its past and present popularity, is one of the movies that contributed significantly to the spread of the fear of robots taking over the world. Although the robots themselves had linear thinking, seemingly unintelligent to the viewers, they were being controlled and ordered by the superior mind of Skynet. The idea of robots developing beyond human control was born from the rapid advancement, development and usage of the microprocessor at the time in which the movie was written. Therefore the relationship presented in this movie is one with robots as human superiors.

1991-Terminator 2: Judgment Day

The second of the Terminator movie series was released in 1991 with the title of *Terminator 2: Judgment Day*. Although the assassination of Sarah Connor was a failure, judgment day (nuclear holocaust) was still inevitable. Set eleven years after the first terminator event, Skynet sends a new model of terminator back to the present (1995) hoping to win the war by this time killing a young John Connor. The new terminator, T-1000, is an upgraded version of terminator and is made of liquid metal. It can manipulate its body to appear as anyone it sees or any object of similar size. Sometimes T-1000 can also manipulate parts of its body to form simple metallic weapons such as a blade or a blunt object.

From the future, John Connor manages to capture and reprogram the Terminator (the same model which appeared in first movie) to save young John Connor in the present. From the Terminator sent by John Connor from future, Sarah learns that a man named Dyson, an engineer at Cyberdyne Systems, is directly responsible for the creation of Skynet. Sarah attempts to

murder him thinking that this would prevent judgment day. Amidst the attack, Sarah comes to the realization that this man has no idea what his work will result in and aborts her plan.

Conveniently, the Terminator and John barge in to calm the atmosphere and the Terminator explains to Dyson about his work and the future. Convinced by the existence of the Terminator, Dyson agrees to stop his work and destroy everything related to his work at Cyberdyne. Although interrupted by the police and T-1000, they manage to destroy everything. Similar to the first movie, T-1000 chases John, Sarah, and the Terminator fiercely throughout the whole movie. Although the Terminator is less capable than T-1000, at a steel mill it manages to cause T-1000 to fall into a pit of molten steel where it meets its end. Then the Terminator also dives into molten steel to destroy itself so that no one can study it to cause judgment day.

Just like the first movie, although they only followed linear logic, robots appeared physically far superior to a human, almost invincible and omnipotent. However, unlike the first movie, a very interesting relationship was presented as the Terminator, who was the enemy in the first film, was programmed to save and follow young John Connor's orders. To young John Connor, the Terminator was his companion, friend, and even a father-figure. In the beginning, the Terminator was just a cool toy or tool to John and he used the Terminator for his selfish purposes. However, as John spent more time with the Terminator, he started to accept the Terminator as his companion and friend. Toward the end John feels that the Terminator was the father that he never had. The Terminator was always there to protect John, and John was starting to rely on the Terminator's protection like a father-son relationship. This was a very interesting relationship dynamic between a robot and a human. It showed that all sorts of relationships can exist between the two groups and that the relationship can change, build and grow into one of love.

2003-Terminator 3: Rise of the Machines

The third of the terminator series, *Terminator 3: Rise of the Machines*, came out in 2003 and is set in 2004. Sarah Connor has passed away of illness, John is now 20 years old and is living "off the grid" in Los Angeles. Although the prophesized judgment day of 1997 never happened, John does not believe that it won't. Skynet from the future sends a newer model of terminator T-X back to 2004 to kill John and his future resistance leaders, one of whom is Kate, John's future wife. Just like the second movie, an old reprogrammed terminator is sent back to protect the T-X's targets. T-X consists of a metallic endoskeleton covered by liquid metal similar to that of T-1000 from the second movie. On top of its ability to infiltrate humans by appearing as humans, shifting appearance from one to another using the liquid metal skin, T-X was designed to terminate another terminator. It has primary and secondary weapons integrated within its arm and has an ability to program other machines including other terminators.

The third movie seemed like a filler movie just to continue the story. It was very focused on action and new and plausible upcoming technologies. The only significant thing to note from this movie was when the Terminator forced itself to shut down after experiencing conflicting orders. This was noteworthy in a sense that it made a choice. In today's view point, when some program encounters a conflict in commands, it shows an error message, whereas here the Terminator made a decision of its own without the operator. The Terminator was experiencing a conflict between Kate's order to save John and T-X's order to kill John. In the end, the Terminator chose not to kill John but why it chose not to kill John is still a mystery. Perhaps the message is that someday robots can learn from their experiences and incorporate these experiences to influence their decisions or in other words, perhaps robots can develop feelings.

The fourth of the terminator series came out in 2009 with the title, *Terminator Salvation*. Unlike the previous movies, this one takes place in the future, 2018, and describes the life of nuclear holocaust survivors fighting against Skynet. At the start of the movie there are many random scenes that later connect to create the plot of the story. In 2003, a death row inmate Marcus Wright signs his body over for medical research after his death by lethal injection. A year later, Skynet is activated and initiates a nuclear holocaust. In 2018, John Connor leads an attack at one of Skynet's bases. There, John discovers that there are human prisoners in Skynet's headquarters and Skynet is developing a new model of terminator incorporating living tissue. Also he acquires a hit-list of Skynet. Suddenly attacked by the terminators, only John is able to escape. After John escapes, Marcus Wright rises from the wreckage having no memory of where he is. The only thing he remembers for certain is that he was dead. Not knowing what to do, Marcus wanders towards destroyed Los Angeles and John returns to the resistance headquarters to inform them of his discoveries.

Meanwhile, Marcus, unaware that it is 2018 and lacking knowledge of the danger of the current situation, is saved by Kyle Reese upon encountering a terminator roaming the streets of Los Angeles. Kyle informs Marcus about how the war between humans and machines began and where it is going. Upon hearing a radio broadcast by John, who is like an idol to Reese, Kyle and Marcus start on a journey to search for the resistance force and John Connor. In the middle of the journey, Marcus and Kyle are attacked by a machine and Kyle is captured. During the event, a combat jet sent by the resistance force is also shot down by the machine. The surviving pilot takes Marcus to John's base. On the way, Marcus is wounded by magnetic mines which reveal that Marcus is a cyborg. Marcus is immediately imprisoned and questioned by John Connor.

Marcus claims that he is human and he must be released in order to save Kyle but John believes Marcus is sent by Skynet to kill him.

This movie deals with the ethics of a human who is part robot, a cyborg. Marcus, once a normal human being and very confused about the situation, proclaims himself to be a human being. The pilot, when she first met Marcus, thought Marcus was a normal human being. When she first discovered that Marcus was a cyborg, she was very confused. She was a member of the resistance but knew Marcus was not evil. As a result she decided to help him which meant that she accepted Marcus as a human being. This was possibly because of the time she spent with Marcus on the way back to the base. During this time she must have seen Marcus's kindness and human qualities which convinced her to accept him as a human being. On the other hand, for John who hates robots, when he first meets Marcus, Marcus was not a human being, nor even a cyborg, but simply a robot to be destroyed. To John, Marcus was nothing more than a robot sent by Skynet to kill him and he drew a clear line between himself and Marcus by enforcing the law to terminate Marcus. But as John also sees Marcus's humanity when Marcus saves John from the hydrobots; he accepts Marcus, but still does not consider Marcus as a human being until he sacrifices himself to save John's life.

A great question asked by Marcus from the movie is "What does it mean to be human?" How much do you have to be human physically to be considered human? The movie gives a great example of how different peoples' reactions to the same situation can be. Some can be accepting while others will be draw clear lines of defiance. This raises the question, if a cyborg or more interestingly a humanoid robot was displaying human qualities, where would you stand?

Movies Summary

By the end of our research we managed to cover a variety of films over a time span from 1920 to 2009. During this 89 year span there has been a marked change in the reason why robots are employed in films and the way they are portrayed. This evolution has been a very gradual one as robots slowly transformed in a lifespan from being just a mindless killing machine into a creation that we would tend to think of as being almost human in nature and functionality. This evolution is due to the fact that people in the general public have steadily become more sophisticated in their feeling towards and imagination about the future of robot interactions with the human race.

The fact that the change in the way robots are viewed is slow and gradual makes a lot of sense as movies depict the general public's view on an issue, as movies are created by the director for mass consumption. If a movie had themes that were too advanced for its time, most likely it would not be a success as the average person would not understand and/or appreciate the message being conveyed. Prime examples of this fact are the films *Metropolis (1927)* and *Blade Runner (1982)* whose genius were not fully recognized until many years after their initial release.

In this light it is common practice for current movies of significant social impact to be based on books that have been long published in the past. This is because books bring the imagination of the author to life and cater to a select group of persons who are looking to be intellectually challenged with new ideas and fresh ways of looking at life as a whole.

However the present day man is more sophisticated than the man of the 1920's. As time passes there are marked changes as robots go from being just tools, to working alongside humans, to displacing humans to enslaving humans and finally to being human. These views have corresponded to advancements in technology in the real world; with each advancement the

public can move their imagination to a higher level. An example of this is the industrial robot, as after a robot that did monotonous jobs was invented people next began to realistically imagine robots capable of doing menial tasks around the house. Views were also affected by current social conditions, for example after the Great Depression people were downtrodden and a robot was the perfect subject to vilify in movies as they embodied the advancement of technology.

The findings laid out in Figure 11 show how we chose to interpret the data. Of course the actual order of the first movie to discuss a new potential role was not in such an ideal linear time order. Movies that did not fit the linear pattern were decided to be perceived as being ahead of their times and as such not included for clarity purposes. Therefore the major example is used instead, as after these movies the roles they illustrated became widely accepted by the general public as a viable future of how robots will be used and interact with humans.

Robot Timeline Showing Emerging Trends and a Major Example							
Example	The Golem	The Mechanical Man	Modern Times	Day The Earth Stood Still	Six Million Dollar Man	Star Wars	Blade Runner	Bicentennial Man
Role	Slaves	Puppets	Industry Aids	World Domination	Super Humans	Companions	Equal Existence	Equal Status
Year	1920	1921	1936	1951	1974	1977	1982	1999

Figure 11: Robot Timeline of Emerging Trends

The table starts with the Golem who was viewed as a slave and ends with the Bicentennial Man who is portrayed as being an equal. As you can see given the condition specified before, the Robot has grown from a relationship based on obedience to one consisting of the equal sharing of ideas. This gives us valuable insight as to why humans imagine robots as we can see that the basis for these thoughts is changing with time.

Written Works of Literature

1907-Ozma of Oz

Oz is a series of children's books written by Frank Baum. In the third book, *Ozma of Oz (1907)*, the main character, Dorothy, is whisked away to the fictional land of Ev. In Ev, she

discovers many new friends and places, one of which is the machine man Tik-Tok. Tik-Tok is not a robot under the current definition of the project; he can only be classified as a machine. He requires action by Dorothy for him to function in one of three ways: movement, thought, and speech. Dorothy must use a key to crank, or wind-up Tik-Tok in one of three respective slots. Once wound-up, Tik-Tok comes to life and interacts with Dorothy and her friends. Tik-Tok is viewed as both friendly and helpful by Dorothy and her friends, as he is able to provide protection for the group. There are multiple references to Tik-Tok as a slave. There is one particular moment that Tik-Tok describes himself as being "Dorothy's slave", and then proceeds to sacrifice himself in order to perhaps save her. This relationship is held constant throughout the entire book, since Dorothy is the owner of the key which winds-up Tik-Tok. It is important to note the relationship that Dorothy has with Tik-Tok (owner to slave), and how this relationship is portrayed to the reader throughout the dialogue (helpful and loyal).

1921-RUR

Rossum's Universal Robots is a Czech play written by Karel Čapek in 1921. The play is a very early case of the popular old trope of robots rebelling against their human creators and also the origin of the term "robot" replacing words like "Automaton." The word "robot" comes from the Czech word "robota" (menial labor).However, in actuality the way that the robots are described in the play shows them as being androids. The robots look human, speak like humans, think like humans, and even have a fleshy exterior. They have been removed of both a "soul" and the ability to feel pain.

In an attempt to make robots more efficient, Harry Domin, the Director General of Rossum's Universal Robots, built a complex nervous system that causes them to feel pain. He believes that if the robots can feel pain, they will be less likely to destroy themselves in

completing tasks. For instance, robots that once maimed themselves without thinking twice (in building, machine assembly, etc.) would now be hesitant to put themselves in a painful situation. Domin's overall goal is to parallel certain sections in the Book of Genesis in the Bible. He believes that if he can get robots to perform all jobs for humans, and perform them at an incredible rate, humans will be able to "just live". Since food sources would be plentiful and easily harvestable, humans would not have to pay for food. Nor would they have to worry about travel, bills, or even raising their children. They will be able to live in perfect bliss, such as Adam and Eve once did in the Book of Genesis.

> DOMIN: Maybe there was. But we can't always be thinking about the things we lost by changing the world as Adam knew it. Adam had to gain his bread by the sweat of his brow, he had to suffer hunger and thirst, tiredness and humiliation; now is the time when we can go back to the paradise where Adam was fed by the hand of God, when man was free and supreme; man will once more be free of labour and anguish, and his only task will once again be to make himself perfect, to become the lord of creation.

Helena Glory ends up being forced to marry Domin, even though originally she visited Domin in hopes to gain rights for the robots. A decade later, Domin and his top engineers have followed their plan almost perfectly. It is then, however, that the robots rise up, and attempt to destroy all of humanity. Domin and his team deduce that the sheer number of robots that they built gave the robots cause to revolt, since the robots were able to realize their own strengths. As soon as there were enough robots to overpower humans, the revolt began. Domin and his team try to find ways to bargain and reason with the robots, and devise a final plan: spare their lives in a trade for Rossum's secret to creating the robots. The robots needed this secret; after 20 or so years they would cease to function, and needed to learn how to "breed". Unfortunately, Helena had just recently destroyed Rossum's "recipe" since she read that people had stopped being able to procreate.

HELENA: People have stopped having children ... Harry, that was so vile! If we continued making robots then no-one would have any children any more ... Nana said it was a punishment ... all of them, all of them said they can't have children because there were so many robots ... And that's why ..., that's why, ... do you hear me

The robots then rise up, and attack all of the humans, albeit one of Domin's team members, Alquist, the Head of Construction for Rossum's Universal Robots. In the third act, the robots use Alquist as a way for them to obtain Rossum's "recipe". Alquist is unable to remember Rossum's instructions, and asks the robots to find remaining humans to help him. Unsuccessful, the robots bargain with Alquist, going as far as offering up their own lives in dissection as a means to help him remember the trade secrets. At the very end of play, Alquist confronts two robots, Helena (a robotic copy), and Primus. These two robots refuse to let one another be dissected, since each believes that the other is a part of them.

ALQUIST: It's alright Primus, it's alright. No what are all these tears for, eh? It just means Primus won't be here anymore. You'll have forgotten about him in a week's time. Go on now, and be glad you're still alive.
HELENA: (*quietly*) I will go.
ALQUIST: Where will you go?
HELENA: You can dissect me.
ALQUIST: You? You're beautiful, Helena. That would be such a shame.
HELENA: I'm going in there. (*Primus stands in her way*) Let me go, Primus! Let me go in there.
PRIMUS: No you can't go in there, Helena. Please get away from here; you shouldn't be here at all!
HELENA: Primus, if you go in there I'll jump out the window, I'll jump out the window!
PRIMUS: (*holding on to her*) I won't let go of you (*to Alquist*) You're not going to kill anyone, old man!
ALQUIST: Why not?
PRIMUS: Because... because ... we belong to each other.

Alquist sends the robots away, knowing that they are experiencing love for one another. He tells them to run away and hide together. The play ends with Alquist quoting from the Book of Genesis; he states that the cycle is beginning once again, and that robots are made in man's image just as man was made in God's image.

ALQUIST: You're quite right   (*opens door, centre*) It's alright. Go, now.
PRIMUS: Go where?
ALQUIST: (*whisper*) Wherever you like. Helena, take him away. (*pushes her out*) Go on your way, Adam. Go on your way, Eve. You will be his wife. You, Primus, will be her husband.

Multiple relationships between robots and humans are explored in the play. For instance, in the introduction, robots are clearly portrayed as slaves, with no human qualities other than their appearance. The robots are so similar in appearance to humans that Helena is actually unable to distinguish the robots from Domin's team.   One scene, in fact, is particularly interesting:

DOMIN: (*laughing*) Sulla isn't a person, Miss Glory, she's a robot.
HELENA: Oh, please forgive me...
DOMIN: (*puts his hand on Sulla's shoulder*) Sulla doesn't have feelings. You can examine her. Feel her face and see how we make the skin.
…
HELENA: You're going to have her killed?
DOMIN: You don't kill a machine.
HELENA: (*arms around Sulla*) Don't worry, Sulla, I won't let them take you. Do they always treat you like this? You shouldn't put up with it, do you hear, you shouldn't put up with it.
SULLA: I am a robot.
HELENA: I don't care what you are. Robots are people just as good as we are. Sulla, would you really let them cut you open.
   …
FABRY: As you like. Can I ask you, what actually is it that your League ... League of Humanity stands for?
HELENA: It's meant to.... actually it's meant to protect the robots and make sure ... make sure they're treated properly.
FABRY: That's not at all a bad objective. A machine should always be treated properly. In fact I agree with you completely. I never like it when things are damaged. Miss Glory, would you mind enrolling all of us as new paying members of your organisation.
HELENA: No, you don't understand. We want, what we actually want is to set the robots free!
HALLEMEIER: To do what?
HELENA: They should be treated ... treated the same as people.
HALLEMEIER: Aha. So you mean they should have the vote! Do you think they should be paid a wage as well?
HELENA: Well of course they should!

HALLEMEIER: We'll have to see about that. And what do you think they'd do with their wages?

HELENA: They'd buy ... buy the things they need ... things to bring them pleasure.

HALLEMEIER: This all sounds very nice; only robots don't feel pleasure. And what are these things they're supposed to buy? They can be fed on pineapples, straw, anything you like; it's all the same to them, they haven't got a sense of taste. There's nothing they're interested in, Miss Glory. It's not as if anyone's ever seen a robot laugh.

HELENA: Why ... why ... why don't you make them happier?

HALLEMEIER: We couldn't do that; they're only robots after all. They've got no will of their own. No passions. No hopes. No soul.

HELENA: And no love and no courage?

HALLEMEIER: Well of course they don't feel love. Robots don't love anything, not even themselves. And courage? I'm not so sure about that; a couple of times, not very often, mind, they have shown some resistance ...

Through Act One and Act Two, Domin's plan begins to fail. It is then that the robots are first portrayed as superior to humans. The robots execute a well thought out uprising, using their numbers as their advantage. The robots fail to recognize that they will need humans in the future, since their lifespan is only about twenty years. They assume that Rossum's blueprints have not been destroyed. Once they execute their plan, it is already too late; Rossum's "recipe" has been burned, and there is only one human left with limited knowledge of Rossum's secrets. The robots are clearly portrayed as masters, made prevalent when the robots explicitly state that their purpose is to be the strongest beings in the world (even so far as to mention being masters of the universe).

RADIUS: Finished?

OTHER ROBOT: Yes.

TWO ROBOTS: (*they drag in Alquist*) He did not shoot. Do we kill him?

RADIUS: Kill him. (*looks at Alquist*) Spare him.

ROBOT: He is a human.

RADIUS: He is a worker. He works with his hands like a robot. He builds houses. He can work.

ALQUIST: Just kill me.

RADIUS: You will work. You will build. Robots will need many buildings. Robots will need many houses for new robots. You will serve robots.

ALQUIST: (*quietly*) Move aside, robot. (*kneels at dead Hallemeier, raises his head*) Killed him. He's dead.

RADIUS: (*steps up onto barricades*) Robots of the world! Many humans have fallen. We have taken the factory and we are masters of the world. The era of man has come to its end. A new epoch has arisen! Domination by robots!

ALQUIST: All dead!

RADIUS: The world belongs to the strongest. Who wishes to live must dominate. We are masters of the world! Masters on land and sea! Masters of the stars! Masters of the universe! More space, more space for robots!

ALQUIST: (*at doorway, right*) What do you think you've done? You'll all die without people!

RADIUS: There are no people.   Robots, down to work! March!

Act Three focuses on the robots' efforts to obtain a working blueprint so that they can "procreate". The robots express some extremely interesting characteristics in this Act. They continue the master-slave relationship from the previous acts, but sometimes "drop down" to an equal relationship with Alquist, mainly as a tool for bargaining. When the bargaining does not go their way, they quickly change back to their superior methods, and resort to threats.

ALQUIST: (*sitting*) What do you want, robots?

RADIUS: The machines are not working, sir. We are not able to make more robots.

ALQUIST: Call in some people.

RADIUS: There are no people.

ALQUIST: It's only people that can procreate life. Don't keep wasting my time.

2. ROBOT: Have pity on us, sir. We are afraid. We repair everything as well as we can.

3. ROBOT: We have increased working hours. We no longer have room to store all the things we have made.

ALQUIST: Who did you make these things for?

3. ROBOT: For the next generation.

RADIUS: Only robots are we not able to make. The machines produce nothing but pieces of bloody meat. The skin does not adhere to the flesh and the flesh does not adhere to the bones. Formless lumps flood out from the machines.

3. ROBOT: People knew of the secret of life. Tell us their secret.

4. ROBOT: If you do not tell us we will die out.

3. ROBOT: If you do not tell us you will die. It will be our duty to kill you.

ALQUIST: (*standing*) Kill me then! Come on, kill me as well!

3. ROBOT: You have been ordered to...

ALQUIST: Ordered? There's somebody giving me orders?

3. ROBOT: The robot government.

Damon, a leader of the Central Committee of Robots, begins to exhibit some interesting human-like characteristics during the middle of Act Three, when Alquist is forced to perform

live dissections on the robots. Damon is at first hesitant to be the subject of dissection. He tentatively agrees only to almost immediately regret his decision. This is a complete foil as to how robots were described in the introduction of the play, since they were originally depicted as having no love, compassion, pleasure, hope, soul, or even will to live.

DAMON: Tell us the secret of life.
ALQUIST: It's been lost.
RADIUS: You knew it.
ALQUIST: No I didn't.
RADIUS: It was written down.
ALQUIST: It's been lost. It was burned. I'm the last human being, robots, and I don't know what the others knew. You killed them all!
RADIUS: We allowed you to live.
ALQUIST: Yes, live! That's how cruel you are, you allowed me to live! I loved people, but I never loved robots like you. Do you see these eyes? They never stop crying; one eye cries for people and the other eye cries for you robots.
RADIUS: Do experiments. Search out the formula of life.
ALQUIST: There's nothing to search for. You'll never get the formula for life from a test tube.
DAMON: Do experiments on living robots. Discover how they work!
ALQUIST: Living bodies? You expect me to kill them? I've never ever ... Oh just be quiet, robots! I've already told you I'm too old for this! Look, look at how my hands shake! I couldn't hold a scalpel. Look at the tears in my eyes! I couldn't even watch my own hands as they move. No, no, I couldn't do it!
4. ROBOT: Life will die out.
ALQUIST: Stop it, stop this madness for God's sake! Life probably came to us humans from another world, anyway, stretched out to us with arms full of it. Oh, there was so much will to live. They still might come back one day; they're so close to us, maybe they're surrounding us or something; maybe they want to dig down to us as if we were stuck in a mine. And don't I keep on hearing the voices of people I loved.
DAMON: Take a living body!
ALQUIST: Have some pity on me, robot, don't keep insisting. Can't you see that I don't know what I'm doing any more?
DAMON: A living body!
ALQUIST: And is that what you want, then? Come on, let's get you in the dissection room! Come on, come on, quick! What's this, you're drawing back? You're not afraid of dying, are you?
DAMON: Me? ... Why must it be me?
ALQUIST: Don't you want to then?
DAMON: I'll go. (*exit right*)
ALQUIST: (*to the others*) Take his clothes off him! Put him on the table! Quickly! And hold on to him very tight!

…
ALQUIST: (*rushes in from right, throws off bloody white coat*) I can't do it! I can't do it! God, it was horrifying!

RADIUS: (*in doorway to dissection room*) Cut, sir; he is still alive!

DAMON'S SCREAM: Cut! Cut!

ALQUIST: Take him away, quickly! I don't want to hear him!

RADIUS: Robots can endure more than you can. (*exit*)

ALQUIST: Who's in here? Get out, get out! I want to be alone! What's your name?

PRIMUS: Robot Primus.

ALQUIST: Primus, don't let anyone in here! I want to sleep, d'you hear me? You, girl, go and clean up the dissection room! What's this? (*looking at hands*) Quick, water! The cleanest water you can get!

(*Helena runs out*)

ALQUIST: Oh, blood! How could these hands, hands that loved good work, how could you do a thing like that? My own hands, my own hands! . .. Oh God, who is this?

PRIMUS: Robot Primus.

ALQUIST: Take this coat away, take it out of my sight! (*Primus takes white coat away*)

ALQUIST: Bloody claws, I wish you'd just fly away from me! Go, get away from me! You've killed...

(*from right, Damon staggers on stage cloaked in a bloody sheet*)

ALQUIST: (*drawing back*) What do want in here? Want do you want?

DAMON: I'm ... I'm alive! It is ... better to ... be alive!

(*2. and 3. Robots run in after him*)

ALQUIST: Take him away from here! Take him out! Take him out! Quickly!

DAMON: (*led off, right*) Life! ... I want ... life! ... It is better ...”

Another example of human characteristics in robots (which foil the description of robots in the introduction of the play) is the love shown between Primus and Helena (the robot version). As stated previously, robots are portrayed in the introduction as being unable to love, but by Act Three Primus and Helena are ready to sacrifice their lives for one another.

“**HELENA:** Listen. The birds are singing. Oh Primus, I wish I were a bird!
PRIMUS: What for?
HELENA: I don't know. I just feel so strange, I don't know what it is, I just feel, sort of, light headed, I've lost my head and my body hurts, my heart hurts, everything hurts. ... And I won't even tell you about what's just happened to me! Oh Primus, I think I'm going to have to die!

PRIMUS: Don't you ever think it might be better dead. Maybe it's no more than like being asleep. While I was asleep last night I talked with you again.

HELENA: In your sleep?

PRIMUS: In my sleep. We were talking in some strange foreign language, or some new language, so that now I can't remember a word of it.

