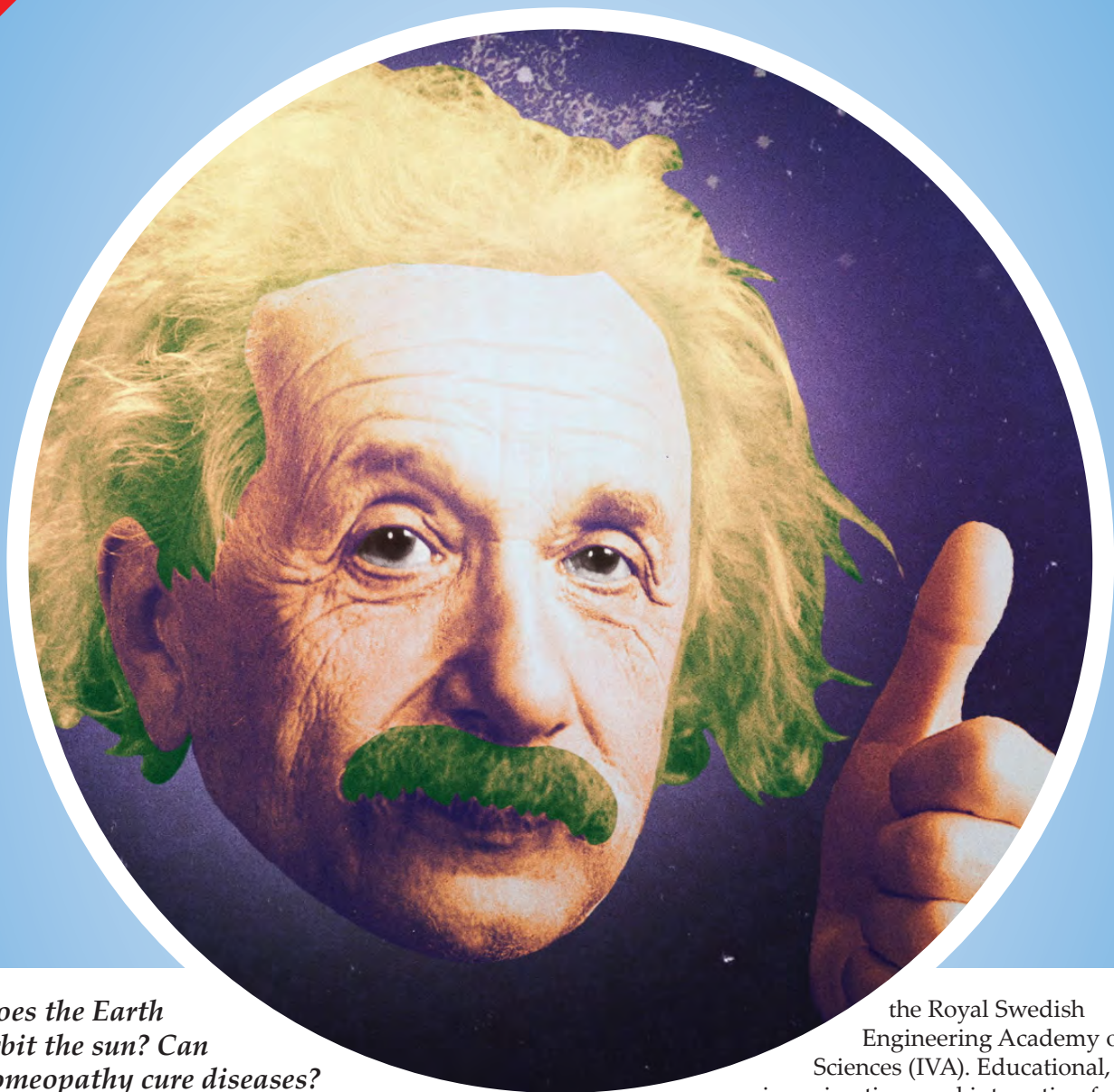


Science vs
Pseudo-science

KLARTÄNKT

Clear Thinking



Does the Earth orbit the sun? Can homeopathy cure diseases? Do you get spasms of swimming after eating? Scientific methodology can help us distinguish true from false.

