

# The Monthly STEM

Student's favourite newspaper

November 2017

Monthly edition related to the eTwinning project "THE MONTHLY STEM"

<https://twinspace.etwinning.net>

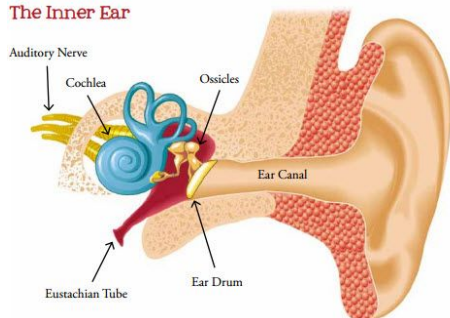
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## Why our ears hurt

(Junior High School of Thermi - Greece  
Nefeli Evangelou)

### The Inner Ear



The ears cough very simply because of the external pressure difference with the internal pressure. When we say inner, we mean the drum of our ear and inside, while when we say outer, we mean the drum and out - in the outside world. The drum is like a fence between the inside and the outside. Now, if the external pressure suddenly increases or decreases, then this fence will "stretch" to the side with pressure. This can happen if we suddenly find ourselves in an atmosphere with greater or lesser atmospheric pressure, for example when a plane takes off (usually we are very fast at different external pressures). So the ears are coughing! However, in order for the body to return the fence to its normal state, it should increase (if the external pressure is increased) or reduce (if the external pressure is reduced) the internal pressure. This is accomplished with some trumpets attached to the throat. These trumpets are normally "closed", but when such a subject is created, they open (and this also helps open and close the jaw) and thus balance the internal pressure with the external pressure. If they are "missing" pressure internally, they then inject an appropriate amount of pressure outwardly and thus balance it, or, respectively, when internally pressurized, emit it outward. When the pressure is normalized, a sound is heard in the ear, accompanied by a relieving breakout! This sound sounds because our drum has come back abruptly. ("A proper pressure has been created to swing and push) in its normal position.

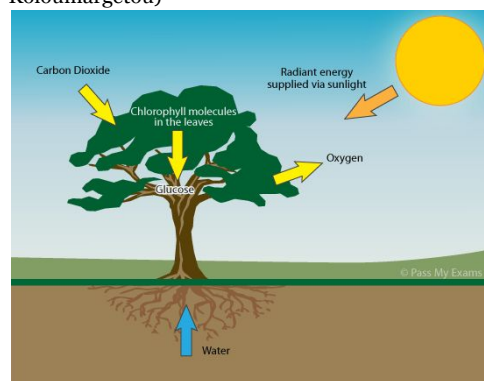
## Mixture Properties

(Junior High School of Xanthi - Greece  
Tarchanidou Michaela, Tektonopoulos Thanassis,  
Chilmi Oglou Gioulens)

Initially, we prepare a water-alcohol mixture by combining 25 mL of alcohol with 25 mL of water. Then, we dip the paper into the mixture of water and

## Photosynthesis - an awesome process

(Junior High School of Thermi - Greece Niki Koloumargetou)



Photosynthesis  
The plants through their leaves store energy, oxygen and heat. This phenomenon is called photosynthesis. During photosynthesis, the leaves of the plant store energy and heat from the sun. The oxygen is stored as humans exhale. When we exhale, we release carbon dioxide. When we release the dioxide into the environment, the plants store it and then exchange it with oxygen. People take oxygen by inhalation.

## Electric Field /Sparks

(Junior High School of Xanthi - Greece  
Bakirtzi Georgia, Papoutsis Vassilia, Rizou Anastasia)

As the disks of *Wimshurst* turn, the charged strip induces an opposite charge on the corresponding strip on the other disk. The metal brushes carry the charges to the opposite strips, and a pair of pointed metal combs collect the charges off each disk. The charge gradually gets larger as the disks keep rotating. Eventually a spark jumps

## Clinostat

(Junior High School of Thermi - Greece)

How do plants react in a simulated microgravity environment? Can plants survive in Space zero gravity? How do stems and roots change their growth direction in microgravity?

