

Instructions for Teachers

This exercise is based on the movie “The 6th day” and as the purpose of instructing students as well as demystifying myths about cloning.

Day 0 - the class before you view the movie:

Students are to be given the cloning questionnaire to answer. This questionnaire is available in two forms – white and with a background. We suggest using the white version as handouts to students, and using the coloured version as a transparency for Day 3. The questionnaire has two purposes: i) It is designed to make the student think about cloning, ii) It will, in part, facilitate a group discussion on Day 3.

Day 1:

View the first part of the movie (2hr)

Day 2:

View the rest of the movie. Ask the students to revise to questionnaire and to indicate in writing if their opinions have changed.

Day3:

With the help of the “Discussion Material” file discuss the movie and cloning in general. You will see that the file is colour coded. Parts highlighted in yellow pertain to the movie while parts highlighted in blue are related to the questionnaire. Ask for student participation, as it is vital for the success of the exercise. Finish the discussion by relating that what is portrayed on television or in the movies is not always reality.

*** All references cited target a general audience and are available to all interested on the Internet.

Cloning Questionnaire

To the best of your knowledge answer the following questions -

1- What is cloning?

2- Do you agree with the cloning of :	Strongly.....	Agree.....	Disagree.....	Strongly
	Agree			Disagree
Animals?	_____	_____	_____	_____
Humans?	_____	_____	_____	_____
Organs for humans?	_____	_____	_____	_____
Food?	_____	_____	_____	_____
Bacteria?	_____	_____	_____	_____

3- Have we cloned

- Animals?
- Humans?
- Organs for humans?
- Food?
- Bacteria?

4- Is there a law against cloning?

5- Would cloning be a source of immortality?

6- Would two clones be exactly alike?

7- Are clones the same thing as identical twins?

8- Could we « custom-make » a clone? *Ex : Looks like Pamela Anderson or Brad Pitt, but smart like Einstein, with the kindness of Mother Theresa.*

9- If you could clone anyone apart from yourself, who would it be and why?

10-Why do most scientists agree with cloning?

11-Why do most religions disagree with cloning?

PART A :Organized Discussion :

Question 1

The word 'clone' denotes an object or organism regarded as identical to another. In biotechnology, it is a generic term for the replication in a laboratory of genes, cells or organisms from a single original entity. As a result, exact genetic copies of the original gene, cell or organism can be produced.

Cloning, or the exact duplication of specific genes and individual types of cells, has been a tool in biotechnology for more than 20 years. This technique has been used to produce medicines and vaccines to treat heart attacks, kidney disease, diabetes, various cancers, hepatitis, multiple sclerosis, cystic fibrosis and other diseases. There is also research into cloning human organs and tissues.

<http://strategis.ic.gc.ca/SSG/1a>

Movie : counter 884 – 920 / time 14.44-15.20 min.

02-23-97 : Clone a sheep – Dolly

In February 1997, Dr. Wilmut's team announced the arrival of Dolly. Dolly is a sheep that has exactly the same genetic code (DNA) as her mother. It took 277 trials in order to create 1 successful Dolly! If Dolly had been created through normal sexual reproduction, half of her DNA would have come from a female and half from a male.

This is why children don't look exactly like only one of their parents, but rather generally resemble both of them. Their genetic code is the result of a combination of their two parents' DNA. However, Dolly's cells contain her mother's entire DNA and no DNA from any other sheep. The researchers took a mammary gland cell (haploid cell) from Dolly's mother, and inserted the DNA from another mammary gland cell from the same sheep. It is for this reason that Dolly is a clone of her mother. It is as if Dolly is her mother's identical twin, but was born many years after her mother, instead of at the same time.

Dolly is undoubtedly the most popular sheep in history, having made the covers of TIME and Newsweek. A sweater knitted from her wool is a treasured showpiece in a museum. And she is certainly the only sheep being hunted after by paparazzi!

Meanwhile, scientists in China hope to save endangered giant pandas from extinction by cloning them. The cloning of a giant panda which is a more complicated task than the cloning of a sheep, and which has been declared a "key project" by the Chinese government, is expected to be completed by 2003.

Scientists have also combined cloning techniques with other familiar biotechnology techniques. For example, Dr. Wilmut's team, in partnership with PPL Therapeutics, has produced "Polly", a sheep clone who carries the human gene that codes for Factor IX, a

blood-clotting factor. The hope is that Polly will produce the protein in her milk, which can then be harvested and used to treat haemophiliacs.

(<http://strategis.ic.gc.ca/SSG/11a>)

☞ 06-26-00 : Human Genetic Blueprint of DNA

Several types of genome maps have already been completed, and a working draft of the entire human genome sequence was announced in June 2000, with analyses published in February 2001. A final draft of the genome is due April 25, 2003, which commemorates the 50th anniversary of the discovery of the DNA double helix by Watson and Crick!

What is the difference between draft sequence and finished sequence?

