

Passage A

Paragraph
Line

- 1 "I laughed when Steven Spielberg said that cloning extinct animals was inevitable," says Hendrik Poinar of McMaster University, an authority on ancient DNA who served as a scientific consultant for a film about the making of Jurassic Park. "But I'm not laughing anymore, at least about mammoths. This is going to happen. It's just a matter of working out the details." 5
- 2 As Poinar himself admits, however, the details are daunting. The two fundamental steps involved in cloning a mammoth, or any other extinct animal, are to recover its complete DNA sequence and to express this data in flesh and blood. The publication of the partial mammoth genome is a good start on the first problem, though the remaining 30 percent of the genome would have to be recovered and the entire genome resequenced several more times to weed out errors that have crept into the ancient DNA over the centuries as it degraded. Scientists would also have to package the DNA into chromosomes - and at present they don't even know how many chromosomes the mammoth had. Yet none of these tasks appears **insurmountable**, especially in light of recent technical advances, such as a new generation of high-speed sequencers and a simple, inexpensive technique for recovering high-quality DNA from mammoth hair. 15
- 3 Transforming this data into a woolly mammoth will be far trickier. The Penn State team used the African elephant genome (genetic map) as a guide to reassemble the pieces of mammoth DNA they'd recovered from hair samples. Since this ancient DNA is far too **fragmented** to use to create an organism, one way to make living mammoth genetic material might be to modify elephant chromosomes at each of the estimated 400,000 locations of the genome where they differ from the mammoth's, effectively rewriting an elephant's cells into a mammoth's. 20
- 4 Once scientists have functional mammoth chromosomes in hand, they could wrap them in a membrane to create an artificial cell nucleus. Then they could follow the approach pioneered in creating Dolly, the sheep cloned in 1996 by scientists at the Roslin Institute in Scotland: Remove the nucleus of an elephant's egg and replace it with the rebuilt mammoth nucleus, electrically stimulate the egg to trigger initial cell division into an embryo, and eventually transfer the embryo into an elephant's womb for gestation. 25
- 5 Some scientists are tackling a less daunting challenge: cloning endangered or recently extinct animals. In 2003 scientists at Advanced Cell Technology used cells stored at the San Diego facility to successfully clone across the species barrier. They created two bantengs, an endangered Southeast Asian ox, by inserting banteng DNA into domestic cow eggs and placing the resulting embryos in cow foster-mothers. There is talk of using similar methods to clone endangered giant pandas, African bongo antelopes, and Sumatran tigers. Ultimately scientists hope to re-create extinct species like the Pyrenean ibex and Tasmanian tiger. 30
- 6 Today the thorniest questions about cloning extinct species may be less technical than ethical. "Mammoths, like elephants, were intelligent, highly social animals," says Adrian Lister, paleontologist and mammoth expert at the Natural History Museum in London. "Cloning would give you a single animal, which would live all alone in a park, a zoo, or a lab, not in its native habitat, which no longer exists. You're basically creating a curiosity." Tom Gilbert, an expert in ancient DNA at Copenhagen University, admits that as a student of mammoths, he'd be the first to go see one trundle across a paddock. But he questions both the utility and the wisdom of cloning extinct species. "If you can do a mammoth, you can do anything else that's dead, including your grandmother. But in a world in global warming and with limited resources for research, do you really want to bring back your dead grandmother?" 40

