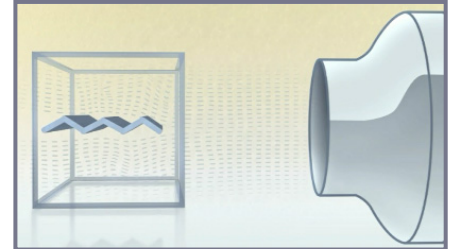


Name: Klasse: 

## Evolutionary Strategy – Solution

### Optimization of Technology based on Ideas of Adaption and Evolution

**i** Professor Ingo Rechenberg, PhD developed an optimization strategy at the Technical University of Berlin. He tried to imitate the principles of natural evolution, the so called “evolutionary strategy”. Watch the film sequence “Artificial Evolution in Scientific Research” about Rechenberg’s experiment with the zigzag surface and the wind tunnel.



1. Why did Rechenberg do his experiment? Phrase the underlying question by completing the following sentence.

**Rechenberg wanted to find out, *how long it takes to reach a (near) perfect flow structure, if the plate segments are altered according to Darwin’s theory of evolution***

2. Each experiment has an *independent variable*, which is methodically changed between individual runs. Each test also has a *dependent variable*, which is measured each time. In addition, there are always a number of *other parameters*, which stay constant to see which influence the independent and dependent variable have on the experiment. Identify those aspects in Rechenberg’s zigzag plate experiment.

The **independent variable** in the zigzag plate experiment is *the angle of the single plate segments*.

The **dependent variable** in the zigzag plate experiment is *the air resistance of the plate*.

Following variables have to be **kept constant** during the experiment, in order to determine the influence the independent variable has on the dependent variable:

e.g. *intensity of air flow, width/mass of the plate, distance of the plate to the wind source*.

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3. Below is a screenshot from the last sequence of the film. Interpret the picture by linking it to the topic of “Evolution and Optimization” and try to explain what the creators of the film wanted to express through it.



*Individual student answers.*

*For example:*

*Many early attempts of humans to fly have initially failed. Through bionics (displayed by the winglets of the flying machine, inspired by the wings of a stork) enormous progress in this area was made. Evolutionary strategies were used to optimize these structures (from multi-winglet to split-wing-loop). It is based on the principles of the theory of evolution by Charles Darwin, who is also shown in the picture. The creators of the film summarize in this picture the elements of bionics, bionic developments through optimization and the evolutionary theory as an underlying construct of ideas. Connected to this is the prospect / hope that human action will always be able to open up new possibilities while contributing to sustainable development.*