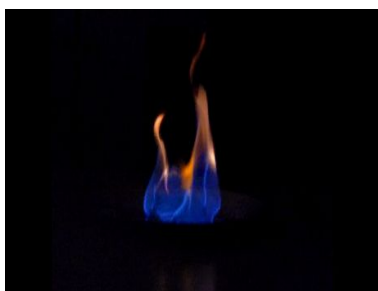


We performed experiments in simulated microgravity in the classroom. The clinostat is an instrument that simulates microgravity in the lab and produces centrifugal acceleration: Gravitational biology can predict the influence of gravity on the spatial growth direction of plants. The clinorotated roots and stems do not clearly show bending in any direction and grow faster. The stationary cultivation clearly shows a root growth down to the centre of the earth (gravitropism) and a stem growth directed to the sun phototropism.

<https://www.youtube.com/watch?v=wJ5oYNzTck4>

rubbing alcohol, using a poker and make sure the paper gets completely soaked. After that, we remove the paper and gently shake off any excess liquid.

Then, the paper is lit with a lighter.



The paper looks like it's burning, but it isn't.



Finally, the burning is stopped using water. We then discover that the paper has remained in its original condition.



The secret, of course, is the addition of water to the mixture. The two ingredients of the mixture sustain their properties.

## Changes of state - Boiling of water

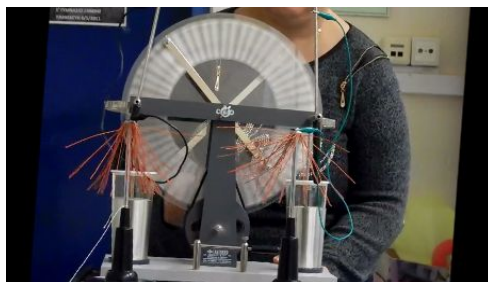
(1 ACT ITCS " G. Zappa " - Saronno )

This lab activity aims to demonstrate how at 100°C ( 212° F ) boiling water reaches an **isothermal period:** although water is continuously heated, its temperature doesn't rise because of the latent heat of boiling, the function of which is to break the weak bonds of water. The result is a change of state from liquid to vapour.

across the gap between two brass spheres connected to the collecting combs.



We also use the machine to visualize the electric field between two charges of the same polarity and two charges of opposite polarity.



## The Excretory System

(Sergio Trujillo and Pablo Luca - CEIP Jose María de la Fuente - Spain)

The excretory system takes place in the Urinary system, respiratory system and the sweat glands.

The urinary system has 4 organs:

The kidneys, the ureters, the bladder, and the urethra.

The kidneys filter the blood, retain waste products and use them to produce urine. Then the urine go to the bladder through the ureters.

Urine is stored in the bladder until it leaves the body through the urethra.

Sweat glands:

are long coiled tubes that are located inside the skin. Each sweat gland connects to a pore on the surface of the skin.

Respiratory system:

It obtains the oxygen we need to live when we breathe in. When we breathe out , it eliminates CO<sub>2</sub> (carbon dioxide), a waste substance produced in our body.

## How our lungs work? (Mehmet Suphi Egemen Ortaokulu MANİSA TURKEY)



The lungs are an essential organ to all mammals. It is the organ that allows for gaseous exchange to ensure we get the enough oxygen into our bodies and also exhale the waste products. Today we're going to find our how lungs work by making a fake lung.

A plastic bottle A straw An elastic band Scissors 2 balloons Play dough

Remove the bottom of your bottle. Tie a knot in one end of a balloon and snip of the fat end. Stretch this end around the bottom of your plastic bottle. Put a straw in the neck of the other balloon and secure tightly with the elastic band but not so that you crush the straw. The air must flow through, so test it with a little bow through the straw to see if the balloon inflates. Put the straw and the balloon into the neck of the bottle and secure with the play dough to make a seal around the bottle – make sure that again, you don't crush the straw.

Hold the bottle and pull the knot of the balloon at the bottom. What happens?

You should find that the balloon inside the bottle inflates, and that as you let go it deflates.

Why does this happen?

