

Up in the clouds



Make your own
model aeroplane wing

Even long before the Wright brothers proved just over 100 years ago that they could build and fly an aeroplane, man has been fascinated by aircraft. The sight of a modern aeroplane's graceful shape spearing our blue skies remains a beautiful sight.

The first planes were made of wood and could only carry one man at about 50 km/h. Today, giant airliners made entirely of metal can carry 400 passengers at a cruising speed of 940 km/h. The Concorde, the only supersonic aircraft that was in commercial use until late last year, could carry up to 120 passengers at supersonic speeds. Its cruising speed was 2 000 km/h. (Supersonic flight is faster than the speed of sound.) There are many military aircraft that can fly even faster than the Concorde.

The design of the Wright brothers' *Flyer* was not that much different from the designs of modern planes. They studied the forces of moving air carefully and came to realise that an aeroplane depends on the air to support it in flight.

FIRST FLIGHT, 17 DECEMBER 1903



ORVILLE WRIGHT



WILBUR WRIGHT

You will need:

- A ruler
- A piece of paper (not too thin) about 30 cm x 5 cm
- Sticky tape
- A straw
- Thread

Fold the paper in half and tape the top half to the bottom half about 2,5 cm from the edge. This will make the top surface curved and the underside nearly straight. This is the ideal shape for "lifting power".

Push the ruler through the paper and rest the paper on a table. Blow over the paper at the thick edge using the straw, and see the paper rise. If you use an electric fan instead of blowing, the results will be even more dramatic.

Now cut a short length of the straw. Make holes in the middle of the wing as shown in the

sketch, and push the straw through these. Fix the straw in place with sticky tape. Push a long piece of thread down through the straw, and hold the thread. Blow straight at the folded edge of the aerofoil and see how it rises. Now try blowing under the wing and see what happens. You would expect the paper to lift if you blow under it. Why do you think it lifts when you blow over the top of the wing?





FIRST TAKE-OFF

For more information on the Wright brothers, the science of flight, activities and teacher's resources, visit these fascinating websites:

<http://www.fi.edu/flights/own2/forces.html>

www.faa.gov/education/wright/wright.htm

(Don't miss the activity booklet)

<http://www.centennialofflight.gov/index.cfm>

<http://firstflight.open.ac.uk/>

DID YOU KNOW?

- ◆ The wealthy aristocrat, George Cayley, had established the basic shape of the aeroplane by 1799. It included a fuselage with fixed wings and a tail. After a lot of research he launched the first glider in 1849.
- ◆ Otto Lilienthal was a German engineer who studied the flight of birds. Eventually he designed a fixed-wing glider. After thousands of experiments he died in a crash in 1896.
- ◆ French-American engineer, Octave Chanute, was already in his 60s when he became interested in flight. During the 1890s he made thousands of successful glider flights, accumulating much information which he passed on to the Wright brothers.

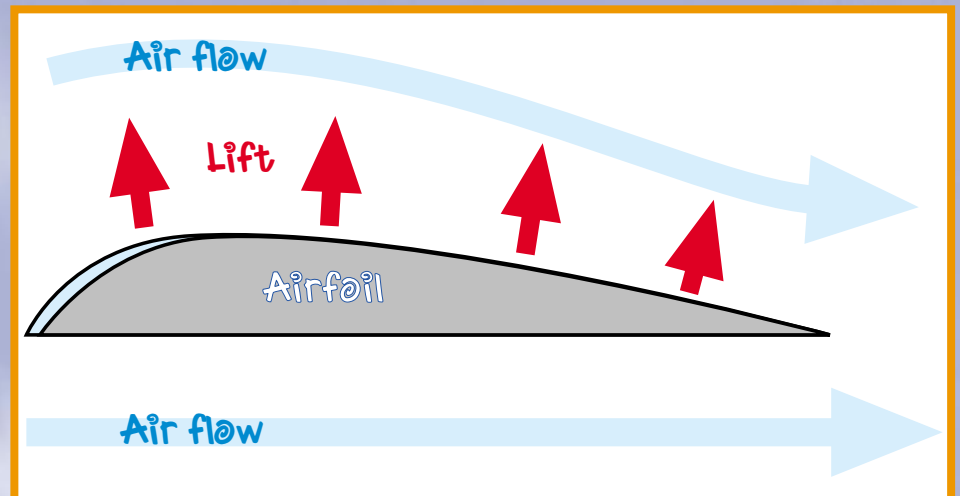
EASY

SCIENCE



How does an aeroplane fly?

