

The theory of being able to

[Science](#), [Genetics](#)



The theory of being able to make a genetic copy (a clone) of another animal has been around for quite a while. In this section as the title reads I will show the history of cloning. 400 million years B. C.- Plants have been cloning themselves since not to long (as far as the Earth is concerned) after their introduction to our planet. They send out runners that create an identical copy of the parent plant. 1938- Hans Spermann, of Germany, envisions what he calls the "fantastical experiment". He suggests taking the nucleus from a cell in the late-stage embryo and transplanting that nucleus into an egg. 1952- Scientists Robert Briggs and T. J. King use a pipette to suck the nucleus from the cell of an advanced frog embryo, they then add it to a frog egg. The egg didn't develop. 1970- John Gurdon tries the same experiment with the same procedure. The eggs developed into tadpoles but died after they were ready to begin feeding. He later showed that transplanted nuclei revert to an embryonic state. 1973- Ian Wilmut just finishes his doctorate at Cambridge University when he produces the first calf born from a frozen embryo. Cows only give birth to five to ten calves in a lifetime. By taking frozen embryos produced by cows that provide the best meat or milk then transferring that to surrogate mother it allows cattle farmers increase the quality of their herd. Mid to late 1970's- Scientists cut down small forests publishing research papers arguing the ethics of cloning and if it can be done. While they do this other researches around the world are actually investigating if it can be done. 1981- Karl Illmensee and Peter Hoppe report that they clone normal mice and embryo cells. It is later found to be a fraud. 1982- James McGrath and Davor Solter report that they can not repeat the mouse cloning experiment. They conclude that once mouse embryos reach

the two cell stage they cannot be used for cloning. Others confirm their results. 1993- Embryologists at George Washington University cloned human embryos: they took cell groups from 17 human embryos (defective ones that an infertility clinic was going to discard), all two to eight cells in size. They teased apart cells, grew each one in a lab dish and a few got to 32 cells- a size when they can be planted into a surrogate mother, although they weren't. 1994- Neal First cloned calves that have grown to 120 cells. 1996- Ian Wilmut repeated First's experiment with sheep but put embryo cells into a resting state before transferring their nuclei to sheep eggs. The eggs developed into normal embryos then into lambs. 1997- Ian Wilmut and his colleague Keith Campbell clone an adult sheep. Different Methods: Of Cloning The most famous sheep in history, Dolly, was cloned by using the method of Nuclear transfer. Previously the only cloning was either done on plants or frogs or mice. In this section the different processes will be described. PLANT CLONING Gardeners have been cloning plants for centuries and plants have been doing it for longer. Here are three different types of cloning out of many. One type of plant cloning naturally occurs when a plant grows a runner. The runner grows horizontally across the ground forming a carbon copy of that same plant at the end. Eventually the runner dies and the daughter plant is separated from the mother plant. Another is when you cut a branch or leaf off of a plant and plant it. It will grow another identical plant. That method is called a cutting. A stolon is where a weak branch of a plant falls over and the tip touches the ground. The tip swells and roots are formed so that growth in the plant can continue. ANIMAL CLONING Lower forms of animals clone themselves quite often like amoeba's and

paramecium which use binary fission to split themselves in half and create a new but identical animal. The only other kind of cloning in animals is nuclear transfer cloning. Which is the whole topic of this report. Nuclear transfer is when the nucleus of one cell is implanted into another cell that has had the nucleus taken out. The first time this happened was when Robert Briggs and T. J. King took the nucleus out of a multi-cell embryo and implanted it into the egg. Cell division then takes place and forms into a tadpole then into a frog. This process has been repeated with mice, sheep, monkey's, etc. That is called embryonic cloning. The kind of cloning that created Dolly is when an adult animal is cloned. What happened in Dolly's case is that Ian Wilmut and his team of scientists took a nucleus from a Finn Dorset sheep and substituted it with a nucleus of an egg from a Poll Dorset. Once the egg had developed to embryo stage it was implanted into a third breed of sheep a Scottish Blackface. Dolly came out 148 days later as an exact genetic copy of the Finn Dorset. The other important thing about Dolly is that her genes came from a dead sheep. The cells came from a frozen mammary gland. This is explained better by the magazine " New Scientist." The mouse is embryonic, the sheep is the cloning of adult animals. Earlier cloning could duplicate embryos. Mouse A Mouse B Male and female mated Mouse X An undeveloped embryo, characteristics unknown. Mouse Y Nucleus of cell from X inserted into one of Mouse Y's egg cells, which starts dividing. Mouse Z Healthy mouse Genetically identical to X. New Method duplicates an adult Sheep X An adult cells were taken from her udder. Nucleus of cell from X inserted into Sheep Y's egg cell electric shock makes it start dividing. Sheep Z Carried embryo in her uterus (a common surrogate breeding technique)

