

J.Batura, V.Chmelenko, Sumy Comprehensive Secondary School №5, Sumy, Ukraine

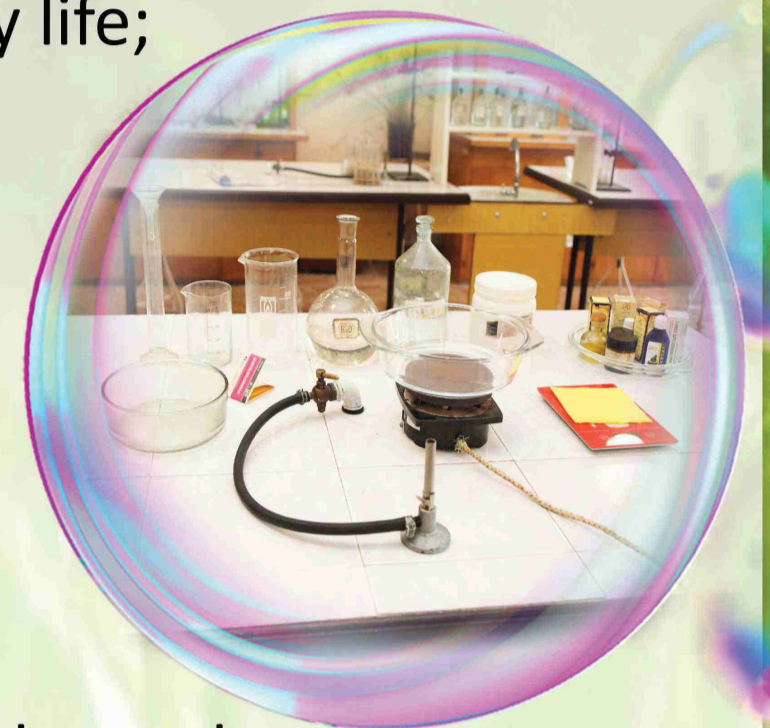
Life in the ECO style!

Aims of the project is:

- to learn the process of soap making using our own recipes in school;
- to use the components that do not pollute the environment;
- to provide a practical application of chemical knowledge in everyday life;
- to demonstrate the simplicity of the soap making process;
- to encourage further interest in science;
- to develop scientific literacy and awareness.

Consequences:

- to use handmade soap in the educational institution;
- to create complex varieties of soap bars and detergents;
- to protect health of students using phosphatefree soap bars and detergents.



Problem of our project is preventing pollution the environment using phosphate-free soap made manually.

János Kapusi | DSZC Bethlen Gábor Secondary School / Tóth Árpád IB Programme | Debrecen | Hungary

Feeling the forest

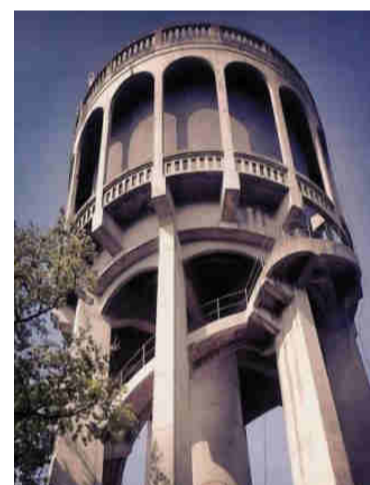
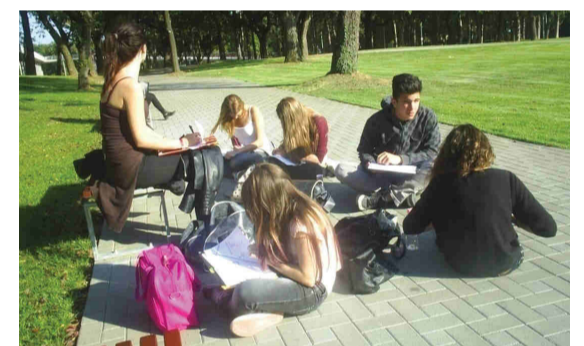
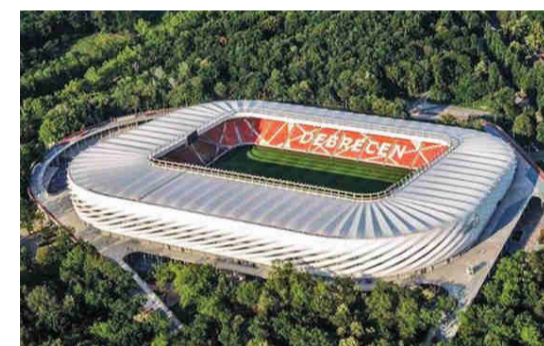
Interactive field trip in the Great Forest of Debrecen

The purpose of this project is **to improve students' geographic thinking and environmental awareness** by visiting the recently renewed Great Forest, a large and complex urban park area in the city of Debrecen.

The project relies on geographical inquiry. It makes use of the forest's outstanding location, its natural and cultural values, attractions, study paths and facilities.

It is actually **a walk through the forest** by stopping at 'stations' where students are given **interactive tasks** about the forest to reveal the pieces of its mosaic. By stepping out of the classroom comfort zone, the project encourages students to be **active observers** of their environment.

It can be integrated into curriculum, but also suitable for thematic outdoor lessons in a variety of school programmes.



Benefits:

- ➔ local & cost-effective
- ➔ complex & informative
- ➔ adaptable to specific goals
- ➔ entertaining & motivating
- ➔ bilingual version available



Subject links:

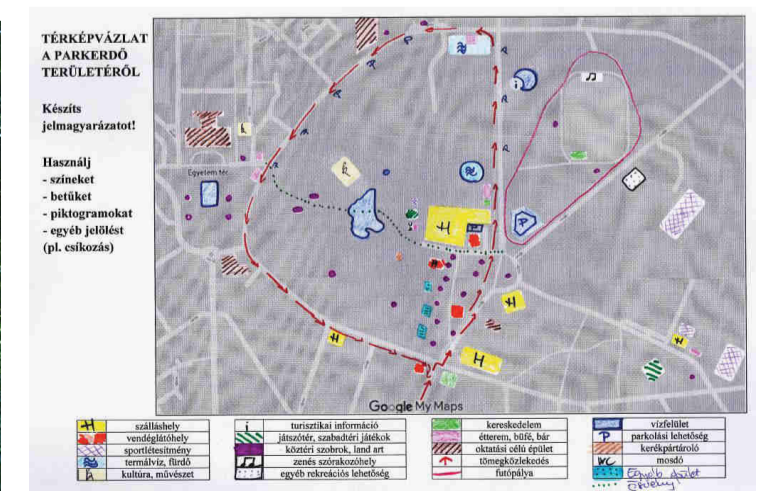
- ➔ Biology & Ecology
- ➔ Tourism & Sports
- ➔ Urban planning
- ➔ Local history
- ➔ Social studies

Tasks:

- ➔ mapping & observations
- ➔ photo challenge
- ➔ stadium quiz
- ➔ statue hunt
- ➔ forest poetry

Other details:

- ➔ takes around 7-8 hours
- ➔ for students aged 14-20
- ➔ no previous knowledge required



100%
Great
and
Local!

The Forest is there for you. Be a part of it.