As the knotted balloon is pulled it creates more space inside the bottle. Air then comes down the straw and fills the balloon with some air to fill the space! When you let go of the

For these activities we used the following tools:

- becher with 50 ml water
- Bunsen burner
- thermometre
- stopwatch
- cylinder



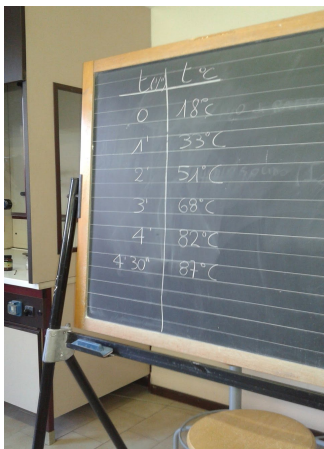
We poured the water from the cylinder into the becher.

Then we turned the Bunsen burner on. At the same time we measured the water temperature at the start.

In our experiment the starting temperature was 18°C ( 64.4 ° F ).

In fact the water temperature depends on factors such as room temperature or pressure.

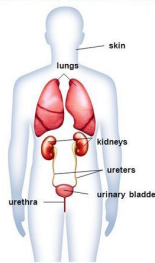
Using a stopwatch, we measured the water temperature every minute and after 4' every 30".



## Excretory System

● **Function:**  
The excretory system eliminates nonsolid wastes from the body.

- Nonsolid wastes are eliminated through lungs, skin, and kidneys.
- Lungs exhale carbon dioxide and water vapor.
- Sweat glands in skin release excess water and salts.



## Systemic Circulation

(Rodrigo García - CEIP Jose María de la Fuente - Spain)

Systemic circulation allows for the exchange of nutrients, gases and waste products in the body cells. It takes place in the systemic circuit. This circuit carries blood with nutrients and oxygen to all body cells. It also returns blood with carbon dioxide and other waste products back to the heart.

In physiology, the circuit of vessels supplying oxygenated blood to and returning deoxygenated blood from the tissues of the body, as distinguished from the pulmonary circulation. Blood is pumped for the left ventricle of the heart through the aorta and arterial branches to the arterioles and through capillaries, where it reaches an equilibrium with the tissue fluid, and then drains through the venules into the veins and returns, via the venae cavae, to the right atrium of the heart.

## Reaction time and breaking

(Maria João Real 9ªA - Escola Pedro Eanes Lobato - Portugal)

The reaction time is the time that a driver takes to react to one obstacle or the danger; on average is about 1 second.



It is influenced by alcohol, drugs, medications, fatigue, physical and psychological state of the driver. The reaction time never decreases, it can only increase.

The reaction distance is the distance traveled by the vehicle after the driver

knot the space no longer exists, so the air from the balloon is expelled making it deflate

## What Is A Heart Transplant? And The Phases Of The Operation

(Pilar Flores and Patricia González - CEIP Jose María de la Fuente - Spain)

The heart transplant, which consists of the total replacement of the diseased organ with a healthy one from a child or an adult in an irreversible brain death situation, is an extreme solution that is resorted to when the rest of treatments is not enough to solve a bad cardiac formation.

Although it is a good remedy, because the transplant can lead an almost normal life, you can not resort to this solution in a generalized way for obvious reasons:

- the limited number of organs available
- the extreme complication of the operation
- the phenomenon of rejection, which limits the duration of the implanted heart

### **PHASES OF THE OPERATION**

#### **1. EXTRACTION OF THE HEART OF THE DONOR**

The donor is an adult or a child who can not survive an injury or illness that has caused irreversible damage to the brain called 'brain death'. The vast majority of these cases are victims of traffic accidents. With the exception of the brain, the rest of the organs of the donor continue to function correctly with the help of medication and other life support, such as respirators and other devices.

Once the brain death is certified and with the consent of the family members or the patient's own, through the Vital Will Declaration, the medical team of the donor's hospital is responsible for extracting the heart and other organs. These will be kept on ice and sent urgently to the points where the different receivers are located, according to the information provided by the ONT. In the case of the heart, the ideal is that no more than six hours pass from the extraction to the implant. That is why the organs are usually transported by plane or helicopter.

#### **2. REMOVAL OF THE HEART OF THE RECEIVER AND IMPLANTATION OF THE HEART OF THE DONOR**

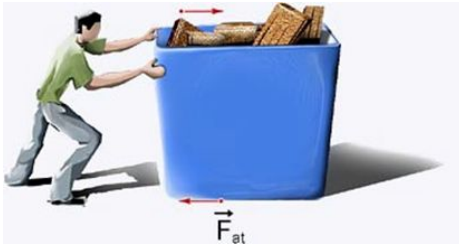
At the temperature of 100°C we could see that the water started boiling but the temperature didn't change even if we kept on heating it.

