

DIGITAL MAGAZINE

“Maths and Science Adventure”

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SPECIAL POINTS OF INTEREST:

- Meeting in Hungary
- Meeting in Poland

INSIDE THIS ISSUE:

On Asteroids and what to do with them	2
Ball lightning!	4
Meeting in Hungary	6
Meeting in Poland	18
Didactical materials	32



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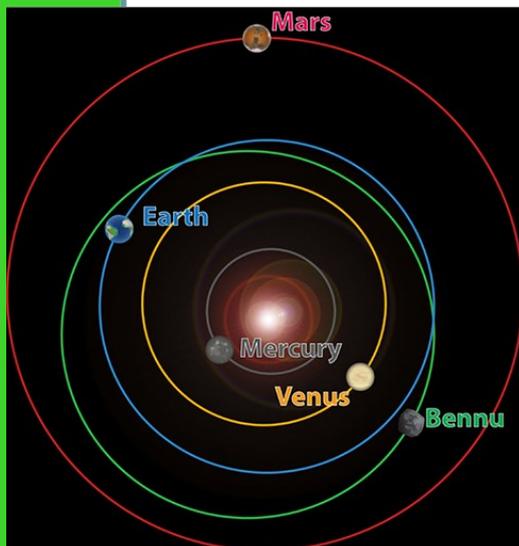
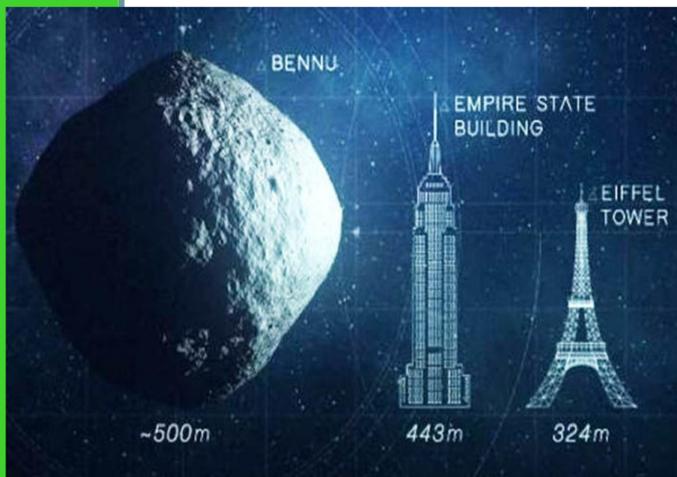
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Erasmus+

On asteroids and what to do with them

In 2135 there is a chance that an asteroid the size of the Empire State building, nicknamed Bennu will crash into Earth. It's a small chance – 1:



2700 but even so near-Earth objects like asteroids and comets are a real threat. In fact we avoid close calls from near Earth objects all the

time and NASA's Planetary Defence Coordination Office is responsible for finding, tracking and in extreme cases eliminating them.

The Planetary Defence Office deals mostly with asteroid because there are millions of

them left over from the formation of the solar system. They are typically composed of rock-forming minerals like olivine and pyroxene but they can also contain metals, sulphides clay and other organic compounds.

These space rocks range from hundreds of kilometers to just to just a few metres across. Like most planets, the asteroids revolve around the Sun in orbits and most of them are found in the asteroid belt between Mars and Jupiter but

because of their unstable orbits some have been known to migrate towards Earth.

Once an asteroid comes within 45 million kilometres of Earth's orbit the Planetary Defence Office classifies it as a NEA (Near-Earth Asteroid). There have been about 18 000 NEAs discovered in the last four decades. Large asteroids that are over 140 meters in diameter and n track to come within about 8 million kilometres of Earth's orbit are classified as PHA (Potentially Hazardous Asteroids). Such is the asteroid Bennu- this PHA is a huge focus for the Office as it passes through the Earth's orbit every six years. It is about as wide as five football fields and weighs more that the Titanic. If it were to slam itself the force would be 80 000 times more powerful than the bomb that destroyed Hiroshima but the chances of it hitting us are very small.

Continues on the next page...



But before we make any rash decisions about Bennu's fate NASA needs to learn more about this PHA and its potential for impact. The spacecraft OSIRIS-REX is on route to Bennu as we speak to collect samples of the asteroid but we'll have to wait until 2023 to get more information on the massive rock and the possibility of it ending our civilisation as we know it.