What makes an aeroplane stay in the air? You might say its powerful engines, but a glider, which does not have an engine, can stay in the air too. An aeroplane stays in the air chiefly because of the shape of its wings. The shape is called an aerofoil.



Lift those wings!

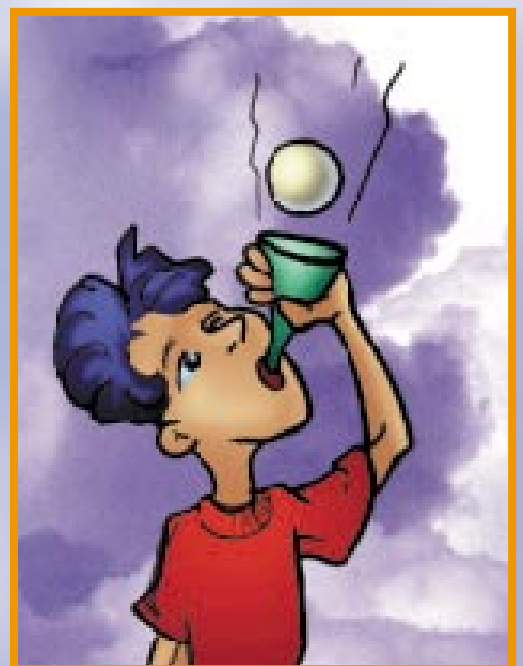
Air rushes past the wings of an aeroplane at great speed when it is up in the air. The air which passes over the curved upper sides of the wings must travel a greater distance in the same time as the air which passes below the wings. That means that the air going over the top of the wing travels faster than the air underneath. This difference in airflow speeds causes a greater air pressure under the wings than above it. The result is that the wings, and therefore the aeroplane, are forced upwards. This is called lift.

The engines are needed to make the aeroplane move fast enough through the air for lift to occur.

Hovering in the air

Here is a simple way to demonstrate lift. Hold one end of a strip of paper, about 5 cm wide, against your chin, just below your lower lip. What happens when you blow across it? The paper moves upwards. By blowing, you are causing the air to move faster along the top of the paper. You are creating an area of low pressure above the paper. Under the paper the air is not moving and the pressure remains normal. The greater pressure under the paper pushes the paper upwards, resulting in lift.

Another trick to show how lift works, is to place a ping-pong ball in a plastic funnel and blow up through the stem of the funnel. The ball will just hover above the funnel. How does this happen? When you blow, your breath lifts the ball up and then flows around it. The air stream with the ball inside is held in position by the still air pushing in all around.



BioTECH

Futhi - South Africa's first cloned animal

Futhi is a perfectly normal and happy little calf, living near Pretoria. What makes her special is that she is the first cloned animal in South Africa. Futhi, (meaning "again" in Zulu) is an identical copy of a nine year old Holstein cow and former milk-producing champion called LMJC 865. Instead of receiving half of her genetic information from each of two parents (from a sperm and egg), Futhi was made using a technique called cloning. She received 100% of her genetic material from LMJC 865 - who is not her mother, but her identical twin or clone, nine years older than her!



Cloning occurs in nature – we see identical twins born, yeast buds, earthworms divide. Many plants also clone themselves. However, cloning and especially human cloning is one of the more controversial areas of biotechnology. There are actually two types of cloning: making an identical copy of a whole organism or just part of one, such as a few cells or even a single gene.

Even in cold environments, cells quickly break down after an organism dies. To date, all the DNA found from long-extinct animals – even those remains found in the Siberian permafrost – has been incomplete and fragmented.

Many countries around the world are calling for a global ban on all types of human cloning because of the many ethical and moral issues – and because this technology is very new and there are still many problems.

Cloning is only possible when the nucleus taken from a living cell (such as with Futhi the calf) is placed into an egg from which the original nucleus has been removed. This substitute nucleus, with its DNA, proteins and other crucial material completely intact, was what controlled the development of Futhi. Injecting fragments of DNA into a cell without a nuclear transfer would not result in a clone.

Sorry, but it seems we are not about to see Jurassic Park in real life soon!

WHAT DO YOU THINK ABOUT CLONING?
Let us hear from you at speakup@pub.ac.za, or send a letter to The Editor, EasyScience, P O Box 1758, Pretoria 0001.