Anna Madaio | Istituto Tecnico Tecnologico "B. Focaccia" | Salerno | Italy

From Nature... Bioproducts!

Biomass is a source of raw “materials from which to obtain **bioproducts** for a better environmental, economic and social sustainability. Cultivated plants, agro-food wastes or agricultural surplus products are able to give useful substances in energy, food, nutraceutical, pharmaceutical and dyeing field. So, various bioproducts were extracted or synthesized by students in our laboratories. A virtual immersive environment has been created to present these **Green Chemistry** topics in an interactive and engaging way.



Indigo dye from *Isatis tinctoria*



Yellow dye from *Reseda luteola*



Immersive Virtual World

Sustainable Chemistry, Laboratory Activities and Virtual Worlds to teach students as biobased products can be an ecofriendly alternative to **Hearth** safety!

Giorgia Messori, Daniela Dallari | I.T.I. Enrico Fermi | Modena | Italy

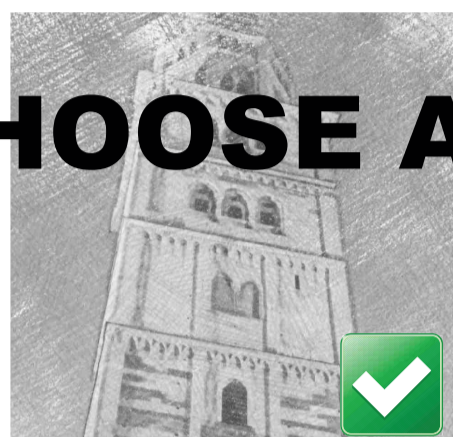
Chemistry and Cultural Heritage

a map of activities and experiments

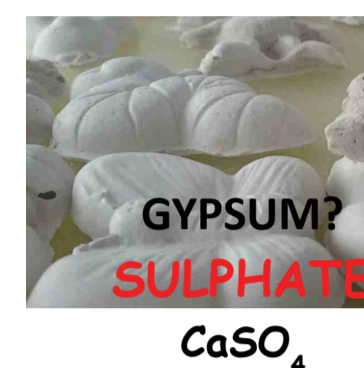
The aim of our project is to introduce students to the cultural heritage of their country, highlighting the role of chemistry in its characterization and conservation.

Our purpose is also to promote good practices such as active citizenship, to increase the sensitivity and responsibility towards the landscape and the historical and artistic heritage.

CHOOSE A MONUMENT



MARBLE? DOLOMITE?
TRAVERTINO?



INVESTIGATE

Types of
Materials



BIOLOGICAL

Degradation?

NO_x

SO_x

CHEMICAL

CO₂

PHYSICAL

Preservation?
Restoration?

IN THE LAB...

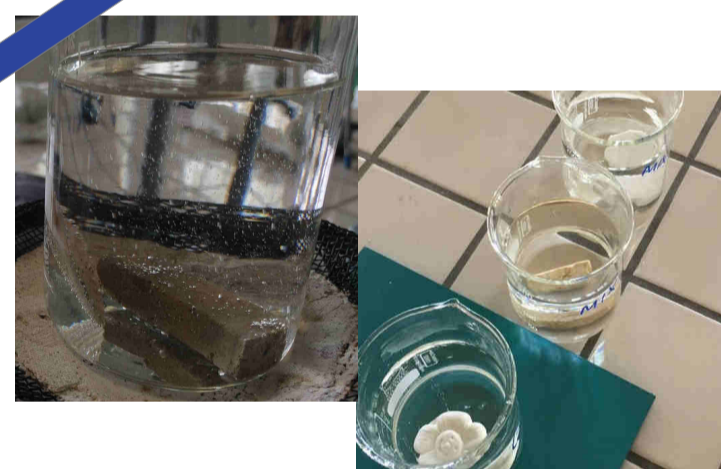
Cleaning tests

- Use compresses with (NH₄)₂CO₃ and EDTA in sepiolite clay or cellulose applied with Japanese tissue

Simulate
ACID RAIN

IN THE LAB...

- Calculate the average of rain/year
- Formulate the best mix of acids
- Test samples of different materials in acid rain
- Titrate the loss of ion Ca²⁺ with EDTA



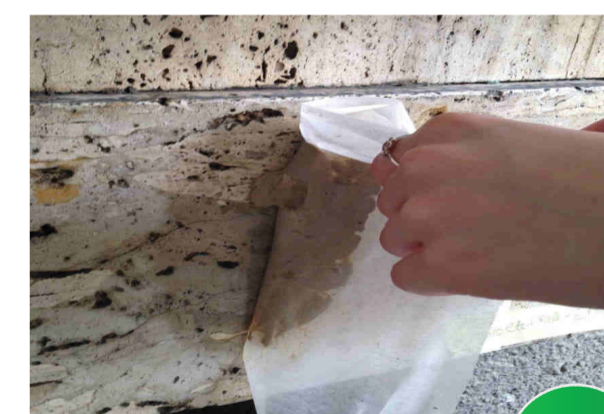
ACID RAIN H₂SO₄ / HNO₃ 3:1

IN THE LAB...
H₂O absorption
Freezing effects...

- Dry/wet weight
- Hot/cold cycle



Age
10-14



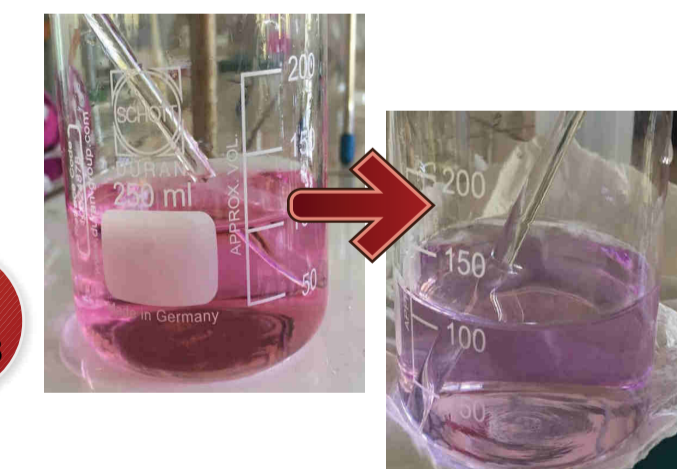
Age
10-14



Rainfall in Modena
600mm/year
1mm=1litre rain/m²

Age
16-18

Find the Seasonal
rainfall
over the sample



After the study of the material, the causes of deterioration and the methods of preservation, the status of the adopted monument is also an indicator of that of the surrounding environment.