Anna-Mariya Velinova,
The Bulgarian team

But for fun let's say that we DO face an armageddon scenario and Bennu DOES head straight for

is detected early several of these will be dispatched to collide with the massive rock.

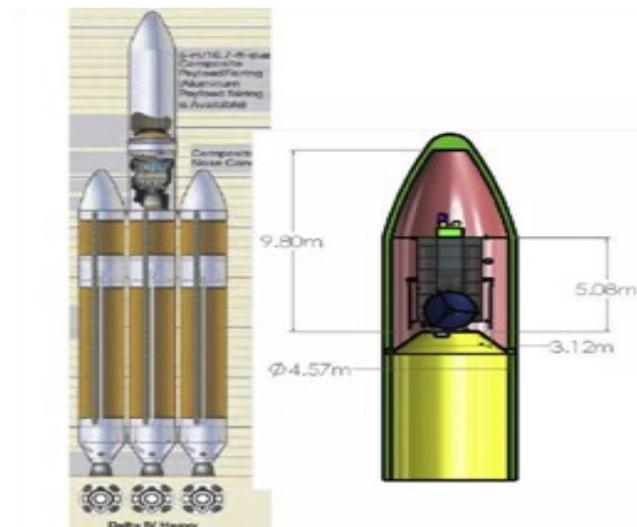
HAMMER

Gravity tractor

Earth. What could NASA do to stop it? To deflect an asteroid and prevent impact, scientists have to change the object's velocity by less than a centimetre per second years before the projected collision.

NASA is investigating two potential ways of doing that. The first method is a gravity tractor. A spacecraft would fly alongside the asteroid for an extended period of time essentially using its own gravity to slowly pull the NEA away from Earth but this could take years and even decades to pull off.

The second method is a Kinetic Impactor which involves sending one or more high-speed spacecrafts in the path of the approaching asteroid. Scientists have already designed a prototype called HAMMER (Hypervelocity asteroid Mitigation Mission for Emergency Response vehicle). If the asteroid



Ball lightning!



© Joe Thomissen / Wikipedia

It has not only been mistaken for UFOs, but has also wreaked havoc on homes and eluded rational explanation for centuries. But now ball lightning, a large, mysterious glow that appears during thunderstorms, has been explained by scientists not for the first time. The eerie orb-light glow is created when microwave radiation given off during a lightning strike becomes trapped inside a plasma bubble, new research suggests. Ball lightning, also known as fireballs and ghost

lights, have spooked sky-watchers for hundreds of years. The strange phenomenon can appear in the sky from the size of a golf ball to several metres across and can last between one second and tens of seconds. The orbs mostly appear during thunderstorms, but can also form inside aircraft and closed rooms. And the globe-like structures can decay silently or explode loudly, producing rancid odours in their wake. These strange and varying characteristics have presented a 'riddle' to scientists trying to work out their origins. Now researchers have come up with a new theory to explain how the mysterious fireballs form. Researchers from Zhejiang University in Hangzhou, China, have proposed that the bright glow of lightning balls is created when microwaves become trapped inside a plasma bubble. 'At the tip of a

lightning stroke reaching the ground, a relativistic electron bunch can be produced, which in turn excites intense microwave radiation,' the scientists said in a research paper published in Scientific Reports. 'The latter ionizes the local air and the radiation pressure evacuates the resulting plasma, forming a spherical plasma bubble that stably traps the radiation.' Microwaves trapped inside the continue to generate plasma for a moments to maintain the bright flashes seen during ball lightning, they added. The fireball eventually fades away as the radiation held within the bubble starts to dissipate - and when microwaves leak out, the lightning balls can dramatically explode.

Continues on the next page ...



The scientists' theory can explain many of the strange characteristics of ball lightning. For instance, microwaves are able to pass through glass, which can explain why fireballs can form indoors. And the strange smells given off from fireballs could be the result of the generation of acrid-smelling ozone from atmospheric oxygen, which is sparked by the microwaves. 'Our theory suggests that ball lightning can be created in the laboratory or triggered during thun-

derstorms,' the researchers added. 'Our results should be useful for lightning protection and aviation safety, as well as stimulate research interest in the relativistic regime of microwave physics.' Other scientists have long attempted to produce ball lightning in laboratory experiments. While some experiments have produced effects that are visually similar to reports of natural ball lightning, it has not yet been determined whether there is any relation.

