# Cloning

How would a person react if this person saw him or herself from a new perspective? Our eyes have limitations, therefore the only way we can view our facial features is through a mirror or other type of reflective object. It would probably be very strange if a person were able to see and interact with a perfect duplicate of themselves. Creating a duplicate of something with the same DNA and genes is known as cloning. Cloning is an idea that has been around for a while, but we have only scratched the surface when looking at what we have managed to accomplish with this idea.

Before we go over what we have managed to do with this concept, let us dive into what cloning is. Cloning is the process in which genetic information is taken and is used to make identical copies. Scientists are not the first to do cloning because nature has been doing this process since the beginning of time. When some organisms perform asexual reproduction, they create offspring that are genetically identical. Also, identical twins not only share the same looks and features but share almost identical DNA. According to the National Human Genome Research Institute (NHGRI), there are three ways of cloning: gene cloning, reproductive cloning, and therapeutic cloning. Genetic cloning is when scientists create copies of genes and DNA. Reproductive cloning is when scientists clone entire animals. Finally, therapeutic cloning is used to create embryotic stem cells that can be used to duplicate and repair tissues (Bradford).

Now we understand what cloning is, but we need to understand why cloning is used and what benefits cloning has. Cloning has much potential when it comes to scientific research. There are many benefits that cloning has to offer already, such as helping the advancement of medicine, reviving extinct species, and assisting in agricultural production of food. Let us first look at how cloning helps improve the field of medicine. First, being able to

clone small rodents helps provide scientists with models for disease. Some animals, such as rats are, are born with genetic mutations that cause diseases. When scientists find an individual animal that contains these types of mutations, they can clone it into several duplicate specimens that can be used for models of research. This helps save time and testing for the scientists because they no longer have to search or try to breed another valid test subject. Also, cloning could be a way for doctors to create stem cells for patients who need them. Stem cells help keep the human body going, as they build and repair the body throughout a human's life. Stem cells can also be manipulated to repair diseases in organs and tissues. Stem cell transplants usually do not work because the body responds badly to the foreign cells. Scientists are working on ways to clone a human's stem cells, so that the supply for them is never low. The benefits of this breakthrough would be extraordinary, and researchers believe that it is possible to grow entire organs with the cloned cells. Another beneficial aspect that cloning has in science is the possibility to clone extinct species. This is a project where it could take many years to make a breakthrough, but the results from this study could be tremendous. Scientists believe that taking a well-preserved source of DNA from the extinct animal and placing this DNA into the embryo of a closely related species would produce a clone of the extinct species. In fact, scientists not only believe this theory, but have successfully proven it. In 2009 scientists were able to use goats as egg-donors to create clones of an extinct species of a mountain goat called the bucardo, or the Pyrenean ibex. Unfortunately, all the clones died. The longest surviving clone lived for a few minutes after its birth. This may seem like a failure, but the future is bright in this area of study, with many projects underway to revive extinct species. Another benefit that has come from cloning is in the field of agriculture. There are many agricultural programs that were created to clone animals such as pigs and cattle. The cloning of these animals is not just to eat them, but to

modify their genetic codes to enhance the value of meat and dairy. For example, some cows that were clones produce twice as much milk as an average cow produces. The future is bright for the agricultural field; with the help of cloning, more superior producers are being created (Genetic Science Learning Center). These are just a handful of benefits that the process of cloning has managed to create; some of them helping our everyday lives right now, and some of them leading us to new discoveries from the past and the future.

We now know that scientists have been able to successfully duplicate living animals using cloning. There are many ongoing projects in the subject of cloning, so it is likely that there are many more discoveries waiting to be uncovered with this process. The earliest recorded successful cloning experiment happened in the late 1800s, and since that time researchers have only excelled in their studies. There have been a variety of successful experiments with many different animals being duplicated. Let us now look at the accomplishments that scientists have already achieved throughout the history of cloning.

**TIMELINE OF SPECIES CLONED & CLONING TECHNOLOGY**

**1885** sea urchins‡

**1902** salamanders‡

**1952** frogs cloned^
**1953** Watson & Crick discover structure of DNA

**1958** cloning of frogs*

**1975** rabbits^

**1986** sheep^
**1987** cows^

**1990** Human Genome Project begins

**1996** Dolly the sheep born* (first mammal cloned via SCNT)
**1997** monkeys‡; transgenic technology introduced
**1998** mice*
**1999** first clone from male (mouse)*; cells can be stored
**2000** pigs*; first clone of a clone
**2001** endangered Gaur and mouflon*, cats*, interspecies surrogacy & therapeutic cloning introduced
**2003** Human Genome Project done; banteng*, deer*, horse*, mule*
**2004** commercially cloned cats available*, fruit flies^
**2005** UN adopts ban on all human cloning; dog*, Japanese team plans to bring back mammoths
**2007** wolves*
**2008** woolly mammoth genome sequenced
**2009** first extinct species (Pyrenean ibex)*
**2010** Neanderthal genome draft published