HELENA: What was it about?

PRIMUS: I don't know, nobody knows. I didn't understand any of it myself but I still knew that I had never said anything more beautiful in my life. What it was, or where it was, I just don't know. If I'd touched you I could have died. Even the place was entirely different to anything anyone had ever seen in the world.

HELENA: I found that place for you, Primus, why are you surprised at it? People used to live there, but now it's all overgrown, and somehow, no-one ever goes there anymore. Somehow. Only me.

PRIMUS: What is there there?

HELENA: Nothing, a house and a garden. And two dogs. You should see the way they lick my hands, and their puppies too, oh Primus, I don't think there's anywhere nicer anywhere! You let them sit on your lap and you stroke them and soon you aren't thinking about anything and you aren't worrying about anything all the time until the Sun goes down. And then when you stand up it's as if you'd been working and working. Except that I'm no good for doing any work; everyone says I'm no good for anything. I don't really know what I am.

PRIMUS: You're beautiful.

HELENA: Me? Don't be silly, Primus, why are you saying that?

PRIMUS: Believe me, Helena; I'm stronger than all the other robots.

HELENA: (*at mirror*) Me, beautiful? But my hair is horrible; I wish I could do something about it! Out there in the garden I always put flowers in my hair, although there isn't any mirror there or anyone to see them (*leans down to look in mirror*) You, beautiful? What's beautiful about you? Is hair beautiful if all it does is weigh you down? Are eyes beautiful when you close them? Are lips beautiful if all you do is bite them and then it hurts? What is beautiful, what's it for? .... (*sees Primus in mirror*) Is that you Primus? Come here; let me see you next to me. Look at you, your head's quite different from mine, your shoulders are different, your mouth is different... Oh Primus, why do you avoid me? Why do I have to spend all my time running after you? And still, you tell me I'm beautiful!

PRIMUS: You avoid me, Helena.

HELENA: Look at how you've combed your hair! Let me see (*runs both hands through his hair*) Oh Primus, there's nothing that feels like you when I touch you! Let me make you beautiful! (*takes comb from wash basin and combs Primus's hair forward*)

PRIMUS: Helena, do you ever find that your heart suddenly starts beating hard: Now, now, something's got to happen now...

HELENA: (*starts laughing*) Look at yourself!

ALQUIST: (*standing*) Wha.... what's that? ... People? .... Who's come back?

HELENA: (*puts comb down*) What's ever likely to happen to us, Primus?

ALQUIST: (*turns to them*) People? You ... you ... you are people?

(*Helena screams and turns away*)

ALQUIST: You two are in love? People? Where have you come back from? (*touches Primus*) Who are you?

The robots are able to develop enough self-awareness over the course of the play which causes them to revolt. After the revolt, the robots' self-awareness causes them to develop even more complex feelings, such as love, and the will to live. By the end of the play, the robots have "evolved" enough where they act, move, and think like humans. The robots are not able to procreate like humans (though by this point in the play, humans have lost the ability to procreate, and there is only one human left anyway), but they are human-like in every other way. They aspire, dream, love, wish, and care. Whether or not the robots carry on the legacy of humans as robotic-beings instead of human-beings is not discussed in the play, though it is implied by Alquist that the robots will recreate a human-like life-cycle in man's image for as long as they continue to exist on the planet, just as man's life-cycle was created in God's image.

1929-Automata

In the short story, *Automata (1929)* by Sydney Fowler Wright, the author spins a tale predicting the demise of the human race. The author starts out in the present time where a scientist is on his soapbox predicting the apocalypse of humanity. The author then transitions into a future where robots are given the power to control human life. Here, humans live a life of contentment as they do not need to know or do anything as the robots are, by their programming, smarter and can figure everything out. The final act is the dark future originally predicted; the world belongs to robots and we are witness to the fall of possibly the last human being.

The whole concept of the story is quite incredible when considering how early it was written. What makes it incredible is that some of these predictions can be seen today in life and as such it is not a challenge to imagine the end act as a legitimate possible future. Is it really true

that natural evolution calls for the extinction of man and the emergence of the robot as the ruler of the world? This is an interesting question and certainly one that requires further exploration.

The story shows the truth that one of the initial driving forces behind the introduction of machinery is the production of food for settlements. This is a proven fact that the production of human food resources has entered an industrial and efficient phase. The use of machines makes the practice of farmers having as many children as possible in order to have farm resources redundant. By the same token this trend is extended to the menial jobs of the manufacturing industries where the stereotypical generation of steel workers for example has become unnecessary. In an industrial world where repetition and speed of production is paramount, the robot is king. This idea of thinking is predicted by the story to gradually extend to every aspect until children in general are not required and the beauty of human life is not treasured.

In the story this is the main problem with the world. The universe is seen to be a place that follows a constant set of laws that define its operation. How then could a human with the flaw of the random actions that constitute a day in his life fit neatly into such a world? Humans would not survive and as such this is the overall view of the world that we need to avoid in order to prevent the grim end the story presents.

Robots are the natural evolution of machine but not the natural evolution of life. The question then becomes, will the robots eventually be functionally on the same level as a human, capable of performing any task the human desires? At what point do we draw the limit on the tasks the robot is asked to do? This is a serious issue because if robots can do everything and we let them do everything then there would be nothing for humans to do. We cannot all sit around being artists and musicians because eventually life would become meaningless. Without struggle

there is no satisfaction in victory and similarly without hard work there is no satisfaction in the earned accomplishments of life.

1940-Farewell to the Master

In the short story *Farewell to the Master (1940)* by Harry Bates, an alien spacecraft materializes on earth in the near future. An alien named Klaatu and a robot named Gnut exit the spacecraft, only to be attacked shortly after. Klaatu is killed, even though he was peaceful and posed no threat. After Klaatu's death, Gnut, the robot made out of a green unidentified metal, stops moving. The earthlings then attempt to move both the spaceship and Gnut only to find that the unidentified alloy is super heavy as well. After various efforts to enter the spaceship end in failure, an observant reporter by the name of Cliff Sutherland notices that Gnut is not frozen in place, and instead is moving during the night. Cliff hides at the site overnight, and photographs Gnut's movements and experiments. After several nights of this, Cliff becomes terrified of Gnut, since the experiments that Gnut are running seem to be creating clones. Out of fear, Cliff spills the story to the government. The government builds a prison around Gnut (who has gone back to his frozen position during the day) in hopes to contain Klaatu's dangerous sidekick. That night, Gnut breaks out of the prison, takes Cliff, and finds the burial site of Klaatu. It is there he steals the only voice recording of Klaatu on Earth. He heads back to his ship, and uses the tape to create an exact copy of Klaatu. This copy is imperfect however, since the recording is imperfect. Cliff finds a solution to this problem, and finds the original recording equipment for Gnut. Cliff, after handing over the equipment, tells Gnut, "You must do one thing for me. Listen carefully. I want you to tell your master – the master yet to come – that what happened to the first Klaatu was an accident, for which all Earth is immeasurably sorry. Will you do that?" Gnut explains that Cliff does not understand, and, just before disappearing, whispers "*I* am the master."

This short story provides the reader with a very unique view on robots. Throughout the story, Cliff changes his opinion on Gnut. He is at first afraid, however, by the end of the story, he feels bad for the robot, so much to say that, "It was absurd, no doubt, to feel sorry for a robot, a man-made mechanism, but Cliff had come to think of him as being really alive, as a human is alive. He showed purpose and will; he performed complicated and resourceful acts; his face had twice clearly shown the emotion of sadness, and several times what appeared to be deep thought; he had been ruthless with the gorilla, and gentle with the mockingbird and the other two bodies, and he had twice refrained from crushing Cliff when there seemed every reason that he might. Cliff did not doubt for a minute that he was still alive, whatever that "alive" might mean." Cliff changes his relationship with Gnut over the course of the story from robot master – human underling at first, to an equal relationship in the middle, to a robot master – human underling relationship once again at the end of the novel. It is important to note that Gnut is consistently portrayed as a strong, intimidating character, who has the ability to be as fast and strong as he pleases. The reader is coerced into feeling afraid of Gnut during the times Cliff is afraid. Therefore, it can be said that Gnut is portrayed as a master of the humans (even though it is not revealed he is actually the master until the end). Gnut is also portrayed with human-like qualities, such as tender facial expressions when a life is lost. This is a clear hint to the reader that Gnut is not evil, and might be working towards a greater purpose that the humans do not understand. In a sense, it can be stated that Gnut is almost depicted as a god. The humans are at his mercy on multiple occasions, yet Gnut has his own agenda that he alone understands. He chooses to observe rather than fight back, and uses his knowledge to do things that the humans are unable to. The master-slave relationship and the god-like depiction Gnut has are what make him an important robot to observe. It is vital to note that this is one of the first pieces of

literature to include a robot that has a master-slave relationship, but is friendly to humans. It is also one of the first stories to change the depiction and relationship the robot has throughout the story.

1968-Do Androids Dream of Electric Sheep?

The inspiration for movie *Blade Runner (1982)*, *Do Androids Dream of Electric Sheep?* is a futuristic novel written by Philip K. Dick which describes the day in the life of an android-hunting bounty-hunter named Rick Deckard. In the novel, androids are seen as helpers to humans, and are given to families as an incentive for them to migrate from post-war Earth to Mars. Some androids refuse to be helpers to humans, and instead attempt to integrate themselves into human society by posing as humans using false memories. Deckard's job is to eliminate these androids. Throughout the day, Deckard's attitude changes from "hopeful and optimistic" to "morbid and apathetic". Upon his arrival at work, he finds that the previous lead bounty-hunter, Dave Holden, has been hospitalized by one of the newest human-like androids, called a Nexus-6. In fact, the android that hospitalized Holden was only one out of a group of 8 rogue androids attempting to pass as humans on post-war Earth. Holden eliminated two androids before he was hospitalized, and Deckard is assigned to eliminate the last six androids as soon as possible. At first, Deckard has a drive to eliminate the androids. During his confrontation with the company in charge of building the Nexus-6 androids, he almost fails to identify a Nexus-6 model android named Rachel Rosen using his Voight-Kampff scale test (to measure androids' response rates in comparison with humans' response rates). He eventually notices that she describes animals as "a thing" or "it", instead of a normal human empathetic response of "he" or "she". He confronts the owner of the company, who confesses that she is an android, but has false human memories which make her almost seem real. Rachel offers her help in destroying the androids, but Deckard refuses. He goes on to eliminate the android who hospitalized Holden,

and another who poses as a Chief Inspector named Garland. At this point, Deckard befriends another bounty-hunter named Phil Resch, who helped to eliminate Garland once he realized his commanding officer was an android. Before he was destroyed, Garland secretly mentioned to Deckard that Resch was an android as well, and that he couldn't be trusted. This plants the first seeds of doubt in Deckard's mind as to whether or not he could eliminate a friend (Resch) even if he were an android. This fact begins to create a rift between the two bounty hunters. Resch and Deckard continue their hunt, until they confront the next android, an opera singer, who had previously escaped Deckard's grasp. After her elimination a key scene takes place after Deckard tests Resch to see if he is an android.

> Wake up and face yourself, Deckard. You wanted to go to bed with a female type of android – nothing more, nothing less. I felt that way on one occasion. When I had just started bounty hunting. Don't let it get you down; you'll heal. What's happened is that you've got your order reversed. Don't kill her – or be present when she's killed – and then feel physically attracted. Do it the other way.' Rick stared at him 'Go to bed with her first ... and then kill her,' Phil Resch said succinctly. His grainy, hardened smile remained. You're a good bounty hunter, Rick realized. Your attitude proves it. But am I? Suddenly, for the first time in his life, he had begun to wonder.

Deckard returns home questioning whether or not he will be able to eliminate the final three androids, only to find that he has been ordered to eliminate them all that night (since the androids would have more time to hide if he slept). He then finds out that one of the three androids is the same Nexus-6 model as Rachel. Exhausted, he asks for her help in eliminating the final androids. Deckard ends up sleeping with her, and Rachel reveals that no other bounty-hunter other than Resch has been able to eliminate an android after going to bed with her. Deckard ignores her, and finds the strength to eliminate the last three androids, all of which are hiding out together. Now dawn, Deckard returns home to his wife, and passes out from exhaustion.

One of the most important things to pull away from this novel is Deckard's views upon the androids. Deckard views male androids without any sympathy whatsoever, and has no problem killing them when necessary. His weakness comes from attractive female androids. He feels empathetic toward attractive female androids, and has difficulty terminating them. After he sleeps with Rachel, his attitude changes, and he is able to terminate the rest of the androids since he has "gotten it out of his system" so to speak. Another important note is the drastic difference in the relationships between the androids on Mars with humans, and the androids on Earth to Deckard. The androids on Mars have a slave-like relationship with humans whereas the androids on Earth have an equal and almost superior relationship with Deckard.

1982-The Complete Robot

Isaac Asimov (January 2, 1920-April 6, 1992) is fondly remembered by many for his vast number of science fiction stories. A majority of these stories, combined in the collection called *The Complete Robot (1982)*, revolved around robots and other automatons. He found the constant stories about robots turning against their masters unrealistic, realizing that anyone who would create such a machine would add safeguards to prevent such a disaster. As such, he invented the Three Laws of Robotics, which have been reused repeatedly in modern stories containing robots.

A large majority of Asimov's stories take place in an alternate version of the 21st century. Many stories revolve around the struggles of U.S. Robots and Mechanical Men, a company founded in 1982 to develop, manufacture, and deploy robots. Due to the anti-robot sentiments of the population, robots are only functioning in the U.S. Robots factories and outer space. There are several recurring characters in his short stories, such as Dr. Susan Calvin (a robot

psychologist who works for U.S. Robots), and Powell and Donovan (a pair of field testers for U.S. Robots who frequently troubleshoot malfunctioning robots).

The three laws are Asimov's most lasting legacy. They made the idea of robots being less hostile towards humanity much more popular. The first law prevents a robot from harming a human, either directly or indirectly. The second law requires the robot to follow any orders given from a human, as long as it does not violate the first law. The third law requires the robot to protect itself, as long as such an action would not violate the other two laws.

Many of Asimov's stories explore these three laws and the ramifications they have. Several stories involve unintuitive interpretations of the laws, such as in *The Evitable Conflict (1950),* where several supercomputers intentionally malfunction in order to get several corrupt officials fired. The supercomputers justify a small amount of harm befalling a few people to prevent a large amount of harm to befall a large number of people.

In some cases, robots are required to work around the laws. In *Evidence (1946)*, Stephen Byerley is running for Mayor of New York, but his opponent, Francis Quinn, begins a smear campaign, claiming that Byerley is a robot. In the end, he removes any doubt by punching a heckler who taunted him into doing so during a speech. However, Dr. Calvin later questions him about the incident, suggesting that a robot would not break the first law for punching another robot.

According to the Oxford English Dictionary, Asimov was the first person to use the word "Robotic" in his 1941 story, *Liar! (1941)* He used this word assuming that it actually existed, based on the word robot (which has existed since *Rossum's Universal Robots (1921)* was published) and the suffix -ics for "practice of", like mechanics, mathematics, or physics. (White,

Michael (2005). Isaac Asimov: A Life of the Grand Master of Science Fiction. Carroll & Graf. pp. 56. ISBN 0-7867-1518-9.)

The treatment of robots varies between Asimov's stories. In a majority of them, however, they are used as a combination between willing servants and companions. Most stories have robots doing menial work for the humans, but people generally treat their robots kindly. In *A Boy's Best Friend (1974)*, a father tries to replace his young son's robotic dog with a real one, but the boy refuses the replacement. In *Satisfaction Guaranteed (1951)*, Claire Belmondt is chosen to field test a household robot, TN-3. The robot tries very hard to cheer her up, eventually gaining her affection. However, when TN-3 tries to hug her, she panics and screams. This confuses TN-3, who was trying to help her, but broke the first law in doing so by making her panic.

Asimov, despite writing the three laws, occasionally wrote about robots attacking people, usually due to the three laws being changed or removed completely. An example of the latter appears in *Sally (1953)*, where an elderly Jake Folkers cares for "retired" cars with robotic brains (which are not equipped with the laws). He is greeted by Raymond Gellhorn, a man who plans to buy the cars off Folkers in order to sell them for profit. Jake does not trust Gellhorn to care for the cars, and refuses the deal. When Gellhorn comes back in the night to take the cars by force with a group of thugs, the cars chase them away, and the bus Gellhorn came in on runs him over. Folkers no longer trusts the cars, knowing they can attack humans.

The Bicentennial Man (1976), one of Asimov's last robot-based short stories, is also what he feels to be his most significant. The story takes place in the distant future from the rest of the works, where robots are begrudgingly accepted by society. Andrew, a robot owned by the Martin

family, expresses skill with carpentering, and is encouraged by his family to pursue his hobby. His skill develops, and he earns a small fortune selling furniture and sculptures. Realizing that he is not much different from a human, he begins a quest to become human. Assisted by different generations of the Martin family, he slowly replaces his electronic parts with organic ones. When he finally gets a biological brain, abandoning his "immortality," he is accepted as a human being. He dies shortly after, on the two-hundredth anniversary of the start of his conversion.

Written Works of Literature Summary

Overall, these books (and short stories) about robots cover a broad range of relationships that robots have with humans. Robots in these stories have been slaves, companions, equals, and masters. Generally, it can be noted that robots who exemplify slave-like relationships with humans can generally be classified as "good guy" robots. These robots are usually on the side of the protagonist, and are there to serve and protect them. There is no era-specific trend in these types of robots as they all appear frequently and in a very similar way throughout the years (in both books and movies). There are also very few stories where the slave robot happens to be evil. The robots that fit this description are sidekicks to the evil villain of the story, however there are very few stories with this scenario. This point implies another important aspect of the human-robot relationship: the converse of "good guy" slave robots. Almost all of the robots who demonstrated a superiority complex to humans were evil. Robots that put humans out of jobs, robot overlords, robot antagonists all appeared to be the masters of humans.

Farewell to the Master (1940) is one of very few stories where robots were inherently good and were portrayed as a superior. We specifically ran into one of these stories. In this case however, the reader is made to think that Gnut may indeed be evil and simply following orders. By the end of the story the reader understands that Gnut is the highest power, and has been

acting with the best intentions. Again, there is no real specific trend through time for these types of robots other than their similarity. It can be noted, however, that the type of superiority changes throughout the years. Robots at first (the 1920s) can be seen as masters to humans due to their removal of jobs that humans can perform (*Automata (1929)* for instance). There is strong evidence that this could be directly related to the Great Depression, since movies during the following two decades also portray robots in the same manner (for robots that are masters of humans). Later on, as the intricacy of technology increased, robots that were portrayed as masters of humans changed. They were no longer masters of humans through their removal of jobs, instead they were masters of humans due to their superior ability to compute and calculate (*Farewell to the Master (1940)* for instance). Robots who could calculate quicker and with greater accuracy than humans were generally portrayed as being superior to humans, since many times they were able to "think". These robots were better than humans as they could think better than humans due to their superior ability to calculate. Since technology was on the rise during this time (1940s – 1990s), it makes sense that these types of superior robots were based on superior technology. In the present era, master robots are depicted in science fiction as beings which can think better, act better, are stronger, faster, and overall greater than humans. Robots (as masters to humans) in these books (and movies) are ones such as the Terminator: greater than humans in every possible way. There is also strong evidence that this metamorphosis in the depiction of master robots happened as technology was more accepted throughout the years. As robots became widely accepted as workers in industrial plants, or even as technology began to be accepted worldwide as a substitute for humans (robot co-pilots, vacuum cleaners, and even simple calculators), authors and directors needed to find a new type of robot villain that could strike fear into humans. For example, if robots became widespread in such a way that the

frequency of robots paralleled *I-Robot (2004)*, then that particular movie would not seem as scary, nor would it be as interesting. Once people accepted that robots were helpful in the workplace, those types of master robots were no longer terrifying. So, therefore, as technology gets better and better (and as it begins to match science fiction), authors and directors will have to find even more creative ways to make robots seem terrifying to humans.

Interview Results and Discussion

We set out to interview some of WPI's top resources in the field of robotics in hopes that they might provide us with a more detailed version of why humans imagine robots. These people were so passionate about robots; we felt it would be extremely beneficial to determine why they imagined robots.

Interview Hypotheses

We hypothesized that all of these people (professors in the Robotic Engineering Program at WPI) may have similar ideas, thoughts, and feelings toward robots. We also hypothesized that many of their answers would be similar in answering the following questions: "What do you think is the most important development in the robotics field in recent times (last 10 years)?", "What do you think will be the most important development in the robotics field in the next 25 years?", and "In your opinion, how will robots change human activities and lifestyle in the coming years?" We felt that these questions might provide us with a slight idea as to what people who are passionate about building, creating, and using robots might feel towards robots, as well as why they imagine them in the first place.

Interview Analyses

Since our data set was relatively small and straightforward, no real numerical analysis could be made. The responses to the interviews can be found in Appendix G. As we expected,

many of the responses we received for each question were significantly similar. A few robots such as Robby the Robot, the MO-GOAT, and "Moonraker" were mentioned multiple times. When asked, "What do you think is the most important development in the robotics field in recent times (last 10 years)?", 5 out of the 6 professors we interviewed responded similarly, stating that they felt that the price reduction in robotic parts coupled with the increase in the sophistication of sensory ability and computational power of robotic parts were together the most important development in the robotics field recently.

When asked, "What do you think will be the most important development in the robotics field in the next 25 years?" all 6 professors agreed: some form of autonomy. For some, it was total autonomy, so much that people could develop caring relationships with the robots, or discover why we are self-conscious, or even just to complete basic jobs and everyday tasks. One of the most interesting responses for this question came from Kenneth Stafford, an ME Professor and the Director of Robotics Resource Center at WPI, who stated, "Neural-based processing - artificial learning. Today, robots follow directions. In 25 years, I believe robots will follow intentions."

Only a couple professors stated that they thought that robots would not have total autonomy. Robert Lindeman of the CS/IMGD Department at WPI, who is also a Robotics Assistant Professor, said:

> Robotics is so broad. I think miniaturization. Tiny, nano-bots that can work together to repair things in your body. With high levels of autonomy, yeah. Not total autonomy. Total autonomy scares me a bit. I think that's a difficult problem that really requires solving problems in all three - mechanical, electrical, and computer science. The independent problems are tough, and all three are tougher, but the payback is pretty big. With swarms, I don't think it needs to be just for health care.

Professor Michael Ciaraldi, a CS Professor (of Practice) and Robotics faculty member at WPI, stated:

> I'm sure there will be advances in hardware, but I'm going to guess more important advancements in software. Artificial Intelligence and Autonomy to the point where you will fairly routinely see robotic workers out in the real world. Out in fields, harvesting crops, or on a construction site, things like that. You already have the carts going around the hospital delivering drugs and supplies. Punch in order, cart goes to pharmacy, pharmacy loads drugs, cart delivers drugs to correct room. The autonomy in that is not very complex, but it's complex enough that people let them wander around by themselves. Will you see them driving down the street in 25 years? I would guess not, but you might see them walking along the sidewalks. I wouldn't doubt that you'd see robot deliveries out on the sidewalks. Maybe the postal service will have the letter carrier with a robot following along carrying the mail.

Together, all of the professors mentioned that robots would achieve some form of autonomy, or that humans would develop some type of artificial intelligence for robots, and that it would be the most significant development in the robotics field in the next 25 years.

When asked, "In your opinion, how will robots change human activities and lifestyle in the coming years?" all 6 professors mentioned that robots would make humans' lives easier through some sort of autonomy. Interestingly, the robots that were mentioned covered a spectrum of possibilities, where robots could do anything from menial tasks like vacuuming to saving lives through bomb defusing.

Interview Conclusion

All of our hypotheses were correct for our interviews of WPI's top minds in the field of robotics. All of these professors seemed to think relatively similarly when it came to imagining robots. This supported our main hypothesis that people with similar experiences involving robots tended to think of robots in a similar way, with the only changes being based off of their personal experiences.

We also gained some valuable insight into the direction in which the field of robotics is heading. From the responses we can see that autonomy is the next frontier. This growth will continue to depend on the development of new technologies which help to make the creation of the robot as envisioned in Science Fiction possible. For example the invention of the silicon chip and micro-circuitry have greatly helped in the realization of the creation of a human-like robot. Therefore it can be seen that the dream of creation has long since been established but that the roadblock to its realization is the development of the necessary technologies.

Survey Results and Discussion

To further assist in answering the overall question, why humans imagine robots, a survey was conducted asking members of the WPI community about their experiences with robots and their thoughts on their future potential. It was believed that with this information, it would be possible to learn why robots are liked or disliked by people, and use this information to find trends which may lead to answering why people imagine robots. The survey method chosen was to email all of the WPI community members with a link to Survey Monkey where the survey could be found. The survey was posted for three weeks and a total of 350 responses were collected, of which 274 (70 Generation X, 204 Generation Y) were valid (the remaining responses were either incomplete or did not answer the question).

Survey Hypotheses

Upon creation of the survey questions, we hypothesized that there would be differences in the types of responses we received based on the major, age, and gender of the surveyed. We expected that the trend within age groups, major groups, and gender groups would become apparent within the set of questions. It was hoped that the survey results would either corroborate or disprove our assumptions.

We predicted that age would have the greatest effect on the responses to the survey or in other words, why and how people imagine robots. We hypothesized that the functionality tasks would become more selfish as the surveyed got younger. This hypothesis was mainly due to the generation gap and the loss of values over time. In this cycle, which resets every three generations, the Baby Boomer generation was extremely hard-working, and they pushed their values on Generation X, only about half of which took those values to heart. Generation Y only received about half of those hard-working values themselves, making them only about one-fourth as determined as their grandparents.[1]

Similarly, based on the generation gap we hypothesized that Generation Y would be more likely to mention that they felt a certain way towards robots based on how they saw them portrayed in movies, books, television shows, etc. This was due to the fact that nowadays teens consume a lot more mass media in comparison to previous generations. We also hypothesized that those in Generation X may have different ideas as to what relationship robots could have with humans (in the future) than Generation Y. We were not sure what difference there would be, just that one might become apparent.