In generating the draft sequence, scientists determined the order of base pairs in each chromosomal area at least 4 to 5 times to ensure data accuracy and to help with reassembling DNA fragments in their original order. This repeated sequencing is known as genome "depth of coverage." Draft sequence data are mostly in the form of 10,000 base pair-sized fragments whose approximate chromosomal locations are known.

To generate high-quality sequence, additional sequencing is needed to close gaps, reduce ambiguities, and allow for only a single error every 10,000 bases, the agreed-upon standard for HGP finished sequence. Investigators believe that a high-quality sequence is critical for recognizing regulatory components of genes that are very important in understanding human biology and such disorders as heart disease, cancer, and diabetes. The finished version will provide an estimated 8x to 9x coverage of each chromosome. Thus far, finished sequences have been generated for only two human chromosomes --21 and 22.

<http://www.ornl.gov/hgmis/faq/seqfacts.html#difference>

☞ Soon after : Human cloning experiment fails

Well, not really!!

1997

The Raelians, a religious group that contends extraterrestrials used genetic engineering to create life on Earth, founded Clonaid in 1997 in the Bahamas. This company is funded by a man whose 10-month-old son died after a heart operation. The father, who has remained anonymous, wants DNA from his son to be used to create a clone. Clonaid was shut down by the government of Bahamas and is now operating in the United States and in another undisclosed country.

2001

Aug 6:

Dr. Panos Zavos announced that his team would attempt cloning human embryos for infertile couples. He stated that he would try to test the new technology on 200 volunteer

couples from around the world. Aware of the anticloning laws in North-America, he stated that his research will be done in one of the two countries where there is no strict ban on reproductive cloning (not yet anyways!), Austria and Luxembourg.

<http://www.cnn.com/2001HEALTH/08/06/human.cloning/index.html>

Nov 25:

Scientists from Advanced Cell Technology Inc. of Worcester, Massachusetts, said Sunday they had created human embryos (6 celled stage) through cloning. The intent of the experiment was not aimed at creating a human being but at producing embryo for the creation of stem cells that could potentially be used to treat disease. (Stem cells are a kind of “transformer” cell that can grow into any kind of cell in the body)

<http://www.cnn.com/2001/TECH/science/11/25/human.embryo.clone/index.html>;

<http://www.glyphr.org/genetic/>

Nov 28:

Clonaid announced that it had created multi celled (blastocyst stage - a hollow fluid-filled rounded cavity bounded by a single layer of cells) human embryo. Since Clonaid is a « secret » lab operation, no publications have been made, and thus the claim cannot be verified. Clonaid also professed to currently having a waiting list for the production of clones, but stated that the company was promising nothing until it had successfully cloned their first baby.

<http://www.cnn.com/2001/HEALTH/11/27/clonaid.clone/index.html>

⌘ Court orders clones to be destroyed

Although the « human embryo clones » came as a surprise to most governments, there was no need for a court order to destroy them since the reported clones have not been viable so far!

⌘ 6th day law passed : Law that bans human cloning - Is there a cloning law in Canada?

Most countries, like Canada, have recently passed bills to make it illegal for any type of human cloning that is not of therapeutic nature. In Canada, any person convicted of such an offense will be liable to a fine not exceeding \$500,000 and/or for a term not exceeding ten years.

http://www.glyphr.org/genetic/n_america.htm

Movie : counter 1250-1260 / time 20.4-21.0 min.

☞ Nacho flavored banana

Genetically modified food is a reality! As a matter of fact, unless you buy organic products exclusively, you have probably eaten some in the last week. Many fruits and vegetables in your supermarket have been modified in order to improve taste, appearance, resistance to pest or again to slow the ripening process. These foods are commonly referred to as GMOs (Genetically Modified Organisms) and opinions on their usefulness and safety vary. For instance, McCain Inc. had to stop using GM potatoes a few years ago because the strong European anti-GMOs attitude was threatening their market.

GMOs also include bacteria, plants and cattle that are engineered to produce drugs (ex :antibiotic production in bacteria, clotting factors produced in sheep milk to treat hemophiliacs ...).

Although we do not yet have « nacho flavoured bananas » it is not proposterous to think that such a product will be available at your local grocers within your lifetime.

<http://www.thecampaign.org/newsupdates/novemberq.htm#McCain>

Movie : counter 1825-1835 / time 30.25-30.35 min.

☞ Scientists get DNA sample and a mental picture (memories) with a simple scan

In order to clone, you need DNA. To get DNA you need a tissue or blood sample. A scan would not have the ability to gather a sample of DNA. The only way that the researchers could have gained access to « Adam's (Arnold Schwarzneger)» DNA is if they had swiped the equipment where Adam might have touched it!

Memories! We are not completely sure how memories work, but the most accepted theory dictates that the memory information is stored in our brain cells. Thus, scanning for memories would be like taking an X-ray of a computer, and then with the resulting film try to decipher what was on the hard disc – impossible!

Movie : counter 2040-2190 / time 34.0 – 36.30 min.

☞ REPET : Cloning of pets.