**From sculptures to the capitals,
Doing chemistry up to the cathedrals.....**

100%
LAB
TESTED

Line Mikkelsen and Asger Senbergs | Sankt Pauls School | Høje Taastrup | Denmark

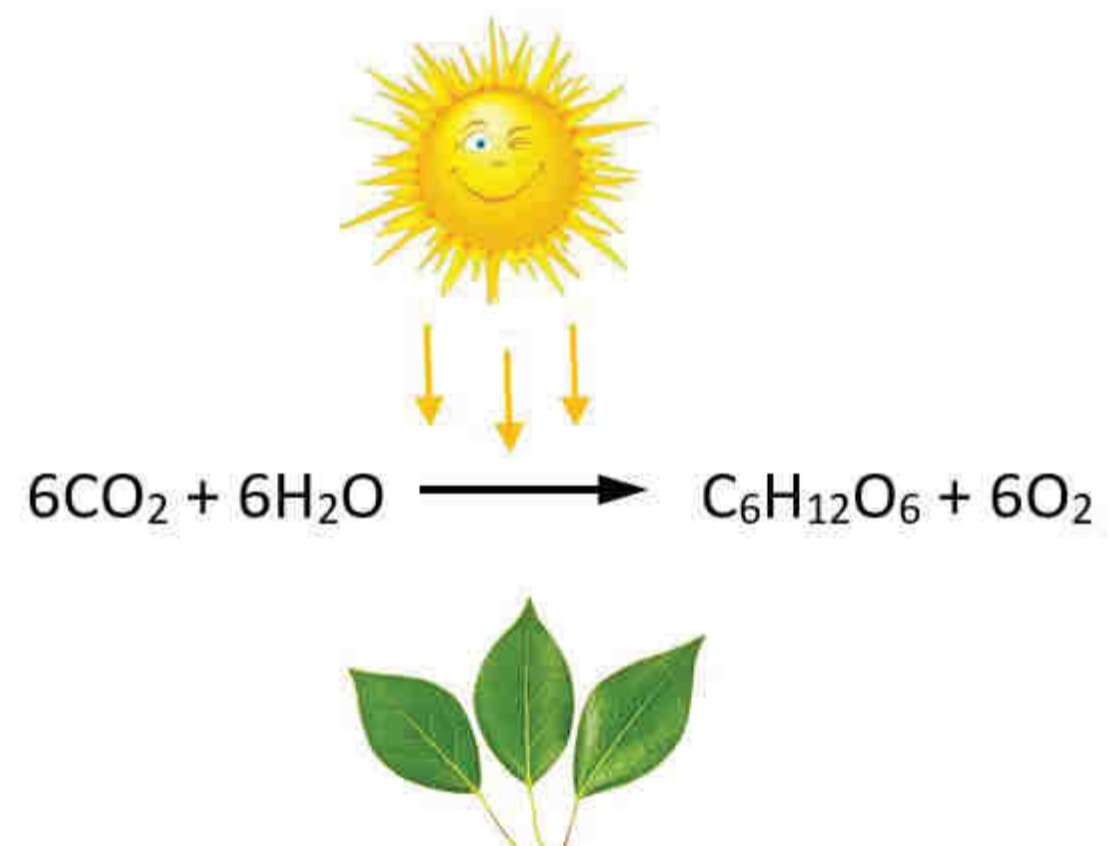
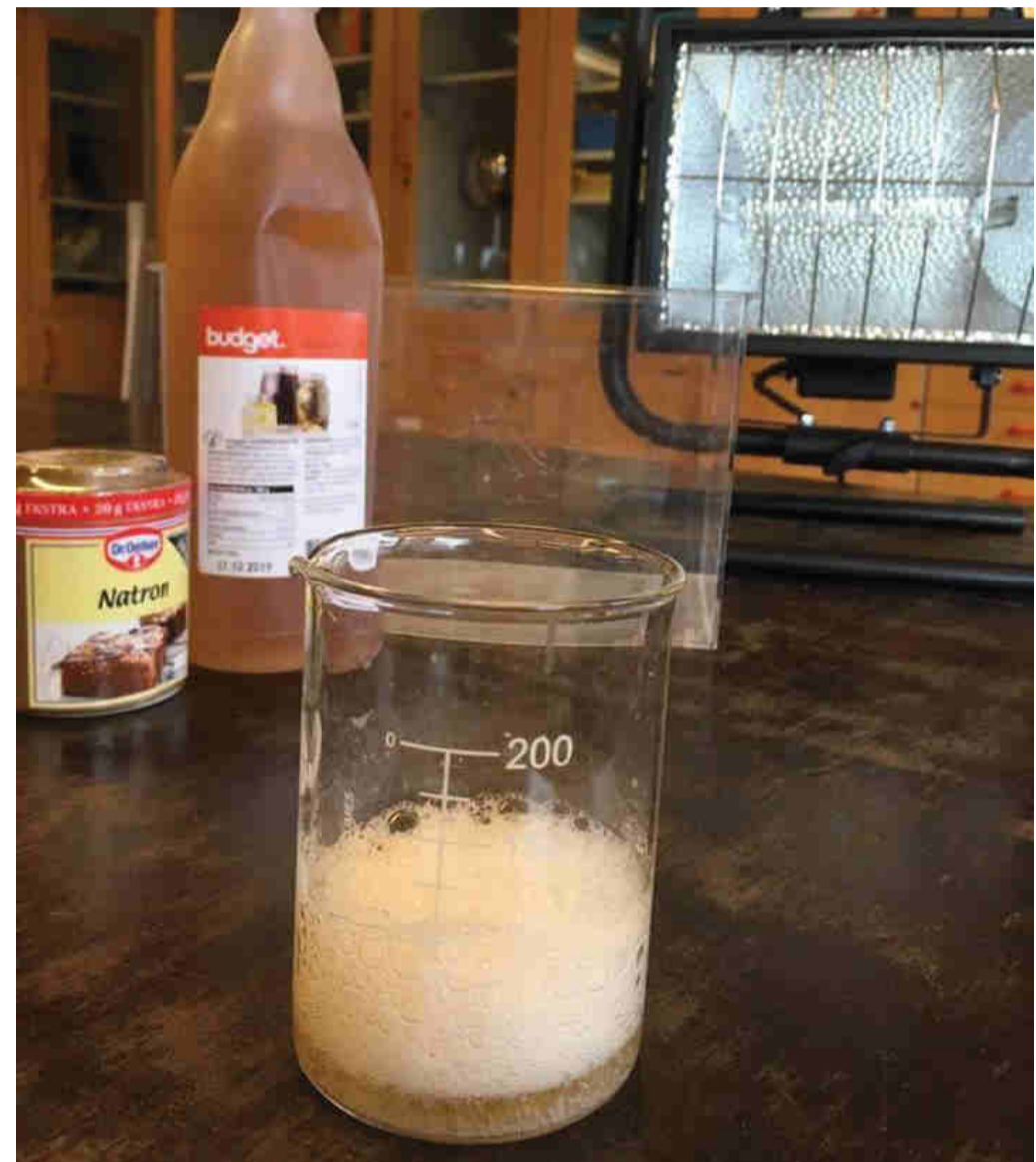
How about those plants?

About climate change and the effect of plants

Are plants connected to the level of CO₂? With the climate change? And how important are plants at home?

This project lets students investigate these types of questions and make conclusions about how the climate works. The students are able to get skills in scientific work and connect CO₂, warmth and plants through the photosynthesis, and hereby learn about a lot of different things like climate change, CO₂-budgets, different kinds of plants for example C4-plants, data collection and chemical reactions.

In this project it's possible to create a learning environment where a lots of subjects can cooperate. It's only the teacher who sets the limit!



How the world works is a big mystery to be solved by the students, to show them in practice through great experiments could engage them to solve even bigger mysteries and create learning with a deeper meaning.

Conclusion: This project enables teachers to explore this topic for students in more ways than one and make them investigate different types of plants and the connection to CO₂.