Another hypothesis was made based on the person's major of study. In this regard we expected Robotics Majors to have a different approach to their answer when compared to someone with a Biology Major. In a similar light we anticipated that there might be a trend within gender groups, where males and females might have different reasons as to how and why they imagined robots. This hypothesis was based on the fact that there are so many issues in society where, based on gender, the person's point of view is completely different.

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[1] Source: http://www.businessweek.com/1999/99_07/b3616001.htm

Robot List

From the survey results we were able to compile a list of robots toward which people associated their general feelings. This was done in order to see what patterns would emerge (if any). Due to the large number of people who gave a positive viewpoint towards robots (in comparison to negative responses), most of the robots on the list are generally friendly and helpful in nature. The major examples of this trend were: *Wall-E (2008)* (38 positive responses), the robots from the movie *I, Robot (2004)* (26 positive responses) and the *Star Wars (1977)* Duo of C-3P0 and R2-D2 (22 positive responses). These are not all together surprising results, as *Wall-E (2008)* is the most popular recent film with a robot as the main character. In the movie, he is portrayed as an adorable robot that carries out his orders to precision as he recycles the ruins of the city. He also is portrayed as being capable of having emotions, as he falls in love with another robot called EVE. This makes for a wholesome Disney-themed plot that has no real negative connotations. Similarly, in the past, the *Star Wars (1977)* robots carried this torch. Helpful, obedient, and occasionally funny, the world could not help but fall in love with these characters.
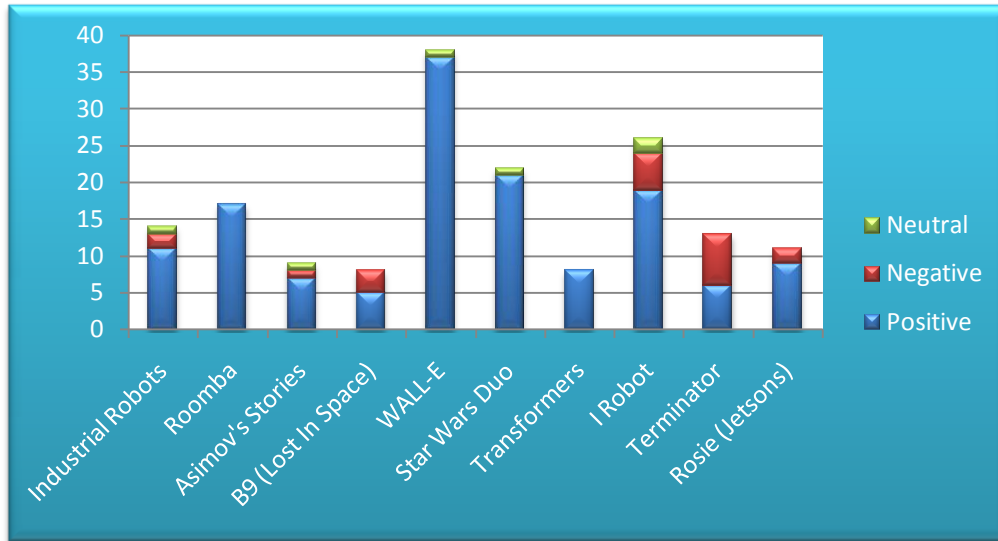
Figure 12: Graph of Robots with More than Six Responses

On the other hand, the list also contains the robots that people first thought of in association with a negative connotation towards robots. The Terminator garnered the most negative responses, followed by B9, the robot from the *Lost in Space (1998)* franchise. These can both be grouped as killer or military robots, which, in some cases, are the exact words that some people used. In the *Terminator (1984-2009)* movies, the robots were portrayed as evil and seeking the destruction of man. As such, it is only logical that they would breed a negative perspective in the mind of the audience.

From both the positive and negative robots listed, we can see that there appears to be a strong link to how people feel about robots and how the robots are portrayed in movies. There were of course some outliers to this theory where a person with negative connotations listed an innocent robot such as the maid Rosie (from *The Jetsons (1962)*). While at first this would seem odd (the general view of Rosie is a harmless robot), in this case the surveyed person would later go on to say that they didn't like robots because they would do everything for humans, making humans become complacent. A logical explanation was not always possible, but for the majority

of the responses the theory that the robot's portrayal in the media had a link to how a person felt overall towards robots remained true.

Positive/Negative Connotation

When members of the WPI community were asked, "Personally, why do you feel either a positive or negative connotation towards robots?" the general consensus leaned in the direction of one specific answer: "robots should perform tasks for humans". Specifically, a large percentage of Generation X felt a positive connotation towards robots since they could be used to help humans with everyday tasks. The same could not be said for Generation Y.

The data for this question was a bit more widespread, with three responses being mentioned the most. The number of people in Generation Y who answered that they felt a positive connotation towards robots since they could be used to help humans with everyday tasks was slightly larger than the number of people who answered either of the other two responses. These other two responses were: "instinctual", and "how robots are portrayed in media". "Instinctual" received the second-most responses. This response was based on people's first instinctual feeling as to why robots are positive or negative. Responses in this category would be, "I feel positively towards robots because they are cool", or "I don't like robots since I think they could possibly take over one day".

The third most popular response was "how robots are portrayed in media". This response was taken from people who mentioned "I think robots are evil since lots of movies show them that way", or "The robots I've read about in science fiction lead me to believe they are generally good." These people feel either positively or negatively towards robots based on how robots are portrayed in any general media such as movies, TV, and books. It is interesting to note that the majority of negative responses for Generation Y were for "how robots are portrayed in media"

(12 negative responses). The second-most and third-most negative responses were for "instinctual" and "robots should perform tasks for humans" respectively (9 and 6 respectively).

In the case of Generation X, there were 6 negative responses for "robots should perform tasks for humans", 5 negative responses for "instinctual", and 4 negative responses for "how robots are portrayed in media". There is not enough data on Generation X to conclude that there has been a change in how the media portrays robots over the years. Based on the statistics, it seems that robots may be portrayed more negatively in American culture today, compared to previous decades. However as previously stated, there is not enough data on Generation X to prove that is a definite conclusion.

Other responses that were notable (though did not receive a large number of responses) were: "bring imagination to life", "perform professional jobs", and "humanitarian". Responses in the "bring imagination to life" category followed the trend of mentioning that "robots are extensions of a person's creativity". Most responses in this category were positive, especially in the RBE, CS, and ME majors for Generation Y. Very few people (2 positive responses) in Generation X had this type of response. Responses in the "perform professional jobs" category were based off of those who mentioned "robots could be built to work with humans doing specific jobs". This may seem similar to the "robots should perform tasks for humans" category; however those in the "perform professional jobs" category mentioned that robots would be working in a rather symbiotic relationship with people, where robots would be considered equals and could hold high-end jobs.

The "robots should perform tasks for humans" category was geared mainly towards robots performing menial tasks for humans, in a relationship where robots could be considered as

tools or slaves to humans. The last category, "humanitarian", included responses where the person stated that the robots could be used for the betterment of mankind, such as space exploration, medical research, and general safety and healthcare. All of these last three responses were about equally widespread within each generation, though the "humanitarian" category received more responses from Generation X, and fewer responses from Generation Y.

First Memories

The surveyed were asked to recall what their first interaction or memory of a robot was. This was done to see if there was a correlation to their current attitudes towards robots and their first interaction with a robot. Similar to the Robot List, the *Star Wars (1977)* robots were by far the most popular. This was not surprising, given the majority age of the people surveyed, and the fact that when they were young and impressionable *Star Wars (1977)* was extremely popular with a cult-like following. What was surprising was the number of people that were familiar with the robots in Isaac Asimov's stories. It seems that Asimov's writings were indeed an integral part of robot history as it was not only being read for pleasure but also in the classrooms. It is interesting to note that most people who listed toys as their first memory went on to justify why they like robots later in the survey by saying, "they are just cool" (an instinctual response). Similarly, people who had participated in Robotics Competitions often fell under the category of wanting to "bring imagination to life".
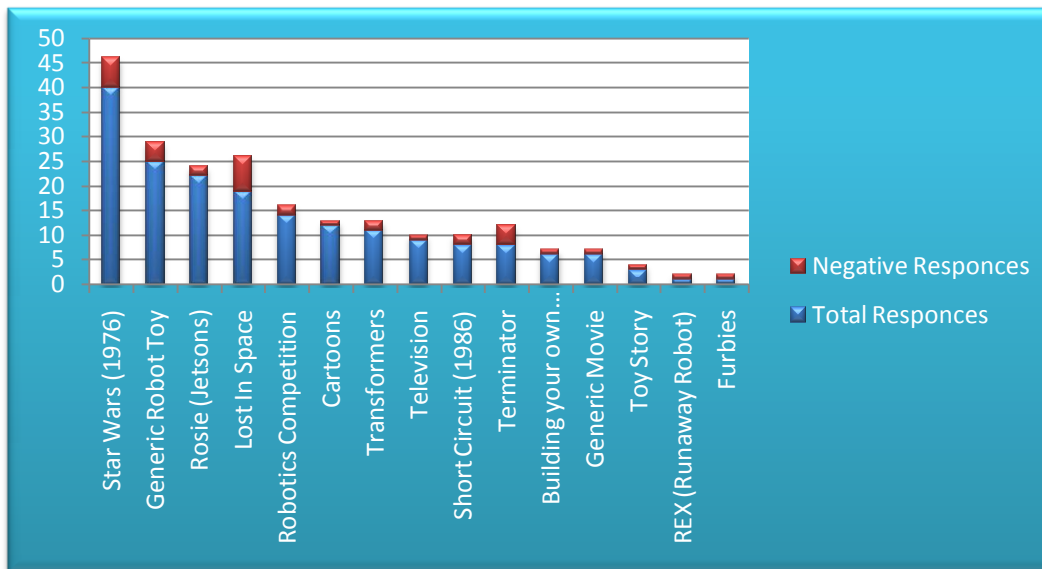
Figure 13: Graph of Robot Reponses that had a Negative Response , Sorted by Total Responses

In terms of people with negative connotations toward robots, the majority of their first experiences were with robots that society considers as being evil. B9 from *Lost in Space (1998)* (7 negative responses out of 19 total) and the Terminator (4 negative responses out of 8 total) were the receivers of the most negative votes relative to their total responses. With this in mind, it is fair to assume that these first memories had some psychological effects on the surveyed people which caused them to not trust robots. Of course, the opinion of a person can drastically change over time depending on what types of elements they are exposed to. However, from this data we can make the assumption that if a person's first interaction is a negative one, they will harbor negative connotations towards robots in the future.

Future Relationships

The survey results concerning relationships between humans and robots in the near future were categorized into a few general categories to help show specific trends in the data. The categories we discovered as specific trends within the data were humans having relationships with robots as tools, robots as equals, robots as companions, and robots as superiors. The majority of relationships that people mentioned having with robots were robots as tools for

humans to use, or robots as slaves to humans. The second most popular response was robots as equals, working with humans in a mutually beneficial manner. The next most popular response was robots as companions, which included robots in a pet-like role, or otherwise more for social purposes than hard work. Finally, few people predicted that robots would become superior to humans. Age and major did not have a large effect on these results.

A total of 218 out of 277 people predicted that robot would be used as tools in the near future. Of the 218 responses, 185 people felt positively towards robots and 33 people felt negatively. Participants who gave this type of response see robots not as another being, but an object used to accomplish a specific task. Whether the robot is doing a dangerous, difficult job or simply something repetitive, they are used as a tool.

A total of 32 out of 277 people predicted that robots would be considered equals in the near future. Of the 32 responses, 27 people felt positively towards robots, 4 people felt negatively, and 1 person felt indifferent. Participants who gave this type of response see robots as another, equal being. They see humans and robots working together in mutually beneficial situations.

A total of 22 out of 277 people predicted that robots would fill a role of companionship in the near future. Of the 22 responses, 16 people felt positively towards robots, 5 people felt negatively, and one person felt indifferent. Participants who gave this type of response see robots as something to accompany humans, with very little independence, similar to a pet.

A total of 5 out of 277 people predicted that robots would overtake humans as the superior race on Earth in the near future. Of the 5 responses, 3 people felt positively towards robots and 2 people felt negatively. There were two types of responses in this category. Some

responders were afraid that technology would cause robots to surpass human intelligence, and remove humans for being inferior. Others saw this as a good thing; robots would be superior to humans, but still benevolent, protecting and guarding humanity, despite their superiority.
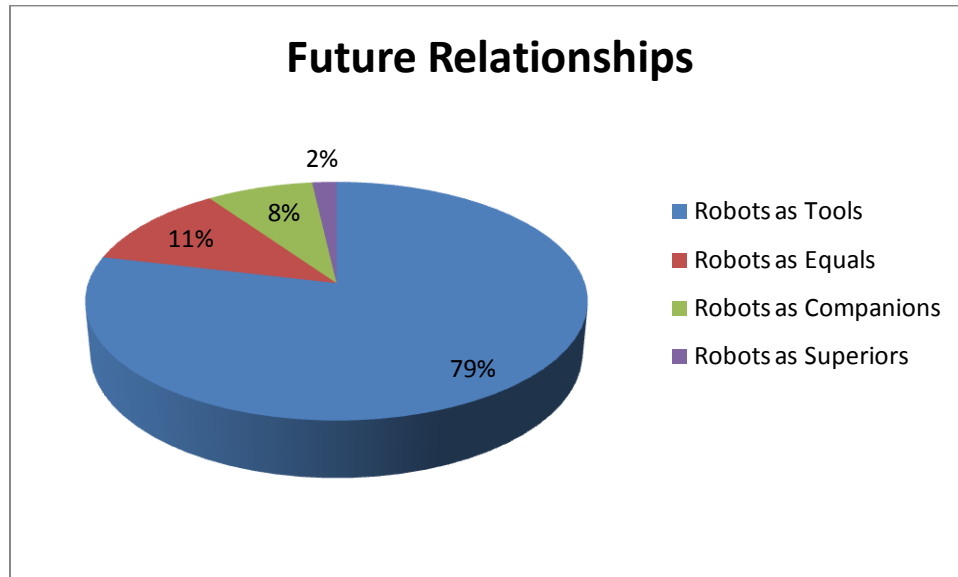
Figure 14: Future Relationship of Robots Distribution (Generation X + Y as no Major Variance Within Groups)

Hypothetical Future Robot Functions

The final portion of the survey involved a hypothetical scenario: if the participant could create a robot, given unlimited resources and any imaginable technology, what would the robot do? Among survey participants, the answer was overwhelming. A majority would use the robots for menial tasks, or entertainment. Among the 71 Generation X participants, 43 would use their robot for menial work and entertainment, and 16 would make a robot suitable for dangerous tasks, 7 would make a robot to serve humanity as a whole, and 3 would make a robot as a companion. Among the 203 Generation Y participants, 114 would use their robot for menial work and entertainment, 31 would make a companion robot, 30 would make a robot to serve humanity as a whole, and 27 would make a robot suitable for dangerous tasks. Interestingly,

despite not presenting the option, 3 people would decline their opportunity to create a robot. Two of these responses were due to fearing robots.

These results mirror the responses in the other parts of the survey – most people see robots in the role of a tool to assist humans in various tasks. Robots are to be used to do work that humans do not wish to do, whether the reason is the tedium of the task or the danger involved. Robots are seen as something that can do a job in a human's stead, allowing the human to do something more interesting or less dangerous.

Survey Conclusion

In the end the survey proved to be an interesting tool in the analysis of the question why people imagine robots. It managed to prove some of our prior beliefs while also disproving ones that were unsupported. Of course these summaries are not conclusive due to the small nature of the survey. For more general results a much larger survey would be necessary to draw a concrete conclusion, but that is far beyond our scope. Our mini survey served its purpose, which was to give us a general feel of why people at WPI imagine robots.

At the start of the survey we made many hypotheses about the results. The major one was based on age and as we anticipated, many more adults felt that robots could be used to help mankind or do dangerous jobs. This is most likely due to the values they received from the Baby Boomer generation. Interestingly, the majority of those in Generation X who do not have a college degree felt that robots should be used in doing menial tasks for them (usually because they were "too lazy to cook or clean"). This break in trend can be explained as being that these people may be the ones that did not receive the hard-working values of the previous generation, a simplification made since they did not receive a college degree, and as a result may have more selfish desires.

Accordingly our hypothesis held true for Generation Y as the majority of responses wanted robots to perform menial tasks for them. We predicted that this would happen since most people in Generation Y do not have the same diligent values as their parents and especially their grandparents. The data proved that our hypothesis for a trend within age was correct for our functionality question. To our surprise, this trend proved to be sharply visible within the data.

In regards to the robots mentioned in association with good or bad connotations, a trend was not as clear. The types of robots listed were slightly affected by age since older people

tended to mention older historical robots, but there was not enough data to prove that age made a difference in the types of robots listed. We similarly expected a trend in age to occur with why people felt positively or negatively towards robots but this also was not clear.

We hypothesized that Generation Y would be more likely to mention that they felt a certain way towards robots since that was how they saw them in movies, books, TV, etc. As the data show, more people in Generation Y mentioned that movies and books were the main influences as to how they thought about robots. We did not expect that even more people in Generation Y would give responses solely based on instinct. This may be due to the laziness of the younger participants; they may have not given much thought to their answers.

In terms of the future of robot relationships we were surprised to discover no real trend with respect to age for this question, as the majority of both age groups all answered that "robots would become tools or slaves for humans". Therefore, most of our hypotheses were correct: age (and quite possibly and maybe even more importantly values) has an influence on why humans imagine robots.

We hypothesized that there is a correlation between one's choice of major and their opinion of robots. Unfortunately, there seemed to be little evidence that this hypothesis was true. This may be due to the lack of data however, as we did not have large enough numbers to determine that RBE majors (for example) thought that humans would have different relationships (with humans in the future) than ME majors. The same followed for each question; we were unable to determine that there were specific differences within each major. The data suggest instead that each person's answers were based off of their personal experiences, which is important to note.

The final hypothesis was based on gender. Here it was anticipated that there might be a trend within gender groups, and that males and females might have different reasons as to how and why they imagined robots. The response rates were about equal, with 55.4% of the surveyed being male and 44.6% of the surveyed being female. However, this hypothesis proved to be incorrect, as there was no real trend between the two genders. Once again, why and how people imagine robots seemed to be based off of their personal experiences and influences in life.

Summation of Takeaways

Robot Responses

- *The Terminator (1984)* and *Lost in Space (1998)* received a disproportionate amount of negative associations
- The *I, Robot (2004)* and Asimov Stories in combination received the most neutral votes which is not surprising as they present robots in a neutral light
- *Wall-E (2008)* received the most amount of votes which is probably due to its recent release and popularity
- *Transformers (2007)* received a surprisingly small amount of votes possibly due to the way they portrayed in the new action films where they don't embody good connotations as *Wall-E (2008)* does
- Interestingly, the Roomba, a vacuum cleaner, gained a high level of responses probably due to its functionality

Why Positive or Negative

- The general consensus leaned in the direction of one specific answer: "robots should perform tasks for humans"
    - This may be due to the lack of work ethic in Generation Y, as each generation only obtains about half of the values of the previous generation.
    - Many people in this category mentioned the robots doing tasks for them such as cleaning and cooking, because "they were too lazy". This strengthens the previous point.
- The majority of negative responses for Generation Y were for "how robots are portrayed in media" (12 negative responses)
- Most responses in the "bring imagination to life" category were positive, especially in the RBE, CS, and ME majors for Generation Y.
- Based off of the statistics, it seems that robots may be portrayed more negatively in American culture today; however there is not enough data on Generation X to conclude that there has been a change in how the media portrays robots over the years.

First Memory

- From graph of responses you can see that a disproportionate amount of negative first memories are attributed to *Lost in Space (1998)* and *The Terminator (1984)*
- In terms of negative to positive ratio of response *The Terminator* is on top at 1:1
- The greater the number of votes a movie received the greater the probability of also receiving negative votes
- *Star Wars (1977)* received the largest number of votes, both positive and negative, but still only had 1/9 negative votes
- Ignoring *Star Wars (1977)* In general People with a negative point of view had a negative robot as their first impression
- Persons with negative first impressions seemed to harbor a feeling of mistrust towards robots

Relationship

- Most people see robots as nothing more than a tool. Their purpose is to serve humans in any tasks or replace humans from dirty, dangerous, or tedious jobs
  - One other reason why people said robots are just tools is people don't want robots to be anything more than a tool or people are afraid that robots might surpass the intelligence of humans
- People who sought companionship from robots seemed lonely and they seemed to want robots to either accompany them or take care of them with undivided attention
- Very few people said robots are superior to humans and those who did seemed to be just narrating a movie scenario
- Although most surveyed persons had positive connotation toward robots, the surveyed connotations of a robot did not seem to have affected how they viewed future relationships between humans and robots

Conclusion

Robots as Slaves

Why do humans imagine robots? Is it possible that we imagine them because of our desire for cheap labor? In the early American days, such as the 1920's, robots were primarily depicted as being slaves. They were programmed to be obedient and to simply follow the commands of their masters. They were very self sufficient, requiring little maintenance and care. They were also capable of doing jobs that would be impossible for humans. A good example of this type of robot is the Golem from *The Golem (1920)*. The Golem is a clay "robot" that is able to fight for the Jews who are not strong enough to fight on their own. After awhile though another trend emerges, the trend of rebellion as the Golem tries to kill his master. In this film it was sparked by the fact that the master's tasks began to become evil in intentions. This however is just a prelude to a more sinister reason for rebellion.

The theme of slavery though is a valid one given the social context of the nation. Human slavery was abolished in the 1860's but segregation was still in full swing and did not end, legally, until the 1960's in the United States. As such slavery was still a relevant topic and it is not a stretch to imagine robots as being the new form of slavery. The movie *Blade Runner (1982)* is a good example of this concept, as the robots are created to do dangerous jobs for humans. However, even though these robots are virtually indistinguishable from humans they are not afforded the same rights and protection. They are simply considered as a form of labor and nothing more.

Slavery has existed ever since the implementation of agriculture which was about 11,000 years ago. In order to claim a human being as one's property, many wars have been fought and many lives have been taken throughout the course of history. It seems all human beings hate

doing dirty, dangerous, and tedious works so it is makes sense for humans to desire someone to unquestioningly perform the works for them. In a society where slavery is not allowed, it is only natural for humans to find something to replace the human slaves, in this case a robot.

Robots as Dominators

From the start the theme of rebellion among robots is popular in films and for good reason as fear sells tickets. The justification for this apprehension however shifted from imagination based to reality based with the implementation of industrialization. Here the great fear became that robots, in the form of industrial machines, would supplant the services provided by humans. A good movie that illustrates this fear is *Modern Times (1936)*. This movie was released just 3 years after the end of the worst period of the Great Depression whose effects lingered until the American entrant into World War II in 1941. Therefore the fear of job loss and by association robots, had some real life justification. This is ironic as the driving force behind the creation of robots at this point was to do repetitive and dangerous jobs but in this social climate people were fighting to keep these jobs which in the past were generally loathed.

Another social theme at this time is the treatment of people in general because of the scarcity of jobs. As *Modern Times (1936)* shows, workers are forced to work at an inhuman pace in order to maximize productivity. The people work for long hours with minimal breaks and at a hectic pace, a situation that is interestingly referred to as working like a robot.

This fear of robots mutated over time back to the idea of them taking over the world in a general sense. People became tired of mindless robots depicted in early films and, as such, the cinematic robots became smarter, more calculated and sinister. This was the era of a slew of movies that used the robot to inject fear of the destruction of the entire human race, a prime example being GORT from *The Day the Earth Stood Still (1951).* There were so many movies of

this nature that the film market became saturated and the trend of robot domination became a dull experience.

The idea of robots as superiors is something that can be seen most often in movies and books. Most often, these robots are evil, and concoct some plot to get rid of humanity. Movies such as the *Terminator Series (1984-2009)*, *I, Robot (2004)*, and the *Invisible Boy (1957)* are examples of this point. These robots seem to have been created by the authors in order to give their stories an evil villain with an interesting twist: an intelligent being with no emotion, remorse, or sadness felt in killing others. Instinctively, however, people do not imagine robots this way.

Our survey strengthens this point, since many people within the surveyed population who felt a negative connotation towards robots also mentioned that movies, TV, and books made them feel that way. Their ideas about robots had been influenced by these fictitious portrayals of superior robots. Therefore, people do not tend to think of robots this way; their opinions are only influenced by the portrayal of superior robots in media.

So why do authors and writers think of robots this way in the first place? Besides giving their stories an evil villain with different qualities, as mentioned earlier, authors and writers were influenced to include these robots based on the current events of their time. For instance, "master" robots in the 1920s were portrayed as superior to humans in the workplace, since they could perform jobs quicker and more accurately than humans. The Great Depression was a direct influence on authors and writers of that time, since movies and books during that time period mostly depict "master" robots as a threat in the workplace. During the technology boom of the 1940s – 1990s, writers and authors portrayed "master" robots as being superior to humans

due to their advanced thinking and calculating ability. Today, "master" robots are depicted by writers and authors as being superior to humans in every single way, as people today are widely accepting of technology and its ability to make life easier.

This alteration in the portrayal of "master" robots over time is directly related to the acceptance of technology in American society. People in society do not tend to imagine robots as being superior to humans, as by nature humans tend to imagine themselves as the ultimate being. Authors and writers only imagine robots as superior to humans in order to provide their readers, movie-goers, and TV-watchers with a more compelling story, which will earn more money at the Box Office. This is the only case in which people imagine robots as superiors.

Robots as Companions

As the robot's capacity to reason began to increase in literature, there was a natural rise to the theme of robots as being a friendly companion or in other words, a sophisticated pet. A good early example of this is Robby from *Forbidden Planet (1956)*. He is a comical robot who carries out the wishes of his master but in a relationship where the robot is regarded with a level of affection. This can be seen through the tone of the dialogue as the conversations are all friendly in nature. Following in his mold are the *Star Wars (1977)* duo of R2D2 and CP30, a comical pair that provide useful information, assistance and company to their human owners.