Can an extinct animal be cloned?


Most scientists now believe that the idea of cloning an extinct animal like a mammoth or a dinosaur is just a fantasy. They say that making an exact copy of a species that died off 10 000 years ago is possible only in science fiction movies.

The reason for this is that, to have any chance at a successful cloning, scientists must start with pristine, complete DNA.

EASY SCIENCE

PUBLIC UNDERSTANDING OF BIOTECHNOLOGY

The Department of Science and Technology has launched a Public Understanding of Biotechnology programme to make sure South Africans understand the scientific principles, related issues and potential of biotechnology. Biotechnology is the part of science that uses the DNA building blocks of life to make useful products from living things. If you have opinions, questions or concerns about any area of biotechnology, let's hear from you at speakup@pub.ac.za or fax 012 320 7803 or visit www.pub.ac.za for more information.

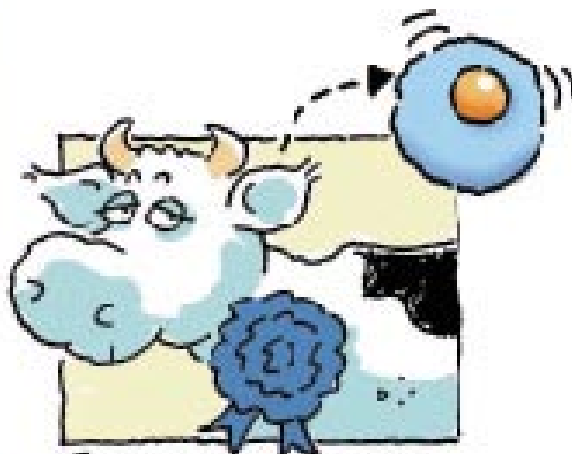


DEPARTMENT OF SCIENCE AND TECHNOLOGY

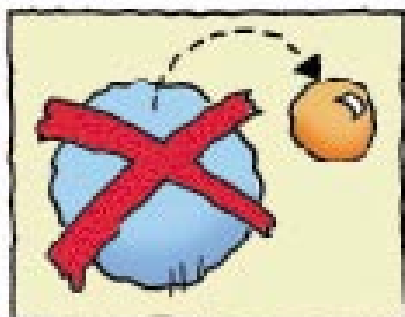
HOW FUTHI WAS CLONED.



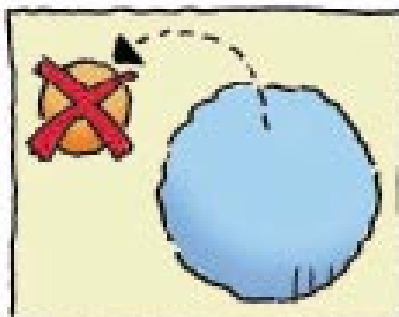
REPRODUCTIVE CLONING



TAKE A CELL FROM A CHAMPION COW...



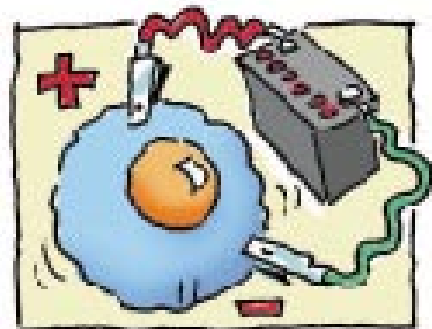
...REMOVE THE NUCLEUS AND DISCARD THE REST



TAKE AN EGG CELL FROM A DIFFERENT COW... REMOVE AND DISCARD ITS NUCLEUS



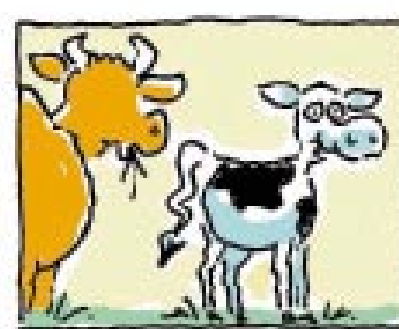
INSERT FIRST NUCLEUS INTO EMPTY EGG CELL...



...GIVE IT A SHORT ELECTRICAL PULSE - IT STARTS TO DIVIDE...



... AND IMPLANT IT INTO THE WOMB OF A SURROGATE COW.



THE RESULT IS A CALF GENETICALLY IDENTICAL TO THE ORIGINAL CHAMPION COW.

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