SUZANNE CORY

Breakthroughs in cancer research

In the past 40 years, the research of scientists such as Suzanne Cory has greatly increased our understanding of cancer.

Suzanne Cory has spent her life trying to understand how disease is related to processes occurring in the **DNA** and **genes** inside our body's **cells**. She has made important discoveries about how genes can sometimes send out the wrong messages, leading to cancer. She has received many prizes, including one of the world's most important prizes for cancer research, the Charles Mott Prize. She is also the first elected female president of the Australian Academy of Science.

fact file

Born: 11 March 1942

Schooling: (Melbourne, Victoria) Kew East Primary School, Canterbury Girls Secondary College, University High School

Selected achievements:

Macfarlane Burnet Medal, Australian Academy of Science, 1997

Australia Prize (shared), 1998

Charles Mott Prize (shared), 1998

L'Oréal-UNESCO Women in Science Award, 2001

Royal Medal of the Royal Society, London, 2002

An early interest in science

Suzanne Cory had a happy childhood in suburban Melbourne. As a young girl, she was keen to be a writer, and even wrote a novel. Later, in Year 9, her interest in science was roused by an inspiring **biology** teacher. She was also inspired by the launch of the first artificial satellite, Sputnik, into space. Suzanne repeated Year 12 so she could study all the subjects she was interested in, both sciences and humanities.

> *I had no idea about being a scientist. I was just interested in science, curious … I wanted to learn more about it and one step led to another.*
>
> – Suzanne Cory, interview in *George Negus Tonight*, ABC, broadcast 19 August 2004

Suzanne trains with famous scientists

Suzanne began studying science at the University of Melbourne in 1961. As the course progressed, she became increasingly fascinated by DNA and genes. To complete her studies, she boldly wrote a letter to one of the world's most famous scientists, Francis Crick, asking if she could work on her **PhD** with him. Francis Crick was famous because, along with James Watson, he had discovered the unique double helix shape of DNA.

To Suzanne's delight, Francis accepted her in his department at the Medical Research Council Laboratory of Molecular Biology in Cambridge, England. There, Suzanne worked alongside many leading scientists, and met her future husband, the United States scientist Jerry Adams, who would come to play a major role in her career.

Did you know?

In 2010, cancer caused just over a quarter of all deaths in Australia. However, every year more people survive cancer, because treatments are improving. Lung cancer is the most deadly of all cancers in Australia.

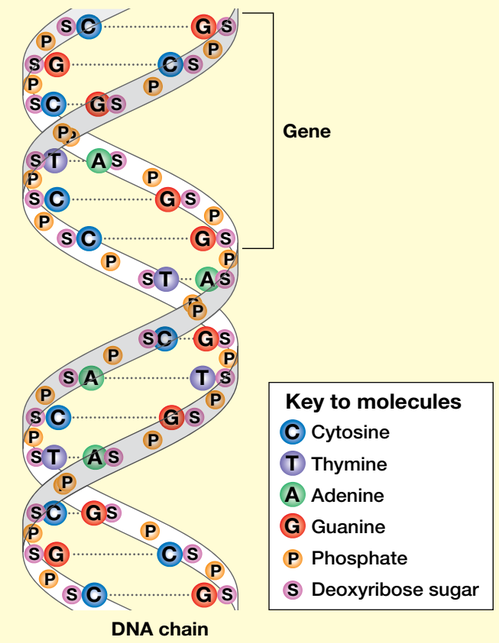
the science behind it

DNA AND GENES

DNA (deoxyribonucleic acid) is found in the cells that make up all living things. It carries the genes that instruct cells how to grow and do their many different jobs.

The **molecules** that make up DNA are arranged in two very long strands, in the shape of a twisted ladder, called a double helix. There are two alternating molecules (shown as 'S' and 'P' in this diagram) which form the sides of the ladder, and four others (shown as 'G', 'A, 'T' and 'C') that pair up to form the rungs. G always pairs with C, and A pairs with T. A group of rungs of the ladder (usually between 100 and 10 000 rungs) makes a gene. Each gene has its own different pattern of G–C and A–T rungs. The pattern is like a code that gives an instruction to a cell. For example, one gene instructs blood cells how to make a substance that transports oxygen around the body.

Complex **organisms**, such as humans, have billions of cells, which each have thousands of genes. They control the development of the body and all its functions.