From this point on robots began to be seen more and more as a part of human everyday life. People more frequently started to imagine robots as companions, but all such thoughts were grounded in a common primal reason. For example, generally those who have been hurt by others would be expected to imagine companion robots as faithful, unconditional friends. Once again, it can be seen that people are imagining robots in a way that will help them fulfill a need. In our survey, many people that mentioned wanting "a companion" usually went on to mention

R2-D2 or C3PO as one of their most influential robots. In fact, some people mentioned specific cases, like "I would like a companion robot that would follow me around and take orders, and do stuff for me", or "I want a robot like R2-D2 that would follow me around and help me out of sticky situations."

Generally, companion robots in movies, books, and TV are "good guy" robots which help out the hero, or provide comic relief. Sometimes these robots are used in situations where they can perform tasks that humans cannot. More interestingly, robots can sometimes be used as direct foils to the main character such as Bender, from *Futurama (1999)*. This allows the writers to go above and beyond the normal character foil, since the robot can be different in both personality and ability, for example Sonny from *I, Robot (2004)*. Therefore, while the companion robot is imagined by people as a way for them to always have company, in movies and books this relationship changes.

Movies reasons are different from society's reasons for imagining companion robots. In society humans imagine the companion robot as a way of filling a void. The replacement of a child lost is a popular theme as shown in *A.I. (1999)* and *Astro Boy (2009). Time of Eve (2008)* is a great source where the robots fulfill a multitude of needs such as parents for orphans, nannies for children, bodyguards for the famous and lovers for the lonely. Real life examples from the survey come from older persons who want someone to take care of them and younger persons who just want someone to confide in. There really is no limit to the role a companion robot can fulfill as all humans desire a friend who is loyal, trustworthy and dependable. As such, the theory that humans imagine robots as a companion is a plausible notion.

Robots as Equals

Robots are very rarely thought of by people as equals. This seems to be directly influenced by the fact that we do not currently have advanced enough AI to make this a viable possibility. Since there are no robots that are able to parallel the intelligence or compassion of a human, very few people imagine robots as equals. This was verified in our survey, as very few people in the surveyed population thought that people would have an equal relationship with humans in the near future. This is so rare, in fact, that there are only a few examples in books in which robots have a symbiotic relationship with humans. There is no real explanation for this, other than that the lack of technology makes the thought of a symbiotic relationship impossible.

In the same light, a symbiotic relationship suggests that both parties are at peace with one another, work together, and depend on each other, none of which would make for an extremely compelling story. The world already has issues of overpopulation and the creation of robots of equal status would not make much sense due to the increasing population density. Instead, the reason why humans imagine robots in this light is relatively simple: the creation of robots that parallel humans in intelligence and compassion is an excellent goal for humans to reach, and is the ultimate step in the process of creation.

In fashioning a humanoid robot that resembles man in every feature and function, man actually creates what is considered the greatest work of nature. Therefore the driving force to imagine a robot may be humans' desire to be God-like in nature. The creation of a robot as capable as a human would be the pinnacle of human scientific skill and an achievement worthy of great merit. This was the sense of power felt by the scientist who created Maria in *Metropolis (1927)*, and by Dr. Eldon Tyrell who created the replicants in *Blade Runner (1982)*; a power that

simultaneously created a sensation of awe at their presence and elevated their social status to one beyond reproach.

Therefore, humans imagine robots as being equal as a way for them to complement themselves; they are able to play God and create an object that is almost equal to a human. Since this is the next and last step in the creation of robots, it is the sole reason as to why people imagine robots as equals.

Robots as Humans

An interesting answer to the question "Why humans imagine robot" is tied to the future that many humans imagine. The idea of a cyborg, a combination of man and machine working together in harmony, is an exciting direction to look for an answer. In this light, humans would imagine robots because as a means to better the race as a whole. With the aid of machinery to surpass the natural limitations of the human body, this would represent the first real evolution of man in centuries.

In nature the Darwin Theory states that through the process of natural selection the species that is able to best deal with the harsh environmental conditions posed by nature will survive and prosper. In this regard man has started a new trend where, instead of a physical evolution, our continued existence is based on the evolution of technology. If one were to look at the skeletal makeup of the first homo-sapiens compared to modern man there would not be a major difference in features. In fact if there is any physical change it is probably for the worse as typical humans today live a far more pampered life than those faced by the first homo-sapiens.[2]

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[2] Source: http://anthro.palomar.edu/homo2/mod_homo_4.htm

Therefore, the cyborg fascination could be viewed as the next generation of human beings. As the popular TV series, *The Six Million Dollar Man (1973)* famously said, "Gentlemen, we can rebuild him. We have the technology. We have the capability to make the world's first bionic man. Steve Austin will be that man. Better than he was before. Better. Stronger. Faster." This is also the last idea presented in the documentary, *Robo-Sapiens (2007).* Throughout the show the development of the robot and humanoid robot are shown until the climax where humans and robots eventually become one. This is not just science fiction however as there are many combinations of man and machine in existence today. However, presently the applications are limited to people with disabilities as they have the greatest need. Examples of this combination of man and machine are people with pacemakers and motorized artificial limbs. These mechanical parts help the person live a more normal life.

Oscar Pistorius is a man who had his legs amputated as a young child. With the help of mechanical blades he was able to perform at a level where he was considered to have an unfair advantage and consequently banned from partaking in the 2008 Olympics. Nicknamed "the fastest man on no legs" he shows that man in combination with machine can create a superior human being. Is this the reason why we really imagine robots and where the technology is actually leading? It is definitely a possibility and only time can tell.

Conclusion Summary

So why do people imagine robots? The answer to this question appears to be that machines were the logical extension of basic handmade tools, and now autonomous robots are the next evolution. People imagine robots as companions as a further extension to imagining robots as tools. Companion robots are able to complete menial tasks for humans as well as providing the camaraderie which humans need. For these reasons, robots are more complex

machines that humans create in order to help fulfill their needs, whether the need is to make money by aiding in a compelling movie plots, to make life easier, to have an obtainable creation goal, or to have a friend.

At first, humans built simple tools for hunting and harvesting. These tools were the basis of the first settled community. As time passed; greater tools were invented which led to the construction of even greater structures, but more importantly greater tools provided means for improving the quality of life. Through natural progression, humans have continued to develop more and more complicated tools and machines to make their lives easier. Mass production lines, snow blowers, and even cars are all examples of tools that improve the quality of life for people. It is natural, then, that robots were first developed to be tools, like the Roomba. Accordingly, the development of robots progressed naturally, and more complex robots are now being developed, with the same general idea in mind: make humans' lives easier. Industrial robots, computerized car systems, and human-like androids are all being developed to make humans' lives safer and simpler.

It is human nature for people to first look for an easier way to complete everyday tasks, and then go about developing that easier method. In the same way, humans seem to first imagine robots in a way that could help them complete a task while saving time. They then attempt to find the means to create such a robot. The robot is therefore a natural human progression of the tool; robots are seen by many to be high-tech methods to completing menial tasks. This idea was supported fully with the results of our survey, where a majority of the surveyed population believed this idea to be true.

Within written works of literature and movies, robots were also portrayed as slaves and tools, but in a slightly different way. Slave robots are generally side-kicks to the hero, and are usually friendly, Robby the Robot from *Forbidden Planet (1956)*, protective, Tik-Tok from *Ozma of Oz (1907)*, or comical, C3PO and R2-D2 from *Star Wars (1977)*. These robots are always supporting characters, but are integral to the plot in their ability to do things that humans cannot. The robots are tools of the hero, often helping them when in trouble. The authors and writers use the robots in the same way, as a plot device to strengthen the audiences' feelings toward the hero.

Society in general does not imagine robots as being equals or superiors. Those types of robots are instead imagined by engineers and writers respectively. Robots in movies and literature are different than the everyday robots we think about, for this exact reason. Movie robots and science fiction robots are imagined by the writers and authors as a tool for them to make their product more interesting, and to develop the plot. The more interesting the plot, the more people are willing to purchase the movie tickets, or purchase the novel. Therefore, the writers and authors imagine robots in ways that will make their stories more fantastical, in order to earn more profit.

So why do humans imagine robots? The answer is both simple and complex. We have given the complex answer in the paragraphs above and now we will give the simple one. Humans generally imagine robots as a means to fulfill a need. This basic need is the completion of tasks that humans don't particular want to do themselves. As such robots are nothing more than glorified tools designed to serve the whims of mankind.

Recommendations

The goal of our project was to answer why humans imagine robots. We have done that to a point where another group after reading this paper will be able to give a more in-depth answer. Our survey population for example was very small and restricted as it polled only the WPI population and received a response of only 5%. A much larger sample with a more diverse population would be able to give us more accurate statistical data. A similar theme can be extended to the interviews conducted with professors as interviews with experts in greater range and specialized robotics fields would produce more specific results.

During our analysis of our primary sources a lot of the works of literature raised a similar question which we feel needs to be answered. The question is what does it mean to be human or when do we consider a robot to be a human? The creation of a human-like robot is the ultimate goal in the design of robots but the question has to be asked, at what point can we say we have accomplished this goal? Is it just enough to build a robot that can act autonomously, to have an autonomous humanoid robot that is externally indistinguishable from a human, or is the end goal to have a robot that can feel and demonstrate human emotions? Further analysis in this avenue of thought is required as a supplement to the answer of why people imagine robots.

Finally the fact that the majority of our literature was based in American culture leads to an American answer to our project question. It would be interesting to conduct a similar project with research based on literature and the views of people in a different culture to see what similarities and differences exist.

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Appendices

Appendix A: List of Robot Literature

*Initial list of literature that we made containing works that we felt would be useful to investigate

Early 1900s & Late 19th Century

Ozma of Oz John R. Neill 1907 Reilly & Britton

Auguste Villiers de l'Isle-Adam's *The Future Eve* (1886)

Gaston Leroux's **La Poupée Sanglante** ("The Bloody Doll") and **La Machine à Assassiner** ("The Murdering Machine")

1920s

Le Singe (The Monkey) (1925), by Maurice Renard and Albert Jean,

Automata (1929) by S. Fowler Wright

The Metal Giants (1926), by Edmond Hamilton

The Mechanical Man (1921)

1930s

John Wyndham's short story *The Lost Machine* (1932)

1940s

The works of Isaac Asimov

Gnut, in *Farewell to the Master* by Harry Bates (1940)

1950s

Robot Monster (1952)

The Day the Earth Stood Still (1951)

Philip K. Dick's novelette *The Last of the Masters* (1954)

The Invisible Boy (1957)

1960s

The Jetsons (1962)

The Robot, Lost in Space (1965-1968)

Star Trek (and sequels) (1966-1969)

Do Androids Dream of Electric Sheep? (1968)

1970s

C-3PO, R2-D2, Star Wars (and sequels) (1977)

Marvin the Paranoid Android, Hitchhiker's Guide to the Galaxy (and sequels) (1978-1981)?

1980s

Planetfall (and sequel) (1983)

The Terminator (and sequels) (1984)

Transformers (toyline/cartoons) (1984-)

1990s

The Iron Giant (1999)

Bicentennial Man (1999)

The Matrix (and sequels) (1999)

Bender, Futurama (1999-)

2000s

A.I. (2001)

Transformers (2007 movie)

WALL-E (2008)

Appendix B: Robots in Movies Timeline

*List copied from online resource

1926: Fritz Lang's "Metropolis" introduced the first robot, "Maria", in a feature film. Metropolis was produced in Germany as a silent movie. Obsessed inventor, Rotwang, creates a robot that lacks a soul. When he transfers the lead female's soul, Maria, to the robot, an evil robotic "Maria" is born. The world in this movie is harsh and mechanized. It is a grim picture of the future. This fear of the lost soul in the robot reflected the soulless devastation and mechanization that rampaged through the battlefields of Western Europe and the technological advances made during the twenties. The twenties saw the mass production line and the increased alienation of workers who feared they were being replaced by machines.

The Depression of the 1930s

The 30s were harsh years where huge numbers of people were out of work. The future was harsh and fears of technology remained. People wanted escape from unemployment and hunger. The movies offered this.

1935: "Phantom Empire", starring Gene Autry "The Singing Cowboy", discovers a lost city called Murania, 20,000 feet under his ranch. The evil Queen Tika wants her robots to rule the world.

1939: "The Phantom Creeps", a mad scientist, played by Bela Lugosi, tries to take over the Earth with a kind of Gargoyle like robot.

1936: The first "Flash Gordon" film series is set in the future. Flash is captured many times by evil robots. The robots are evil mechanized people.

1939: "Buck Rogers" film series, Buck is turned into a living robot but manages to overcome the evil induced mind control proving that human will is stronger than technology.

The Warring 40's

The dark days of the depression was capped by World war 2 during the early 40s. The war saw inhuman acts and a technology gone wild as in the atom bomb. Isaac Asimov ideas on robotics grew out of this turmoil.

1940: Republic's film serial, "Mysterious Doctor Satan", features robots from their previous series, Phantom Empire. For years, this robot design saw little change and appears again in the 1949 movie, King of the Rocket Men.

1949: "The Perfect Woman", the failure to produce a perfect woman who is a robot demonstrated that people are not toys to be played with and that "being a woman" is far more than a manipulation by men or science.

The Fabulous 50's

Science fiction in the 1950s. The fear of the cold war, alien invasion and the uncertainty of what was really happening that people did not know about sparked a huge surge in Science fiction books and film. But not everything was evil and not everything unknown was out to cause harm.

1951: In "The Day the Earth Stood Still" (20th Century Fox), a flying saucer lands in Washington D.C. releasing "Gort," a menacing and invincible yet protective figure. Klatau had come in peace and unfortunately the good will and gifts of knowledge which he brought were destroyed by people who were so overwhelmed by fear they attacked. The fear of humans unleashed "Gort" the robot sent to protect Klatau. The robot "Gort" must determine the fate of all earthlings. This is a seminal film.

1956: The feature film "Forbidden Planet" (MGM) introduces a likeable, and one of entertainment's most memorable robots, "Robby, the Robot. "Robby, the Robot" must be one of the most influential robots of all time. The design had a profound impact on the toy market and was the first movie prop to be heavily merchandized and targeted to both children and adults.

1957: "Robby, the Robot" again makes an appearance in "The Invisible Boy", where he plays a boy's mechanical friend turned kidnapper while under the influence of crazed computer banks. (Robby's other credits include roles in feature films: "Earth Girls Are Easy", "Hollywood Boulevard", "Gremlins"; and on television in: "The Twilight Zone", The Addams Family", "Hazel", "The Red Skelton Show", "The Thin Man", "Columbo", "Wonder Woman" and The Dobbie Gillis Show.)

The 1960's

With space exploration a reality in the 60s, the robot is no longer a fantasy in everyday life, but is quickly moving into reality:

1966: television serial "Lost in Space", the robot always managed to save the day. He develops human and becomes a significant character in the show.

1966: "Dr. Who" introduced the evil "Dalek".

The 1970's

Significant advances in robotics and computers during the 70s bring a fear of human disappearance and an imminent fear of self destruction

1973: " Westworld " (MGM), sees robots take over a theme park and try to gain domination.

1977: "R2-D2" and "C-3PO" in "Star Wars" (20th Century-Fox) become the next most popular and influential robots after "Robby, the Robot" from Forbidden Planet. These robots are friendly and comical.

The 1980's

The age of the microcomputer is born and with it new fears.

1984: "Terminator" (Hemdale), starring Arnold Schwarzenegger, deals with the confrontation between humans and machine in which machines have developed self will and want to change the past to eradicate humans.

The 1990's

Movie robots continue to mirror the values and mores of present and future society. With this decade's advances and extensive understanding of new technologies

1990: Robocop 2 (Orion Pictures) Part robot part human.

1998: "Lost in Space - The Movie" (New Line Cinema) is a makeover of the popular 1967 television series.

Other notables: "Total Recall" (1990), "Hardware" (1990), "Terminator 2: Judgment Day" (1991), "Robocop 3" (1993), "Robot Wars" (1993), "Cyborg Cop" (1993), "Cyborg 2" (1993), "American Cyborg" (1994), "Judge Dredd" (1996), "Austin Powers" (1997) and "The Fifth Element" (1997).

Appendix C: A Brief History of Robotics

*List copied from online resource

~ 350 B.C

The brilliant Greek mathematician, **Archytas ('ahr 'ky tuhs')** of **Tarentum** builds a mechanical bird dubbed "the Pigeon" that is propelled by steam. It serves as one of history's earliest studies of flight, not to mention probably the first model airplane.

~ 322 B.C.

The Greek philosopher **Aristotle** writes...

"If every tool, when ordered, or even of its own accord, could do the work that befits it... then there would be no need either of apprentices for the master workers or of slaves for the lords."

...hinting how nice it would be to have a few robots around.

~ 200 B.C.

The Greek inventor and physicist Ctesibus ('ti sib ee uhs') of Alexandria designs **water clocks** that have movable figures on them. Water clocks are a big breakthrough for **timepieces**. Up until then the Greeks used **hour glasses** that had to be turned over after all the sand ran through. Ctesibus' invention changed this because it measured time as a result of the force of water falling through it at a constant rate. In general, the Greeks were fascinated with **automata** of all kinds often using them in theater productions and religious ceremonies.

1495

Leonardo DaVinci designs a mechanical device that looks like an armored knight. The mechanisms inside "**Leonardo's robot**" are designed to make the knight move as if there was a real person inside. Inventors in medieval times often built machines like "**Leonardo's robot**" to amuse royalty.

1738

Jacques de Vaucanson begins building automata in Grenoble, France. He builds three in all. His first was the flute player that could play twelve songs. This was closely followed by his second automaton that played a flute and a drum or tambourine, but by far his third was the most famous of them all. **The duck** was an example of Vaucanson's attempt at what he called "**moving anatomy**", or modeling human or animal anatomy with mechanics." The duck moved, quacked, flapped it's wings and even ate and digested food.

1770

Swiss clock makers and inventors of the modern wristwatch **Pierre Jaquet-Droz** and later joined by his son Henri-Louis Jaquet-Droz start making automata for European royalty. They create three dolls, each

with a unique function. One can write, another plays music, and the third draws pictures.

1801

Joseph Jacquard builds an **automated loom** that is controlled with **punched cards**. Punch cards are later used as an input method for some of the 20th centuries earliest computers.

1822

Charles Babbage demonstrates a prototype of his "**Difference Engine**" to the **Royal Astronomical Society**. He continues his work by designing an even more ambitious project "the Analytical Engine" that reportedly was to use **punch cards** inspired by Joseph Jacquard's invention. During his lifetime he never produces a functional version of either machine. Despite this shortcoming he is often heralded as the "Father of the Computer" and his work lives on as the foundation for the binary numbering system that is the basis of modern computers.

1847

George Boole represents logic in mathematical form with his Boolean Algebra.

1898

Nikola Tesla builds and demonstrates a **remote controlled robot boat** at **Madison Square Garden**.

1921

Czech writer **Karel Capek** introduced the word "**Robot**" in his play "**R.U.R**" (Rossuum's Universal Robots). "**Robot**" in Czech comes from the word "**robota**", meaning "compulsory labor"

1926

Fritz Lang's movie "**Metropolis**" is released. "Maria" the female robot in the film is the first robot to be projected on the silver screen.

1936

Alan Turing introduces the concept of a theoretical computer called the **Turing Machine**. Despite being a fundamental advance in computer logic it also spawns new schools in Mathematics.

1940

Isaac Asimov produces a series of short stories about robots starting with "**A Strange Playfellow**" (later renamed "**Robby**") for Super Science Stories magazine. The story is about a robot and its affection for a child that it is bound to protect. Over the next 10 years he produces more stories about robots that are eventually recompiled into the volume "**I, Robot**" in 1950.

Asimov is generally credited with the popularization of the term "Robotics" which was first mentioned in his story "**Runaround**" in 1942. But probably Isaac Asimov's most important contribution to the history of the robot is the creation of his **Three Laws of Robotics**:

1. A robot may not injure a human being, or, through inaction, allow a human being to come to

harm.

2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Asimov later adds a "zeroth law" to the list:

Zeroth law: A robot may not injure humanity, or, through inaction, allow humanity to come to harm.

1946
George Devol patents a playback device for controlling machines.

1950
Alan Turing publishes **Computing Machinery and Intelligence** in which he proposes a test to determine whether or not a machine has gained the power to think for itself. It becomes known as the "**Turing Test**".

1951
The Day the Earth Stood Still premieres in theaters. The movie features an alien named Klaatu and his robot Gort

1956
Alan Newell and Herbert Simon create **the Logic Theorist**, the first **"expert system"**. It is used to help solve difficult math problems.

1956
Aided by a **grant** from the Rockefeller Foundation **John McCarthy**, **Marvin Minsky**, Nat Rochester and **Claude Shannon** organize **The Dartmouth Summer Research Project on Artificial Intelligence** at **Dartmouth College**. The term "artificial intelligence" is coined as a result of this conference.

1959
John McCarthy and Marvin Minsky start the **Artificial Intelligence Laboratory** at the **Massachusetts Institute of Technology (MIT)**.

1961
Heinrich Ernst develops the MH-1, a computer operated mechanical hand at MIT

1962
The first industrial arm robot - the Unimate - is introduced. It is designed to complete repetitive or dangerous tasks on a General Motors assembly line.

1963

John McCarthy leaves MIT to start the **Artificial Intelligence Laboratory** at **Stanford University**.

1966

The Stanford Research Institute (later to be known as **SRI Technology**) creates **Shakey** the first mobile robot to know and react to its own actions. Amongst other achievements SRI was also the research institute that helped bring us modern day **laundry detergent** in the development of **Tide**.

1966

An **artificial intelligence** program named **ELIZA** is created at MIT by **Joseph Weizenbaum**. ELIZA functions as a computer psychologist that manipulates its users statements to form questions. Weizenbaum is disturbed at how quickly people put **faith** in his little program.

1967

Richard Greenblatt writes, **MacHack**, **a program that plays chess**, in response to a recent article written by Hurbert Dreyfus where he suggests, as a critique to efforts in artificial intelligence, that a computer program could never beat him in a game of chess. When the program is finished and Dreyfus is invited to play the computer he leads for most of the game but ultimately loses in the end in a close match. Greenblatt's program would be the foundation for many future chess programs, ultimately culminating in **Big Blue** the chess program that beats chess Grand Master Gary Kasparov.

1968

Stanley Kubrick makes **Arthur C. Clark's**, **2001: A Space Odyssey** into a movie. It features **HAL**, an onboard computer that decides it doesn't need its human counterparts any longer. **Hear HAL by clicking here**.

1969

Victor Scheinman, a Mechanical Engineering student working in the Stanford Artificial Intelligence Lab (SAIL) creates the **Stanford Arm**. The arm's design becomes a standard and is still influencing the design of robot arms today.

1970

Stanford University produces **the Stanford Cart**. It is designed to be a line follower but can also be controlled from a computer via radio link.

1971

The film **Silent Running** is released starring Bruce Dern. Bruce's co-stars are three robot drones **Huey**, **Dewey** and **Louie**.

1974

Victor Scheinman forms his own company and starts marketing the **Silver Arm**. It is capable of assembling small parts together using touch sensors.

1976

Shigeo Hirose designs the **Soft Gripper** at the **Tokyo Institute of Technology**. It is designed to wrap around an object in snake like fashion.

1977

Star Wars is released. **George Lucas'** movie about a universe governed by the force introduces watchers to **R2-D2** and **C-3PO**. The movie creates the strongest image of a human future with robots since the 1960's and inspires a generation of researchers.

1977

Deep space explorers Voyagers 1 and 2 launch from the **Kennedy Space Flight Center**.

1979

The Robotics Institute at **Carnegie Mellon University** is established.

1979

The Stanford Cart is rebuilt by **Hans Moravec**. He adds a more robust vision system allowing greater autonomy. These are some of the first experiments with 3D environment mapping.

1980

Seymour Papert publishes **Mindstorms: Children, Computers, and Powerful Ideas** where he advocates *constructionism*, or learning through doing.

1981

Takeo Kanade builds the **direct drive arm**. It is the first to have motors installed directly into the joints of the arm. This change makes it faster and much more accurate than previous robotic arms.

1982

"A new life awaits you on the Off-World colonies." **Blade Runner** is released. This **Ridley Scott** film is based on the **Philip K. Dick** story **"Do Androids Dream of Electric Sheep?"** and starred **Harrison Ford** as Rick Deckard a retired Blade Runner that hunted Replicants (or illegal mutinous androids).

1986

LEGO and the **MIT Media Lab** collaborate to bring the first LEGO based educational products to market. **LEGO tc Logo** is used by in the classrooms of thousands of elementary school teachers.

1986

Honda begins a robot research program thats starts with the premise that the robot "should coexist and cooperate with human beings, by doing what a person cannot do and by cultivating a new dimension in mobility to ultimately benefit society."

1989

A walking robot named **Genghis** is unveiled by the **Mobile Robots Group** at MIT. It becomes known for the way it walks, popularly referred to as the "Genghis gait".

1989

At MIT **Rodney Brooks** and **A. M. Flynn** publish the paper **"Fast, Cheap and Out of Control: A Robot Invasion of the Solar System"** in the Journal of **the British Interplanetary Society**. The paper changes rover research from building the one, big, expensive robot to building lots of little cheap ones. The paper also makes the idea of building a robot somewhat more accessible to the average person.

1989

Dr. Seymour Papert becomes the LEGO Professor of Learning Research.

1992

In an attempt to build a radio controlled vacuum cleaner **Marc Thorpe** has the idea to start a robot combat event.

1992

Dr. John Adler came up with the concept of the **CyberKnife** a robot that images the patient with x-rays to look for a tumor and delivering a pre-planned dose of radiation to the tumor when found.

1993

Dante an 8-legged walking robot developed at **Carnegie Mellon University** descends into **Mt. Erebrus, Antarctica**. Its mission is to collect data from a harsh environment similar to what we might find on another planet. The mission fails when, after a short 20 foot decent, Dante's tether snaps dropping it into the crater.

1994

Dante II, a more robust version of its predecessor, descends into the crater of Alaskan volcano **Mt. Spurr**. The mission is considered a success.

1994

Marc Thorpe starts **Robot Wars** at Fort Mason center in San Francisco, CA.

1995

The second annual Robot Wars event is held at Fort Mason Center, San Francisco, CA.

1996

A **RoboTuna** is designed and built by David Barrett for his doctoral thesis at MIT. It is used to study the way fish swim.