Konstancja Nowakowska , Gabriela Pluciak , Nicolaus Copernicus Junior High School,
Zloty Stok, Poland .

„CIRCUS SHOW”

This project „Circus show” is the performance that takes viewers to the famous circus Copernicus. It consists of acrobatic stunts, juggling and magician-comedian performances commented on by an announcer. In every part of the show students become circus artists who perform gymnastic pyramids, walk the balance beam, juggle plates and bands and tame the dragon. At the same time the second part of the students performs adequate to the show physical experiments. The main purpose is to present the impact of center of gravity, inertia, Magnus effect, centrifugal force or resilience on the circus show.



Conclusion:

Are tightrope walking, juggling, hat throwing, acrobatics shows supernatural or it is just pure Physics? „Circus show” is a „Physics show”

The pH of water: acids and colours

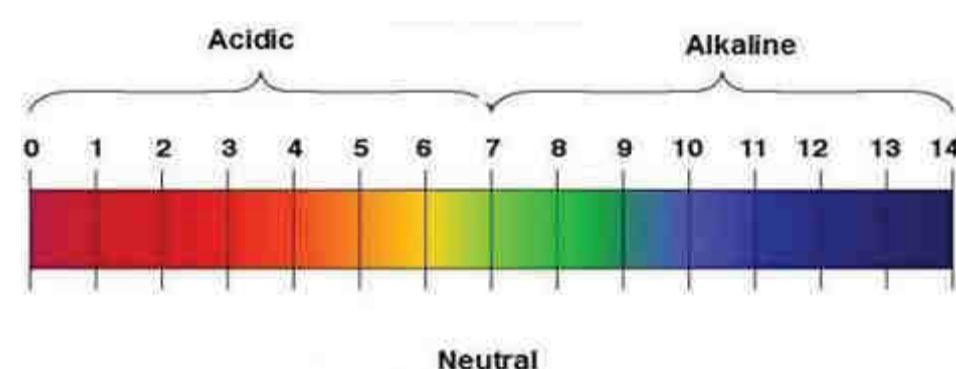
An educational project in chemistry

We all know, from the school, this definition:

$$\text{pH} = -\log[\text{H}^+]$$

There are two deeply rooted convictions about pH:

- 1) It only varies in function of the concentration of H^+ ions
- 2) In an aqueous solution it can range only between 0 and 14.

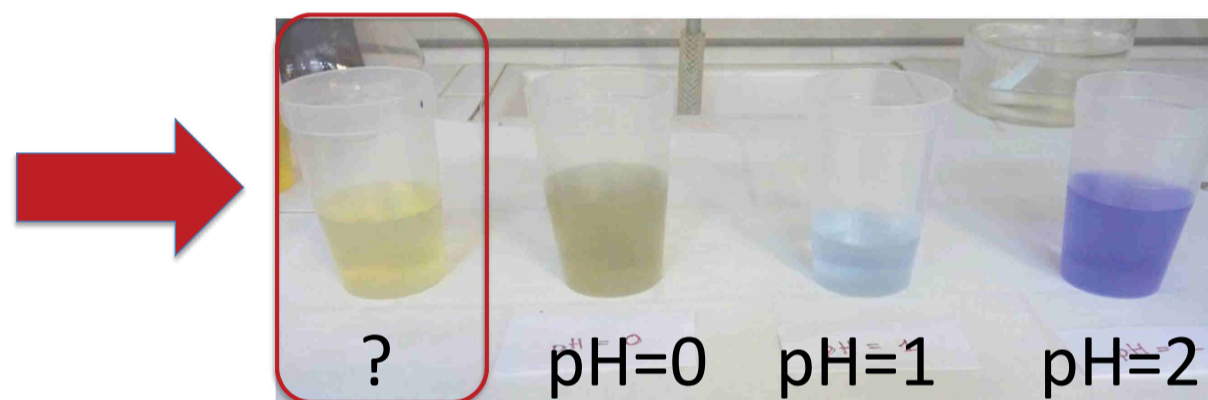


But are you **SURE** about this....?



A **SIMPLE** experiment will challenge your opinion!

This solution, obtained from a mixture of pH 1 solution with 12M LiCl solution in equal parts, is **NOT VIOLET** (as expected) but **BRIGHT YELLOW**, and even visibly yellower than the pH 0 solution!



So do aqueous solutions with $\text{pH} < 0$ actually exist?



The strange behaviour of the bright yellow solution can be explained using another definition of pH, that depends on **ACTIVITY** of H^+ ions:

$$\text{pH} = -\log A_{\text{H}^+} = -\log\{[\text{H}^+].\gamma_{\text{H}^+}\}$$

Are negative pH aqueous solutions present only in "lab" conditions?



THEY DO EXIST IN REAL LIFE ENVIRONMENTS!



NORDSTROM K et al. Negative pH, efflorescent mineralogy, and consequences for environmental restoration at the Iron Mountain Superfund site, California *Proc. Natl. Acad. Sci. USA* Vol. 96, pp. 3455–3462, March 1999

White Island, New Zealand



“There are more things in heaven and earth,
Horatio, than are dreamt of in your philosophy”