DNA chain

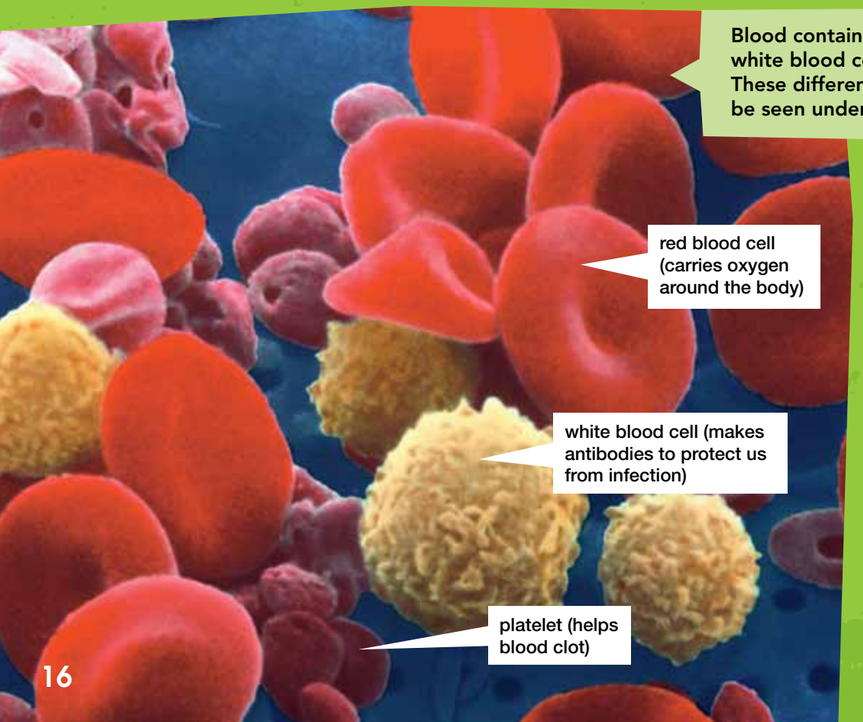
The twisted ladder shape of DNA is called a 'double helix'.

The birth of genetic engineering

In the early 1970s, a new technology for studying **DNA**, called genetic engineering, was emerging overseas. Scientists were learning how to cut out a single **gene** from the DNA of a complex **organism**, such as a human, and insert it into the DNA of a **bacterium**, a simple, single-celled organism. The bacterium could then be grown in unlimited amounts, forming a sort of factory for producing the human gene. In this way, scientists could figure out the particular nature and function of human genes.

Suzanne and Jerry pioneer genetic engineering in Australia

In 1971, Suzanne and Jerry set up a laboratory in Melbourne, at the Walter and Eliza Hall Institute (WEHI). The institute was internationally famous for discoveries made there about the **immune system**. Suzanne and Jerry introduced genetic engineering to WEHI, and pioneered its spread in Australia. Genetic engineering allowed them to explore a question that was puzzling scientists. How could a type of **white blood cell** called a lymphocyte have only a limited number of **antibody** genes but produce the billions of different antibodies needed to protect our bodies from so many different kinds of infection? The answer was totally unexpected, and Suzanne and Jerry made important contributions to discovering it. They helped show that, unlike all other genes in our bodies, antibody genes are stored within the DNA in bits, and lymphocytes have the special ability to make genes by stitching the bits together, in a vast number of different combinations.



Blood contains red blood cells, white blood cells and platelets. These different parts of blood can be seen under a microscope.

the science behind it

CANCER

A human life begins from a single **cell**, formed when a woman's egg is fertilised by a man's sperm. That cell divides and multiplies, forming two new cells, which again divide and multiply, and this process continues not only as the human grows up but also throughout adult life. A fully grown person is made of trillions of cells.

At the same time as some of our cells are multiplying, others are dying. This is because almost all human cells have a limited lifespan. Some die when they reach a certain age. For instance, skin cells die and flake off after only a few weeks. Other cells die when they have done the job they were meant to do. For instance, as a baby develops in its mother's womb, it starts with hands that are webbed like the feet of a duck. The webbing cells later die away to create proper fingers. Cells can also die if they are infected by **viruses** or if their genes are faulty.

When we are healthy, the death of cells balances their multiplication. When someone has cancer, this balance is upset. A genetic mistake instructs cells to keep multiplying or not to die when they are meant to. Masses of these cancer cells can then build up in an uncontrolled way and eventually upset the way the body works.

web watch

To read why Suzanne Cory won the Australia Prize, see http://pandora.nla.gov.au/nph-arch/2000/S2000-Feb-27/http://www.abc.net.au/science/sweek/ausprize/default.htm

Tumours are cancer cells growing uncontrollably, and often where they do not belong. Several tumours can be seen in this human liver.