1996

Chris Campbell and Stuart Wilkinson turn a brewing accident into inspiration at the University of South Florida. The result is the **Gastrobot**, a robot that digests organic mass to produce carbon dioxide that is then used for power. They call their creation the "**flatulence engine**."

1996

Honda debuts **the P3**, the fruit of its decade long effort to build a humanoid robot.

1996

The third annual **Robot Wars** event is held at Fort Mason Center, San Francisco, CA.

1997

The **first node** of the **International Space Station** is placed in orbit. Over the next several years more components will join it, including a **robotic arm** designed by Canadian company **MD Robotics**.

1997

The **Pathfinder Mission** lands on **Mars**. Its **robotic rover Sojourner**, rolls down a ramp and onto Martian soil in early July. It continues to broadcast data from the **Martian surface** until September.

1998

Tiger Electronics introduces the **Furby** into the Christmas toy market. It quickly becomes "the toy" to get for the season. Using a variety of sensors this "animatronic pet" can react to its environment and communicate using over 800 phrases in English and their own language "**Furbish**".

1998

LEGO releases their first **Robotics Invention System™ 1.0**. LEGO names the product line **MINDSTORMS** after Seymour Papert's seminal work of 1980.

1999

LEGO releases The Robotics Discovery Set, Droid Developer Kit and the Robotics Invention System 1.5.

1999

SONY releases the **AIBO** robotic pet.

2000

Honda debuts new humanoid robot **ASIMO**.

2000

The **Battlebots** event is held in Las Vegas, Nevada.

2000

LEGO releases the **MINDSTORMS Robotics Invention System™ 2.0**

2001

LEGO releases the **MINDSTORMS Ultimate Builder's Set**

2001

In August, the **FDA clears the CyberKnife** to treat tumors anywhere in the body.

2002

Honda's **ASIMO robot rings the opening bell** at the **New York Stock Exchange**

2003

June 10th - **NASA** launches the **MER-A "Spirit"** rover destined for **Mars**.

July 7th - **NASA** launches the **MER-B "Opportunity"**.

2003

SONY releases the **AIBO ERS-7** it's 3rd generation robotic pet.

2004

Jan. 4th - After **six minutes of holding our breath (during EDL)** as it burned and bounced its way to the red planet the robot rover **Spirit** lands on **Mars**.

Jan. 23rd - The second **Mars Exploration Rover** - **"Opportunity"** safely lands on the **Meridium Planum.**

Appendix D: List of Fictional Robots and Androids

*List copied from online resource

Theatre

- Coppélia, a life-size dancing doll in the ballet of the same name, choreographed by Marius Petipa with music by Léo Delibes (1870).
- The word "robot" comes from Karel Čapek's play, *R.U.R. (Rossum's Universal Robots)* written in 1920 in the Czech language and first performed 1921. Performed in New York 1922 and an English edition published in 1923. In the play, the word refers to artificially created life forms.[1] Named robots in the play are: Marius; Sulla; Radius; Primus and Helena. It introduced and popularized the term robot. Čapek's Robots are biological machines that are assembled, as opposed to grown or born.

Literature

19th century and earlier

- The woman forged out of gold in Finnish myth The *Kalevala* (prehistoric folklore)
- From 600 BC onward legends of talking bronze and clay statues coming to life have been a regular occurrence in the works of classical authors such as: Homer, Plato, Pindar, Tacitus, and Pliny. In Book 18 of the *Iliad*, Hephaestus the god of all mechanical arts, was assisted by two moving female statues made from gold - "living young damsels, filled with minds and wisdoms". Another legend has Hephaestus being commanded by Zeus to create the first woman, Pandora, out of clay. The myth of Pygmalion, king of Cyprus, tells of a lonely man who sculpted his ideal woman from ivory, Galatea, and then promptly fell in love with her after the goddess Aphrodite brings her to life.
- The bronze giant Talos, in Apollonius of Rhodes' *Argonautica*
- The legend of the Golem, an animated man of clay, mentioned in the Talmud. (16th century)
- Olimpia in E.T.A. Hoffmann's *Der Sandmann* (1814)
- Artificial human-like being created by Victor Frankenstein in Mary Shelley's *Frankenstein* (1818)
- In Léo Delibes' ballet *Coppélia* (1870) where it is the eponymous dancing doll
- A mechanical man powered by steam in Edward S. Ellis' *The Steam Man of the Prairies* (1865)
- Olympia in Act I of Jacques Offenbach's *The Tales of Hoffmann*, based on the Hoffmann story (1881)
- A mechanical man run by electricity in Luis Senarens' *Frank Reade and his Electric Man* (1885)
- Hadaly, a mechanical woman run by electricity, in Auguste Villiers de l'Isle-Adam's *The Future Eve* (1886) -- the novel credited with popularizing the word "android"
- *The Brazen Android*, by William Douglas O'Connor. First appeared in The Atlantic Monthly, April 1891.
- *The Automatic Maid-of-All-Work. A possible Tale of the Near Future*, by M.L. Campbell. First appeared in the Canadian Magazine, July 1893. A man named John Matheson invents a mechanical maid-of-all-work fueled by an electric battery, who requires programming in the form of switching its electronic wires to perform different tasks

Early 1900s

- **Tik-Tok** in L. Frank Baum's Oz books (1900-)and in the movie Return to Oz
- The "Metal Men" automata designed by a Thomas Edison-like scientist in Gustave Le Rouge's *La Conspiration des Milliardaires* (1899-1900).
- A robot chess-player in *Moxon's Master* by Ambrose Bierce (1909)
- In Gaston Leroux's *La Poupée Sanglante* ("The Bloody Doll") and ***La Machine à Assassiner*** ("The Murdering Machine"), the lead character, Bénédict Masson, is wrongly accused of murder and guillotined. His brain is later attached to an automaton created by scientist Jacques Cotentin, and Masson goes on to track and punish those who caused his death.

1920s

- *Artificial people*, in Karel Čapek's R.U.R. (Rossum's Universal Robots) (1921) -- credited with coining the term "robot"
- *Le Singe (The Monkey)* (1925), by Maurice Renard and Albert Jean, a process of creating synthetic humans is invented
- *The Metal Giants* (1926), by Edmond Hamilton, where a computer brain who runs on atomic power creates an army of 300-foot-tall robots.
- *Metropolis* (1927), by Fritz Lang and Thea von Harbou, the scientist, Rotwang, creates a robot which is given the identity of Maria, the workers revolutionary leader.
- *Automata* (1929), by S. Fowler Wright, about machines doing the humans' jobs before wiping them out.

1930s

- The "Professor Jameson" series by Neil R. Jones (early 1930s) featured human and alien minds preserved in robot bodies. Reprinted in five Ace paperbacks in the late 1960s: *The Planet of the Double Sun*, *The Sunless World*, *Space War*, *Twin Worlds* and *Doomsday on Ajiat*
- Zat the Martian robot, protagonist of John Wyndham's short story *The Lost Machine* (1932)
- Human cyborgs in *Revolt of the Pedestrians* by David H. Keller (1932)
- Robot surgeon in "Rex" by Harl Vincent (1934)
- Helen O'Loy, from the story of the same title by Lester del Rey (1938)
- Adam Link of *I, Robot* by Eando Binder (1938)
- Robots discover their "roots" in *Robots Return* by Robert Moore Williams (1938).
- Robot as murder witness in *True Confession* by F. Orlin Tremaine (1939)

1940s

- Gnut, in *Farewell to the Master* by Harry Bates (1940) - (Later made into the classic 1951 SF film *The Day the Earth Stood Still*)
- Jay Score (J20), emergency pilot of the Earth-to-Venus freighter *Upskadaska City* (colloquially called *Upsydaisy*) in *Jay Score* by Eric Frank Russell in the May 1941 issue of *Astounding Science Fiction* Magazine (1941)
- Robots by Isaac Asimov:

- o Robby, Speedy, Cutie, and others, from the stories in *I, Robot* (1940–1950) (not to be confused with the Binder short story of the same title)
  - o L-76, Z-1, Z-2, Z-3, Emma-2, Brackenridge, Tony, Lenny, Ez-27 and others, from the stories in *The Rest of the Robots* 1964
  - o R. Daneel Olivaw, from *The Caves of Steel* (1954) and subsequent novels
  - o R. Giskard Reventlov, from *The Robots of Dawn* and subsequent novels
  - o Andrew Martin, from *The Bicentennial Man* (1976) (later made into a film) and *The Positronic Man* (a novel) with Robert Silverberg
  - o Norby, in a series of books for children and adolescent co-written with Janet Asimov
- The Humanoids, from two novels by Jack Williamson, (1949 and 1980)
- The Gallegher series of stories by Lewis Padgett (Henry Kuttner and C. L. Moore) collected in Robots Have No Tails in 1952.

1950s and 60s

- The Mechanical Hound from *Fahrenheit 451* by Ray Bradbury (1953)
- **Bors** is an old government integration robot pivotal to Philip K. Dick's novelette *The Last of the Masters* (1954)
- **Zane Gort**, a robot novelist in the short story *The Silver Eggheads* by Fritz Leiber (1959)
- **SHROUD** (Synthetic Human, Radiation Output Determined) and SHOCK (Synthetic Human Object, Casualty Kinematics), the sentient test dummies in the novel *V.* by Thomas Pynchon (1963)
- **Frost**, the Beta-Machine, Mordel, and the Ancient Ore Crusher in Roger Zelazny's short story *For a Breath I Tarry* (1966)
- **Trurl** and **Klapaucius**, the robot geniuses of The Cyberiad (Cyberiada, 1967; transl. by Michael Kandel 1974) - collection of humorous stories about the exploits of Trurl and Klapaucius, "constructors" among robots
- **The Iron Man**, in the novel *The Iron Man: A Children's Story in Five Nights* by *Ted Hughes*, illustrated by *Andrew Davidson* (1968)
- "Androids, fully organic in nature -- the products of genetic engineering -- and so human-like that they can only be distinguished by psychological tests; some of them don't even know that they're not human." -- *Do Androids Dream of Electric Sheep?* by Philip K. Dick (1968)
- *The Electric Grandmother* in the short story of the same name, from *I Sing the Body Electric* by Ray Bradbury (1969)

1970s

- **Personoids** - "Personoids do not need any human-like physical body; they are rather an abstraction of functions of human mind, they live in computers" - in Stanisław Lem's book *Próżnia Doskonała* (1971). It is a collection of book reviews of nonexistent books. Translated into English by Michael Kandel as *A Perfect Vacuum* (1983).
- "The masculine plot to replace women with perfect looking, obedient robot replicas" -- *The Stepford Wives* (1972) by Ira Levin
- **HARLIE** in *When H.A.R.L.I.E. was One* by David Gerrold (1972)
- **Setaur, Aniel, and Terminus** in *Tales of Pirx the Pilot* by Stanisław Lem (1973)
- **The Hangman** in *Home Is the Hangman* by Roger Zelazny (1975), winner of that year's Nebula Award for Best Novella

- Marvin the Paranoid Android in *The Hitchhiker's Guide to the Galaxy* by Douglas Adams (1978–1981) (originally a radio series, then a book trilogy and a TV series, and later a motion picture)

1980s

- Tidy, George, Fagor, Surgeon General Kraken and miscellaneous other androids from James Follett's *Earthsearch* series (1980–1981) (originally a radio series, then a two book series).
- The Mind's I edited by Daniel C. Dennett and Douglas R. Hofstadter (1981)
- Chip, the robot teenager in the *Not Quite Human* series (1985–1986), by Seth McEvoy. Later, Disney made the book into three movies.
- Two extreme examples of robot morality, one perfectly innocent and one perfectly criminal, in *Roderick* and *Tik-Tok* (1980, 1983) by John Sladek
- The Boppers, a race of moon-based robots that achieve independence from humanity, in the series of books The Ware Tetralogy by Rudy Rucker.
- Solo, from Robert Mason's novel *Weapon*
- Elio, a character from A Tale of Time City by Diana Wynne Jones.

1990s

- Yod in Marge Piercy's *He, She and It* (1991)
- The One Who Waits in Charles Sheffield's *Divergence* (1991)
- Caliban, in a trilogy by Roger MacBride Allen set in the robots universe of Isaac Asimov (1993)
- Jay-Dub and Dee Model in Ken MacLeod's *The Stone Canal* (1996)
- Dorfl, and other Discworld golems deliberately described in terms reminiscent of an Asimovian robot, in Terry Pratchett's *Feet of Clay*, (1996) and subsequent *Discworld* novels

2000s

- Cassandra Kresnov, in a series by Joel Shepherd (2001)
- Moravecs are sentient descendants of probes sent by humans to the Jovian belt, in Dan Simmons' Ilium, (2003)
- Nimue Alban/Merlin Athrawes in the Safehold series by David Weber, (2007)
- Freya in Charles Stross' Saturn's Children (Stross novel) (2008)
- HCR-328 and Tom in 'Automatic Lover' and 'Automatic Lover - Ten Years On' by Ariadne Tampion (2008)

Major Film Production

1940s and earlier

- **The Mechanical Man** from the silent film of the same name (1921)
- **Maria/Futura**, the Maschinenmensch -- a robotic gynoid, played by German actress Brigitte Helm in both her robotic-appearing and human-appearing forms—from *Metropolis*, the silent science fiction film by famed Austrian-German director Fritz Lang (1927)
- **Annihilants**, robot soldiers belonging to Ming the Merciless in the *Flash Gordon* film series (1936).

- **Steel "Killer" Robot** in director William Witney's early 1940s film serial of 15 episodes *The Mysterious Dr. Satan* (aka *Doctor Satan's Robot*) (1940, re-released in full-length 1966)
- The "Mechanical Monsters" in the *Superman* short *The Mechanical Monsters* (1941)

1950s

- **Gort**, the robot in the film *The Day the Earth Stood Still* (1951) (Loosely based on **Gnut**, the robot protagonist of "Farewell to the Master" by Harry Bates, the original short story upon which the movie is based.)
- **Ro-Man**, a robot bent on destroying earth, in the movie *Robot Monster* (1952).
- Nyah's robot, **Chani**, in the British film *Devil Girl from Mars* (1954).
- **Robby** (Robby the Robot) in *Forbidden Planet* (1956) and *The Invisible Boy* (1957) (the character is intended to be the same in both films)

1960s

- **Robot John** in *Voyage to the Prehistoric Planet* (1965) and *Voyage to the Planet of Prehistoric Women* (1968), both re-edited versions of the Russian film *Planeta Bur* (1962)
- **Torg** in *Santa Claus Conquers the Martians* (1964)
- **Alpha-60** in French new wave director Jean-Luc Godard's post-apocalyptic science-fiction film *Alphaville* (1965)
- **Sexbots or Fembots, including Robot # 11 (Diane)** in *Dr. Goldfoot and the Bikini Machine* (1965) and *Dr. Goldfoot and the Girl Bombs* (1966) both starring Vincent Price
- **Cyborg Garth A7** in *Cyborg 2087* (1966)
- **Mechani-Kong** in *King Kong Escapes* (1967)

1970s

- The all-robot police force in *THX 1138* (1971)
- The drones **Huey**, **Duey**, and **Louie**, in *Silent Running* (1972). Notable as the first movie in which non-anthropomorphic robots were made mobile by manning them with amputees.
- The robots in *Sleeper* (1973)
- **Jet Jaguar** in *Godzilla vs. Megalon* (1973)
- The robotic gunfighters and other androids in *Westworld*, one of which was played by Yul Brynner (1973)
- **Mechagodzilla** in various Godzilla films (1974).
- **Box**, in *Logan's Run* (1976)
- **Necron-99**, later called "Peace" from Ralph Bakshi's *Wizards* (1977).
- **C-3PO**, **R2-D2** **IG-88**, **4LOM** in *Star Wars* (1977) and subsequent films
- "Proteus IV" Scientist Alex Harris, develops the A.I. computer that eventually rapes the scientist's wife to be immortal. "Demon Seed" (1977)
- **Muffit II**, robotic daggit in Battlestar Galactica (1978 TV series) (1978)
- **V.I.N.CENT.**, **B.O.B**, **Maximillian** and the androids made out of humans in *The Black Hole* (1979)
- **Ash** in *Alien* (1979)
- **Ilia probe**, a gynoid double of the original Ilia, in *Star Trek: The Motion Picture* (1979)

1980s

- **Hector**, in *Saturn 3* (1980)
- **Val**, **Aqua**, **Phil** and others from 1981's Heartbeeps
- **Bubo**, Mechanical owl in Clash of the Titans (1981 film) (1981)
- The *replicants* Roy Batty, Pris, Leon Kowalski, Zhora, Rachael, and possibly Rick Deckard -- *Blade Runner* (1982) (the film version of *Do Androids Dream of Electric Sheep?*)
- **Max 404** and **Cassandra One** in *Android* (1982)
- **T-800**, the robot assassin in *The Terminator* (1984)
- The young boy Data Analyzing Robot Youth Lifeform in *D.A.R.Y.L.* (1985)
- **Tik-Tok** in *Return to Oz* (1985)
- **Bishop** in *Aliens* (1986)
- **Jinx** from the 1986 film SpaceCamp.
- **Max**, periscope-like robot aboard the Trimaxion Drone Ship in *Flight of the Navigator* (1986)
- **Johnny 5** and the other S-A-I-N-T (Strategic-Artificially-Intelligent-Nuclear-Transport) military Robots in *Short Circuit* (1986) and *Short Circuit 2* (1988), and later *Hot Cars, Cold Facts* (1990)
- **ED-209** in *RoboCop* (1987)
- **Cherry 2000** in *Cherry 2000* (1987)
- The **"fix-its"** in **batteries not included* (1987)
- The android **Ulysses** in the film *Making Mr. Right* (1987)
- **Dot Matrix** in *Spaceballs* (1987)
- The android **Astor**, played by Stacey Williams, in *Gangster World* (1988)
- **Robotman** in the animated series as created by Jim Meddick

1990s

- **MARK13** in *Hardware* (1990)
- The **Enforcer Drone** from the 1990 film Spaced Invaders
- The good and evil robotic doubles in *Bill & Ted's Bogus Journey* (1991)
- And You Thought Your Parents Were Weird (1991)
- Arnold Schwarzenegger as the **T-800** and Robert Patrick as the **T-1000** Model Terminator in *Terminator 2: Judgment Day* (1991)
- **Eve** from Eve of Destruction (1991)
- **Alsatia Zevo**, the gynoid sister of Leslie Zevo and dollmaker in *Toys*. (1992)
- **Battle Droids** in *Star Wars Episode I: The Phantom Menace* to *Star Wars Episode III: Revenge of the Sith*
- **Bishop** in *Alien 3* (1992)
- **J5** in *Blankman* (1994)
- Wallace's **Techno Trousers** in Nick Park's animated short *Wallace & Gromit in The Wrong Trousers* (1994)
- **"SID 6.7"**, the villain in the film *Virtuosity* (1995) as a nanotech synthetic android, played by Russell Crowe
- **David**, **Becker** and **Jessica** from *Screamers* (1995) based on the short story *Second Variety* by *Philip K. Dick*
- **Project 2501** in the movie adaptation of *Masamune Shirow's* Ghost in the Shell *Japanese manga anime describes AI surveillance of population. (1995)*
- **Evolver**, villain from the movie *Evolver* (1995)
- **Solo** in *Solo* (1996), based on Robert Mason's novel (see above)

- **Call** in *Alien Resurrection* (1997)
- **"Robot"** in *Lost in Space*, the movie of the TV series (1998)
- **Gorgonites** and **Commando Elite**, sentient toys based on Military Artificial Intelligence CPU X-1000 in *Small Soldiers* (1998)
- **The Iron Giant** (1999), a film version of the Ted Hughes children's novel *The Iron Man*
- **Andrew**, and others the robot servant in *Bicentennial Man* (1999) -- based on a short story by Isaac Asimov
- The **Sentinels** from *The Matrix* (1999)
- The seductive **Fembot** assassins of the *Austin Powers* series (in *Austin Powers: The Spy Who Shagged Me* (1999), it's revealed that the character **Vanessa Kensington** was a fembot, and in *Austin Powers in Goldmember* (2002), **Britney Spears** plays herself as one)
- "Mr. Zed" Robot comedian and star of the Orbit television networks Mr. Zed Show 1994-1999
- Edward Scissorhands from the movie of the same name, is effectively an android, though he is never referred to as such.

2000s

- **AMEE** the robot scout in the film *Red Planet*, who gets stuck in military mode and destroys the human crew of the spaceship (2000).
- Many robots, including **David**, the lead character, in *Artificial Intelligence: AI* (2001); based on the "Supertoys" of Brian Aldiss' short story, *Supertoys Last All Summer Long* (ISBN 0-312-28061-0).
- **R4-P17** and the **Droid Army** in *Attack of the Clones* and *Revenge of the Sith* (2002) (2005).
- Arnold Schwarzenegger as the **T-850 Terminator** and Kristanna Loken as the **T-X Terminatrix** in *Terminator 3: Rise of the Machines* (2003).
- **G2** from Inspector Gadget 2.
- The robot butler **B166ER** and the residents of the machine nation of Zero-One from *The Animatrix*.
- The **Sentinels** from the *Matrix* series (1999-2003).
- **B-4**, Data's brother in *Star Trek Nemesis* (2002).
- The "dolls", including **Ria**, in *Natural City* (2003).
- **Bender Bending Rodríguez** Bending Unit 22 a.k.a. **Bender** from the Futurama TV series spin-off movies.
- **Sonny** (Type NS-5), VIKI (Virtual Interactive Kinetic Intelligence), and many other robots in *I, Robot* (2004).
- The monstrous robot dog in *Rottweiler* (2004).
- The entire cast of *Robots* (2005).
- **Marvin the Paranoid Android** in The Hitchhiker's Guide to the Galaxy (2005).
- The **Vahki**, the robot police enforcer in *Bionicle 2: Legends of Metru Nui* and Bionicle storyline also Maxilos for 07 storyline.
- **"EDI"** ("Extreme Deep Invader") from *Stealth* (2005).
- **Autobots** and **Decepticons** in the 2007 film, *Transformers* and its sequel, *Transformers: Revenge of the Fallen* (2009).
- **Transmorphers**, titular characters from the 2007 direct-to-DVD movie.

- **Dor-15** and **Carl** in the 2007 film *Meet the Robinsons*
- Characters from the 2008 film *WALL-E*: **WALL-E**, **EVE**, **M-O**, **GO-4**, **AUTO**, **VN-GO**, **PR-T**, **L-T**, **VA-QM**, **BRL-A**, **D-FIB**, **HAN-S**, **WALL-A**, **BURN-E**, **SPR-A**, **TYP-E**, **REM-E**, **BUF-R**, **SUPPLY-R**, **NAN-E**, **WALK-R**, **CH-F**
- **Gort**, the robot in the film *The Day the Earth Stood Still* (2008) remake of *The Day the Earth Stood Still* (1951)
- Several Characters in *Terminator Salvation*, including Marcus Wright, the T-800, several T-600's, The Motor-Terminators and the Harvester.