Nikola Tesla could also artificially produce 1.5-inch (38 mm) balls and conducted some demonstrations of his ability, but he was truly interested in higher voltages and powers, and remote transmission of power, so the balls he made were just a curiosity. Many modern experiments involve using a microwave oven to produce small rising glowing balls, often referred to as plasma balls. Generally, the experiments are conducted by placing a lit or recently extinguished match or other small object in a microwave oven. The burnt portion of the object flares up into a large ball of fire, while "plasma balls" float near the oven chamber ceiling. Some experiments describe covering the match with an inverted glass jar, which contains both the flame and the balls so that they don't damage the chamber walls. (A glass jar, however, eventually explodes rather than simply causing charred paint or melting metal, as happens to the inside of a microwave.) Experiments by Eli Jerby and Vladimir Dikhtyar in Israel revealed that microwave plasma balls are made up of nanoparticles with an average radius of 25 nanometres (9.8×10^{-7} in). The Israeli team demonstrated the phenomenon with copper, salts, water and carbon. Scientists have proposed many hypotheses about ball lightning over the centuries. Scientific data on natural ball-lightning remains scarce, owing to its infrequency and unpredictability.

Boyana Zlatanova
The Bulgarian team



MEETING IN HUNGARY

The teachers of Teleki Blanka, singing welcome songs!



19.02.2018—Welcome to Teleki Blanka!

The warm welcome all teams received by “Teleki Blanka” Gymnasium is a great example for breaking the ice with the very first steps into the school. On the doorstep the headmaster of the school and his smiling students were lined up, treating us to their delicious “chimney cake”.

After that followed a

very well-structured programme where the Hungarian school system was introduced and heart melting songs were sung by both students and teachers.

After the long applause the photos of all teams were carefully examined and voted for and while the votes were counted the teams got to explore “Teleki

Blanka” Gymnasium, a beautiful and very old building.

A small break was sweetened by more snacks, fizzy drinks and laughter after which all returned to the hall and Cyprus` winning scientific photos were awarded.

In a nutshell, the entire welcome ceremony was obviously enjoyed by all. Cheerful songs, presentations, educational competitions, arts, good wishes and much more made the first day in Budapest bright and fresh!

*Written by the
Bulgarian team*

Some of the pictures from the Photo Contest



A tour in the town of Budapest

19.02.2018

After a lunch with traditional Hungarian cuisine a bus was waiting for us just on time for a tour around the beautiful capital. The sunny day and the equally radiant guide made all historical sites all the more fascinating.

We marvelled and took way too many selfies on Heroes' Square while listening about the great kings. Next was Vajdahunyad Castle, there the teams saw all the archi-

tectural styles in one place and got to touch the pen of the writer Anonymus and take from his magical powers!

After that- the Zoo, the Thermal Baths, the House of Terror and after passing tunnels and bridges the magnificent Buda Castle was ours to explore!

All in all, in spite of the limited amount of time we took in as much Budapest beauty as it is possible and all thanks to the



***This is how to
become a
famous
author!***

good schedule. Everybody laughed, took pictures and all teams most certainly had a blast. We will surely come again!
Written by the Bulgarian team



Cruise on the river Danube

19.02.2018

In the evening on Monday 19th February 2018, on the first day of our meeting in Budapest, there was organised a sightseeing cruise on Danube.

The cruise lasted about one hour and during that time we could admire Budapest by night. The views were astonishing, the illuminated bridges, Buda Castle and especially the House of Parliament looked really impressive. Thanks to the audio guide, which we could listen to on the headphones, we learned about the history of the city and the buildings. Sailing along the Danube we could also see the Margaret Island, which is one of many spectacular



views in Budapest. The Island was artificially formed by linking some smaller islands into one. There are bridges which link the island with Buda and Pest.

We were happy to be able to take part in the cruise and see the city from the perspective

we wouldn't be able to see while visiting the place on foot.

The cruise after a day full of impressions was a crowning achievement of that day.

Michał Leja – Wrocław, Poland

Some of the breathtaking sights!