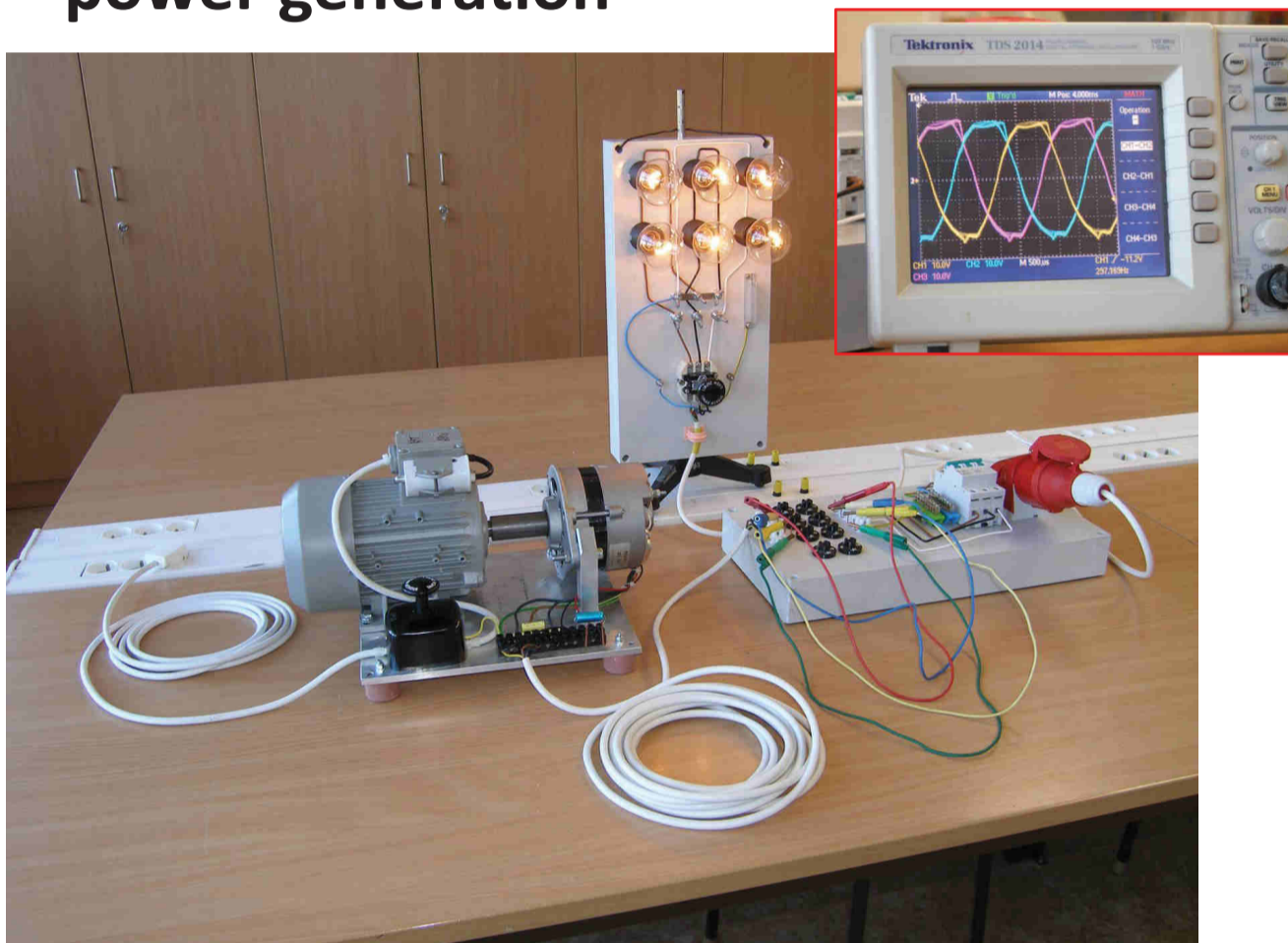
William Shakespeare - Hamlet

Peter Žilavý | Pierre de Coubertine grammar School | Tábor | Czech Republic

Induction in many forms

The word induction brings together a number of phenomena in physics, mathematics and also in chemistry and biology. Examples are electrostatic, electromagnetic or mathematical induction or inductive effect in the particles of organic compounds.

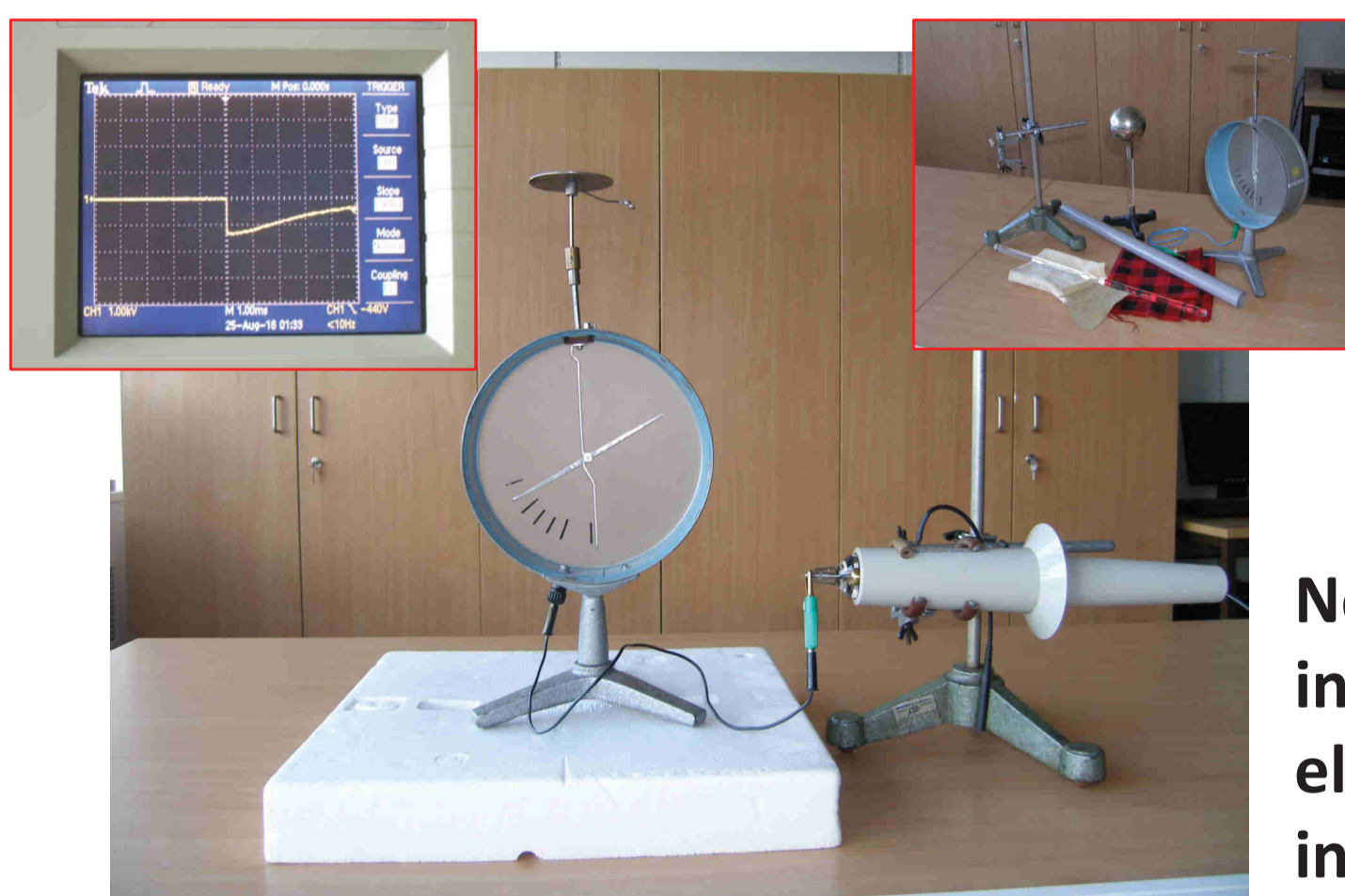
Use of electromagnetic induction - power generation



Experiments with an induction cooker



Induction heating



Non-traditional investigation of electrostatic induction



Physics
is Cool!

... but we can also meet induction in biology, chemistry, mathematics, philosophy, logic, statistics, computer sciences...
Let's think about connections!