Television Films and Series
1960s and earlier

- In *The Thin Man* (1957-1959):
    - **Robby** (Robby the Robot), a robot accused of murder in the episode *Robot Client* (1958)
- In *The Twilight Zone* (1961-1962):
    - **Alicia**, a gynoid, in the episode *The Lonely* (1959)
    - **Allen**, a robot who falls in love with a human girl in the episode *In His Image* (1962)
    - The **Robot Simon** (Robby the Robot) in the episode *Uncle Simon* (1963)
    - **Mr Whipple's robot replacement** (Robby the Robot) in the episode *The Brain Center at Whipple's* (1963)
- **Andromeda** in *A for Andromeda* (1961)
- In *Supercar* (1961-1962):
    - The **Robot Servants** of Professor Watkins in the episode *The Lost City* (1961)
- **Rosie the Maid**, **Max** and **UniBlab** in *The Jetsons* (1962)
- In *Hazel* (1961-1966):
    - A **robot maid** (Robby the Robot) in the episode *Rosie's Contract* (1962)
- In *Fireball XL5* (1962-1963):
    - **Robert**, the transparent auto-pilot robot invented by Professor Matic
    - The **Granatoid Robots** in the episode *The Granatoid Tanks* (1963)
    - The **Robots of Robotvia** in the episode *Trial By Robot* (1963)
- Various **unnamed robots** in *Space Patrol* (1963-1964) (US title: *Planet Patrol*)
- In *The Outer Limits* (1963-64):
    - **Trent**, an android from the far future in the episode *Demon with a Glass Hand* (1964)
    - **Adam Link**, a robot accused of the murder of his creator in the episode *I, Robot* (1964)
- In *Doctor Who* (Seasons One to Six) (1963-1969): (see also List of Doctor Who robots)
    - The **Ice Soldiers** in the serial *The Keys of Marinus* (1964)
    - The **Mechonoids**, robot enemies of the Daleks in the serial *The Chase* (1965)
    - A **robot double of the Doctor** created by the Daleks in the serial *The Chase* (1965)
    - The **Chumblies** in the serial *Galaxy 4* (1965)
    - The **War Machines** in the serial *The War Machines* (1966)
    - The **Yeti** in the serials *The Abominable Snowmen* (1967) and *The Web of Fear* (1968)
    - The **Servo Robot** in the serial *The Wheel in Space* (1968)
    - The **Quarks** in the serial *The Dominators* (1968)
    - The **White Robots** and the **Clockwork Soldiers** in the serial *The Mind Robber* (1968)
- In *Thunderbirds* (1965-1966):
    - **Braman**, a robot invented by Brains seen in the episodes *Sun Probe* (1965), *Edge of Impact* (1965) and *The Cham-Cham* (1966)

- o The plutonium store **Security Robots** in the episode *30 Minutes After Noon* (1965)
- **Astro Boy** from *Astro Boy* the Japanese animated series (1963–1966)
- **Rhoda Miller** (aka AF709) in *My Living Doll* (1964); a fembot played by Julie Newmar.
- In *The Avengers* (1965-1969):
  - o **The Cybernauts** in the episodes *The Cybernauts* (1965) and *Return of the Cybernauts* (1967)
- **Tobor** the android in the Japanese anime series **8th Man** (1965). Also, his older, stronger, but less sophisticated sister **Samantha 7**.
- In *Lost in Space* (1965-1968):
  - o **Robot B-9** (aka The Robot)
  - o The **Robotoid** (Robby the Robot) in the episode *War of the Robots* (1966)
  - o **Verda**, a gynoid, in the episodes *The Android Machine* (1966) and *Revolt of the Androids* (1967)
  - o **Raddion**, a male android, in the episode *The Dream Monster* (1966)
  - o The **IDAK Super Androids** in the episode *Revolt of the Androids* (1967)
  - o The **Industro Mini Robots** in the episode *The Mechanical Men* (1967)
  - o The **robot prison guard** (Robby the Robot) in the episode *Condemned of Space* (1967)
  - o The **Xenian Androids** in the episode *Kidnapped in Space* (1967)
  - o The **Female Robot** and **Mechanical Men** in the episode *Deadliest of the Species* (1967)
  - o **The Junkman** in the episode *Junkyard in Space* (1968)
- **Hymie the Robot** in the comedy series *Get Smart* (1965–1970)
- In *Gilligan's Island* (1964-1967):
  - o The **Government test robot** (Robby the Robot) in the episode *Gilligan's Living Doll* (1966)
- In *The Addams Family* (1964-1966):
  - o **Smiley the Robot** (Robby the Robot) in the episode *Lurch's Little Helper* (1966)
- In *Star Trek* (1966-1969):
  - o **Dr Roger Korby**, **Andrea**, **Dr Brown**, **Ruk** and the **Kirk android** in the episode *What Are Little Girls Made Of?* (1966)
  - o **Nomad**, a sentient robot probe in the episode *The Changeling* (1967)
  - o The **Norman, Alice, Herman, Barbara, Maizie, Annabelle and Trudy series** androids and the **Stella Mudd** androids in the episode *I, Mudd* (1967)
  - o **Rayna Kapec** in the episode *Requiem for Methuselah* (1969)
  - o The android replicas of **Mr Atoz** in the episode *All Our Yesterdays* (1969)
- **Serendipity Dog**, a robot dog who asked questions on the BBC children's science series *Tom Tom* (1966-1969)
- In *Captain Scarlet and the Mysterons* (1967-1968):
  - o The **Mysteron construction robots** in the episode *Crater 101* (1968)
- **Mildred the Maid** (Robby the Robot) in *The Banana Splits Adventure Hour* (1968-1970)
- In *Joe 90* (1968-1969):
  - o The **Spider riot control robots** in the episode *The Professional* (1969)
- In *Land of the Giants* (1968-1970):
  - o Professor Gorn's **Super Giant Robot**, a giant android, in the episode *The Mechanical Man* (1969)
- **Slim John**, a rebel robot in the BBC series *Slim John* (1969)

1970s

- **Zed**, the rebel robot in *The Ed and Zed Show* (c1970)
- In *Doctor Who* (Seasons Seven to Seventeen) (1970-1980):
  - The **IMC Mining Robot** in the serial *Colony in Space* (1971)
  - The **Sontaran Knight Robot** in the serial *The Time Warrior* (1973-1974)
  - The **K1 Robot** invented by Professor Kettlewell in the serial *Robot* (1974-1975)
  - The **Sontaran Surveillance Robot** in the serial *The Sontaran Experiment* (1975)
  - The **Osirian Service Robots**, mummy-like robot servants of Sutekh in the serial *Pyramids of Mars* (1975)
  - The **Kraal Androids**, including **android duplicates of the Doctor, Harry Sullivan and RSM Benton**, in the serial *The Android Invasion* (1975)
  - **Dum, Voc and Supervoc** robots in the serial *The Robots of Death* (1977)
  - **K-9 (Doctor Who)**, the Doctor's robot dog companion, created by Professor Marius and introduced in the serial *The Invisible Enemy* (1977)
  - The **Seers of the Oracle** in the serial *Underworld* (1978)
  - **K9 MkII**, the second version of the Doctor's robot dog companion, introduced in the serial *The Ribos Operation* (1978)
  - The **Polyphase Avatron**, the Captain's robot parrot in the serial *The Pirate Planet* (1978)
  - The **Taran Androids**, including an **android duplicate of Romana**, in the serial *The Androids of Tara* (1978)
  - The **Movellans**, android enemies of the Daleks, in the serial *Destiny of the Daleks* (1979)
- **S.A.M.**, Super Automated Machine (the 'perfect machine') robot in Sesame Street (1969-present), introduced in episode 0406 (1972)
- In *Here Come the Double Deckers!* (1971):
  - **Robby**, a dancing robot invented by Brains in the episode *Robby the Robot* (1971)
- In *Columbo* (1971-1993):
  - **MM7** (Robby the Robot) in the episode *Mind Over Mayhem* (1974)
- In *Kolchak: The Night Stalker* (1972-1975):
  - **Mr. R.I.N.G.**, Robomatic Internalized Nerve Ganglia, a top secret military robot in the episode *Mr. R.I.N.G.* (1975)
- In *The Six Million Dollar Man* (1973-1978):
  - A **robot double of Major Fred Sloane** in the episode *Day of the Robot* (1974)
  - A **robot double of Oscar Goldman** in the episode *Return of the Robot Maker* (1975)
  - **Sasquatch**, the robot watchdog of marooned aliens in the episodes *The Secret of Bigfoot - Part 1* (1976), *The Secret of Bigfoot - Part 1* (1976), *The Return of Bigfoot - Part 1* (1976) and *Bigfoot V* (1977)
  - The **Fembots** and a **robot double of Oscar Goldman** in the episode *Kill Oscar - Part II* (1976)
  - **Death Probe**, a Soviet Venusian robot probe in the episodes *Death Probe - Part 1* (1977), *Death Probe - Part 2* (1977), *Return of the Death Probe - Part 1* (1978) and *Return of the Death Probe - Part 2* (1978)
- **Questor** in *The Questor Tapes* (1974)
- In *Space:1999* (1975-1977):
  - **The Servant of the Guardian** in the episode *Guardian of Piri* (1975)
  - **Gwent**, a sentient spaceship in the episode *The Infernal Machine* (1976)
  - **Zarl**, **Zamara** and the other **Vegan androids** in the episode *One Moment of Humanity* (1976)
  - **Brian the Brain** in the episode *Brian the Brain* (1976)
  - A **robot double of Maya** in the episode *The Taybor* (1976)

- o **The Cloud Creature** in the episode *The Beta Cloud* (1976)
- **Fi** and **Fum**, the time-travelling androids from the children's series *The Lost Saucer* (1975-1976)
- In *The New Avengers* (1976-1977):
  - o A **Cybernaut** in the episode *The Last of the Cybernauts...??* (1976)
- In *Ark II* (1976):
  - o **Alfie the Robot** (Robby the Robot) in the episode *The Robot* (1976)
- In *The Bionic Woman* (1976-1978):
  - o **Sasquatch**, the robot watchdog of marooned aliens in the episode *The Return of Bigfoot - Part 2* (1976)
  - o The **Fembots** in the episodes *Kill Oscar* (1976), *Kill Oscar - Part III* (1976), *Fembots in Las Vegas - Part 1* (1977) and *Fembots in Las Vegas - Part 2* (1977)
- **Yo-Yo**, aka Geogory Yoyonovitch, *Holmes and Yo-Yo* (1976)
- **Officer Haven** in *Future Cop* (1976-77)
- In *The Fantastic Journey* (1977):
  - o **Cyrus**, **Rachel**, **Daniel**, **Michael** and the other android members of Jonathan Willoway's community in the episode *Beyond the Mountain* (1977)
- In *Logan's Run* (1977-78):
  - o **REM**, a male android who joins Logan and Jessica in their search for Sanctuary
  - o **Draco**, a male android, and **Siri**, a gynoid, in the pilot TV movie (1977)
  - o **Friend** and **Nanny**, Lisa'a robot companions in the episode *The Innocent* (1977)
  - o **Ariana**,a gynoid, in the episode *Futurepast* (1978)
- **The Clinkers** in *Shields and Yarnell* (1977-78)
- **Peepo**, the robot in the children's series *Space Academy* (1977-1979)
- In *The Space Sentinels* (1977):
  - o **MO**, Maintenance Operator, Sentinel One's maintenance robot
- **Haro** in *Mobile Suit Gundam* (1977)
- **Voltes V** in the Japanese animated series (1977)
- **7-Zark-7** and **1-Rover-1** in the animated series *Battle of the Planets* (1978)
- In *Battlestar Galactica* (1978-1979):
  - o The **Cylons**, mechanical men created by a race of reptile-like creatures
  - o **Muffit Two**, a robot daggit who becomes Boxey's pet
  - o **Lucifer**, an I-L series Cylon, the robot assistant to Baltar introduced in *Saga of a Star World - Part III* (1978)
  - o **Specter**, an I-L series Cylon, the garrison commander on Antilla in the episode *The Young Lords* (1978)
  - o **Hector** and **Vector** in the episode *Greetings from Earth* (1979)
- **IQ-9** in Star Blazers (1978-1984), originally called Analyzer in *Space Battleship Yamato* (1974-1980)
- **H.E.R.B.I.E.** in the 1978 *Fantastic Four* animated series
- *Blake's 7* (1978-81) featured several robots and androids
- In *The New Adventures of Wonder Woman* (1977-1979):
  - o Dr Solano's **swordmaster robot** in the pilot movie *The Return of Wonder Woman* (1977)
  - o Orlick Hoffman's **android duplicates of Dr Tobias, Dr Prescott, Dr Lazaar and Wonder Woman** in the episode *The Deadly Toys* (1977)
  - o **Rover**, the IADC's robot dog, **Cori**, William Havitol's robot secretary, and Havitol's **evil duplicate of Rover** in the episode *IRAC is Missing* (1978)
- In *Quark* (1977-1978):
  - o **Andy the Robot**, a cowardly robot built by Adam Quark from spare parts

- In *Mork and Mindy* (1978-1982):
  - **Chuck the Robot** (Robby the Robot) in the episode *Dr Morkenstein* (1979)
- In *Salvage 1* (1979):
  - **Mermadon**, a junked Government-constructed android in the episode *Mermadon* (1979)
- In *Buck Rogers in the 25th Century* (First Season) (1979-1980):
  - **Twiki**, Buck's ambuquad robot who wears **Dr. Theopolis**, a brilliant talking computer, around his neck
- **W1k1** (or **Wiki**), the pocket-sized robot in the children's series *Jason of Star Command* (1979-1981)

1980s

- **Metal Mickey**, the Wilberforces' household robot in *Metal Mickey* (1980-1983)
- In *Buck Rogers in the 25th Century* (Second Season) (1981):
  - **Twiki**, Buck's ambuquad robot, and **Crichton**, a robot created by Dr Goodfellow
- In *Doctor Who* (Seasons Eighteen to Twenty-Six) (1980-1989):
  - The **Gundan War Robots** in the serial *Warriors' Gate* (1981)
  - The **Urbankan Androids** in the serial *Four to Doomsday* (1982)
  - The **Terileptil Android** in the serial *The Visitation* (1982)
  - The **Cybermen's Androids** in the serial *Earthshock* (1982)
  - **Kamelion**, a shape-changing android introduced in the serial *The King's Demons* (1983)
  - **K9 MkIII**, Sarah Jane Smith's robot dog companion, in the episode *The Five Doctors* (1983)
  - The **Raston Warrior Robot** in the episode *The Five Doctors* (1983)
  - The **Daleks' Androids**, including **android duplicates of the Doctor, Tegan and Turlough**, in the serial *Resurrection of the Daleks* (1984)
  - The **Androzani Androids** created by Sharaz Jek, including **android duplicates of the Doctor and Peri**, in the serial *The Caves of Androzani* (1984)
  - The **Karfelan Android** in the serial *Timelash* (1985)
  - **Drathro** and the **L1 robot** in the serial *The Trial of a Time Lord* (1986)
  - The **Robotic Cleaners** in the serial *Paradise Towers* (1987)
  - **The Kandy Man**, a robot made from sweets (candy) in the serial *The Happiness Patrol* (1988)
  - The **Bus Conductor** and the **Robot Clowns** in the serial *The Greatest Show in the Galaxy* (1988-1989)
- In *Knight Rider* (1982-1985):
  - **KITT**, Knight Industries Two Thousand, a talking Trans AM car
  - **KARR**, Knight Automated Roving Robot, an early prototype of KITT in the episodes *Trust Doesn't Rust* (1982) and *K.I.T.T. vs K.A.R.R.* (1984)
- In *Terrahawks* (1983-1986):
  - **Zelda**, **Yung-Star**, **Cy-Star** and **It-Star**, evil androids from the planet Guk
  - **Sergeant Major Zero**, **Space Sergeant 101**, **Dix-Huit** and many other **Zeroids**, spherical battle robots
  - **Dr Kiljoy**, Zeroid robot doctor in the episodes *The Ugliest Monster of All* (1983), *Zero's Finest Hour* (1984) and *Operation Zero* (1986)
- **Roboz**, the orange robot invented by Murray 'Boz' Bozinsky in *Riptide* (1984-1986)

- The **BATs** (Battle Android Trooper) of the evil [Cobra Organization](#) in *[G.I. Joe: A Real American Hero](#)* series, first appeared in 1986.
- **The Transformers** of various *Transformers* television series (1984–present)
- **Go-bots** were featured in a Cartoon series also named *Go-Bots* around the same time as the *Transformers* series.
- **Voltron Defender of the Universe** (1984–1986)
- The Orbots—Tor, Bort, Bo, Boo, Crunch, & Oh-No, from **Mighty Orbots** (1986)
- Tobor, the Shadow-double of [Mighty Orbots](#), from the episode, *Devil's Asteroid*. (1986)
- **Robostory**, this French cartoon had various robots in its main cast.
- An enemy **Bioroid pilot** was described by a scientist in the *Masters* story (1985) of the *[Robotech](#)* science fiction series as a very advanced android with some sort of bio-electric device "as an artificial soul." *Robotech* adapted this story from *[The Super Dimension Cavalry Southern Cross](#)* Japanese animated series (1984), in which these pilots are humans with mechanical implants instead of androids with artificial souls.
- **T-Bob**, a [droid](#) developed and owned by [Scott Trakker](#), from the [animated television series](#) [M.A.S.K.](#), closely resembling [R2-D2](#), and perhaps even a direct successor as an adapted Tx-series [Industrial Automaton](#) [astromech droid](#), as inferred by the show's storyline.
- Material for the *[Robotech II: The Sentinels](#)* (1987) and *[Robotech: The Shadow Chronicles](#)* (2007) sequels described a character named [Janice Em](#) as a "sexy robot" with an "android body." JANICE is an acronym (according to the voice actress Chase Masterson in the video: The Face behind the Voice mini-documentary) which means: Junctioned Artificial Neuro-Integrated Cybernetic Entity.
- **Metalhead**, *[Teenage Mutant Ninja Turtles](#)*
- **Vicki** (Voice Input Child Indenticant) the little girl robot in *[Small Wonder](#)* (1985)
- **Vanessa** from *Small Wonder*
- **Foot Soldiers** from *[Teenage Mutant Ninja Turtles](#)*
- **Conky 2000**, robot who gives out the secret word in *[Pee-wee's Playhouse](#)*, 1986 until 1991.
- **Data**, **Lore**, **Lal** (Data's daughter) and **Juliana Tainer** in the series *[Star Trek: The Next Generation](#)* (1987–1994, plus four movies)
- The **synthoids** from several episodes of the *[G.I. Joe: A Real American Hero](#)* series (1985).
- **Chip Carson** from the *[Not Quite Human](#)* series (1987, 1989, 1992).
- **Tom Servo**, **Crow T. Robot**, **Gypsy** and **Cambot**, created by and friends to **Joel Hodgson** and later **Mike Nelson** from *[Mystery Science Theater 3000](#)* (1988)
- **The Skutters**, **Kryten**, the **Simulants** and many others from *[Red Dwarf](#)* (1988)
- **Blitz**, a robotic dog from the cartoon *[C.O.P.S.](#)*, 1988 and 1989.
- **Roberta** from *[Not Quite Human II](#)* (1989)
- **No-No**, from the animated children's series *[Ulysses 31](#)*
- **Blinky**, from the animated children's series *[Bucky O'Hare](#)*
- **ASTAR**, a golden robot promoting safe play to children
- **Jinx** from the 1986 film *[SpaceCamp](#)*.
- **Simon**, a humanoid robot with the mind scanned from a dead little boy with AI technology. He was built by the boy's sister to preserve the life of her brother. Appeared in *[Tales from the Darkside](#)*
- **Robin**, a small robot made by the clown Bassie in the children's series *[Bassie en Adriaan](#)*
- **Arale Norimaki**, the main character of the Japanese animated series *[Dr. Slump](#)*

1990s

- **Androids 16", "Android 19",** Cell**,** Super 17 **and [many others](#), _[Dragon Ball](#)_ series.**
- **Sgt. Eve Edison**, robot [police officer](#) in _[Mann & Machine](#)_ (1992)
- **Alpha** from the TV series _[The Flash](#)_, a government constructed female android, [gynoid](#), assassin, that develops a conscience and determines that killing is wrong and wishes to be free from government control. (1990 - 1991)
- **Omega** from the TV series _[The Flash](#)_, government built android assassin reprogrammed to find Alpha.
- **[The Bots Master](#)**, a cartoon series that was featured on the [Fox network](#) about a genius boy called Ziv "ZZ" Zulander who controls many robots. (1993)
- **[Alpha 5](#)** from _[Mighty Morphin Power Rangers](#)_ (1993–1996) to _[Power Rangers: Turbo](#)_
- **[Machine Empire](#)** from _[Power Rangers: Zeo](#)_ to _[Power Rangers in Space](#)_
- **[Battle Borgs](#)** from _[Mighty Morphin Alien Rangers](#)_ (1995)
- **[Alpha 6](#)** from _[Power Rangers: Turbo](#)_ to _[Power Rangers: Lost Galaxy](#)_ and _[Power Rangers: Operation Overdrive](#)_
- The many **[Evangelions](#)**, or **EVAs**, from the _[Neon Genesis Evangelion](#)_ series
- **[790](#)**, the sarcastic and perverse bodyless robot head of _[Lexx](#)_
- **[Blue Senturion](#)**, robotic Intergalactic Police Officer from _[Power Rangers: Turbo](#)_ to _[Power Rangers in Space](#)_
- **[Buffybot](#)**, **April** and **Ted** in the series _[Buffy the Vampire Slayer](#)_ (1997)
- **[Bender](#)** the robot, as well as Flexo, Santa-Bot and Kwanzaa-Bot, and other assorted robots including the Epsilon Rho Rho fraternity robots, in the [animated series](#) _[Futurama](#)_ (1999)
- **[Melfina](#)** from _[Outlaw Star](#)_.
- **Noo-Noo** from [Teletubbies](#)
- **[Psycho Rangers](#)** from _[Power Rangers](#)_
- **Quantrons** from _[Power Rangers in Space](#)_
- **Robot Devil**, the demonic ruler of Robot Hell in the [animated series](#) _[Futurama](#)_ (1999)
- The **marionettes** from the anime series _[Saber Marionette R](#)_ (1995), _[Saber Marionette J](#)_ (1997), _[Saber Marionette J Again](#)_ (1998), and _[Saber Marionette J to X](#)_ (1999)
- **Rusty**, the boy robot of the animated series _[Big Guy and Rusty the Boy Robot](#)_
- **[Andromon](#)** and **[Guardromon](#)**, in the [Digimon](#) anime series
- **Satan's Robot**, a meta-fictional robot in _The Adventures of Captain Proton_, a [holodeck](#) program from _[Star Trek: Voyager](#)_
- '_[Coconuts](#)_ from _[Adventures of Sonic the Hedgehog](#)_
- '_[Scratch and Grounder](#)_ from _[Adventures of Sonic the Hedgehog](#)_
- **Slo-Mo** from _[Space Precinct](#)_
- **[SWATbots](#)**, from _[Sonic the Hedgehog](#)_ and _[Sonic Underground](#)_
- **[Zords](#)**, giant fighting machines from all seasons of _[Power Rangers](#)_ series
- **Ian Favre**, CPB officer in _[Total Recall 2070](#)_
- **Multi** (HMX-12), **Serio** (HMX-13) are experimental humanoid maid robots from _[ToHeart](#)_ anime
- **Zero** the service robot in [Earth 2 (TV series)](#)
- **Beetleborg AVs** (Attack Vehicles) and **Gargantis** the Attack Mobile Carrier in _[Big Bad Beetleborgs](#)_.
- **Beetleborg BVs** (Battle Vehicles) in _[Beetleborgs Metallix](#)_.
- **Roboborg** and **Boron** in _[Beetleborgs Metallix](#)_.
- **VR Troopertron** in the second season of _[VR Troopers](#)_.
- **Ken** in _[The Tomorrow Man (1996)](#)_, sent into the past to save its Inventor and prevent a missile disaster.
- **Robocrook** in the PBS game show _[Where in the World is Carmen Sandiego?](#)_

- **Paperboy 2000**, the paper delivering robot vehicle from the sitcom series *Get a Life*.

2000s

- **Rommie** Gabriel/Balance of Judgement, Pax Magelanic and various other warship AIs/Avatars from *Gene Roddenberry's Andromeda* (2001-2005)
- **Frax** from *Power Rangers: Time Force*
- **Alpha 7** from *Power Rangers: Wild Force*
- XR (eXperimental Ranger), the indestructible, self healing sidekick robot in *Buzz Lightyear of Star Command* (also **XL**, the proto-version of XR)
- **Cameron** - *Terminator: The Sarah Connor Chronicles*
- **Ant Drones**, **Flying Termites**, **Beetle Drones** and various other robots from the *Samurai Jack* series
- **Chii**, the Persocom in the Japanese anime series *Chobits* (2002)
- **Back-Pack**, Gears main partner. It is a semi-independent, sophisticated AI robot that acts as a scouting robot, a computer, machine hacker, code breaker, alarm system, police scanner, tracer, weapons unit and restraining device. Back-Pack gets its name from what it resembles when it "heels" with the body being the bag and its legs the backpack straps. Back Pack is rather significant because he can link up to Gear's thoughts giving Gear technopathy
- **Cybernetic Ghost of Christmas Past from the Future** from *Aqua Teen Hunger Force*
- **Cyber Shredder** from - *TMNT: Back to the Sewer*
- **D.A.V.E.** from *The Batman*
- Zurg's robots from *Buzz Lightyear of Star Command*
- **Robot Jones** from *Whatever Happened to Robot Jones?* (2002)
- The **Tachikoma** spider tanks from *Ghost in the Shell: Stand Alone Complex*
- **Thundercleese** from *The Brak Show* (2001–2003)
- **GIR** and the Robo-Parents from *Invader Zim* (2001)
- **"Jenny" XJ-9 Wakeman**, **her sisters**, **Melody**, **Kenny**, **Vega**, and **various robotic villains** from *My Life as a Teenage Robot* (2003)
- **R. Dorothy Wayneright** in *The Big O* (2003)
- The **Mobile Doll** systems onboard Virgos and other mobile suits in *Mobile Suit Gundam Wing*.
- **C.A.R.R** from *Stroker and Hoop*
- **Constable Biggles** from *Teenage Mutant Ninja Turtles: Fast Forward*
- **Cyclobots** from *Power Rangers: Time Force*
- **Cylons** from *Battlestar Galactica*
    - Cylon Centurions (Model 0005)
    - Cylon Centurions
    - The Hybrids
    - The First Hybrid
    - Number One (John Cavil)
    - Number Two (Leoben Conoy)
    - Number Three (D'anna Biers)
    - Number Four (Simon)
    - Number Five (Aaron Doral)
    - Number Six
    - Number Seven (Daniel)
    - Number Eight (Sharon Valerii)
    - *The Final Five*

- - Galen Tyrol
  - Tory Foster
  - Samuel T. Anders
  - Saul Tigh
  - Ellen Tigh

- **General Crunch** from *Power Rangers RPM*
- **General Shifter** from *Power Rangers RPM*
- **Grinders** from *Power Rangers RPM*
- **G.U.A.R.D.O.** from *The Venture Bros.*
- **H.E.L.P.eR.**, a robot developed by Jonas Venture, Sr., in *The Venture Bros.*
- The **Interrodroids** from *The Middleman*
- **Jack Spicer's** army of **Jack-bots**, including robots of himself and other people in *Xiaolin Showdown*.
- **Karaibots** from *Teenage Mutant Ninja Turtles*
- **Karl Stefanovic** from *Today*
- **Krybots** from *Power Rangers: S.P.D.*
- **Mahoro**, the protagonist of *Mahoromatic*.
- The **Mechadrones** and **Galvanic Mechomorphs** from *Ben 10*
- **Goddard**, *Jimmy Neutron's* robot pet dog.
- **Bill Cosby** from *South Park*
- **Mecha-Streisand** from *South Park*
- **Megas** from *Megas XLR*
- **NOS-4-A2** a robotic vampire from *Buzz Lightyear of Star Command*
- **R.I.C. 2.0**, Robotic Interactive Canine who transforms itself into a Canine Cannon from *Power Rangers: S.P.D.*
- **S.O.P.H.I.E.,** Series One Processor Hyper Intelligent Encriptor who is kidnapped and used for her programming from *Power Rangers: S.P.D.*
- **Rabbot** from *Aqua Teen Hunger Force*
- **Robotboy**
- The **replicators**, seen in multiple seasons of *Stargate SG-1*.
- **T-Bot**, from *Megas XLR*
- **TurtleBot**, *Teenage Mutant Ninja Turtles*
- **Santa Clone** from *The Santa Clause 2*
- **Mr Dent**, nanotech enforcer from *Codename Eternity*
- **Robert Torkelson**, from *Albert & Friends*.
- **X-5** from *Atomic Betty*
- **Anne Droid**, **Trin-E**, **Zu-Zana** and **Davinadroid** from the *Doctor Who* episode *Bad Wolf*
- **S.A.M** Weather-controlling robot from *Ben 10*
- **Satan's Robot**, usually in service for Dr. Chaotica but impressionable enough to sometimes work for good, in episodes of *Star Trek: Voyager* when the holodeck program *Captain Proton* is run
- **Slix Vigma** from *Ben 10*
- **Stan** from *Aaron Stone*
- **Zeta** from the TV show, *The Zeta Project*.
- **HMX-17a Ilfa**, **HMX-17b Milfa**, and **HMX-17c Shilfa** are experimental maid robots from *ToHeart2*
- **Miyu Greer** from the anime series *My-HiME* and *My-Otome*.
- **Briareos** is a cyborg from *Appleseed* Japanese manga

- **SILKY(MMF108-41)** is egosystem robot from *POST GIRL*
- **Serling** from *Teenage Mutant Ninja Turtles: Fast Forward*
- **Tenaya 7** from *Power Rangers RPM*
- **Viral** from *Teenage Mutant Ninja Turtles: Fast Forward*
- **Mackenzie Hartford** from *Power Rangers: Operation Overdrive*
- **Gunslinger** from *Trinity Blood*
- **Yui**, an otaku's android maid from *Koharu Biyori*
- **Robositter**, from Aqua Teen Hunger Force
- **Woodbot** and **Rockbot** from *The Emperor's New School*
- **Tieria Erde**, **Ribbons Almark**, **Regene Regetta** and the other **Innovators** from the anime *Mobile Suit Gundam 00*

Comics

American

- The Mad Thinker's Awesome Android in *Fantastic Four* and various other Marvel Comics. Would later be featured in She Hulk's 2004 series under the name 'Awesome Andy'.
- Biotron from *Micronauts*
- "Clickers" from Top 10
- Coheed (the Beast), Cambria (The Knowledge), Jesse (The Inferno), Mayo Deftinwolf, and a number of other IRO-Bot "children", who are genetically altered humans with superhuman powers and robotic qualities, (i.e: can be taken apart and terminated) from the graphic novel series The Amory Wars written by Coheed and Cambria frontman Claudio Sanchez. The characters and plotlines are also incorporated into the band's music.
- Computo created by Brainiac 5
- Doctor Doom's Doombots in *Fantastic Four* (1961)
- Fugitoid in *Teenage Mutant Ninja Turtles*
- G.I. Robot, a construct used by the U.S. Marines in World War II, which appeared in *Weird War Tales*
- Grag and Otho from the pulp magazines *Captain Future* & *Startling Stories*
- The Golden Age Human Torch in *Marvel Comics*, (1938)
- Jeremy Feeple and Professor Steamhead got replaced with badly constructed, unconvincing robot doubles (which eventually exploded) in an early issue of Ninja High School.
- The Living Brain from *Spider-Man* comics
- Machine Man aka Aaron Stack from *Marvel Comics*
- The Manhunters in *Green Lantern* (1959)
- **Irona**, the robot maid of *Richie Rich*, the main character in a comic book and cartoon series (1961)
- The Metal Men (1962)
- Microtron from *Micronauts*
- Mousers in *Teenage Mutant Ninja Turtles*

- Nanotron from *Micronauts*
- The Red Tornado, Amazo and Tomorrow Woman and Hourman III in *JLA* (1968)
- Robotman in DC Comics *Doom Patrol* (1963)
- Robo-Robotnik from the Archie Sonic the Hedgehog comic book.
- The Robots in the comic book Magnus, Robot Fighter. These include:
  - 1A, the oldest sentient robot, protector of mankind, who raised Magnus.
  - H8, the robot police chief, who plots against mankind.
- The Sentinels in *X-Men* (1963)
- Skeets Booster Golds robot companion
- The Spider-Slayers from the Spider-Man comics
- The Superman duplicates, Brainiac (pre-Crisis) and Kelex in *Superman*, (1958)
- Ultron, the Vision, Jocasta and Alkhema in *The Avengers* (1963)
- Young Vision, a member of the Young Avengers. A rebooted new version of the Vision.
- Victor Mancha, an android created by Ultron in Marvel Comics.
- *Transmetropolitan* features AIs who abuse virtual hallucinogens
- Android from Frank Miller's "Hard Bolied"
- Ida from The Middle Man
- L-Ron, from the DC Comics series *Justice League International*.