Visit to the Physics Laboratory at ELTE University—20.02.2018



Our visit to the ELTE university in Budapest was very interesting. We were informed that currently about 2500 international students study at Elte.

We had the opportunity to visit the Physics Laboratory

where we had an explanation of an experiment showing how the earth revolves around its axis and is a satellite of the sun. Afterwards the professor of the Geology Department gave us a seminar about Earth and Lunar rocks and all of us observed some of the rocks with the use of microscopes. We found that the shapes of the rock particles were amazing. Finally two masters students showed

us an experiment, simulation of a Tsunami and Waterspout and Hydrostatic Pressure and its impact on the speed of a boat.

Written by the Cyprus Team



Walking to the Statue of Liberty

20.02.2018

On
Tu-



esday evening we took a trip to the Gellért Hill as the last programme of the day. Despite the weather being freezing cold, on the top of the hill a fun snowball fight escalated. There was fog and it was getting dark but we could still enjoy the view of Budapest's sights.

The Gellért Hill is a 235 m high hill overlooking the Danube. It is also a part of the UNESCO World Heritage site. The Liberty Statue or Freedom Statue is the famous monument on top of the Gellért Hill. The statue itself is 14 meters tall, with its base up to 40 meters above the hill. It commemorates those

who sacrificed their lives for the independence, freedom and prosperity of Hungary.

Despite the weather being cold, it was a great experience to walk in the snow and see our beautiful city when it's snowy.

Hungarian Team

Ready for
the
snowball
fight!



Visit in Palace of Wonders

21.02.2018

During the Erasmus+ meeting in Hungary, on Wednesday the 21th of February 2018 the groups from Portugal, Finland, Cyprus, Bulgaria, Hungary and Poland visited “the House of Wonders”.

“Palace of Wonders” is a centre, where you can learn among other things about physics and chemistry.

We had a lesson in a special laboratory, where a man showed us some interesting experiments in an interesting way. We learnt about acids, alkali, reagents, how to make a rocket from a bottle or

how firework’s colour is made.

Another attraction was 9D cinema, where we watched a film feeling like we were inside the action; for example when a camera was moving to the right, our seats did too, when the wind was blowing we felt it too and when water was squirting on the screen it was squirting on us, too.

After those two attractions there was a time given to watch an exhibition, where there were various zones: Birth exhibition, Illusions, Newton’s apple garden, Space

station, Magnetic field, Gossips’ corner, Hall of scientists and Nature’s workshop.

Our visit to this place was an extraordinary and unforgettable lesson about humanity, science and the world.

Michał Leja – Wrocław, Poland



Visit to the University of Engineering and Technology

22.02.2018

The flight route of the Masat-1 satellite (picture on the right)



Pictures showing the university campus, with nuclear reactors dome in the middle; the University's two large satellite dishes Bulgarian and Cypriot students getting introduced to the different radiation detectors

On Thursday, the second last day of our trip, we visited the University of Engineering and Technology. This university was right across the street from the other university that we visited on Tuesday. First we headed to the top-level of the university, to get a presentation of satellites.

This university had sent the first satellite of Hungary to space. This satellite, named as a Masat-1,

was launched in 2012, weighing only 1,33 kg with dimensions of 10*10*10 cm. Masat-1 orbited

for 1062 days, for almost 3 full years. The continuation project, named as Smog-1, is planned to

continue its predecessors footsteps. Smog-1 is a smaller version of the previous satellite in all

aspects; it is smaller in size, lighter in weight and shorter on its mission time. These satellites are

cleverly designed, so that they have special magnets installed, which will cause them to fall to Earth

after their mission is completed, to prevent the increase of space junk orbiting Earth. We got to

see miniature models of these satellites, which just looked like plain cubes, barely the size of a

clenched fist. After our presentation we got see the hardware of their satellite trac-



king system, 2

large satellite antennas installed on the university roof. We also got a nice look of Budapest and

the university complex, including the large dome where their nuclear reactor is located.

Our next stop was on the other side of the university, where the unit of medical physics lab was

located. We got a large presentation about radiation, radiation therapy and body-imaging

techniques, including x-ray, MRI and CT-scanning. All

through the presentation the presenters

asked us questions on the topic at hand. The right answers were rewarded with chocolate, so

everyone was quite keen to interpret the medical images of different body parts or fruits. In the

end we had a Kahoot quiz about what we just learned, with another, even bigger chocolate

reward waiting for the top three competitors.

