



Josef Penninger, *Geneticist*

What would have happened if Josef Penninger was still afraid of mice today?

Josef Penninger was born in Gurten, a small village in Austria near the border with Bavaria, in 1964. His parents owned a farm. Because they had to work so much of the time, they sent Josef to boarding school. When he was a child, he often had terrible nightmares about scary rats. He therefore had an awful fear of rats and mice.

Back then, neither he nor his teachers suspected that one day he would become a scientist – a very famous one, in fact. As a boy, Josef himself dreamed of being a professional footballer or a doctor. Later on he studied medicine, art history and Spanish in Innsbruck. After graduating he began to do research on the human immune system. “I worked in the laboratory from morning till night, and even on holidays and during my vacations,” he recalls. “I wanted to be able to explain where killer cells go to ‘school’ and how they learn to kill other cells.” Killer cells are the cells in the immune system that know whether other cells of the body have been attacked by bacteria or viruses that can make them

ill. They immediately kill these sick cells and are therefore very important for human health.

Genes determine people’s characteristics

Together with his team, Josef Penninger investigates human genetic material, which contains many thousands of genes. There are genes in every individual cell of the human body. The skin consists of skin cells, the heart consists of heart cells, and so on. These types of cells are very different, because after all the skin is very different from the heart, but all of these cells contain genes. The genes are in effect the command headquarters, or the bosses, of the cells.

The genes determine if the eyes are blue or brown or whether a person has a snub nose or ears that stick out. Children inherit their genes from their parents, so characteristics such as black or blonde hair are also inherited. That’s why children often look very much like their parents.

As a geneticist, Josef Penninger investigates what other effects genes have. Experimenting with human cells is allowed only in exceptional cases, so he generally does his research with cells from other animals, such as mice. Before he could do that, he had to learn to overcome his awful fear of these little animals. “It took me a year before I could walk into a room where there were cages full of mice,” he says. It’s an interesting fact that mouse genes are very similar to human genes. Some of the results of researchers’ experiments with mice can therefore be transferred to human beings.

Genes regulate our day-and-night rhythm

For example, Josef Penninger recently discovered a gene that regulates the biological clock of mice. The biological clock of animals and of human beings ensures that these creatures live according to a day-and-night rhythm, as if they were guided by something like a clock. At certain times they are wide awake, and after a relatively constant number of hours they feel tired and have to go to sleep. Of course this “biological clock” is not a real clock, but it acts like one. Josef Penninger investigated mice whose “biological clock gene” did not function properly. These animals did not have a healthy day-and-night rhythm. The scientists also investigate the role that genes play in cancer and illnesses of the heart, lungs and bones. They would also like to find out how genes influence the immune system, which protects us from illnesses such as cancer and the flu. The goal of Josef Penninger and his colleagues is to gain new knowledge about genes that could help to develop new medicines in the future.

The main purpose of knowledge is to protect the world

Josef Penninger worked as a geneticist in Canada from 1990 to 2002. After that he returned to Austria with his wife, a Chinese doctor, and his three children. Since then he has been the Director of the



Institute of Molecular Biotechnology (IMBA) of the Austrian Academy of Sciences.

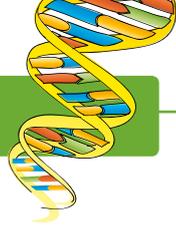
“Being a scientist is one of the coolest jobs you can have, even though it often takes years to get results,” says Prof Josef Penninger. “It’s exciting to do research in an area nobody knows anything about yet, to be allowed to ask uncomfortable questions, and not to have to believe everything other people tell you. Having more knowledge will be the real power of the future.”



Genes control the “biological clock” of animals and human beings. The “biological clock” regulates our periods of sleeping and waking. (@fotolia.com/PhotoSG)



Now it's your turn!