Suzanne and Jerry start researching cancer

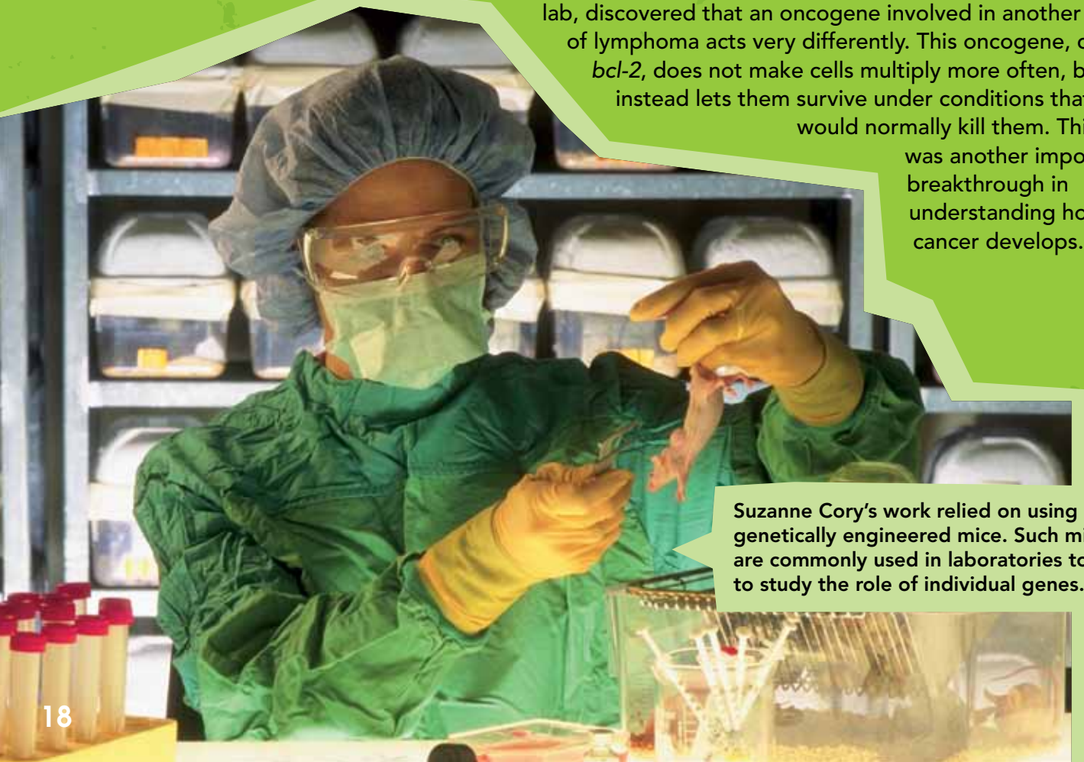
During the late 1970s, United States scientists were discovering how some **genes** in a **cell**, called oncogenes, can cause cancer if they start acting the wrong way. Suzanne and Jerry were so excited about these discoveries they switched to cancer research in the early 1980s. They began by asking whether some cancers that affect lymphocytes might be caused by a mistake occurring during the process of stitching together **antibody** genes. Could an accident cause a bit of an antibody gene to become stitched to an oncogene, and could this cause cancer?

Understanding Burkitt's lymphoma

Suzanne and Jerry, and their colleagues, went on to show that a cancer which affects the lymphocytes, called Burkitt's lymphoma, was in fact caused by a mistake that linked an antibody gene to an oncogene, called *myc*. To prove this was the case, they obtained a *myc* gene that had been altered in this way, and injected it into mice egg cells. Remarkably, all the mice born with the altered *myc* gene developed lymphoma. This was an exciting breakthrough in understanding the cause of Burkitt's lymphoma.

Discovering another path to cancer

The *myc* oncogene contributes to cancer by forcing cells to keep multiplying. Scientists thought all oncogenes acted like this. Then, in 1988, David Vaux, who was studying for his **PhD** in Jerry and Suzanne's lab, discovered that an oncogene involved in another type of lymphoma acts very differently. This oncogene, called *bcl-2*, does not make cells multiply more often, but instead lets them survive under conditions that would normally kill them. This was another important breakthrough in understanding how cancer develops.



Suzanne Cory's work relied on using genetically engineered mice. Such mice are commonly used in laboratories today, to study the role of individual genes.

Suzanne holds important positions

Suzanne became the first female director of the Walter and Eliza Hall Institute (WEHI), in 1996, and held that position until 2009. The following year, she became the first elected female president of the Australian Academy of Science, an organisation representing Australia's most distinguished scientists.

Suzanne continues her research at WEHI. As president of the Academy, Suzanne also lobbies the Australian Government to support science, for instance, by improving science education, and providing scientists with the funding and new technology they need for their research.

As president of the Australian Academy of Science, Suzanne Cory helps politicians make decisions based on scientific evidence. She has met many politicians, including Prime Minister Julia Gillard.

> *We need to turn the explosion of new knowledge about cancer into rational new treatments.*
>
> – Suzanne Cory, interview in *Australian Society of Medical Research Newsletter*, July 1997

more about...

WHAT CAUSES CANCER?

Scientists do not fully understand how mistakes in our genes lead to cancer. However, they know that by damaging the **DNA** in our lung cells, smoking increases a person's chance of developing lung cancer. Sunburn similarly increases the risk of skin cancer. Drinking alcohol too much or being exposed to some chemicals also increases the risk of cancer.

SUZANNE'S CONTRIBUTION TO MEDICAL SCIENCE

Suzanne Cory's research has furthered scientific understanding of cancer. Today, other medical scientists are building on what Suzanne discovered about the way mistakes in our genes lead to cancer. Suzanne's work is continuing to contribute to the development of new cancer drugs and treatment.