Antti Pekkala, the Finnish team



Tour of the Town, walking by the Danube, National Theatre, Museum, Labiriynth, Zwack Museum

22.02.2018

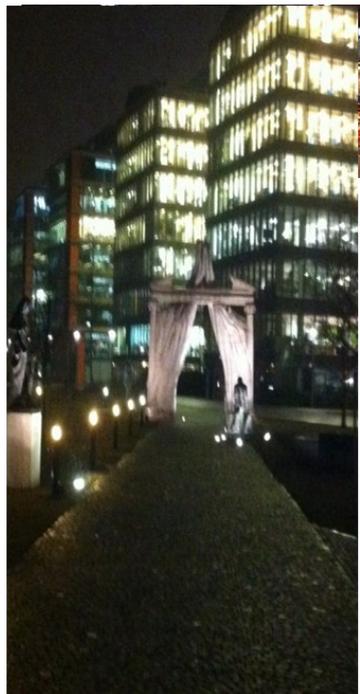
The Tour of the Town and walking along the Danube, stands out in our memory as one of the most beautiful life experiences! Although we walked a lot that day, we enjoyed every moment, because we loved everything, the places, the buildings, the works of art, the market, the bridge and the river, the museums, the history, the great civilization.

Students found climbing up to the Labyrinth building very amusing and had a nice view from the top. Inside the Central Market- this is the biggest, with a 120 meter long tunnel directly from Danube -, many stores sell special collections of souvenirs, traditional food and other local items. There we had a free lunch of tasty pizza.

Apart from the teachers, the students spent the evening at the Zoo Café-for students. The Cypriot students had an incredible experience of touching and feeling reptiles, like chameleons and snakes.

At the National Theatre we were struck by the beauty of the building, with the majestic change of colours during the night and the very interesting statues outside the building.

Written by the Hungarian team



Visit to the Zwack museum and Zoo Cafe

22.02.2018



Testing the production

After the delicious lunch at the bustling Budapest markets our group split up into two! The teachers headed to the Zwack Museum and the Students walked to the Zoo Cafe.

The Zwack museum is a look into the Zwack family who are the creators of the famous Unicum liqueur which was created in 1790. This museum was at the site of the Unicum factory and the tour begins with a look into their cellars where all the Unicum is being tanned, using the same recipe of herbs and spices handed down in the Zwack family

since its creation!

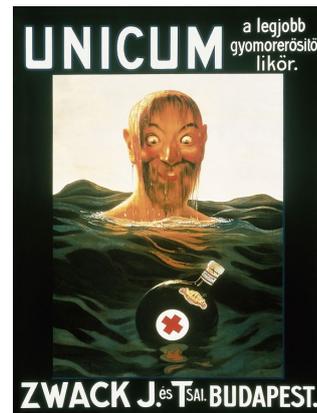
We learnt all about the process and the history of the unique blend, its a well kept secret even after many many generations! We tried the original blend straight from a barrel, as well as the newer blend which is aged on plums! It was much sweeter and fruitier. After this there is a display about all the important points in history for the Zwack family and the Unicum brand. It survived many trials but it made its way back to Hungary and continues to be an iconic symbol of Hungary to this day! The museum also

has an enormous collection of unique mini spirit and liquer bottles from all around the world!