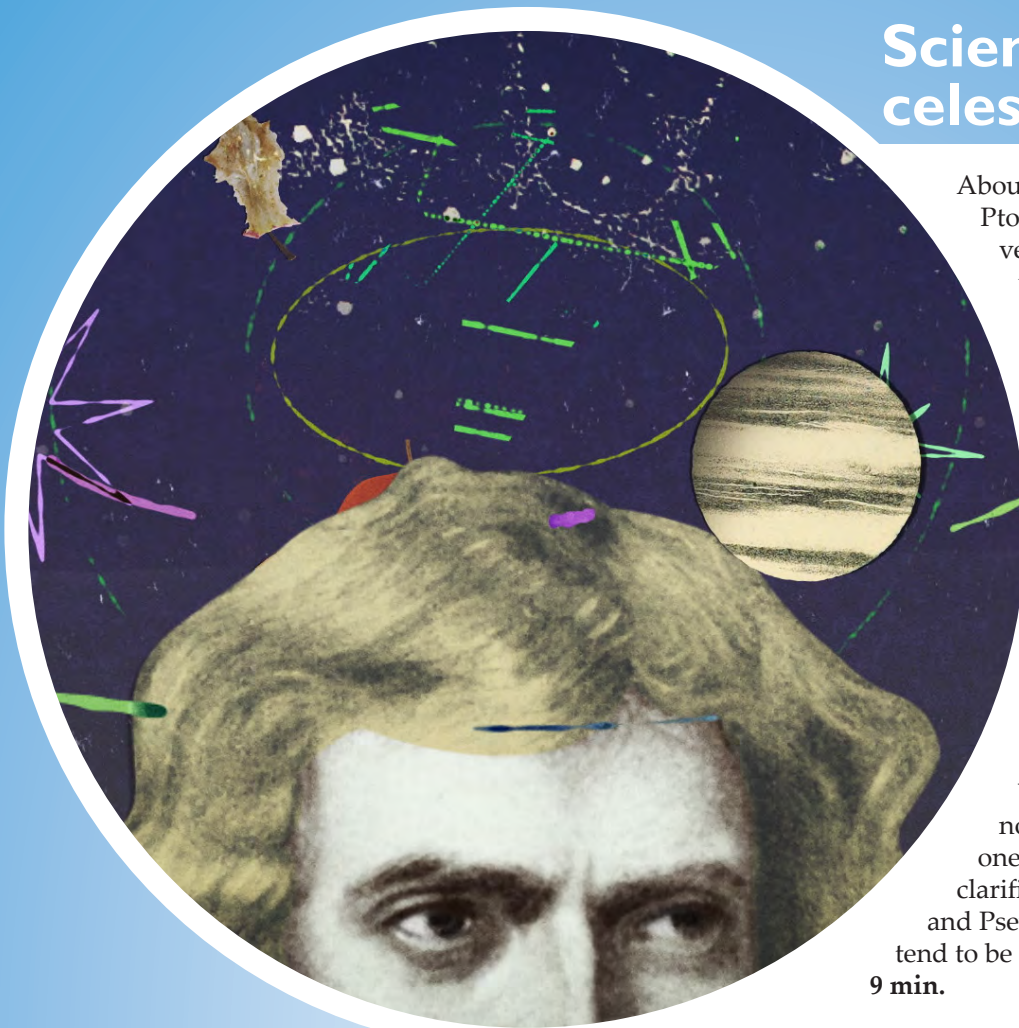
The brain often thinks fast but wrong. So we can fall into mind traps and argue in wrong way. Critical thinking is the tool that helps. Take a look at the four short films in the series "Clear Thinking" produced by Mediabruket AB on behalf of

the Royal Swedish Engineering Academy of Sciences (IVA). Educational, nice animations and interesting fun examples make the movies extremely useful in teaching.

Was smallpox eradicated by vaccine or by homeopathy? Scientific progress nowadays needs to be both defended and explained. The films can therefore benefit pupils from 12 years of age.

For more information see the back page.

Scientific method and celestial bodies



About 2,000 years ago, Greek astronomer Ptolemaios made some important discoveries. He studied the sky and claimed that the planets were moving in orbits around the earth. This became the start of the science astronomy.

But Ptolemy also believed that the planets had power over us humans. He wrote a book about the impact of the stars on humans and our surroundings. This became a basis for astrology.

The film *Clear thinking 1* is based on a comparison between these areas. The main message is that the scientific method of studying the world constantly increases our knowledge and move our society forward.

What is the difference between astronomy and astrology? One answer is that one is science, the other is not. The film clarifies how to differentiate between science and Pseudo-science, that is, beliefs that pretend to be science but are not.

