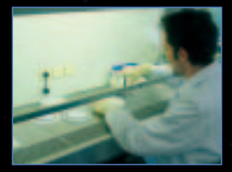
Examples of student experiments

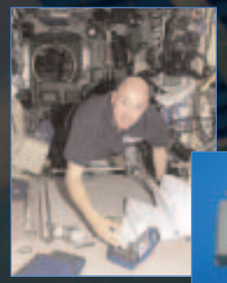
Bone Proteomics



Adalberto Costessi, the winner of the SUCCESS 2002 Student Contest, is now preparing his experiment for flight to the ISS in April 2005. His experiment investigates the protein content of human bone-producing cells that have been stimulated in a weightless environment. Many astronauts suffer from bone loss when exposed to weightlessness for longer times. The mechanisms responsible for this loss parallel the osteoporoses disease that affects millions of mainly elderly people all over the world. Research could therefore contribute to a cure for this disease.

BugNRG

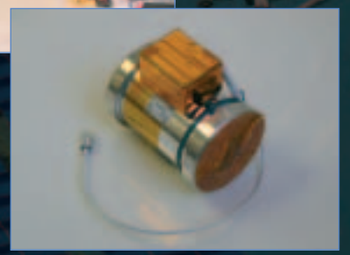
During the Dutch Soyuz Mission, the BugNRG experiment studied the influence of weightlessness on the output of two bacterial fuel cells. Since certain bacteria can transfer carbohydrates into free electrons, protons and waste products, a bacterial fuel cell that utilises these bacteria can produce an electrical current. The hypothesis behind the experiment was that, since weightlessness can affect the performance of bacteria, the output of a bacterial battery could be altered by weightlessness.



Chondro

Since many people suffer from cartilage-related diseases, modern medicine is trying to come up with solutions, such as growing artificial cartilage that can be implanted in the human body. On Earth, gravity disturbs the growth of cartilage owing to sedimentation of the newly formed material. Growing cartilage in weightlessness could eliminate this sedimentation helping to improve our understanding of how cartilage is formed and therefore possibly leading to cures for cartilage diseases.

For the Chondro experiment, a small battery-powered incubator was built to keep sample material and nutrients at mammal temperature for the 10-day space mission to ISS. To prevent the biological material coming into contact with the astronauts, the facility was constructed of several nested jars, rather like a Russian Matroshka doll. Small electronics and a resistive heater guaranteed the temperature on inside , while safeguarding the requirements for the maximum allowable temperature on the outside.



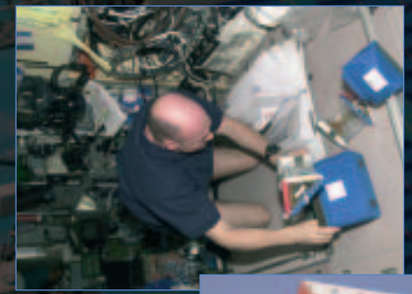
Winograd

A Winogradski column is a colony of different types of bacteria (contained within ordinary pond or lake water) that have organised themselves according to a pattern where waste produced by one type serves as a nutrient for the other. A special feature of the Winogradski column is that, on Earth, the cooperating organisms always arrange themselves in predictable horizontal layers. The goal of the experiment was to find out whether this layering is due solely to the biological cooperation of these organisms or if gravity plays an additional crucial role. In the latter case, the distinct layering was not expected to appear in weightlessness. Since the bacteria live off each other's waste products and the only input needed is light, the system can be regarded as semi-perpetual.

The Winograd experiment on the International Space Station was accompanied by a duplicate experiment on ground at 1 g for reference. Four "Winogradski Sample Containers", containing water from a pond, were placed in the "Winograd Block", where they were illuminated by four light emitting diodes for eight weeks.

GraPhoBox

The GraPhoBox experiment assessed the effect of phototropism (growth towards a light source) and gravitropism (growth towards the gravitational vector) on the basic architecture (root growing 'down', shoot growing 'up') of plants. The questions to answer were: does light have an effect on the growth direction of the root, and does gravity affect the growth direction of the shoot? These are directly opposite to experiments that have been conducted for many years, where gravity-influence on the root and light-influence on the shoot have been examined. In the experiment, wild and mutant seeds of Arabidopsis thaliana, the 'lab rat' of the plant biologist, were germinated in dark and light growth chambers under both microgravity and 1 g conditions. At the end of the experiment, photos were taken of the seedlings' roots and shoots. On Earth, the root and shoot curvatures of the space-germinated seeds will be compared to those of the seeds germinated in a 1 g environment. Interactions can be made clear by variance analysis of the deviations of the curvatures.



The SUCCESS Student Contest is a competition for European University students from all disciplines to propose experiments that could fly on the International Space Station (ISS).

Imagine how you would feel if your ideas were up there!

The first prize is a paid one-year internship at the European Space Research and Technology Centre (ESTEC) in the Netherlands. During this internship, you can work on your own experiment to prepare it for flight to the ISS.

SUCCESS is for everyone!

The competition is certainly not only for space engineering or astronomy students. A lot of research is being conducted in fields like:

- Life sciences
- Physical sciences
- Space sciences
- Earth observation
- Technology

SUCCESS wants proposals from **your** field of interest!

Just imagine how the Space Station environment (weightlessness, the vacuum of outer space, the high altitude above the Earth, space radiation, the isolated environment for the astronauts) could benefit **your** experiment!

How to participate

In order to participate, students have to register via the SUCCESS web page.

After registration, students are required to describe their ideas in an essay of not more than 800 words. The essay must be submitted electronically via the web page no later than 28 February 2005.

A specialist board will select essays to move on to the second phase of the contest. The second-phase participants will be invited to ESTEC for a few days to learn about ESA in general, the International Space Station and all the experiments proposed in the essays. In addition, the visit will provide the chance to socialise and relax with a trip to Amsterdam.

Second-phase participants will have to write a more detailed experiment proposal, which should be submitted before a second deadline and should not exceed 10 A4 pages. The specialist board will review the detailed proposals and select participants for the final phase of the competition.

All of the third-phase participants will be invited to the Award Ceremony, where the First, Second and Third Prize winners will be announced.

In addition to SUCCESS, there are other doors to space, which can be found via the links on our web pages.

Detailed information on the SUCCESS Student Contest can be found at:

www.esa.int/success

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To participate, register via the SUCCESS web page before the deadline. It is advisable to revisit the web page frequently to spot the latest news.

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Space station Utilisation Contest Calls for European Student initiativeS

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