Notice that the more water we have to heat, the longer it takes to reach the boiling point.

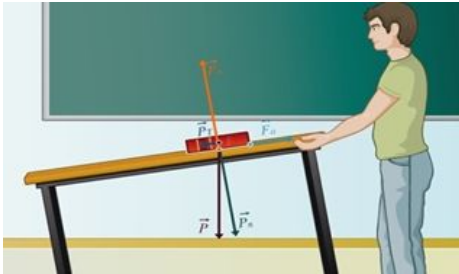
## Friction forces

(Diana Ovelheiro 9ºD - Escola Pedro Eanes Lobato - Portugal)

Friction is a force caused by the roughness of contacting surfaces. While the surfaces are joined together they tend to interpenetrate, offering resistance to relative movement.



**Static friction** - Acts when there is no sliding of bodies. The maximum static friction force is equal to the minimum force required to initiate the movement of a body. When a body is not in motion the frictional force must be greater than the applied force.



**Kinetic friction** - arises as the force that opposes movement when the body moves. The kinetic friction force is less than the maximum static friction force. Unhelpful and helpful friction forces: Unhelpful:

- on motor parts;
- in the joints of the bones;
- when you want more speed.

Helpful:

- in a car movement;
- to start walking or running;
- to hold an object.

perceives danger or an obstacle until reacts, this is influenced by:  
**speed** - the higher the speed the greater the distance traveled;  
**reaction time** - the larger the reaction time the greater the distance traveled;



The braking distance is the distance traveled by the vehicle from the moment the driver puts his foot on the brake until the car stops completely, it is influenced by:

**speed** - the higher the speed the greater the distance traveled;  
**road condition** - If the road has oil or any other factor that decreases grip, the greater is the distance traveled;  
**slope of the road** - the steeper the descent the greater the distance traveled;  
**car condition** - if the brakes are in bad condition the longer the distance traveled.

## Newton's law of inertia

(Guyllherme Feliciano 9ºE - Escola Pedro Eanes Lobato - Portugal)

Sir Isaac Newton's first law of motion states that an object in uniform motion tends to remain in motion unless a force is applied to it. We can see clear examples of this law in our daily lives like when we are in a car and it makes a curve and then we feel "pull" a little to the side or when break suddenly on a bike and fly forward.



Similarly, an object that is stopped tends to remain stationary unless a force is applied to it.

This second operation, which is performed by administering general anesthesia and anticoagulants to the patient, is carried out by the Hospital's medical team.

Its complication depends, in part, on whether the patient has had previous heart surgery (something quite common in people with congenital heart disease). Cutting scar tissue can complicate and lengthen this second phase of the transplant.

## Free fall acceleration

(Raquel Anjos 9ºB - Escola Pedro Eanes Lobato - Portugal)

Free fall is the vertical movement, close to the surface of the Earth, when a body is abandoned in a vacuum or in a region where the air resistance is negligible.



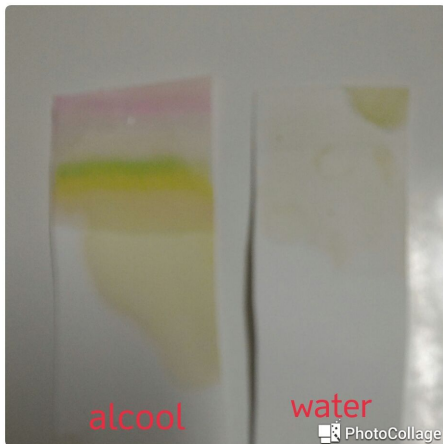
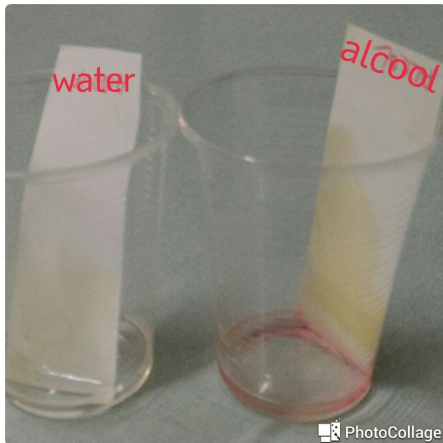
Free fall is a uniformly varied movement, with a nearly constant acceleration of 9.8 m/s<sup>2</sup> (at sea level), called gravitational acceleration.