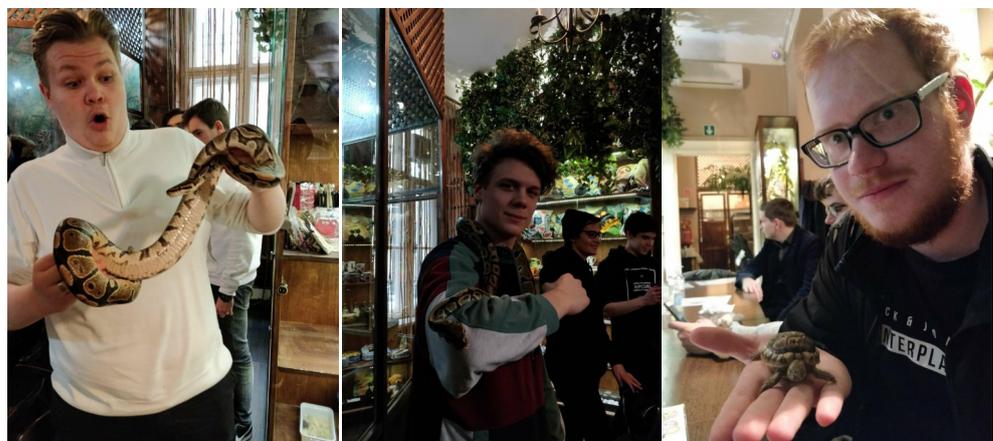
Over at the zoo cafe, the students treated themselves to the normal cafe fare but enjoyed them with some very strange guests! They were joined by snakes, cats, birds, lizards and many other animals! They got to interact and take pictures with all the animals!

Julia Kosonen, the Finnish team

UNICUM Advertisement



Interacting with the animals in the Zoo Cafe



Dinner in a Szeged restaurant !

22.02.2018



On 22 of February all the groups of students and teachers from Hungary, Poland, Portugal, Cyprus, Finland and Bulgaria had dinner in a Szeged restaurant.

It is a very traditional restaurant with a good meal with typical dishes. We tried a Chicken Paprika, pike perch with mushrooms and a strudel for dessert.

The food was delicious! The local folk band played good music when we were there, and the waiters

were friendly and helpful. We had a nice time, some of the teachers and students sang typical songs from their countries.



Parliament and tour to St. Stephen's Basilica

23.02.2018

Our tourist guides presented one of the most beautiful Parliament buildings: Hungarian. During our visit on 23 of February 2018, we could see the Main Staircase, the coronation jewels in the Dome Hall, the Old Upper House Hall and the Lounge. The duration of the visit including the security check was about 50 minutes. Standing on the banks of the Danube, in Budapest's Pest district, Hungary's Parliament Building has been witness to some of the country's most pivotal moments over the last 200 years. We explored its rich history. A contest was held during the 1880s to find an architect for a new Hungarian Parliament Building which would represent the nation's sovereignty.

Drawing inspiration from London's Houses of Parliament, the winner was Hungarian architect Imre Steindl who designed the grand, neo-Gothic building which stands today. Work began in 1885;



building,
Bu-

the building's inauguration was held in 1896 (the 1000th anniversary of Hungary) and the Parliament Building was finished in 1902, when the first sessions took place. The construction of the Parliament Building took 17 years and sadly Imre Steindl went blind before his grand design was completed and died in 1902. Standing at 268m long, 123m wide and 96m tall, the Hungarian Parliament is the country's largest

dapest's tallest, and the third largest parliament building in the world. Inside its grand walls there are 691 rooms. Architecturally, the building is in the Gothic Revival style with a Renaissance Revival style dome.



Podpis do obrazu/
grafiki.

„Aby przykuć
uwagę
czytelników,
umieść tutaj
interesujące
zdanie lub
ciekawą cytację
z artykułu.”

Podpis do
obrazu/
grafiki.



On the same day the group visited the St. Stephen's Basilica (Szent István-bazilika), which is the largest church of Budapest. The building was finished in Neo-classicist style in 1905, following 54 years of planning. Similarly to the Parliament, it is 96 meters high, which makes it the highest building of Budapest. Its capacity is 8,000 persons. The interior is characterized by rich ornamentation; the huge windows radia-

te dignity. This place of Catholic worship was named after St. Stephen, the first Christian king of Hungary, whose mummified body is buried in the undercroft. His intactly preserved right hand, the Holy Dexter, is kept as a relic in the Basilica's chapel. The Basilica is also a significant musical venue, where various concerts are held.

Portuguese team



MEETING IN POLAND

City game "Dwarf hunt"-23.04.2018

On our first day in the beautiful city of Wrocław we had the opportunity to take part in a great ice breaking activity that also helped us get to know the city better – the "Dwarf Hunt". The activity



was mainly meant for students but teachers were also allowed to participate. The students were divided into three different groups and each group consisted of students from the different partner schools, mixing everyone, so that they would get to know each other better. Their task was to find as many dwarves as possible in two hours. They also had to take funny group pictures with the dwarves whenever they found them, and the group with the funniest photos would win the competition. This activity was excellent in many ways. The students had the opportunity to discover the new city, make new friends and have fun using creativity when posing in the funny photos. Besides, everybody loves "treasure" hunts!