A few companies are currently willing, for a undisclosed sum, to freeze a few of your pet's cells, to be able to clone it in a few years' time when the technology is more advanced. The most famous company is missyplicity. It started when a billionaire gave scientists 2.2million \$ to clone his dog « missy ».

www.missyplicity.com

☞ Takes a few hours

With current technologies you would have to grow an embryo – thus a lot more than a few hours, try many months!

STEP 1 : Made from grown blanks, animal grown stripped of all characteristic DNA in embryonic tanks.

The most common method to clone an entire organism is to take a blank cell (a cell where all the DNA has been removed) and insert into it the desired DNA. It would be impossible to use a blank organism because the organism needs DNA to develop into that organism. In the movie they state that the body is blank of all « characteristic » DNA. In such a case you would not be able to predetermine how thick the skin and how big the heart should be, how many veins, if curly or straight hair is intended, male or female, small or tall, to name but a few characteristics that all need stem cells to arise. Stem cells in a grown body are extremely scarce and could not be used that way ... at least not in the near future!

STEP 2 : Pet DNA extracted from a lock of hair or drop of blood and then infused on a cellular level into a blank.

DNA could easily be extracted that way, but again not put in blank organisms but more likely in blank cells.

STEP 3 : By using REPET's cerebral syncing process, all of the to-be-cloned pet's thoughts, memories and instincts are painlessly transplanted via the optic nerve

As mentioned above - not possible ... taking a X-ray of computer A, sending the information gathered into computer B ... useless!

☞ Clones have no soul

Depends on how you define a soul. If in your opinion a soul is acquired through genes, or through life experiences – then yes the clones would have a soul. On the other hand, if you believe that a soul is something given to you by a supreme being – for example God – then no the clone would not have a soul, unless the supreme being decided to give it a soul.

☞ « Pet Oliver will be exactly the same dog ... He'll know the same tricks you taught him, he'll remember where all the bones are buried, you won't even know he's a clone »

It is established that an organism is a product of both his genes and his environment. Since it is impossible to both transfer memories and make a grown-up ready version of a pet, Oliver would ultimately become a product of his new life experiences ... a different dog altogether!

☞ « We can make him smaller, with softer teeth, ... even color coordinate him to match your decorating scheme »

With DNA technology improving everyday, it will become possible to attribute specific characteristics to specific genes, and therefore target those genes. It thus would become

possible to design pets with existing information that we have on desired traits. Nature being as it is, and evolution having converge to camouflage fur patterns, it would be possible to match your pet to your neutral decor, but perhaps almost impossible to coordinate with your plaid bachelor pad!

Movie : counter 2735-2835 / time 45.35-47.15 min.

☞ Cloning organs will inevitably lead to human cloning

The two are very different things. Cloning organs entails making new organs for humans, without having to take it out of another human. This can be foreseen via two different routes.

Stem cells could be grown into specific organs. These cells could either be made by reverting the patient's normal cells to the stem cell stage (possibility being investigated as we speak) or again by finding those rare and precious stem cells within the patient (also a technology being avidely researched). This technology would allow to grow rejection free organs in a petry dish!

Another way to clone organs would be to harvest them from animals ex : pig kidney. The problem with this method is the potential from rejection of organs by patient's immune system. But recently (January 2002), Dr Randall Prather's research group at the University of Missouri Columbia have created pigs than lack 1 of the 2 identified protein that can cause organ rejection.

... So, would cloning organs inevitably lead to cloning humans ... would the science be pushed to clone entire organism when the entire organism is defective? It is a matter of opinion!

<http://www.cnn.com/2002/HEALTH/01/03/pig.cloning/index.html>

☞ Cloning has saved the fish population and feed half the world population

It very well could! By inserting selected genes, we can make crops more resistant to bugs, heat, water stress; or make fish more resistant to hot/cold, or various pollutants. By engineering organisms to better suit their environment, they would ultimately be protected and more successful!

PART B :Free Discussion

Question 2 :

Do you agree with the cloning of :	Strongly... Agree	Agree.....	Disagree....	Strongly Disagree	
Animals?	_____	_____	_____	_____	
Humans?	_____	_____	_____	_____	
Organs for humans?	_____	_____	_____	_____	
Food?	_____	_____	_____	_____	
Bacteria?	_____	_____	_____	_____	

WHY?

Movie : counter 2800-2835 / time 45.30-46.05 min.

☞ *From those who answered they were against human cloning :* Do you think differently after the speech about the kid with the brain tumor.

Movie : counter 5300-5310 / time 88.20-88.30 min.

☞ Do you agree or disagree with this statement and why? « If you believe that god created man in his own image, then you also believe that god gave man the power to understand evolution, to exploit science, to manipulate the genetic code. To do exactly what I'm doing. I'm just taking over where god left off! »

Question 9 :

If you could clone anyone apart from yourself, who would it be and why?

Question 10:

Why do most scientists agree with cloning? / Why do most religions disagree with cloning?

Others:

- Ethics behind cloning
- Conquering death
- Societal Ideals
- Loss of diversity