In our Physics classes we measured the gravitational acceleration experimentally, by dropping a small sphere through two photogates connected to digimeters, as in the photo below.



## [Not just green in spinach!](#)

(Junior High School of Monte Sant'Angelo-Italy  
7th grade class A)



## [Lets Make a 3D Plant Cell](#)

### [Model with Jello](#)

(Junior High School of Xanthi - Greece, M. Ketipi, A. Kafetzopoulou, A. Komninakidis, K. Koutra, K. Koutsis)



(click on the picture to see the videoclip)  
By this we can conclude that Newton's first law, the law of inertia, states that an object does not change its velocity unless some force is applied to it. We demonstrated this law using our Philip Harris air track.



(click on the picture to see the experiment)

## [STRAWS IN PLANTS](#)

(Junior High School of Monte Sant'Angelo-Italy  
7th grade class C)

Hello guys!  
Do you want to make an experiment with us? Good!  
But first let's see what it is:  
We will talk about plants and small "straws" that are inside them. These "straws" are the vessel element (xylem) and sieve tube elements (phloem) and are used to feed the plant nutrition from leaves to roots and roots to leaves.



What we need:

- ❖ two branches of celery
- ❖ red food dye

(click on the picture to see the experiment)  
The 2,0 cm diameter sphere interrupted the first sensor for 15 ms (1,3 m/s), and the second sensor for 6 ms (3,3 m/s). The experiment was repeated to measure the time between sensors and we got 199 ms. In 199 ms, the speed increased 2,0 m/s, so we got an acceleration of approximately 10 m/s<sup>2</sup>, very close to the expected!

## [My favourite volcano](#)

(I.V.Liteanu, High School, Romania- Bia 10c)

If you didn't see by now a volcanic eruption, I'm going to show you a great experiment that it looks like this natural



phenomenon. To do this, you need baking powder, red dye, vinegar, a piece of cardboard, water, dish soap and plasticise. You have to make a cone from the piece of cardboard, put a recipient into it and the plasticise on the cardboard in order to look like a mountain. In the recipient mix the baking powder, red dye and water, then add a drop of dish soap. Shake it good and after that add some vinegar. Now you can see how the volcano erupts.

## [How to Make a Jello Animal Cell Model](#)

(Junior High School of Xanthi - Greece  
D. Kalpakidis, V. Kampouris, A. Laxana, F. Kainourgiou, P. Kostoglou)

A cell is the basic unit of life.  
For this experiment we need: a clear plastic bag, jello, a nut, and beans.



Inside the plastic bag, our Plasma Membrane, we place the jello, our Cytoplasm. We add a nut for the Nucleus and beans for Mitochondria. We seal the

Have you ever wondered what the inside of a cell looks like?

For this experiment we need: a clear plastic bag, jello, a nut or a ball, beans or red pasta, green pasta or dried flowers, a balloon and a plastic food container.



All plant cells have a cell wall to provide protection and support. It is mostly made of cellulose.



Inside the food container, which represents the Cell wall we place a clear baggie for our Plasma Membrane, jello for Cytoplasm, a nut for the Nucleus and beans for Mitochondria.



We also add green pasta for Chloroplasts, where photosynthesis takes place. A semi inflated balloon is our Vacuole. In Vacuoles plants store water and other important materials.

Cell wall, Chloroplasts and Vacuole are found only in plant cells.

- ❖ water
- ❖ two plastic cups.

Pour the water into both glasses and add one of the red dye (abundant) . After we put the two branches of celery and wait for one night .... Drin! Drin! The alarm clock, it is played. Observe the celery immersed in the dye,



**it has become red!**



Let's try to open it. . . WOW! Now the vessel elements (xylem) and sieve tube elements (phloem) are well visible thanks to the red color!



You are wondering, but how does water rise? It is soon said to be capillary, in fact, in small section tubes (the vessel element (xylem) and sieve tube elements(phloem), the adhesion strength of water molecules to the walls makes it up.

Thank you for reading this experiment and for the next!