What are the dwarves like? The dwarves are quite small metal statues that resemble gnomes. They are scattered all over the city, and during our walking tour, our guide told us that there are hundreds of them in Wrocław. It is hard to know the exact number since new dwarves, both legal and illegal, keep popping up every year. Some of the dwarves represent famous Polish people. They all have a name and often some object, such as a motorbike or a guitar with them, so it is great fun to discover these different personalities. They are not always easy to spot since they are so small (20-30

cm), which brings some more challenge to the game. We were given maps to help us in the search, but it still proved to be quite challenging! In the end, we did find a lot of dwarves, but there are still plenty more left to be discovered for the next visit.

How did all these dwarves end up in the streets and lamp-posts of Wrocław? Our guide told us that the dwarves commemorate an anti-communist movement called the Orange Alternative. This movement adopted the dwarf as its symbol. The first dwarf, called "Papa Dwarf", was placed on Świdnicka Street in 2001. That is where the Orange Alternative used to meet in the 1980s to protest against the authoritarianism of Poland's Soviet masters. After the first dwarf, more and more dwarves were placed in different parts of the city and their number is still likely to grow every year.

In addition to carrying a deeper meaning and reminding us of the struggles against communism in the past, the dwarves provide a charming decor and create a cosy atmosphere in the city. We had a great time hunting for these jolly little fellows!

The Finnish team

Walking tour around Wrocław - the hidden jewel of Poland– 23.04.2018



THE DWARFS OF WROCLAW



over the city and are one of the city's most intriguing sights. But don't just visit them and take photos. Read up on them; every gnome has a name and a story behind it.

The guided tour around this picturesque city was what made our visit even more enjoyable and memora-

ble. Not only were we immersed in the rich history of Wrocław, but we also had the chance to admire the impressive architecture all around the city centre. If you have never visited some of the old German towns, this is the place where you can get an idea what they look like. Having absorbed the Bohemian, Austrian and Prussian influence, Wrocław has a unique architectural and cultural make-up, symbolized by its magnificent market place, Rynek. Laid by city planners in 1241, it was then and it remains even now one of the largest squares of its kind in Europe. And the magnificent

Once you've visited Wrocław, you'll immediately fall in love with it. Though in some way it is a manageable version Krakow, with all the cultural attributes and entertainment of that popular destination, the capital of Lower Silesia also has an appealing character all of its own. The city's location on the Odra River, with its 12 islands, 130 bridges and riverside parks is idyllic. And as you stroll through the pretty streets, you might even spot what Wrocław is famous for – its numerous gnomes. These mini statues are scattered all

Town Hall, Ratusz, as its centre is a masterpiece of medieval architecture. For us the most fun part of the Town hall was to explore the elaborate exterior decoration – the scenes from Aesop's fables along with the grotesque scenes of medieval pub life.

Another important landscape is the St. Elizabeth's Minor Basilica. Being among the oldest churches in Wrocław, located in the Old Town, it dominates over the other buildings with its 90-

meter tower. A church has stood on this site since the 12th century but the current Gothic structure dates back to 14th and 15th centuries.

During the time it was destroyed many times – by heavy hail in 1529, severe damage in WWII and mysterious fire in 1976. Today the church serves as a military garrison church and is being under reconstruction.

Only a block north from there you'll find Wrocław's smallest and most engaging street -Stare Jatki , The Shambles, which was once the place where butchers sold meat.

Continues on the next page...



Wrocław—the hidden jewel of Poland—part 2

Our next stop was the stunning Baroque palace complex on the Odra riverbank rebuilt to its late 17th century designs after being damaged heavily during WWII. Today it is one of the most outstanding works of Baroque architecture in Poland.