Clone of Sheep X Healthy sheep genetically identical to X The Cloning Debate The thought of cloning to some people is repulsive and immoral. Others think that it is a scientific breakthrough to be valued for its own worth. Anti-cloners believe Man should not meddle in God's business of creating new beings. They take from the Bible this quote which supports their beliefs: " For I testify unto every man that heareth the words of the prophecy of this book, if any man shall add unto these things, God shall add unto him the plagues that are written in this book: And if any man shall take away from the words of the book of this prophecy, God shall take away his part out of the book of life, and out of the holy city, and from the things which are written in this book" [Revelations 22: 1819]. Advocates for cloning respond by stating that when the airplane was invented people hated the idea and said that if God wanted men to fly he would of given them wings. Now airplanes are thought of as one of the safest and fastest ways of travel. Human cloning presents many ethical problems because it is playing with Life itself. The father of cloning Ian Wilmut stated before the U. S. subcommittee on health last March. " In previous work with cells from embryos, three out of five died soon after birth and showed developmental abnormalities. Similar experiments with humans would be totally unacceptable." While that argument is good, almost no experiment can be done perfectly the first time. The current methods are a start and can be improved upon. One thing to point out is that when Thomas Eddison invented the light bulb he did it hundreds of times before he got one to work. Those against cloning condemn that argument because when Henry Ford dug up the ground behind his lab he found all the light bulbs that Eddison

had just thrown out the back like a garbage dump. You cannot just throw out human lives that didn't come out the way you wanted it to, and if you if it doesn't turn out the way you wanted it to do you have the right to take its life. Then what if it reproduces with others like it or reproduces with humans. Can you take away its life and all of its offspring. Some suspicions have arisen that even if the U. S. makes cloning of humans illegal, that it will be carried overseas and done there. " Cloning humans from adults' tissues is likely to be achievable any time from one to ten years from now." Cornell University biologist W. Bruce Currie estimates that only about ten labs around the world have the ability to clone humans (his not among them) However, an in-vitro fertilization clinic could be upgraded with only a small investment to be able to clone humans. President Clinton proposed a ban on cloning saying that, " Banning human cloning reflects our humanity. It is the right thing to do.... At its worst [this new method] could lead to misguided and malevolent attempts to select certain kinds of children--to make our children objects rather than cherished individuals." Those against cloning praised the proposed ban but said that it should include animals because they are cherished individuals too. In the U. K. all research on human embryos is regulated by the Human Fertilization and Embryology Act passed in 1990. This provides appropriate framework for resolving the legal and ethical issues involved in cloning. The U. S. is considering whether it should regulate human cloning or just ban it. (Britain, Denmark, Germany, Belgium, the Netherlands, and Spain already do.) This may not help anything though, since as of June 17, 1997 federal funds are not allowed to be used for human embryology research, but privately funded research can . When the National

Biotechnics Advisory Commission issued its report, it recommended that cloning of human beings be outlawed in the United States. The panel did say this at the end of the report, " The members recognized that if further research made cloning safer and more familiar, society might one day change its mind." So the panel recommended that any legal ban be re-evaluated after three to five years. If Congress agrees, the cloning debate could go well into the next century. Those who are against allowing people to clone themselves and others, say that if this process were to be perfected, some lunatic could theoretically go out and clone another Adolph Hitler or Saddam Hussein and that we would have another World War, or Gulf War. Most everybody agrees that the world does not need another Fuhrer or Dictator. Supporters of cloning have stated that this scientific discovery is not a science fiction book unfolding that this will not allow people to clone themselves when they are dying so they could live forever, that this will not create robots who will look the same as the person they were cloned from or act and think the same. This is summed up best by a quote from Harry Griffin who works at the Roslin Institute. " And what is left when we strip away the hyperbole and what has been written to entertain us? Most certainly a major scientific breakthrough. Most scientists had thought through differentiation - the gradual process of specialization that allow a single fertilized egg to develop into hundreds of different cell types that make up the whole animal- was irreversible.... The new nuclear transfer techniques could be used to examine how the so-called somatic mutations - mutations that take place in the adult cell which are not inheritable- contribute to aging and lead to tumors. Understanding the process involved in 'reprogramming ' could

provide new insight into control of gene expression in differentiated cells and lead to new approaches to cell therapy." One of the huge bonuses of cloning animals is that if you cloned endangered species you could boost their populations immensely. You could clone a whole herd of rhinoceros or panda. The problem with this is that it decreases the diversity of the gene pool and makes the herd less tolerant to disease. A disease, like a virus, could kill the entire herd of animals. Much like in a forest where there are many of the same trees one virus can come through and decimate it. The benefit of cloning domestic animals is that you human genes can be incorporated into an animals body so that they have human genes. These animals are called transgenic animals. A cow named Rosie was genetically engineered in this manner by PPL Therapeutics (the company that funded the Dolly project). Rosie makes a human protein because, when she was a mere embryo in a dish, scientists slipped the gene for the protein into her cells. The cow's milk contains the human gene alpha- lactalbumin an amino acid that newborns need. The idea is to purify her milk and sell it in a powdered form, for premature babies who cannot nurse. Transgenic pigs are being studied as a possible source for organs. If pigs and other animals are genetically engineered scientists hope they can save the ten people that die every day waiting for a donated organ. On Both sides a majority agree that it should not be legal to raise clones just for spare body parts. Imagine having a room full of people being raised so that one day they can be sent off to a slaughter house for humans. Just so that whoever they were cloned from can live a little better or longer. One of the common misconceptions created mostly by the media about cloning is that clones would be identical copies of the

people they were cloned from. They will maybe look alike but we can't even be sure of that because if the person was born from a different uterus or at a different time the whole environment during pregnancy is different and the embryo can be affected. Because of this and many factors, a clone would be a completely different person. Most of us at some time or another in our life have probably met a clone before. Those people are identical twins. They do not necessarily think and act the same, but they do both think and act.

Conclusion This topic is a very controversial issue and I don't think I will be the last person to do a report on it. I also don't think that this report will answer all the questions as to whether cloning should be allowed for animals or humans. Personally, I think that there are many benefits for cloning animals. The most important one in my opinion is the possibility of having animals be organ donors. I am undecided on the benefits, ethics and morality of cloning humans. It does not matter about my opinion because it can do little for or against this issue, this genie (Dolly) has been let out of the bottle and it will not go back in.