## Growing and shrinking a naked egg

(Izaro Anza, Amaïur Aurrekoetxea, Gaizka Aurrekoetxea and Sare Barbarias - Larramendi Ikastola - Basque Country)

Fill a beaker with distilled water and fill another beaker with a solution of water and salt. The first beaker will be a hypotonic solution because the water has

plastic bag and our cell is ready.



The Plasma Membrane plays a key role in communication among cells and between cells and external environment.

The Nucleus contains the cell's genetic inheritance and controls day to day functions.

Everything between the Nucleus and the Plasma Membrane is Cytoplasm

Last but not least, Mitochondria is the cell's powerhouse. Plasma Membrane, Nucleus, Cytoplasm and Mitochondria are found both in animal and plant cells.



## Egg osmosis

(Izaro Anza, Amaïur Aurrekoetxea, Gaizka Aurrekoetxea and Sare Barbarias - Larramendi Ikastola - Basque Country)

Place three eggs in a beaker and fill the beaker with vinegar so that the egg is completely covered.

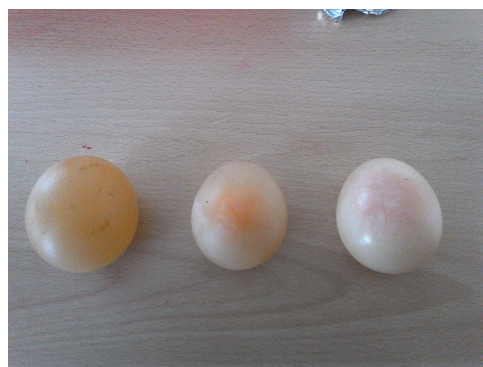


We will have to wait as the acetic acid in the vinegar begins to react with the calcium carbonate in the egg shell. A

a lower concentration of dissolved substances. The second beaker will be a hypertonic solution because the water has a higher concentration of dissolved substances. After that, place one naked egg inside each glass. We leave the third naked egg just in the beaker, without any solution at all.



Allow the eggs to soak for 24 hours. Pull the eggs out of the beakers and observed what has happened.



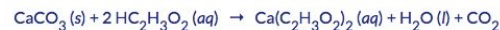
From left to right:

- Egg that has been in distilled water.
- Egg that has been left just in the beaker.
- Egg that has been in salt and water solution.

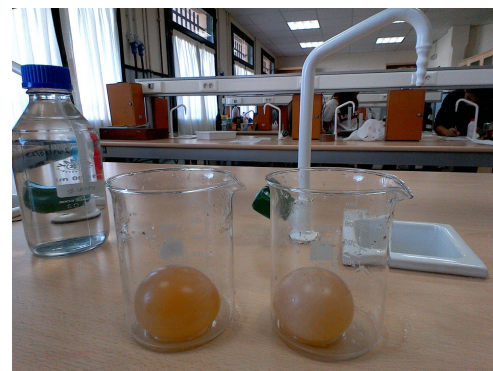


The egg that has been in distilled water gets bigger. The water moves inside the

chemical reaction starts and this chemical reaction dissolves the calcium carbonate shell. The acetic acid reacts with the calcium carbonate in the egg shell and releases carbon dioxide. We notice the bubbles of the carbon dioxide gas form on the egg and release to the surface.



The result is three “naked”, or shell-less, eggs. You can see just two in the image below.



Notice that the eggs are a bit bigger than we started. This is because some of the vinegar (and some of the water in the vinegar) has moved through the membranes to the inside of the egg. The membranes are semipermeable and allow water to move through them. This is called osmosis.

Naked eggs are cool because they are kind of rubbery. Drop your egg above the table and it will bounce it! You can see the result in [this video](#).

egg through the semipermeable membrane to equalize the amount of dissolved substances inside and outside of the egg membrane. This process of water moving through a membrane is called osmosis. You can even colour the inside of your egg if you soak it in some water with food colouring. See the images below.

The egg that has been in salt and water solution should shrink, but we can't notice that in the image above. Supposedly, the amount of dissolved substances is higher outside the shell than inside and water should have moved from inside the naked egg to outside in order to equalize concentrations. The result should have shrunken the egg. But it doesn't work in our case. Perhaps we should try the next time with corn syrup.



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