Recipe for a Resurrection by Tom Mueller

Passage B

Paragraph
Line

- 1 Human cloning is wrong because scientists are doing it to control nature and get money. Firstly, a human clone is the ultimate pedigree child. I know that cloning of human embryos has already been achieved. It is only a matter of time, months or a very few years before human cloning is a reality for anyone with enough cash, willing to take the risks of a hideously malformed or emotionally damaged child. Secondly, huge amounts of money are at stake in human cloning research. Teams have announced their aim, many people have come forward with offers of eggs, their own adult cells and money - and the US still has no laws to prevent human cloning from happening, nor do most other countries of the world. 5
- 2 The result is a secretive network of laboratories working illegally to clone humans because the lack of laws. Former US President Bill Clinton launched an immediate 90 day report into the implications for human cloning as soon as the news of Dolly became public. Dolly the sheep, cloned from an adult's frozen cells showed that animals (and in theory people) could be cloned after death. US scientists also revealed that they had cloned monkeys using cells from an embryo. The British scientist responsible for Dolly admitted to a Parliamentary committee (6 March 1997) that human cloning could be possible in two to three years (after initial vigorous denials by many embryologists). The news on these cloning experiments exposed the fact that most nations of the world had little or no legislation covering genetic engineering. This has to change. 10 15
- 3 What's more, governments are unable to come up with solid decisions regarding cloning **legislation**. Clinton announced in May 1997 that human cloning should be banned. He was warmly applauded. However, what he went on to say was that the proposed ban was only for 5 years, and that basic human cloning technique could continue, though not with government money. In other words "Clones may be made, but not born for the next five years". However, Clinton could not even deliver - his own partial ban was thrown out by Congress. Meanwhile UK Parliament in January 2001 made experimental creation of human clones legal, so long as the embryos were made for medical research and destroyed before implantation. 20 25
- 4 30 35

Scientists further their human cloning projects by purposely keeping truth from the public. Hence you only knew about Dolly's creation when she was already 7 months old. They think the public has no real understanding and so these matters should be kept from the public eye, discussed only by scientists and ethical committees. But these committees are **dominated** by the industry interested in profit. One such industry player and scientist, Richard Seed, said over two years ago that he was "a few weeks" from his human cloning experiments. He has attracted money and people. I've met him and debated with him on TV. He has been followed by Clonaid, a new human cloning organisation with cash and 300 couples ready to start. Dr Seed declared that he cannot be stopped from human cloning under current US law, and if human cloning laws are changed he will move the work to Mexico. He has announced a human cloning lab for Japan with purchase of land and \$15 million backing.

What will be the next human cloning headline? You can be sure that we will see a continuous stream of new **revelations** on such projects. The lax legislation and influence of corporations will ensure that it is politically acceptable for scientists to come out of the woodwork and talk about these things.

Edited by Dawn Fung, inspired by <http://www.globalchange.com/clonech.htm>

From Passage A:

From Paragraph 1

1. a) "I laughed when Steven Spielberg said that cloning extinct animals was inevitable." Explain **in your own words** what "cloning extinct animals was inevitable" means. [2M]
- b) What is the reason that Hendrik Poinar is "not laughing anymore"? [1M]

From Paragraph 2

2. a) What are the "two fundamental steps involved in cloning a mammoth"? [2M]
- b) Give one reason why scientists do not think the details to cloning a mammoth is insurmountable. [1M]

From Paragraph 3

3. Explain why turning the data into a real life mammoth is "trickier". [2M]

From Paragraph 4

4. Give one reason why the steps taken by the scientists would not guarantee success. [1M]

From Paragraph 6

5. Give two reasons why cloning a mammoth may be unethical in today's world. [2M]

From Passage B:

From Paragraph 1

6. Why would human cloning be wrong? [2M]
7. The author suggests that cloning humans will be risky. **In your own words**, what are these risks? [2M]

From Paragraph 4

8. Give a reason how we know that scientists purposely keep truth from the public. [1M]
9. "I've met him and debated with him on TV". What is the author's stand in this debate? [1M]
10. "Dr Seed declared that he cannot be stopped from human cloning under current US law, and if human cloning laws are changed he will move the work to Mexico." How does the author view Dr Seed's attitude? [1M]

From Paragraph 5

11. Explain **in your own words** why it would be politically acceptable for scientists to talk about human cloning in future. [2M]

From Passages A & B:

12. For each of the following words, give one word or short phrase (of not more than seven words) which has the same meaning that the word or phrase has in the passage. [5M]

From Passage A

- a) insurmountable (line 15)
- b) fragmented (line 21)

From Passage B

- c) legislation (line 22)
- d) dominated (line 34)
- e) revelations (line 44)

From Passage B:

13. **Using your own words as far as possible**, summarise from the author's point of view, why human cloning is wrong, and the problems that affect government, science and the public.

Use the material in Passage B from Paragraphs 1 to 5.

Your summary, which must be in continuous writing (not note form), must not be longer than 150 words (not counting the words given to help you to begin).

Begin your summary as follows:

I feel strongly that human cloning is wrong because scientists... [25M]

- END OF PAPER -