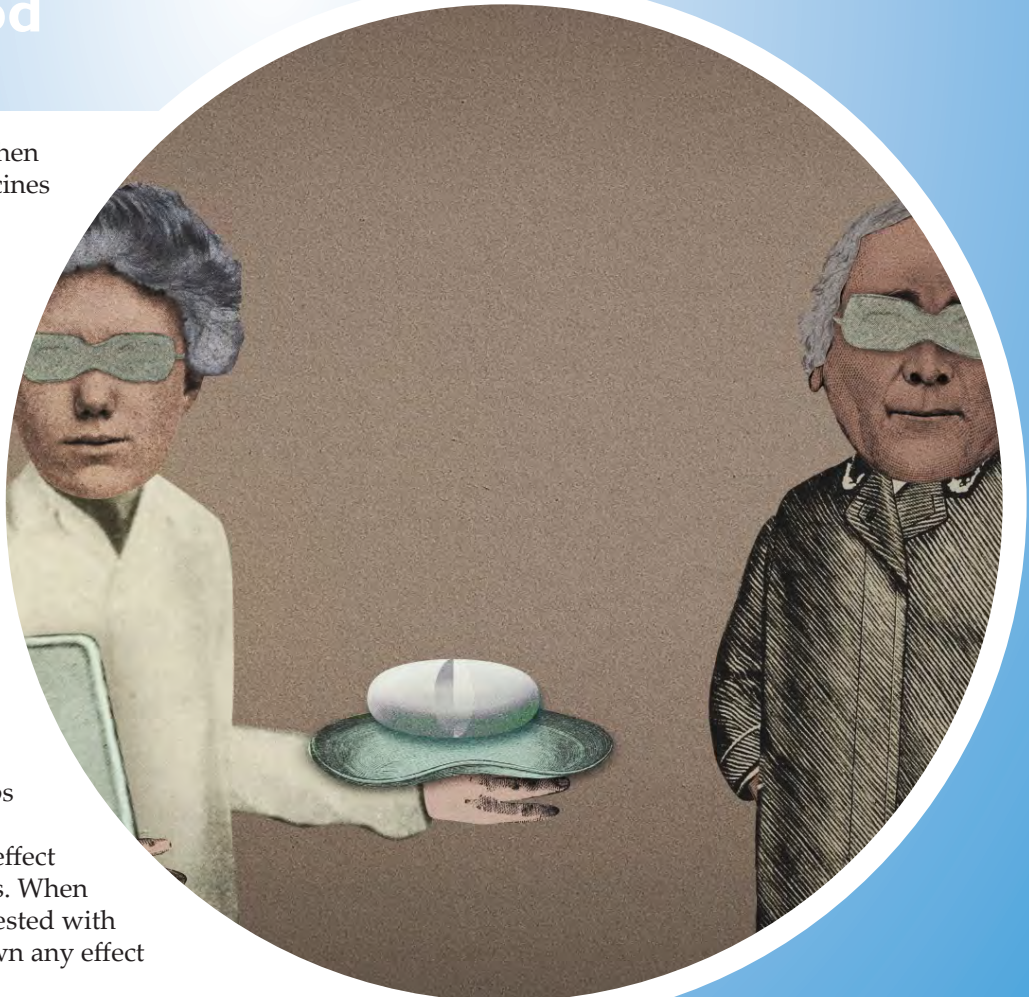
9 min.

Scientific method and vaccination

Vaccines have, since the late 1700s, when Edward Jenner began to develop vaccines against smallpox saved hundreds of thousands of lives.

Today, there are vaccines against a number of diseases that could cause permanent disability or premature death. About the same time as Jenner begins his work in England, the theories about the so-called homeopathy were develop. According to this method of alternative medicine, a substance that causes disease symptoms in a healthy person can cure the same symptom of a sick person. The film *Clear thinking 2* lists both these methods and points to crucial differences between them. Vaccines have been developed with a scientific method. They are tested in many steps before given to humans.

In this way, we know that they have effect without seriously harmful side effects. When the homeopathic preparations were tested with scientific methods they have not shown any effect at all. 9 min.





To avoid mind traps

Will something be truer because it is repeated often? Do we rather believe in what we are familiar with rather than what is unknown?

Do we prefer simple explanations even if the problem is complicated?

Or do we believe in people we like rather than those we do not like?

The film *Clear thinking* 3 points to different mental traps we can end up in when we think too fast. They lead to answers to questions, perceptions and decisions completely different from what they would be if we were thinking about things a little longer. **10 min.**

