

# Dolly the Sheep's scientists paved the way for stem cell research today

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Dolly the Sheep at the National Museums of Scotland, in Edinburgh, Scotland. Wikimedia Commons

It was a glorious day in the hills above Edinburgh, Scotland, when old friends and co-workers Ian Wilmut and Alan Trounson set off on a hike two decades ago. High over the city, Wilmut confided that he had a secret to share. He and several co-workers had successfully birthed a lamb in the lab — not from egg and sperm, but from DNA taken from an adult sheep’s mammary gland. They had cloned a mammal.

“Crikey! I was stunned,” says Trounson, a stem cell biologist at Monash University in Melbourne, Australia. He remembers sitting down hard on a nearby stone. It was a warm day but Trounson felt a chill pass over him as he realized the implications. “It changed everything,” he says.

The success led to dire and fantastic predictions as to whether humans could be cloned, diseases could be prevented or children could be re-birthed.

Today, 20 years after Dolly’s birth on July 5, 1996, the impact of cloning on basic science has surpassed expectations. But the reality of what is technically called nuclear transfer—the form of

cloning used with Dolly—has largely faded from public consciousness.

### **From Nuclear Transfer To Stem Cell Research**

In 2016, cloning a person remains unfeasible, with no scientific benefit and an unacceptable level of risk, several scientists say. Most know of no one even considering the feat. The cloning of animals remains limited—although it is likely growing. Some agricultural cloning is used in the U.S. and China to capitalize on the genes of a few extraordinary specimens, scientists say. But the European Parliament voted last year to ban cloning animals for food. One scientist in South Korea charges \$100,000 to clone pets, although the level of demand for the service is unclear.

Cloning's biggest impact, several researchers say, has been in the stem cell advances it has sparked. Stem cell biologist Shinya Yamanaka said that Dolly's cloning motivated him to begin developing stem cells derived from adult cells. This accomplishment won Yamanaka a Nobel Prize in 2012. Yamanaka used adult cells—first in mice, although the technique is now possible in human cells—to make stem cells that can form a wide range of other cells. Because they are artificially created and can have a variety of futures, these cells have reduced the need for embryonic stem cells, which have long caused moral concerns for some. The cells that Yamanaka developed now form the basis for most of today's stem cell research.

Dolly's birth was transformative because it proved that the nucleus, or central core of the adult cell, had all the DNA necessary to give rise to another animal.

“Dolly was the first example of taking an adult cell and getting an adult,” says stem cell biologist Robin Lovell-Badge of the Francis Crick Institute in London. “That meant you could reprogram an adult cell nucleus back to an embryonic stage.”

### **What Ever Happened To Baby Dolly?**

Dolly died on Feb. 14, 2003, at age 6 from a lung infection common among animals who are not given access to the outdoors. It probably had nothing to do with her being a cloned animal, says Ian Wilmut.

Wilmut says he thinks it would be possible to clone a human—but highly inadvisable. The cloning technique used to create Dolly has been shown to not work in primates. He believes it could be possible using other techniques but he is vehemently opposed to the idea of cloning a person.

“Just because it may now work in the sense of producing offspring doesn't mean to say we should do it,” he says. “The likelihood is you would get pregnancy losses and abnormal births.”

For example, one of the lambs his lab cloned soon after Dolly developed lung problems that caused it to hyperventilate and regularly pass out. “It was distressing enough to see that in an animal,” he says. “I wouldn't want to be the person who looked a cloned child in the face and said ‘very sorry.’”

### **You Get What You Pay For**

There is a potentially large market for cloned livestock. In 2008, the U.S. government decided there were no discernible differences between cloned and non-cloned cows, goats and pigs so it allowed the process in those animals, although mainly for breeding rather than meat production. In China, a company has plans to produce at least 100,000 cloned beef cattle.

Theoretically, cloning could bring back endangered species. There has been talk of using it to restore woolly mammoths, giant pandas and even an extinct species of Ice Age humans called Neanderthals. Lovell-Badge dismisses these ideas as “fairly silly.”

Trounson says he still has a stash of skin samples from critically endangered northern hairy-nosed wombats stored in liquid nitrogen, in case someone ever wants to attempt to restore the species’ numbers. Clones, however, are created by taking an adult cell and fusing it to an egg cell. Cloning requires an intact nucleus, which would not be available for most extinct species.

The idea of cloning a deceased loved one—human or pet—has fallen out of favor in part because of the recognition that environment affects behavior. The genetics might be the same, but would a clone still be the same lovable individual? Lovell-Badge notes that he thinks the idea of cloning a pet is “stupid.”

Lovell-Badge is even more dismissive of the idea of cloning a person. “We’d have to know an awful lot more about reprogramming and how to make it 100 percent efficient,” he says. “I have never thought of a good enough reason [to clone] a human being.”

## Quiz

1 Read the sentence from the section "You Get What You Pay For."

*Theoretically, cloning could bring back endangered species.*

Does this particular sentence support the main idea of the article? Why or why not?

- (A) Yes, it illustrates one method of cloning that is useful for today's scientists.
- (B) Yes, it shows the vast possibilities of how cloning can be helpful to humans.
- (C) No, it is an extreme idea of cloning that would probably not be considered by scientists.
- (D) No, it is about cloning extinct animals rather than animals that are alive today.

2 Which central idea is supported by the following sentence from the article?

*But the reality of what is technically called nuclear transfer—the form of cloning used with Dolly—has largely faded from public consciousness.*

- (A) Even though the cloning of Dolly was an impressive feat, there are other scientific experiments that are more interesting to people.
- (B) While nuclear transfer practices 20 years ago were notable, scientists have found more effective ways to clone animals today.
- (C) Despite the knowledge gained from nuclear transfer twenty years ago, this practice is too complex and not worth the effort.
- (D) Although the success with Dolly was a big scientific breakthrough, cloning is so provocative that practicing it can be challenging.

3 What is the most likely reason for including information about stem cell research?

- (A) to show how scientists have changed their cloning practices
- (B) to show how cloning animals is similar to cloning humans
- (C) to show the negative effects cloning has had on science
- (D) to show the positive effects cloning has had on science

4 What is the relationship between the introduction and conclusion of the article?

- (A) The introduction sets the stage for the exciting discovery of cloning and the conclusion presents the reality of such a debated practice.
- (B) The introduction sets up the problems surrounding cloning 20 years ago and the conclusion presents the ways scientists have remedied them.
- (C) The introduction poses the questions scientists and the public have had about cloning and the conclusion provides the answers.
- (D) The introduction describes the cloning practices 20 years ago and the conclusion contrasts those practices with the ones used today.