1st Vocational Lyceum of Salamis GREECE

Teachers: P. Poutos , P. Andrianos , I. Armenakis , S. Argiriou , A. Tsapelis

Prototype Robotic Photovoltaic Detector with partial Simulation of earth's Motion

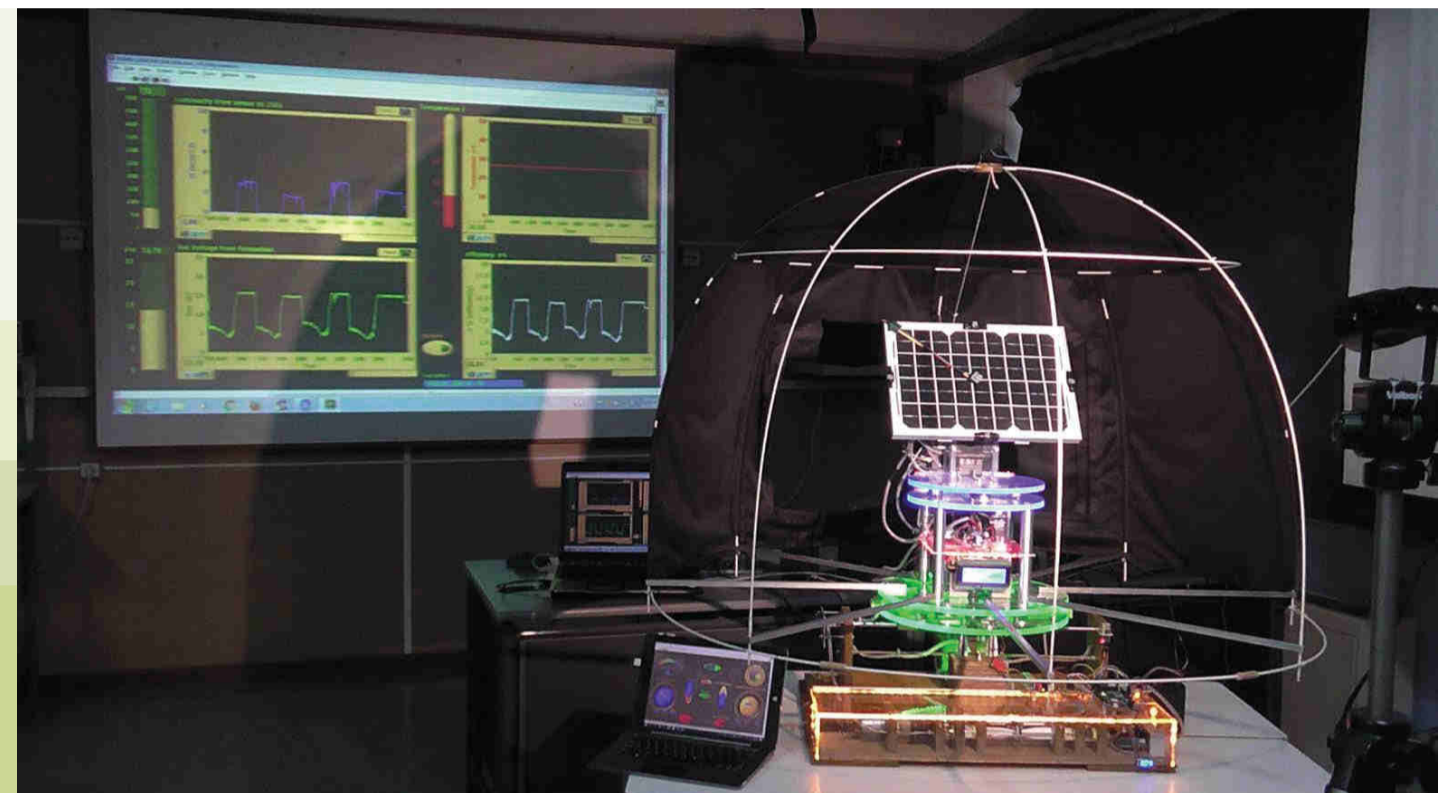
General

Study the environmental effects in solar panel efficiency & performance optimization