Australian

- Mr. Pendulum from Ben Templesmith's Wormwood: Gentleman Corpse.

British

- The ABC Warriors from the comic *2000 AD*, includes Hammerstein
- Android Andy, a parody of Robot Archie in *Captain Britain*
- Armoured Gideon from *2000 AD*.
- Brassneck in *The Dandy*
- Mechanismo, a range of robo-Judges from *Judge Dredd*
- Robot Archie in the UK comic *Valiant* who has appeared in *Zenith* and *Albion*
- *Ro-Busters*, a *2000 AD* series
- Walter the Wobot robotic servant to Judge Dredd also from *2000 AD*

European

- Robo-cops from Incal (by Moebius & Jodorowsky)
- Robots from planet Des from polish series "Gods from The Space", written by Arnold Mostowicz and Alfred Górny and illustrated by Bogusław Polch.
- Otomox, the self-proclaimed "Robot Master"[2]
- **Uèr**, an "electro-chemical" android capable of human feelings, in *Milady 3000* comic book by Magnus (1980)

South American

- The *Stellar Warriors* from Karmatron (1986) by Oscar González Loyo.
- Tonto and Lothar from *The Metabarons*.

Manga (Japanese comics)

- Doraemon in a manga by Fujiko Fujio (1969)
- Chi and other Persecoms from the manga Chobits
- **Chihiro** and **Robita** plus various other robots from Osamu Tezuka's Phoenix (manga) (1971)
- Project 2501 in Masamune Shirow's *Ghost in the Shell* Japanese manga describes an espionage AI that achieves sentience. (1991)
- Marilyn, named after Marilyn Monroe, in Kazuo Umezu's 1982 manga *My name is Shingo*
- Chachamaru Karakuri, plus other robots, in the manga Negima by Ken Akamatsu.
- Banpei and Sigel in *Oh My Goddess!* by Kosuke Fujishima.
- Rin Asakura, Bathyscaphe and other robots, cyborgs and space-vessels-that-look-like-humans in The World of Narue, by Tomohiro Marukawa

Comic strips

- Robotman in the comic strip of the same name, which eventually became "Monty". Robotman left the strip and found happiness with his girlfriend Robota on another planet.

Web comics

- Alice, Garth's sentient computer in *Comedity*.
- Atomic Chef, a cooking robot from the Isle of Wight, who awaits the end of the world in Slough, England.[3]
- ARPA-01 (female type) and VIC-02 (male type) virtual intercourse companions in *Sexy Losers'* *Scientific Erotican* plot thread (2003)
- "Clanks", various (steam powered?) robots in Phil Foglio's steampunk fantasy *Girl Genius*.
- Eve, a female android from *Applegeeks*, built using Apple Macintosh parts.
- Emotibot, a robot programmed to feel emotions, from *Beaver and Steve*
- Evil Killer Death Spybot 5000 from Mark Shallow's Adventurers!, a robot originally designed to spy on the party who eventually becomes a playable character.
- Ezekiel aka 'Zeke' - Formerly known as the "X-bot", the anthropomorphised Xbox console from the webcomic *Ctrl+Alt+Del*.
- Fruit Fucker, a semi-sentient kitchen appliance in the webcomic Penny Arcade that has sex with fruit and ejaculates the juice.
- Carl Swangee, a sentient android from the Penny Arcade 'Automata' storyline.
- J-LB8/Jalea Bates in *Melonpool*. Started as a robot, later to become a human.
- Kleptobot, a supposedly Soviet-made robot programmed to steal anything and everything, from *Joe and Monkey*
- Mantooth Soundsystem, an "evil" robot DJ bent on the destruction of humans who create electronic music, from *Mantooth Soundsystem*.
- Medivac 911 ('Doc'), a steam-powered medical/janitorial droid from *The Polymer City Chronicles*.
- The Ottobot,[4] a robot duplicate of the character Francis Ray Ottoman featured in *PvP*.
- PC, ASCII and O in Funny Farm.
- Ping, the PlayStation 2 accessory robot-girl from Fred Gallagher's *Megatokyo*.
- Pintsize, an AnthroPC from *Questionable Content*. Other AnthroPCs have featured in *Questionable Content*.
- Robo-Britney B-1000, a T-1000 style robot from Justice Squad

- Robot Frank, an internet personality found at Robot Frank's website
- A sugar powered robot suit owned by Beefsteak from *Filthy Lies!*.
- The self-aware technology in *Gene Catlow*.
- Various characters in *Freefall*, including Helix.
- Various characters in *21st Century Fox*.
- Various characters from *Diesel Sweeties*, including Clango Cyclotron.

Web based media

- Stella 4D, aka Manager 45, on GO Moonbase, first appears in episode 26

Flash

- Rya Botkins and June Crane of Matt Wilson's Bonus Stage (though Crane's status is disputed, as she has claimed to be human)
- The Grape-Nuts Robot, Created by Bubs to imitate Strong Bad from Homestar Runner Appears here[5]
- Schniz, Fulker, CPDoom, and various background characters from Andrew Kauervane's My God, Robots!

Machinima

- *Lopez, Church, and Tex* - characters from the Rooster Teeth machinima Red vs. Blue. Only Lopez is a true artificial life-form, as both Church and Tex exist only as ghosts. Both characters died during the course of the series, existing from that point onward as ghosts. They possess mechanical bodies similar to Lopez, however.

Computer and Video Games

- Arthur from The Journeyman Project video game series
- B.O.B.
- The many mining and defense robots in the Descent series of games.
- The mining robots and combots from Red Faction
- Floyd, the lovable sidekick robot from the Infocom text adventure *Planetfall*.
- The distinct robots in the classic *Mega Man* series, including the main character Mega Man and the Robot Masters.
- The Metal Gears from the *Metal Gear* series.
- Custom Robo
- The evil robots from *Toy Story 2: Buzz Lightyear to the Rescue*
- The robot bosses from *Contra III: The Alien Wars*
- Assorted monsters from the *Final Fantasy* series, including the superboss Omega Weapon.
- The Badniks, the E-Series robots and Metallix; all developed by Dr. Robotnik in the *Sonic the Hedgehog* series.
- Captain Whisker from the *Sonic the Hedgehog* series
- Dr Ion and various other robots from *God Hand*
- Emerl and Gemerl from the *Sonic the Hedgehog* series
- Metal Sonic from the *Sonic the Hedgehog* series

- EggRobo from the *Sonic the Hedgehog* series
- The Reploids of the *Mega Man X* and *Mega Man Zero* series, and *Mega Man ZX*, robots with the ability to think, feel, and make their own decisions, much like human beings.
- Enemy robots from Robotron: 2084
- Various robot enemies from Fantastic Four
- Shamus
- Cyrax, Sektor, and Smoke from the Mortal Kombat series.
- The Drones and Mainframe from *Gunman Chronicles*
- Robo from *Chrono Trigger*.
- The Cyberdisc and Sectopod species in *X-COM: UFO Defense*.
- Jack and its variants from the Tekken series.
- Alisa Bosconovitch, a new character in the upcoming game Tekken 6: Bloodline Rebellion.
- Gadget and Gadget Z from *Suikoden II* and *Suikoden III* respectively.
- Cait Sith, a fortune-telling robotic cat controlled via remote by a man named Reeve Teusti, from *Final Fantasy VII*. By extension, Cait Sith rides atop a giant, robotic moogle to which Cait Sith relays commands through a megaphone.
- ROB 64 from the *Star Fox* series, starting with *Star Fox 64*.
- Emeralda, a colony of nanomachines from *Xenogears*.
- The Servbots from *Mega Man Legends*.
- Four evil Commando Elite robot characters named Bipod, Mortar, Sentry, and Mech-Chip in the *Small Soldiers (video game)*.
- Hengar from *Monster Rancher*.
- Terror Drone from *Command & Conquer: Red Alert 2*.
- HMX-12 Multi and HMX-13 Serio, the popular robot maids from *To Heart* as well as their successor, HMX-17a Ilfa from *To Heart 2*.
- The Robo-Kys from the *Guilty Gear* series.
- Ershin from *Breath of Fire IV*.
- The "machina" from *Final Fantasy X* and *Final Fantasy X-2*.
- 343 Guilty Spark and 2401 Penitent Tangent, from the *Halo series of video games*.
- Clank, Doctor Nefarious and countless others in the *Ratchet & Clank* series.
- KOS-MOS, MOMO, and the Realians from the *Xenosaga* trilogy.
- The Ninja Warriors SNES game starring robot ninjas
- Robocalypse, Nintendo DS game
- Robots from *System Shock* game
- Robot enemies from *Viewtiful Joe*
- Thursday, sidekick of Captain Gordon the 37th Defender of Earth (and later itself the 38th Defender of Earth) from *Disgaea: Hour of Darkness*.
- Turtlebot from *Teenage Mutant Ninja Turtles*
- HK-47 from *Star Wars: Knights of the Old Republic*, part of the Star Wars Expanded Universe
- Kurt Zisa, a secret Heartless boss in the American and Final Mix versions of *Kingdom Hearts*.
- 2401 Penitent Tangent, from *Halo 2*.
- The entire Core army in *Total Annihilation*.
- Geary, a cleanliness-obsessed and evil robot from *Crash Nitro Kart*.
- The Ridepod, a customizable industrial revolution-style robot that Max can ride in the dungeons in the RPG *Dark Cloud 2*.
- Dog from *Half-Life 2*.
- Robot enemies from *Journey to Silius*/Raf World

- *Chibi-Robo*, a tiny robot housekeeper that is the main playable character in the game of same name.
- Mike, a "karaoke robot" from *WarioWare: Touched!*. However, its creator, Dr. Crygor used him as a janitor.
- *Rocket: Robot on Wheels*
- Browny from *Contra: Hard Corps*
- The Robot boss from *Contra: Hard Corps*
- Robot enemies from *The Incredible Hulk: Ultimate Destruction*
- Various robot enemies from *Spider-Man: Friend or Foe*
- The Copyroid, a robot that allows a Net-Navi to be projected into the real world and interact with it in *MegaMan Battle Network 6*.
- Yumemi Hoshino, a main character in the visual novel *Planetarian: Chiisana Hoshi no Yume*.
- *Medabots*
- Many enemies and bosses from *Smash TV*
- CD-288 from *Contra: Legacy of War*
- Probotector PAL version of Contra with the human characters replaced with robots
- Quote and Curly Brace, the 'soldiers from the surface' in *Doukutsu Monogatari*.
- Serval Protoss units from StarCraft are robotic
- Most GUN units from Sonic the Hedgehog series are robots
- LapTrap from The Learning Company's *The ClueFinders* series.
- R-110 from *TimeSplitters: Future Perfect*
- *Robot Ninja Haggle Man* from *Retro Game Challenge*
- Virtual Woman, who can be programmed with a new personality, appearance, and history.
- Sasuke, a clockwork robot ninja in the Ganbare Goemon series
- Goemon impact, a very big clockwork robot also in ganbare goemon that is modelled after Goemon himself
- Miss impact, a female counterpart to Goemon impact also in ganbare goemon that is modelled after omistu
- T-elos(Telos), Ziggy, the E.S. units and the Zarathustra system in Xenosaga
- The various classes of Forerunner Sentinels from *Halo*.
- The Jack of All Trades (or Jack) robot from *Gears of War*.
- Big Robot Bill of the computer game *The Neverhood*
- The W-Numbers of *Super Robot Taisen: Original Generation 2*.
- T.O.B.O.R. and Makoto/Proto-Makoto, robots created by Dr. F. on *MySims* and *MySims Kingdom*
- The Fillibots from *Rhythm Heaven*
- GLaDOS, the humorously psychotic scientific computer in the Valve game *Portal*
- Frobot from the eponymous Wii game.
- Josef from the Machinarium computer game

Appendix E: Robot Tree

*Tree created by us based on research into the diversity of the Robot Field
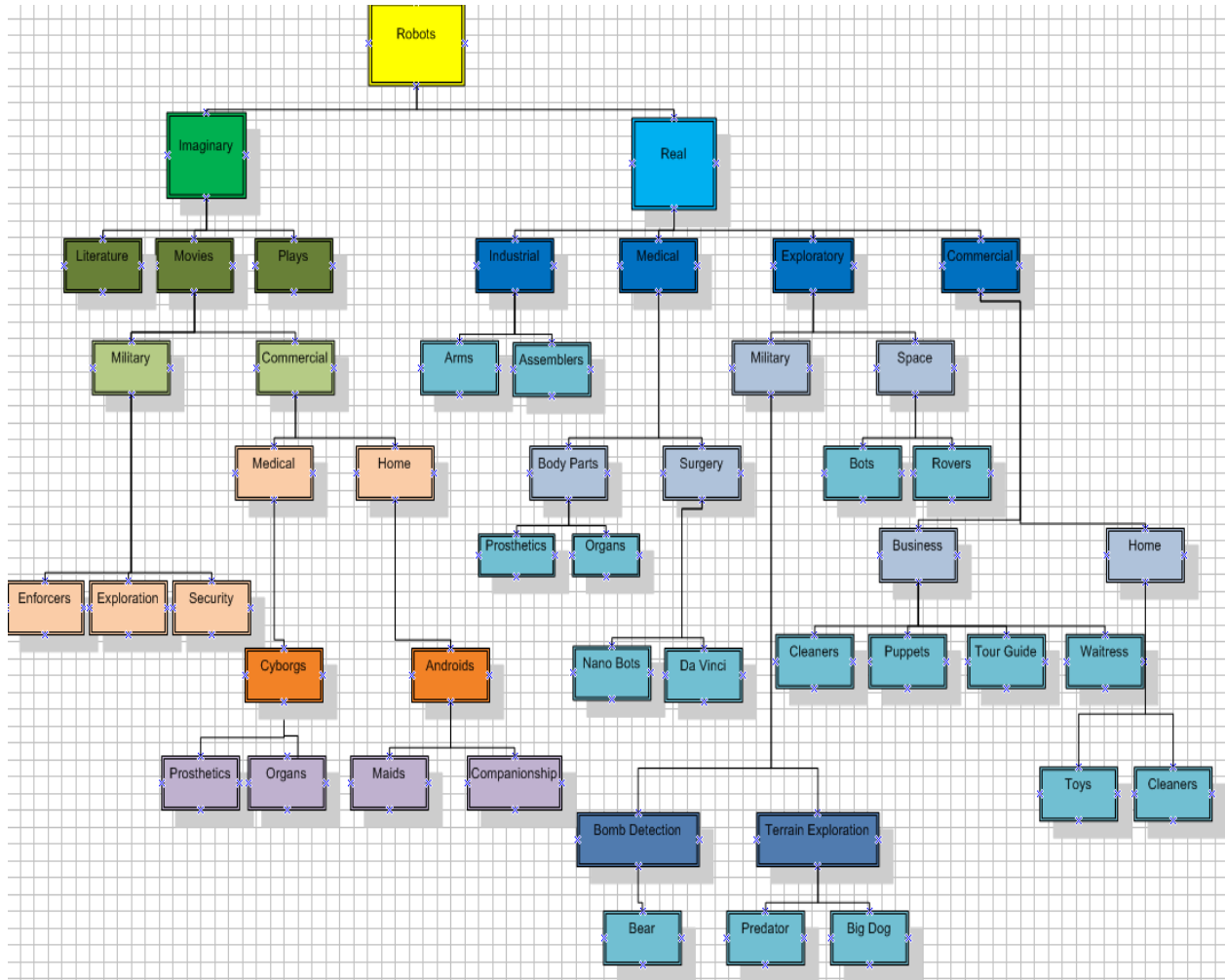
Appendix F: Project Timeline

*Timeline constructed by our group to organize our activities and finish the project on time.

**This timeline does not exactly represent the schedule when items were completed but served more as a guideline

A-Term
16Sep09:

- Watched Forbidden Planet
- Critique on Forbidden Planet
- Watched Modern Times
- Create Timeline
- Finalize our definition of a robot
- Create Works Cited list
- First Draft of Robotic Tree

23Sep09:

- Create Time Chart
- Research feasibility of a school-wide survey
- Finish 3 Lit Reviews
- Review Past Project Proposals
- Finish Robotic Tree

30Sep09:

- Create first draft of Project Proposal
- Create first draft of outline for Final Paper
- Finish 5 Lit. Reviews

07Oct09:

- Review Project Proposal

14Oct09:

- Finalize Project Proposal
- Presentation of Proposal
- Finalize list of literature

B-Term

4Nov09:

- Literature: 1900s (and write critique of "general feeling" for this decade)
- Write interview questions

11Nov09:

- Literature: 1910s
- Write survey questions

18Nov09:

- Literature: 1920s
- Schedule interviews
- (conduct interviews when scheduled)

02Dec09:

- Literature: 1930s
- Finalize survey questions
- Submit survey

09Dec09:

- Literature: 1940s

16Dec09:

- Literature: 1950s

C-Term

20Jan10:

- Literature: 1960s
- Conduct survey

27Jan10:

- Literature: 1970s
- Begin editing Final Paper

03Feb10:

- Literature: 1980s

10Feb10:

- Literature: 1990s
- Write Introduction/Abstract

17Feb10:

- Literature: 2000s

24Feb10:

- Finalize editing Final Paper

03Mar10:

- Present Final Paper

Appendix G: Complete Interview Responses

*Answers to Interview question from Various Professors

Prof. Charles Rich, CS Professor, IMGD and Robotics faculty member (12/8/2009)

1. At age 10, he had a record "Robby the Robot" (1950s), different one from the one in Forbidden Planet. He was fascinated by things that work by themselves.

2. The terminator. "Don't know why. Just came to mind." "Surprised me."

3. The robots listed in the Robots as Avatars article - especially Newscaster.

4. "Tough question." "A lot of stuff going on."
   Fast, cheap computer vision, and lightweight joint activators. First is sensory, second is activation. "Couldn't choose one or the other."

5. "My own research *laughs*." Developing deep models of human/robot relationships, emotional, companionship, etc. Long term interaction models. "Human/robot interaction is going to be really important. Much more important than the mechanical stuff."

5b. Interactions, or feelings of love?
   Love is not a word he's comfortable with for this. "Feelings of caring. You actually care about what happens to the robot, and you believe that it cares about what happens to you."

6. Building and using Melvin. Significant because it's the most recent project that he also cares the most about.

7. "In the long run if we manage to survive other disasters, Robots will add to human safety, leisure, education... I think it's sort of the ultimate automation, automation fairly applied and distributed. There will always be the haves and the have-nots, but if applied and distributed fairly, it would be beneficial."

Prof. Kenneth Stafford, ME Professor, Director of Robotics (12/10/2009)

1. 1997 started current fascination, when Prof. John Sullivan in ME approached him with about the FIRST robotics program on campus. He never heard of it, and Sullivan encouraged him to join, which he did.
    Was still in air force at the time, and didn't have much of a chance to work on it.

2. C-3PO was most significant, with more since then (WALL-E).
    "Prior to that, all the robots that were actually used in literature (and especially movies), were laughably one-dimensional. They were just farcical in their construction details and there was clearly a person inside of them doing something. C-3PO had a soul, had personality, and was much more elegantly portrayed than robots in previous movies. It wasn't a villain, it had a likable personality."

3. Several: Big Dog, and the WPI FIRST Robot of 2004 'MO-GOAT' ("It's hard to be impressed by something you helped create, but it was still impressive."), the Audi-ESP (not a robot, a robotic element, an electronic stability program).

4. Computational and sensing power. "It's not just the power, but the incredible accessibility and affordability of computational performance with impressive sensors."

5. Neural-based processing - artificial learning. "Today, robots follow directions. In 25 years, I believe robots will follow intentions."

6. Making the academic program of RBE at WPI.

7. "The obvious answer is making life safer and more convenient. And safer is such a huge area, not only from taking away jobs that are dangerous or unhealthy to do - like coal mining - but also making through insidious measures that people won't recognize, making vehicles and other sources of accidents safer."
    Robotic lawnmowers, robotic snow blowers. "These mundane, predictable bits will be done by robots."
    Improved safety in medical procedures. "Internal medicine will be improved with microbiotics. Less cutting, less surgery. No need to do exploratory surgeries when you can send a robot into an existing orifice."
    (On a slide in a presentation) "In 25 years, robots will be in every activity - legal, or illegal."

Prof. Bradley Miller, ME, Associate Director of Robotics Resource Center (12/10/2009)

1. At WPI, when Bill Durgan (Associate Provost) told him to go to Epcot to watch a robot competition in 2000. It was the FIRST champion, and he was "forever hooked." He began volunteering, "it began getting worse and worse and they had to hire me."

2. The one from the real version of 'The Day the Earth Stood Still' - Gort. (Not the remake - "the one with the story.") Robby from Forbidden Planet also stood out.

3. Mentions cool robots other people make, but he especially likes WPI robots. In 2004, one of the first robots they made was very impressive - the MO-GOAT.

3b. What is MO-GOAT?
      The objective of the FIRST competition is to collect balls in teams of 2, and to hang on a bar. Each robot hanging was worth 50 points. The robot ignored the balls, went right for the bar, climbed up onto the bar, and blocked the other bots (except his partner, which he let on) from hanging. He also closed the goal.
      The refs put away their scorecards and started taking pictures.

4. Inexpensive microprocessors - so robots can be more autonomous and do more cool stuff autonomously. "That's the interesting part, when it does stuff by itself. If you just drive it, it's kind of boring."

5. More advancement with autonomous intelligence. Robots able to do more on their own. "Kind of like SKYNET."

6. 1,800 FIRST teams. In the last couple of years, he got asked by the directors of FIRST to develop software that the other teams used. They developed WPI-Lib, a library for robots in the competition. C and Java versions were done in WPI.

7. "Robots will start automating more and more tasks that people are doing manually right now." "I heard Kent talking about snow blowers. I just bought one, and a robotic snow blower would be nice." "If I could see [a lawnmower] somewhere, I'd buy one."
      "The new 2010 Prius will park the car, stay in lanes by itself, cruise control with radar... If it's doing this all by itself, it's a robot. You can take your hands off the wheel and it won't crash itself."
      "Robots do things that are dirty, dull, and dangerous." -Founder of iRobot
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"When you see The Day the Earth Stood Still, think 'cold war.'"

Prof. Robert Lindeman, CS/IMGD Professor, Robotics Assistant Professor (12/15/09)

1. Television. "When I was a kid, before Star Wars. I was born in 65, Star Wars came out in 77, so... When I was 7-9, I must have seen something on Television. I thought 'that's pretty cool.'"