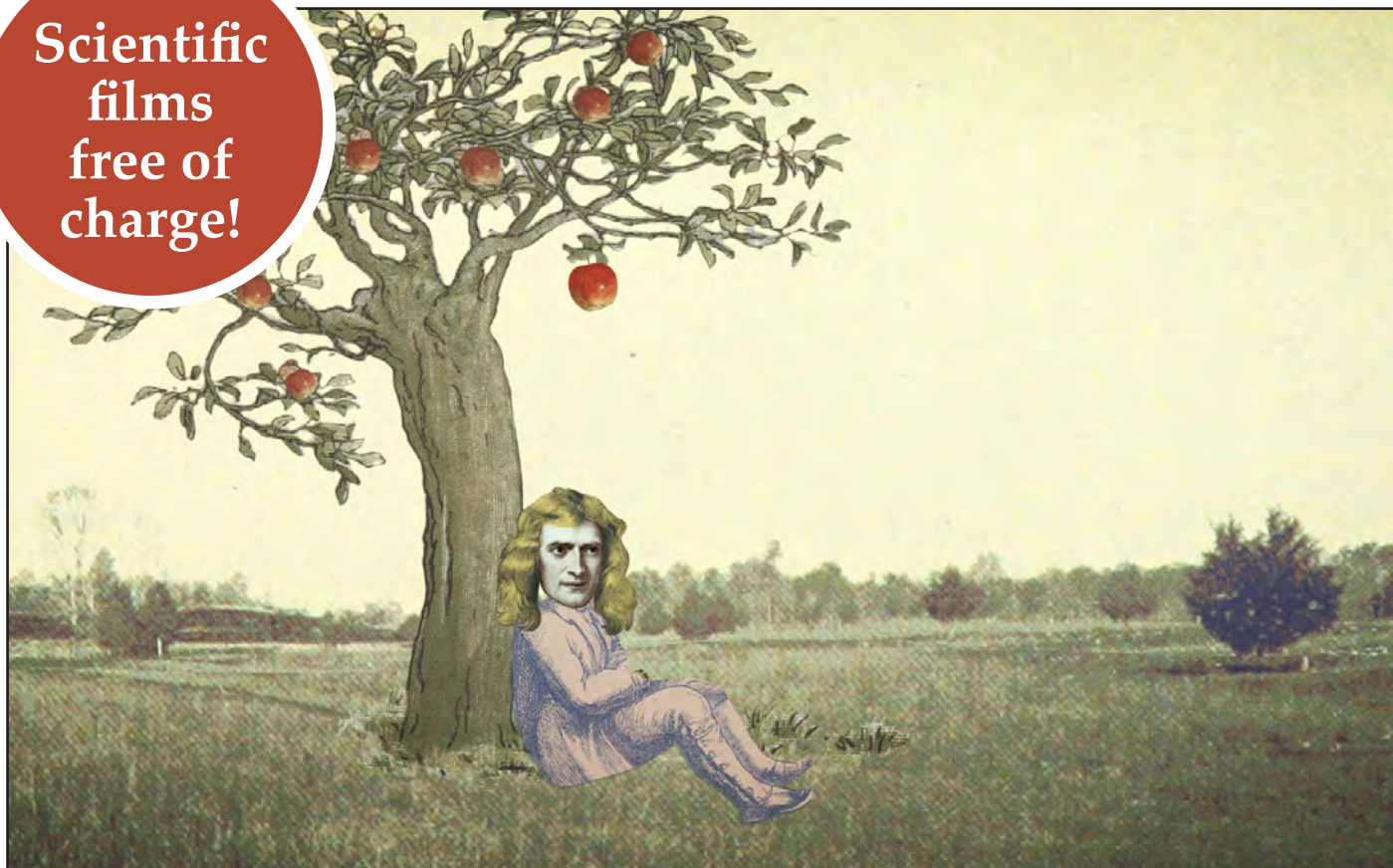
Argument fallacies

How can you say that people must stop activities that make the earth warm up? I know you always go by car to school. "Celestial bodies affect us. No way, you say. But you can you prove that they do not?"

The final movie in the series "Clear thinking" is about argumentation. The purpose is to alert the students to argumentation errors as in the examples above, so that they get a feel for how they sound and do not get fooled by them. In that way they can facilitate discussions without getting caught in argument fallacies that make the conversation lead nowhere. The film illustrates the argument errors with examples from previous films in the series, but also with cases that are common in all discussions. **10 min.**



Scientific
films
free of
charge!



The series of four ten minutes long films and a teacher's guide are intended for the education of schoolchildren at least ~ 12 years of age. The goal is to provide them with tools to critically review information and to understand what characterizes scientific thinking.

The first two films describe the scientific method and the difference between science and pseudo-science. The differences are exemplified by comparisons between astronomy and astrology and vaccines and homeopathy.

The following two films are based on ideas of how we think, developed by, among others, the psychologist Daniel Kahneman, who was rewarded with the economics prize in Alfred Nobel's memory. For example, they are about incorrect conclusions that we can draw when we think too quickly and intuitively. With specific examples, they show how to recognize disinformation of different kinds. The students are also taught how to carry on constructive discussions by learning to recognize and avoid argumentation errors.



FILM OCH SKOLA

Film och Skola - en del av Swedish Film AB

www.filmochskola.se • ann.nordstrom@filmochskola.se

Access to the films:

You can find links to the films on page 2 of the "Teacher's guide" document that you can download from <https://goo.gl/6PtoFX>