Serves many courses

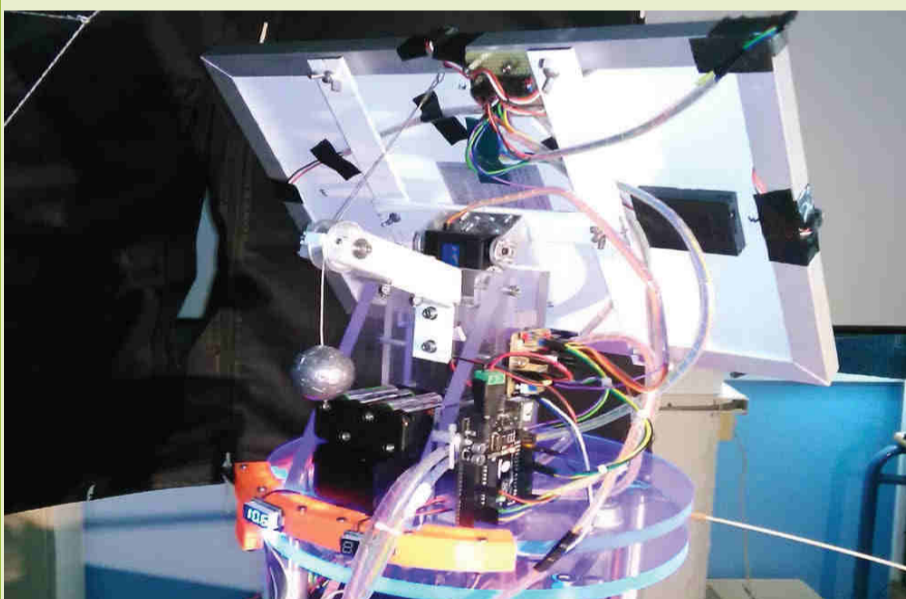
STEM educational process followed

Designed & manufactured by teachers and students

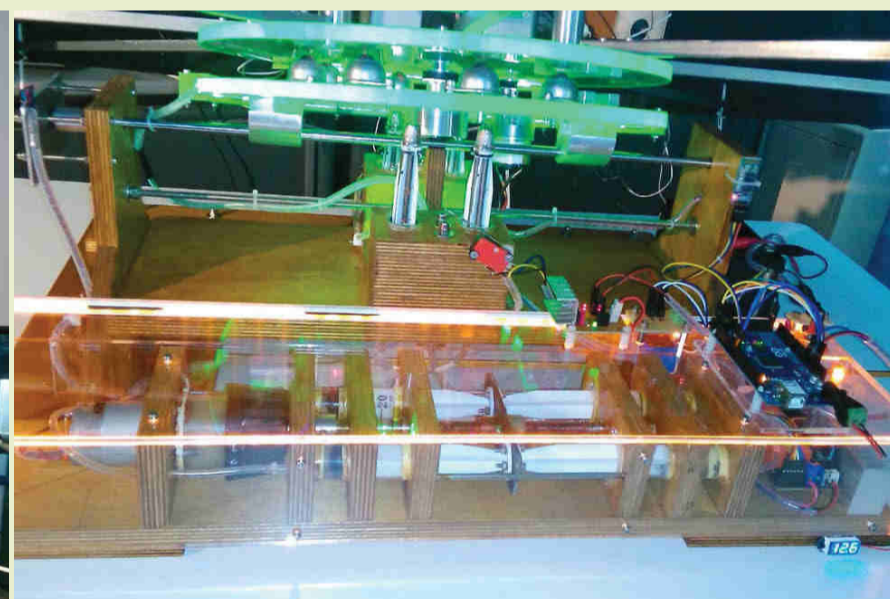


Consists of

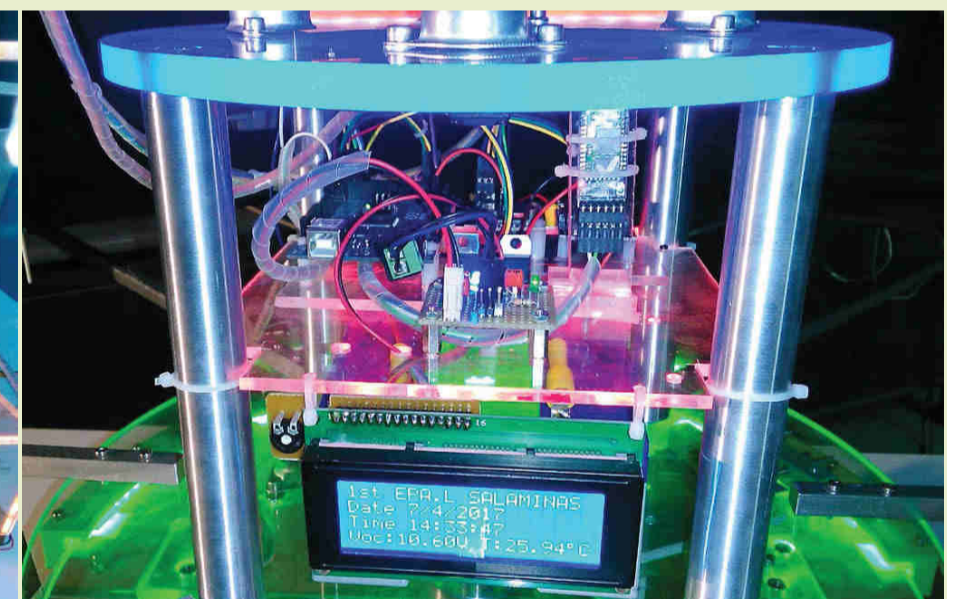
Solar Panel Robotic Mechanism



Earth Movement Simulation



Data Acquisition & Wireless Control



Ed. Possibilities

Compare the performance of different types of solar panels

Stores the measurements on SD card

Display Graphs in Real time

Demonstrates the effect of robotics autonomous systems on S.P efficiency

Explain the Photovoltaic phenomenon and how a solar panel works

Explain how the earth's motion affects the efficiency of a solar panel

Describes how Science can be applied in everyday life

Ed. Benefits

Interdisciplinary approach

Classroom becomes a collaborative community.

Educates the students for solving real-life problems

Familiarizes the students with new technologies

Applies *computational thinking* methodology through robotics autonomous systems

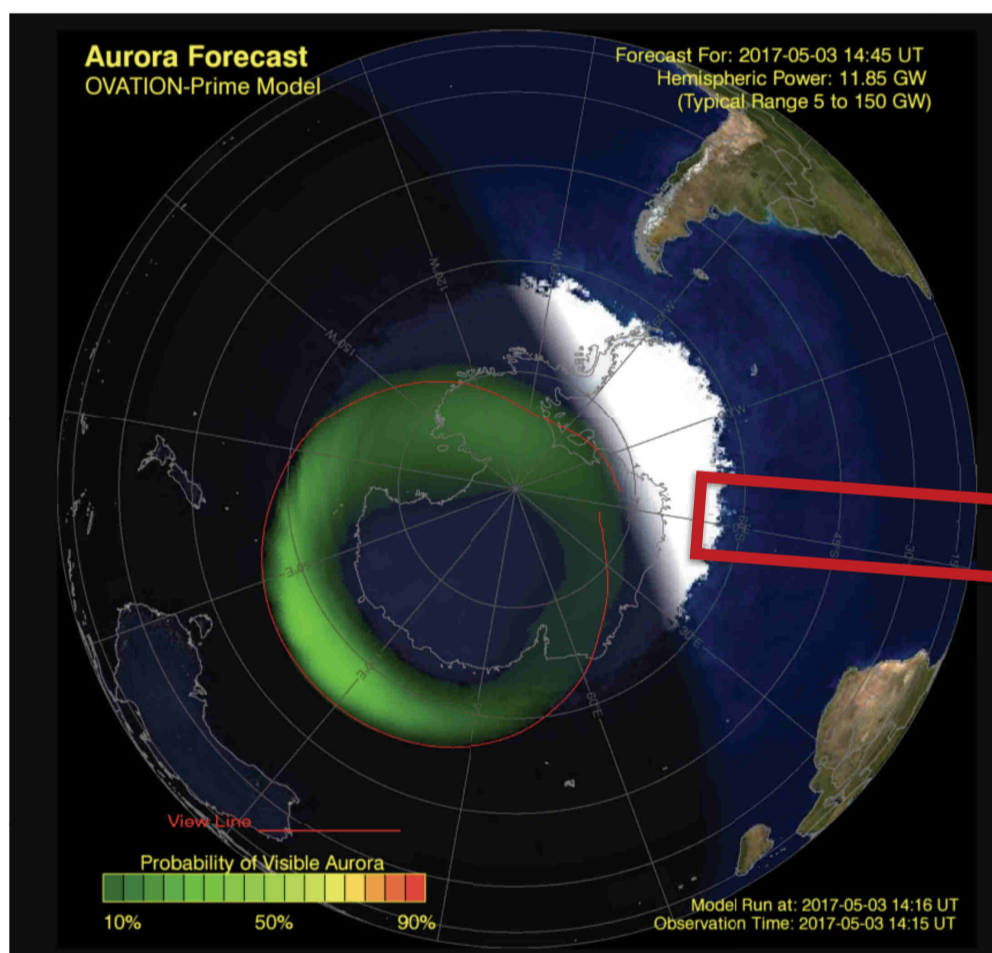
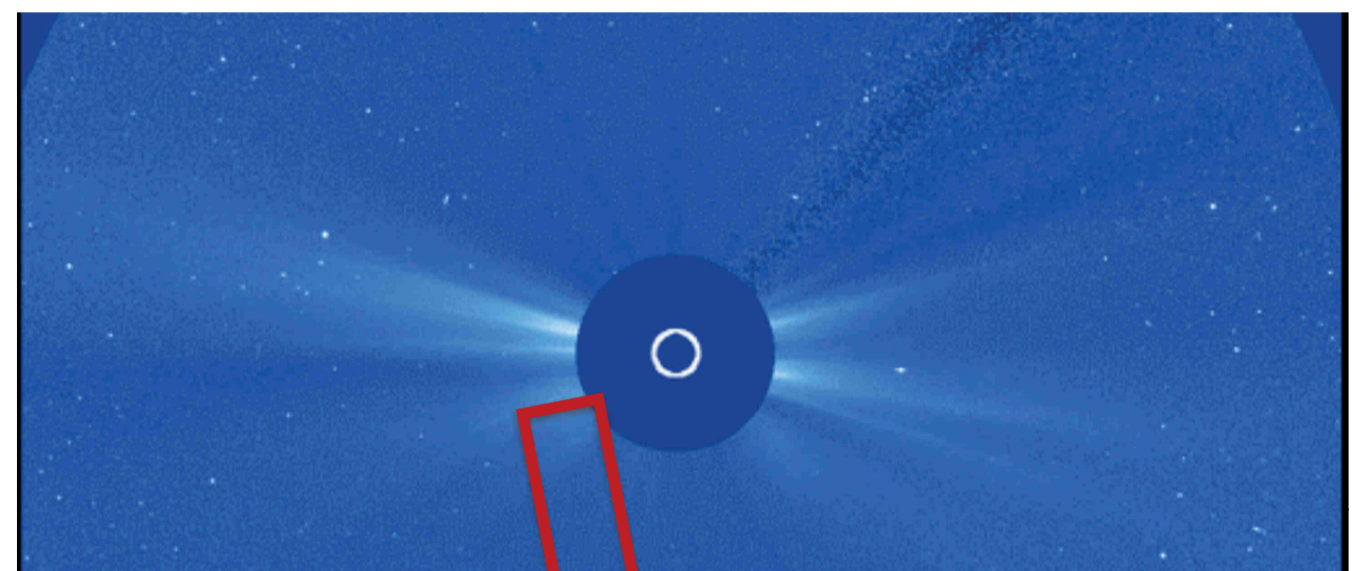
Philippe JEANJACQUOT | Ecole Normale Supérieure - Lycée Charlie Chaplin | LYON | France