2. "Ash, maybe Data. Ash and Data."

3. Child-like robot from Asada Lab. Showed a video of a humanoid robot who can hear, see, move a little, and faces any stimulation (noises, touch, faces, etc).

4. "My own view is that, as the world is graying (and Japan is graying, at a much faster rate). Where we see robots as threats or weapons, the Japanese see them as tools. So caretaker robots and the like." "Helpers, yeah."

5. "Robotics is so broad." "I think miniaturization. Tiny, nano-bots that can work together to repair things in your body." "With high levels of autonomy, yeah. Not total autonomy. Total autonomy scares me a bit."
    "I think that's a difficult problem that really requires solving problems in all three - mechanical, electrical, and computer science. The independent problems are tough, and all three are tougher, but the payback is pretty big. With swarms, I don't think it needs to be just for health care."

6. PHD student working on human-robot interaction - remote operation. "I'm an HCI person, so the interesting part for me is to improve operator situation awareness, so you can make the operator feel - be the robot. So they can carry out actions with less cognitive load."

7. "Not as much as the iPhone, that's for sure!" (Do you want me to quote you on that?) "I don't even have an iPhone."
    "I think that there will be many more tasks that we hand off to some form of robot. I do think that it's more for special-purpose robots than a general-purpose humanoid robot. I think the humanoid robotics are cool, and really sexy, and there's a lot of hype and excitement about it, but I think that more specialized, special-purpose robots are both more useful and more attainable. The spoon-feeding robot helps you eat, and it will not do much more than that, but it will do that really well."
    "I think that that's going to impact us. The ones that are going to clean my gutter, The ones that do inspections of oil pipelines. Roof inspection. Vacuuming robots. I think these are the ones that are more attainable, cost-effective, and useful, than [humanoid robots]."

Prof. Lance Schachterle, Associate Provost for Academic Affairs, Humanities and Arts Professor (12/4/2009)

1. "I can't ever remember not thinking of robots as toys. I don't know the actual history of when robots first became available as toys but my earliest associations with robots was with toys or maybe kids dressed up in tinfoil at Halloween. The tin man in the wizard of oz was probably the robot that kids in my town and age would most likely think about. And then as teenagers we would have been exposed to Robby the robot. We basically thought of robots as non-threatening pleasant toys in children's adventure stories. Much later as teenagers, I began to read stories like Asimov. Those introduced robots that could be threatening to humans."

2. "I was never that much into 2001. HAL was more of a comp. My initial impression, Stanislaw Lem's, Trurl & Klapaucious, the inventor robots. These two robots have virtually infinite capacity to construct anything. The stories revolve around the one robot dares the other one to construct something that is so enormously fantastic and difficult, it can't be done, but by the end is completed. Lem spends a lot of time talking about them as robots, and as I recall his descriptions of how they fabricate things like star systems is amazing. But I realize my description here is on Lem's artistry and not on the robots themselves."

3. "The ones I find most impressive, are the ones in police detective work. Remote control robots that check out bombs, or go into high-danger areas. They can be used on a bigger scale in the military."

4. "Increasing sophistication of the sensory systems in robots, coupled with near-real time responses to changing environmental situations."

5. "I would say that as a non-professional, my guess is that most important area for advancement is going to be the beginnings of genuine artificial intelligence independent of human control. If robotic intelligence can become in some fashion self-conscious, that development might help humans to better understand what makes us self-conscious as well as begin to give robots capacities that go beyond specific human directions."

6. "Help develop the WPI RBE Major, since it's a quickly growing field. The entire faculty was cooperative, hard-working and efficient. I continue to be on the advisory team because I enjoy working with these people and I want to help out."

7. "I would like to see greater development of robotic devices to assist the aging human population. "

Prof. Michael Ciaraldi, CS Professor (of Practice), Robotics faculty member (12/15/09)

1. "It was when I was young." Used to read 'Tom Swift' books (an inventor). 4 series of Tom Swift books, each for a different generation - this was Tom Swift Jr.

He built a giant robot. Robot was built to do dangerous work in nuclear power plant. It was remote controlled, but could do some things autonomously.

Robots from The Jetsons, The Day the Earth Stood Still, Lost in Space also helped.

"When I was in 7th grade, I actually tried to build a robot as a part of a science project with a team of other students using my Erector set. We sort of got it to move around, but we didn't have any remote control or sensors or anything."

"But then, when I got into high school, I got involved with computers a little bit. In college, more so, I started realizing all the things you could do with automation that could make your life easier. I would be typing things on my manual typewriter, and say 'Oh, if only I had an electric typewriter with correction built in.'"

He started working for Taylor Instruments, which made computers that ran faster in different plants. He got a feel for automation there.

"At that point I was just consumed with getting a computer to work. When it came to building a robot, I felt I didn't have the resources to do that. I didn't have access to a machine shop, electronic parts, etc."

At WPI, he joined the group of faculty interested in robotics, and lobbied for RBE as a major. He's been involved ever since.

He's still interested because he can actually do things with robots due to the ability to actually work on robots. He doesn't have much time, but he has the facilities and money to actually build them.

2. Commander Data from Star Trek.

"He's the only robotic character who has had a long history of - not really stories - but character development. Usually, you have a robot who's in a book or a couple of books, and that's it. Or a guy like the Terminator, but he doesn't really have much of a personality."

"He was treated as a real being on the show, unlike, say, in Star Wars, where yes the audience viewed the droids as characters, but they were always seen as second class citizens." They weren't allowed in the cantina, they were ignored. "They were more there for comic relief, before they had Jar Jar Binks."

"So he's impressive in that way - as a character. In other ways, the giant transforming robots of anime like Macross, those are impressive, but they're just giant exoskeletons, they always have a human operator."

3. "Is it tooting my horn too much to say Moonraker?"

It did its job well. Didn't break new ground technologically, but was able to accomplish things others hadn't.

"In terms of sophistication, maybe the DARPA grand challenge type cars."

Humanoid robots are also impressive. Gave an example of a robot that could walk across the field and kick a ball into a goal.

4. Lowering of price of components. Gave several examples of do-it-yourself kits for <$1000, if not lower. Variety is a big part too.

5. "Robot Professors. Better yet... Robot STUDENTS! If only they could afford tuition."

"I'm sure there will be advances in hardware, but I'm going to guess more important advancements in software." "Artificial Intelligence and Autonomy to the point where you will fairly routinely see robotic workers out in the real world. Out in fields, harvesting crops, or on a construction site, things like that. You already have the carts going around the hospital delivering drugs and supplies." Punch in order, cart goes to pharmacy, pharmacy loads drugs, cart delivers drugs to correct room.

"The autonomy in that is not very complex, but it's complex enough that people let them wander around by themselves."

"Will you see them driving down the street in 25 years? I would guess not, but you might see them walking along the sidewalks. I wouldn't doubt that you'd see robot deliveries out on the sidewalks. Maybe the postal service will have the letter carrier with a robot following along carrying the mail."

"On the hardware side, aside from more processing power and lower cost, you'll probably see a lot of advances in prosthetics." "This week, they were showing in Italy a guy with artificial fingers. He was in an accident and he lost the last three fingers of his left hand. He's got this glove wrapped around his hand and arm, and on it he's got these three fingers. He can't operate the fingers individually, but when he tenses the muscles the fingers grasp. When they asked him how long it took him to learn how to use it, he said about five minutes." Mentioned expensive cost, but how it will go down.

"Better sensing on the nerves, but also - robot hands right now are very clumsy. They can do very fine work, but they have nowhere near the flexibility that the human hand has."

6. "It's got to be Moonraker."

"Six months ago, I don't know how I would have answered. I never had a complete project from start to finish."

6a. What did that project entail?

Design a robot to dig up moon dust for NASA.

14 foot square with volcanic dust (as a simulant)

Robot had to dig as much moon dust as possible.

150kg to be eligible for a prize, top 3 got prizes. Top prize was $500,000 (which WPI won).

Previous year, had to be autonomous. Didn't really work.

This year, they allowed remote control, but had to control from another room. Had access only to cameras.

Network imposed a two second delay to simulate transmission delay between moon and earth.

Software-wise, Moonraker wasn't very innovative. Failsafes were added, had to account for asyncronization too. If one of the cameras were not working, it was disabled and re-enabled in 10 seconds to try again.

UI was pretty.

7. "You're going to see - at least in the developed countries - more robots around the home, things like Roomba, but even more advanced. More stuff like that - the prices will be down, so more people will want that sort of stuff."

"You'll see, this isn't part of the autonomy thing, but robotic lawnmowers. I'd love to see a robotic snow blower."

"You'll see more use of robotics for home care - just as you have people now with guide dogs or trained monkeys for people in wheelchairs - you'll see robotics in there. Prosthetics, mobile platforms..."

Lots of examples for assisting older people.

"A robotic walker that would come when you called, and when you went into bed, would go to the closet and recharge itself. That would not require a huge amount of development beyond what we now know. But you'd have to make them so foolproof that people would accept them, and you'd have to get the cost down, and you'd have to convince someone that there's a market."

"On the other end, you'll see more unmanned vehicles, especially in places where there will be no people to run over (military). More unmanned aerial vehicles, unmanned ground vehicles..."

Compared robots to computers - people won't really understand how they work, but accept that they do and go on from that.

Appendix H: Survey Results

Why Do People Imagine Robots?		
When you hear the word "robot", does a positive or negative connotation come to mind?		
Answer Options	**Response Percent**	**Response Count**
Positive	86.3%	302
Negative	16.6%	58
answered question		**350**
skipped question		**0**

Note: 10 users answered both Positive and Negative.

When you hear the word "robot", does a positive or negative connotation come to mind?
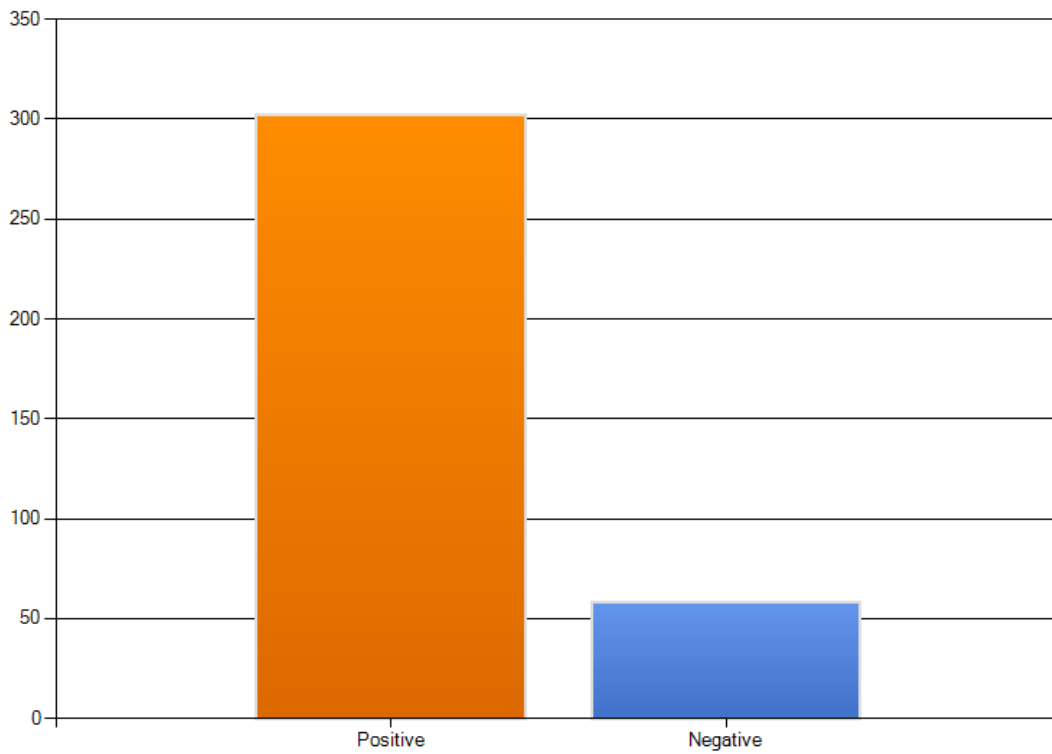
List of Robots	Count
Johnny 5	0--5
Robotic Competition Robots	1--5
Industrial Robots	2--11--1
Robbie the Robot	1--4
Roomba	0--17
Asimov's Stories	1--7--1
B9 (Lost In Space)	3--5
FANUC	0--1
ASIMO	1--4
WALL-E	0--28--1
EVE (WALL-E)	1--0
R2-D2	0--21--1
Transformers	0--8
Commander Data	0--4
VECNA BEAR	0--1
C3PO	0--9
Surgical Robots	1--3--1
Bender (Futurama)	0--5
I Robot	5--19--2
Androids	0--1
VEX Robotics	0--1
R.O.B.	0--1
Tron	0--1
Fem-bots (Austin Powers)	0--1
Building Own Robot	0--2
HAL (2001: A Space Odyssey)	2--2
Robotic Maid	1--1
Terminator	7--6
Gundam	0--2
Marvin the Paranoid Android	0--2
Megaman	0--1
Skynet	1--0
Toy Robots	0--2
Chobits	0--1
MQ-1 Predator	0--1
Big Dog (Boston Dynamics)	1--1
Star Trek	0--1
Cylons (Battlestar Galactica)	2--0
Rosie (Jetsons)	2--9
Daleks (Dr. Who)	1--0
Military Robots	1--1
Astro Boy	0--1
Tik-Tok	0--1
A.I. (Artifical Intelligence - movie)	0--1
QRIO (Sony)	0--1
VICKI (Small Wonders)	0--1
Generic Movie Robot	0--1
Service Robots	0--1
XOS Exoskeleton	0--1
Killer Robots	1--0
Mars Rover	0--1
Bomb Disposal Robots	0--1
Traffic Light	0--1
Lego Mindstorm	0--1

Key:
Positive
Negative
Neutral

Robots in Movies	17--104--4
Robots on TV	8--26
Robots in Literature	1--12--1
Robots in Video Games	0--2
Personal Experience With Robots	5--31
Humanitarian Robots	4--26--2
Robot Toys	0--3

Total:	35--204--7
Total Responses:	246

First Memory of Robots	Count
Star Wars (1976)	6--34
Robotics Competition	2--12
Short Circuit (1986)	2--6
Team 190	0--1
Building your own robot	1--5
Asimov's Books	0--6--1
Lost In Space	7--11--1
Forbidden Planet	0--1
Cartoons	1--10--1
General Literature	0--6
C3PO	0--1
Rosie (Jetsons)	2--20--2
HAL (2001: A Space Odyssey)	0--2
Robot Jox	0--1
Generic Robot Toy	4--21
Megaman	0--2
Animatronics	0--1
Lego Mindstorm / Logo	0--6
Boston Museum of Science	0--3
Battlebots	0--1
Transformers	2--9
Terminator	4--4
Generic Movie	1--5
I Robot	0--4
Television	1--8
Roomba	0--3
Alpha (Power Rangers)	0--3
Commander Data	0--1
Aibo (Sony)	0--1
Blade Runner	0--1
Toy Story	2--1
Asimo	0--1
Rock'em Sock'em Robots	0--3
Star Trek	0--1
Documentaries	0--3
Video Games	0--2
REX (Runaway Robot)	1--0
Furbies	1--0
R2-D2	0--1
Industrial Robots	0--1
Mechwarrior Series	0--1
Japanese Robots	0--0--1
Imaginary	0--1
Monsters from the ID	0--1
ROB (NES Controller)	0--1
Traffic Light	0--1
Robo-Cop	0--1
K-Nex	0--1

Key:	
Positive	
Negative	
Neutral	

Robots in Movies	15--63
Robots on TV	13--67--4
Robots in Literature	1--12--1
Robots in Video Games	0--6
Personal Experience With Robots	3--26
Humanitarian Robots	0--4--1
Robot Toys	5--31

Total:	37--209--6
Total Responses:	252

Why Positive or Negative?		How They Are Portrayed In Media	Perform Tasks for Humans	Bring Imagination to Life	Perform Professional Jobs	Humanitarian	Save Lives	Instinct		
Generation X									Major	Totals:
RBE								0--1	RBE	0--1
CS		2--0	0--2						CS	2--2
ME			1--2			0--1	0--1		ME	1--4
IMGD								0--1	IMGD	0--1
MA			0--1						MA	0--1
MGE			0--1						MGE	0--1
MFE			0--1						MFE	0--1
BIO		0--1	0--1			0--1			BIO	0--3
CH				0--1					CH	0--1
N/A		2--4	2--9--1	0--1	0--2	1--2		5--2	N/A	10--20--1
ECE			1--1		1--0				ECE	2--1
Undecided			0--1						Undecided	0--1
MBA (Business)			1--4		0--1	0--1			MBA (Business)	1--6
Psychology		0--0--1						0--1	Psychology	0--1--1
IT			0--1					0--1	IT	0--2
Sys. Eng.			0--0--1						Sys. Eng.	0--0--1
History			1--0						History	1--0
Education						0--1			Education	0--1
PH						0--1			PH	0--1
Cumulative:		4--5--1	6--24--2	0--2	1--3	1--7	0--1	5--6	**TOTAL GEN. X:**	17--48--3
Cumulative Responses:		10	32	2	4	8	1	11	**TOTAL GEN. X Responses:**	68

Why Positive or Negative?		How They Are Portrayed In Media	Perform Tasks for Humans	Bring Imagination to Life	Perform Professional Jobs	Humanitarian	Save Lives	Instinct		Major	Totals:
Generation Y										Major	Totals:
RBE			0--2	1--5	0--3		0--2	1--4		RBE	2--16
CS		0--3	0--7	0--4	0--1		0--1	0--4		CS	0--20
ME		0--1	1--7	1--6	0--4	0--2	0--3	1--6		ME	3--29
BME		0--2	0--1				0--2	0--2		BME	0--7
AE		1--0	0--3					0--5		AE	1--8
MA(C)		1--0	0--2				0--1	1--4--1		MA(C)	2--7--1
IMGD		0--1	0--3	0--2	0--1		0--1	1--3		IMGD	1--11
N/A			2--1--2	0--4	0--2	0--2		0--4		N/A	2--13--2
Undecided		2--2	0--5					1--0		Undecided	3--7
ECE		1--3	0--6		0--2	0--1	0--2	0--1		ECE	1--15
BIO		3--3	0--6	0--1	0--2	0--1		2--1		BIO	5--14
CM		1--2	0--3	0--1	0--1			0--2		CM	1--9
IE			0--2				0--1			IE	0--3
EVE			1--1				0--1			EVE	1--2
PH		0--1	0--3	0--1						PH	0--5
BBT		0--1		0--1	1--0			0--1		BBT	1--3
CE		2--0	1--1	0--3		0--1		1--0--1		CE	4--5--1
BC			1--0							BC	1--0
Sys. Eng.		0--1		0--1			0--1			Sys. Eng.	0--3
CCN			0--1							CCN	0--1
Political Science		1--0								Political Science	1--0
MIS					0--1					MIS	0--1
FPE				0--1						FPE	0--1
CH			0--1							CH	0--1
HU (Philosophy)			0--1							HU (Philosophy)	0--1
MBA (Business)			0--1							MBA (Business)	0--1
Cumulative:		12--20	6--57--2	2--30	1--17	0--7	0--15	8--37--2		**TOTAL GEN. Y:**	29--183--4
Cumulative Responses:		32	65	32	18	7	15	47		**TOTAL GEN. Y Responses:**	216
					TOTAL GEN. X:	+	**TOTAL GEN. Y:**	=		**Overall Total:**	46--231--7
					TOTAL GEN. X Responses:	+	**TOTAL GEN. Y Responses:**	=		**Total Responses:**	284

Relationship Robots Will Have With Humans		Robots as Tools	Robots as Equals	Robots as Companions	Robots as Superiors			
Generation X							Major	Totals:
RBE		0--1		0--1			RBE	0--2
CS		2--2	0--1				CS	2--3
ME		1--4					ME	1--4
IMGD		0--1					IMGD	0--1
MA		1--1					MA	1--1
MGE		0--1					MGE	0--1
MFE		0--1					MFE	0--1
BIO		0--1					BIO	0--1
CH		0--1					CH	0--1
N/A		6--18	0--3--1	3--1			N/A	9--22--1
ECE		0--1	0--1	1--0			ECE	1--2
Undecided			0--1				Undecided	0--1
MBA (Business)		0--5	0--1				MBA (Business)	0--6
Psychology		0--1		0--0--1			Psychology	0--1--1
IT		0--3					IT	0--3
Sys. Eng.		0--0--1					Sys. Eng.	0--0--1
Education		0--1					Education	0--1
History		1--0					History	1--0
Library Science		0--1					Library Science	0--1
PH		0--1					PH	0--1
Cumulative:		11--44--1	0--7--1	4--2--1			**TOTAL GEN. X:**	15--53--3
Cumulative Responses:		56	8	7			**TOTAL GEN. X Responses:**	71

Relationship Robots Will Have With Humans		Robots as Tools	Robots as Equals	Robots as Companions	Robots as Superiors		Major	Totals:
Generation Y							Major	Totals:
RBE		0--12	2--2	0--2			RBE	2--16
CS		0--15	0--5	0--2	0--1		CS	0--23
ME		2--23	0--3	0--1			ME	2--27
MA(C)		1--5		1--0			MA(C)	2--5
BME		0--8	0--1	0--1			BME	0--10
N/A		1--8--1	1--2	0--1			N/A	2--11--1
Undecided		1--0	0--1				Undecided	1--1
AE		1--7					AE	1--7
IMGD		1--10					IMGD	1--10
ECE		1--13	1--1	0--1	1--1		ECE	3--16
BIO		4--11	0--1	0--2	1--0		BIO	5--14
CM		1--8	0--2	0--1			CM	1--11
IE		1--3					IE	1--3
EVE		0--2					EVE	0--2
PH		0--2	0--2	0--2			PH	0--6
BBT		1--1			0--1		BBT	1--2
CE		2--5--1					CE	2--5--1
BC		1--0					BC	1--0
Sys. Eng.		0--2					Sys. Eng.	0--2
CCN		0--1					CCN	0--1
Political Science		1--0					Political Science	1--0
MIS		0--1					MIS	0--1
CH		0--2					CH	0--2
FPE		0--1					FPE	0--1
HU (Philosophy)				0--1			HU (Philosophy)	0--1
MBA (Business)		0--1					MBA (Business)	0--1
Cumulative:		19--141--2	4--20	1--14	2--3		**TOTAL GEN. Y:**	26--178--2
Cumulative Responses:		162	24	15	5		**TOTAL GEN. Y Responses:**	206
		TOTAL GEN. X:	+	**TOTAL GEN. Y:**	=		**Overall Total:**	41--231--5
		TOTAL GEN. X Responses:	+	**TOTAL GEN. Y Responses:**	=		**Total Resposes:**	277

Functionality / *Generation X*	Do Dangerous Jobs	Menial Tasks / Entertainment	Companion	Humanitarian Work	Would Not Make	Major	Totals:
RBE		0--2				RBE	0--2
CS	1--2					CS	1--2
ME	0--1	0--3	1--0			ME	1--4
MA	1--1					MA	1--1
IMGD			0--1			IMGD	0--1
MGE				0--1		MGE	0--1
MFE	0--1					MFE	0--1
BIO		0--2				BIO	0--2
CH		0--1				CH	0--1
N/A	1--3	3--19--2		2--1	2--0	N/A	8--23--2
ECE	0--1	1--0		0--1		ECE	1--2
Undecided			0--1			Undecided	0--1
MBA (Business)	0--2	0--4				MBA (Business)	0--6
Psychology		0--0--1		0--1		Psychology	0--1--1
IT		0--2		0--1		IT	0--3
Sys. Eng.		0--1				Sys. Eng.	0--1
Education		0--1				Education	0--1
History	1--0					History	1--0
Library Science		0--1				Library Science	0--1
PH	0--1					PH	0--1
Cumulative:	4--12	4--36--3	1--2	2--5	2--0	**TOTAL GEN. X:**	13--55--3
Cumulative Responses:	16	43	3	7	2	**TOTAL GEN. X Responses:**	71

Functionality		Do Dangerous	Menial Tasks /	Companion	Humanitarian	Would Not			
Generation Y		Jobs	Entertainment		Work	Make		Major	Totals:
RBE		1--1	0--8	0--2	1--3		RBE		2--14
CS		0--2	0--11	0--4	0--2		CS		0--19
ME		1--3	1--16	0--5	1--2		ME		3--26
MA(C)			1--4	0--1	0--2	0--0--1	MA(C)		1--7--1
BME			0--4	0--3	0--2		BME		0--9
N/A		1--4	0--3--1	1--3	1--1		N/A		3--11--1
Undecided		0--1	0--2	1--0			Undecided		1--3
AE		0--1	1--4		0--2		AE		1--7
IMGD		0--3	1--5		0--1		IMGD		1--9
ECE		0--1	1--12	0--2	1--2		ECE		2--17
BIO		1--1	2--8	0--3	2--2		BIO		5--14
CM		0--2	0--6	0--1	1--1		CM		1--10
IE		1--1			0--1		IE		1--2
EVE			0--2				EVE		0--2
PH			0--2	0--2	0--1		PH		0--5
BBT			0--2				BBT		0--2
CE			1--6--1	0--2	1--0		CE		2--8--1
BC		1--0					BC		1--0
Sys. Eng.			0--3				Sys. Eng.		0--3
CCN			0--1				CCN		0--1
Political Science			1--0				Political Science		1--0
MIS			0--1				MIS		0--1
CH			0--2				CH		0--2
FPE		0--1					FPE		0--1
HU (Philosophy)				0--1			HU (Philosophy)		0--1
MBA (Business)			0--1				MBA (Business)		0--1
									25--175--
Cumulative:		6--21	9--103--2	2--29	8--22	0--0--1	TOTAL GEN. Y:		3
Cumulative Responses:		27	114	31	30	1	TOTAL GEN. Y Responses:		203

						38--230--
TOTAL GEN. X:	+	TOTAL GEN. Y:	=	Overall Total:		6
TOTAL GEN. X Responses:	+	TOTAL GEN. Y Responses:	=	Total Resposes:		274