**2013** TEDxDeExtinction conference

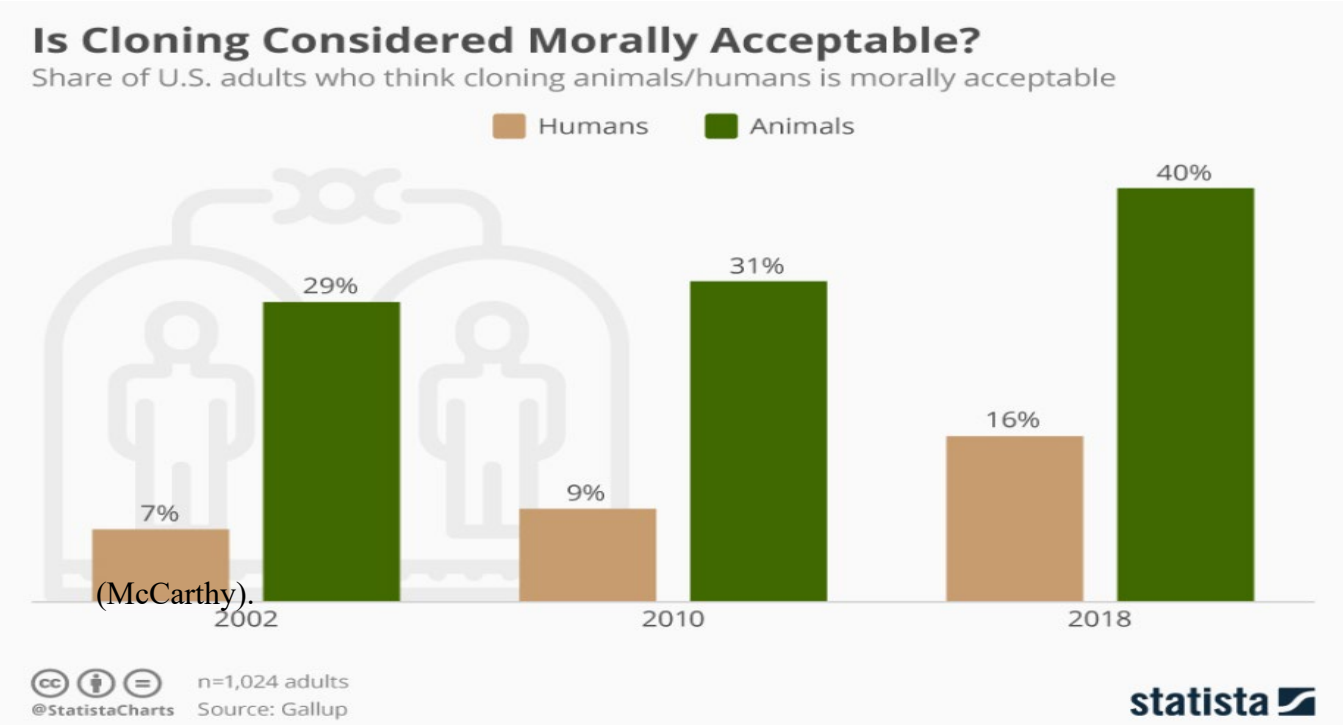
* = SCNT (somatic cell nuclear transfer)
^ = ENT (embryonic nuclear transfer)
‡ = embryo splitting

(Cottrell).

As seen above, cloning has has produced duplicates from simple specimens such as sea urchins and salamanders, to the famous sheep known as Dolly, to now a project working on the revival and cloning of the extinct wolly mamoth. If scientists are actually able to use cloning to

bring back prehistoric animals such as the wolly mammoth, imagine what the future holds for this study. This could help us learn things about the past that we have never known.

Now that we have seen what types of animals have been subject to cloning experiments, there is one question that still remains. Will we ever be able to clone humans? This is a very controversial question worldwide, and it seems that the public opinion is that it is unethical to do these kind of tests on human beings. According to a German study, "Judging from the official documents dealing with the moral and legal aspects of human reproductive cloning there seems to be a nearly worldwide consensus that reproductive cloning is incompatible with human dignity" (Birnbacher). This shows that people think it is disrespectful to humanity to clone a human being. Down below is a chart that shows the percentage of people in the United States that think it is appropriate to clone humans and animals.




(McCarthy).

This report has taught me a lot of information about cloning. I was never awfully familiar with the subject, but now I feel that I have a decent understanding of it. I learned that there are

three different types of cloning and how they are different. I also learned how scientists conduct these cloning experiments; the basic step of cloning is placing the nucleus of one cell into another. I learned the many benefits that cloning produces for our society. I learned the history of cloning: the types of species that were successfully cloned and the species that have yet to bring success. There are many different studies currently going on that are furthering the research of cloning. Some of these studies are looking to revive extinct animals, which I thought sounded incredible. Finally, I never knew how controversial this subject was until researching it. Very little people approve in human cloning and many people disapprove of animal cloning as well. I think that there is much potential in this field of study. I believe that future research will bring amazing results and that we should continue to fund this study. I personally support animal cloning and I'm not decided on my opinion about human cloning. I do think it would be unusual to clone a human, and I would only support it if no human subjects were harmed during the testing. I am glad that I researched this topic because I learned about a subject that I did not know much about. I think cloning is a fascinating subject and I believe it will bring us many scientific breakthroughs in the future.

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