

Science Fair Experiments and Activities from the Laboratorial Centre of Natural Sciences (EKFE) of Rethymno

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1. Introduction

The teaching of Natural Sciences with alternative methods and the projection of their beauty and usefulness are issues which have been repeatedly dealt with by the group of the EKFE of Rethymno. With our participation in the European interdisciplinary network "Hands-on Science" (HSci), a series of activities has been started from the year 2004 onwards, incorporated in the spirit and aims this Program. Last year in the 1st Conference in Ljubljana we had promised that: "The main aim of our effort to be completed roughly within a year would be **"a work-package"** that would include:

- 1) **A Laboratorial manual (Book and CD)** with experiments with simple materials
- 2) **A DVD** with tens of videotaped experiments and constructions with simple materials.
- 3) **A book and a CD** with tens interesting questions and answers related with application of Natural Sciences in daily life.
- 4) A proposal to equip a **"Suitcase of Experiments with simple materials"**.

Our eventual objective about this material is to be replicated and distributed to the teachers, as soon as it is completed, in order to provide assistance in difficult task of teaching science."

This year at the 2nd HSci Conference 2005 in Rethymno we are in the pleasant situation to announce that we have already provided the teachers we trained this year with 2 DVDs and 2 CDs relative to the above mentioned material. The contribution of EKFE to the Science Fair organised within the 2nd HSci Conference 2005 focuses on the presentation of this material, more concretely:

- a) A series of experiments on heat, fluids and biology with simple materials (a complete CD is available)
- b) A parallel projection of videotaped experiments from members of the EKFE team of Rethimno (there are 2 DVDs available)
- c) A completed demonstration of the "Suitcase of experiments".

Indicatively we report the titles of the experiments to be presented in the Science Fair, whereas one experiment is recorded extensively, in order to show the written structure of the presented material in a comprehensible way. The contents of the experiments presented in the CDs are compatible with the videotaped experiments the on DVDs.

2. Experiments to be presented in the Science Fair

• FLUIDS

1. The glass is upside down, but the water is not poured (Atmospheric pressure)
2. The bottle is upside down, but water is not poured. (Atmospheric pressure)
3. How we can we pick up a coin sunk in a plate with water, without getting our hands wet? (Atmospheric pressure)
4. How we will break a wooden piece of board covered with a newspaper? (Atmospheric pressure)
5. How we will carry water in a bottle with holes? (Atmospheric pressure)
6. The straw that does not suck liquids (Atmospheric pressure)
7. The bottle that sucks eggs and balloons (Atmospheric pressure)

8. When the air crashes the metals (Atmospheric pressure)
9. Powerful welding ... without glue (Atmospheric pressure).
10. Transport of a liquid from one glass to other with a straw (Atmospheric pressure)
11. The air has weight
12. Dry paper under the water. (The gases have volume)
13. A small ball that overcomes gravity (Bernoulli Law)
14. When tap water acquires attributes of attraction (Bernoulli Law)
15. When the air acquires attributes of attraction (Bernoulli Law)
16. High depth, big pressure. (Hydrostatic pressure)
17. How do the aqueducts (water towers) work? (Hydrostatic pressure, communicating vessels)
18. Communicating vessels. Transfusion of liquids. (containers that communicate)
19. How can we transport air from one glass in another? (Attributes of gases)
20. How can we raise a sunken object with the aid of air? (Attributes of gases)
21. Lifting a glass using air only. (Attributes of gases)
22. Cartesian diver. (Pascal principle)
23. The liquids press every surface within them
24. Construction of a densitometer with simple materials (buoyancy)
25. The "egg – submarine" (buoyancy)
26. Molecular forces, surface tension
27. A simple observation of molecular forces
28. How will the coin fall in the bottle?
29. Automatic ink sprayer (Bernoulli Law)

• **HEAT**

1. The water boils in a paper box
2. Thermal expansion – contraction of solids
3. Thermal expansion of liquids
4. Thermal expansion of gases
 - 1st way: Air bubbles through water
 - 2nd way: The liquids go up in the pipe
 - 3rd way: The balloon inflates on its own
5. Thermal conductivity of solids

6. The metals are the best thermal conductors
 - 1st way: The cigarette cannot burn the handkerchief
 - 2nd way: Cutting the flame in the middle
7. The distribution of heat in the liquids is done with currents. - The hot coloured water climbs up
8. The distribution of heat in gases is done with currents - The turning paper snake
9. The distribution of heat in gases is done with currents - Which ice cube will melt faster?
10. Colours and the absorption of light
11. Emission of radiant heat
12. The greenhouse effect
13. The water boils with water
14. Evaporation
15. Condensation of Water – A rain maker

3. The structure of a recorded experiment

UNIT: Fluids

Experiment 1:

The glass is upside down, but the water is not poured

Aim:

To show the existence of atmospheric pressure



Process:

- In a basin filled with water (lightly coloured for better observation), we sink a glass, so as to fill it up with water completely.
- Having the opening of the glass turned downwards, lift it up slowly in a way that

most of the glass rises above the surface of the water of the basin.

- We observe that the water is held inside the glass and it is not poured out of it, contrary to the logic of the laws of gravity.

Explanation-theoretical elements:

The atmospheric pressure exerted on the surface of the water of the basin, is bigger than the hydrostatic pressure exerted by the water of the glass (in same horizontal level), and this does not allow the water to be poured.

Conclusion:

- ✓ The atmosphere exerts pressure on every surface with which it comes into contact.

Incorporation in science instruction: C, D, (atmosphere pressure).

This work is being developed further and we have already recorded experiments in chemistry, biology, mechanics and electricity. We aim, if possible, to have it completed within the following year.