AURORA BOREALIS AT SCHOOL

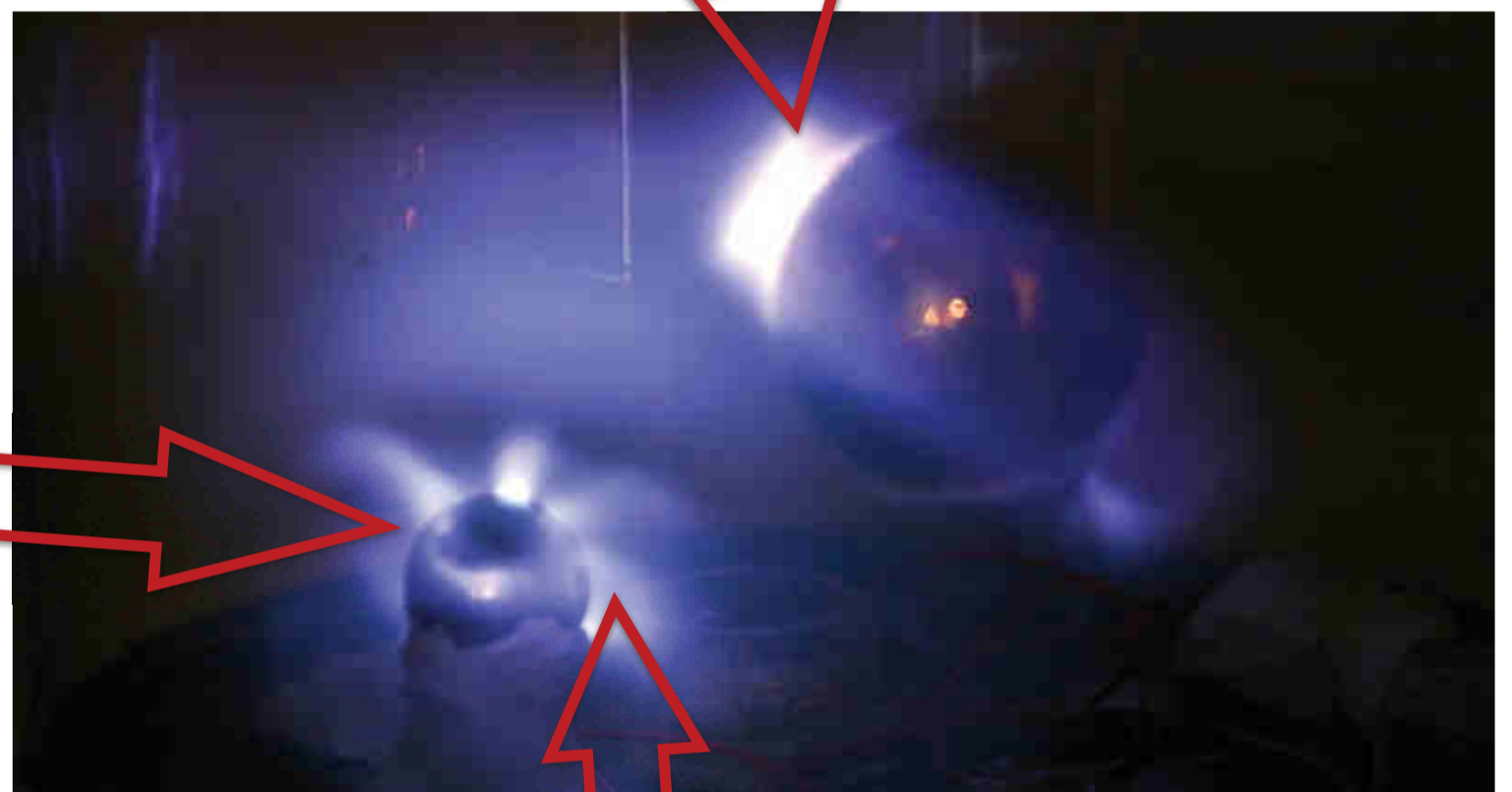
How to build with the device with equipment of your school.

We build a small device with the equipment of our school to see the aurora borealis phenomenon. It is inspired by the Birkeland experiment but for a school scale. In a small vacuum chamber, we set up 2 magnetic spheres. When the pressure is around 10 Pa we provide a strong electric field between the two spheres.

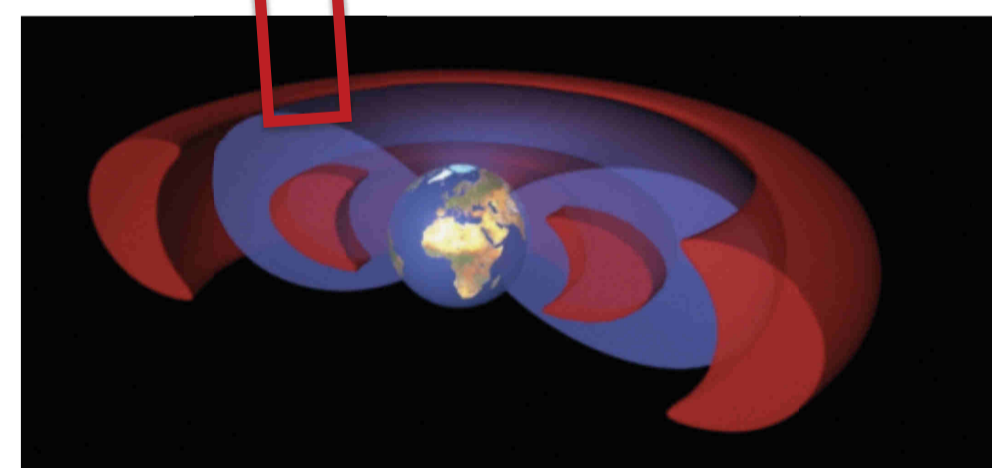
Stellar Jets (from SOHO the 17/05/03)



Aurora Ring (NOAA)



Our experiment (P Jeanjacquot)



Van Allen Belt (ESA)

The beam of the discharge follows the same shape than in space. We can get the simulation of: the aurora ring, the stellar jets, the Van Allen belt, the aurora on other planets (Uranus...)

This experiment can be a good way to introduce the stellar wind, the magnetic field, the electric field, the light due to a discharge, the plasma, astrophysics



The “aurora borealis at school” device is another way to introduce and explain natural phenomenon, and discover the beauties of astrophysics.