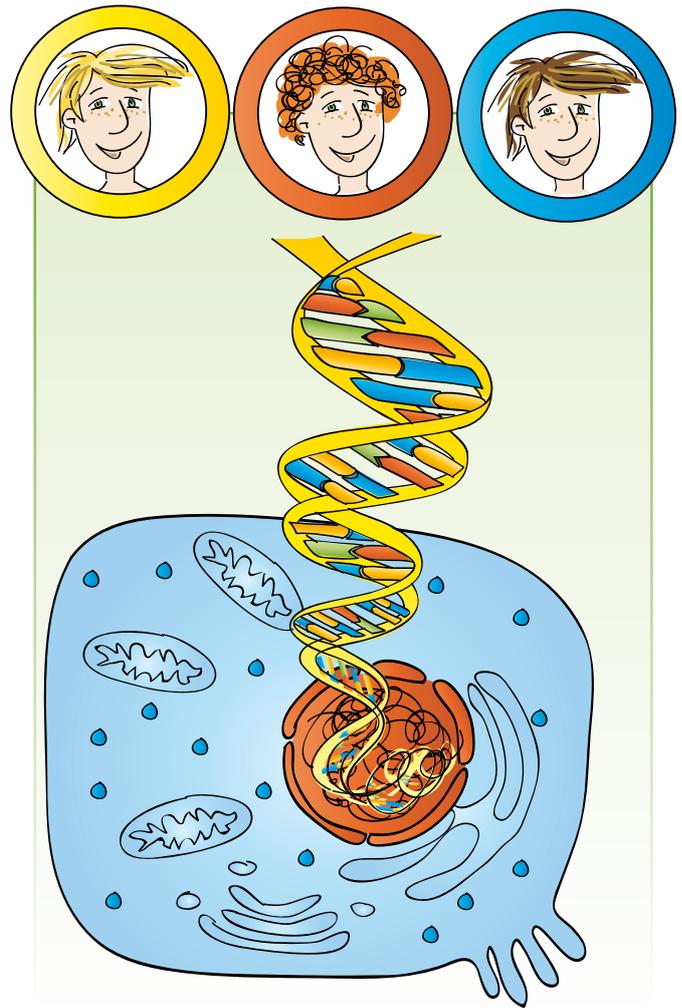


1 Questions about the text

- ▶ Josef Penninger investigates certain cells of the immune system that find sick body cells and kill them. What are these special cells called?
- ▶ Experiments with human cells are allowed only in exceptional cases. That's why Josef Penninger works with animals. Why did he choose mice, even though he wanted to investigate the characteristics and sicknesses of human beings?
- ▶ Josef Penninger and his research group want to find out how genes function in the cells of the body. How could the findings of this research help people?

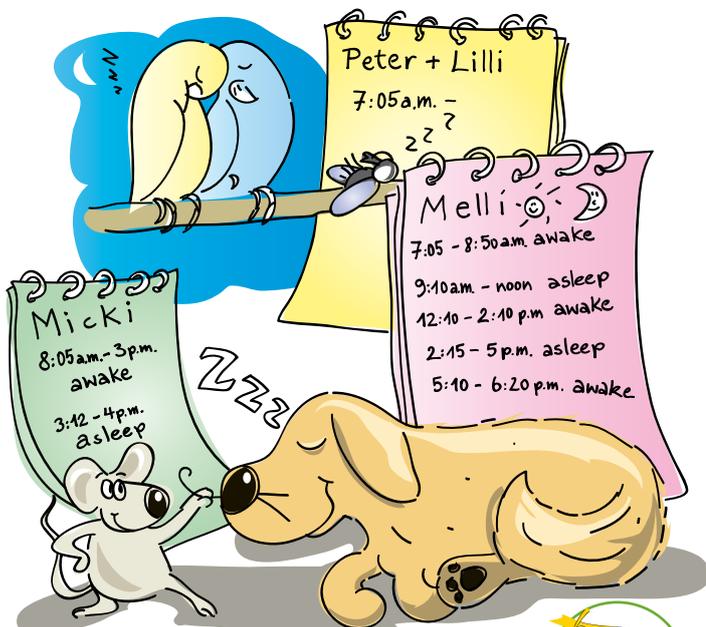
2 The "biological clock" of animals

- ▶ Find animals that you can observe for a longer period of time.
- ▶ Observe these animals' waking and sleeping times.
- ▶ Record your observations in such a way that you can compare them with your classmates' observations.
- ▶ Consider what other questions you would like to investigate.



3 Making a model of a body cell

- ▶ Look in books or on the Internet for pictures of body cells in which you can clearly see the different parts of the cell.
- ▶ Use the pictures to build a model of the cell. Use materials that you can find at school or at home.



Imprint

Taken from

Lantern Moon and Hot Ears – Language promotion in primary school teaching through inquiry-based learning using biographies available in English and German
www.science-on-stage.eu/lantern_moon

Published by

Science on Stage Deutschland e.V.
Poststraße 4/5
10178 Berlin · Germany

Translation

TransForm Gesellschaft für Sprachen- und Mediendienste mbH
www.transformcologne.de

Credits

The authors have checked all aspects of copyright for the images and texts used in this publication to the best of their knowledge.

Design

WEBERSUPIRAN.berlin

Illustration

Rupert Tacke
info@ruperttacke.de

Please order from

www.science-on-stage.de
info@science-on-stage.de

Creative-Commons-License: Attribution
Non-Commercial Share Alike



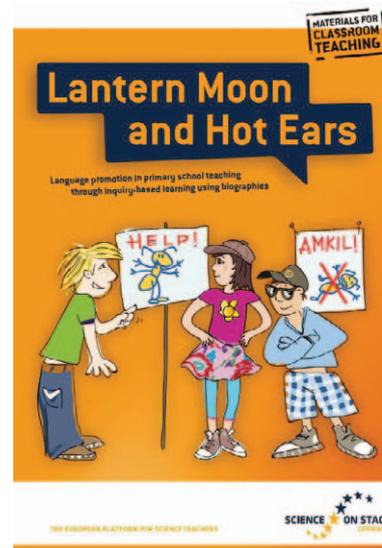
First edition published in 2015
© Science on Stage Deutschland e.V.



MAIN SUPPORTER OF
SCIENCE ON STAGE GERMANY



IN COOPERATION WITH



Science on Stage – The European Network for Science Teachers

- ... is a network of and for science, technology, engineering and mathematics (STEM) teachers of all school levels.
- ... provides a European platform for the exchange of teaching ideas.
- ... highlights the importance of science and technology in schools and among the public.

The main supporter of Science on Stage is the Federation of German Employers' Associations in the Metal and Electrical Engineering Industries (GESAMTMETALL) with its initiative think ING.

Join in - find your country on

WWW.SCIENCE-ON-STAGE.EU

- www.facebook.com/scienceonstageeurope
- www.twitter.com/ScienceOnStage

Subscribe for our newsletter:

- www.science-on-stage.eu/newsletter