Within a walking distance to the river stands the oldest university in Wrocław. Founded by the Jesuits in 1670, the magnificent Baroque main building of the University and the adjacent Church of the Blessed name of Jesus are certainly the places worth seeing. In 1811 Prussia secularized all church property and took over administration of the university. In the past the campus was used for several purposes: a hospital, prison and finally a



food store. At the end of the war the German faculty was exiled with the replacement professors arriving from the University of Lviv forming the first Polish faculty to teach here. Walking down the street, you can notice the statue of the Naked Swordsman which has been here since 1904. The story behind the sculpture is what makes it interesting. It represents a rich, former student who bet everything but his sword during a card game. It is to serve as a warning to students to avoid gambling.

Walking through the cobbled streets, we had completely forgotten about the time and to our surprise the winding river came into view. We crossed the river on one of the oldest bridges heavy with the countless padlocks on it and headed for the beautifully preserved Cathedral Island, Ostrow Tumski—a treat for lovers of Gothic architecture.

Our tour ended at the entrance of St. John the Baptist Cathedral which is the largest

icon of Wrocław, seen from almost every corner of the city. The Gothic Cathedral 91 m high and 68m long is the highest building of its kind in Wrocław so far. When the construction began in 1244, this was the first brick building in Poland with the largest organ inside but it took five more centuries to be what we see it now. The real highlight of the Cathedral, however, is the panoramic view from one of its towers, which can be enjoyed easily by using the elevator inside it. Because of lack of time we couldn't enter the Cathedral but took a wonderful photo of the group in front of the imposing building.

Finally, after visiting this place we could say that Wrocław is not just a pretty face. It is Poland's fourth largest city and the major industrial, commercial and educational center for the region; virtually everything in southwestern Poland starts, finishes or is taking place here. Our overall impression is that Wrocław is a charming old town with imposing architecture and unique atmosphere which undoubtedly make it a popular tourist destination.

The Bulgarian team



Botanical Garden of the University of Wrocław

—23.04.2018



To complete a thorough tour of Ostrow Tumski you should not miss the charming Botanical Garden. The garden began life as a scientific pursuit, but have become a favourite retreat for Wrocław's residents and for anyone wanting to enjoy the beauty of nature but are too lazy to leave the city centre. The garden was built from 1811 to 1816 on the riverbed where the Odra once flowed around Ostrów Tumski. The 7.4 hectare grounds include a huge diversity of plant life, aquariums, sculptures, a plant shop and cafe, and a large pond with picturesque bridges and even characteristic for

the city small figures of gnomes. The original Botanical Garden (Ogród Botaniczny) was located on around 5 ha. Its first director ordered 427 seeds and seedlings. But the Garden developed rapidly. In 1816 there was already two thousand plants and its surface was getting bigger and bigger. Today with the surface of 7.5 ha there are 11.5 thousand plants and their cultivars registered, including mountain, rock, water, marsh, tropical and subtropical plants. Originally established by Wrocław University in 1811 as a scientific resource, the Botanical Garden is still used for academic purposes but today also doubles as a leisure attraction for Wrocławians and visitors to the city. The Garden has a status of a separate institute of the Faculty of Biological Sciences of University of Wrocław; there is a Natural Museum and the Garden itself has been registered as a monument of history. The Botanical garden has an open garden and glasshouses filled with palms and cacti, a rose garden and various trees and flowers labelled in Latin. Entering the framed areas

really feels like being in a jungle. All green and alive is not a common view in the everyday life of the urban city. The mission of the Botanical garden of Wrocław University is to provide comprehensive information about the flora and work for the conservation of rare and endangered plant species. The rich collection of the garden includes about 1500 species some of which are ferns, palms, or-

chids, peonies, clematises, roses.

There are a few lovely benches that offer you a nice rest in the shadow. You could take a book and enjoy the day there. The place is magical compared to the world outside of it. The fragrance and colour of the area makes you want to stay in the garden forever.

Open seasonally from early April until mid-November, on some days your peace and quiet could be disturbed by noisy groups of schoolkids (especially April-June), but the beautiful manicured landscapes include enough nooks and crannies that you should have no trouble forgetting you're in the centre of a big city.

We were lucky to visit the Botanical Garden in spring when the trees had blossoms, the grass was green and the landscape was full of the bright colors of the flowers. All this helped us take wonderful photos of our visit there.

The Bulgarian team



Welcoming in school and ice breaking activities—24.04.2018

On the second day of our stay in Wrocław, we visited our partner school, Liceum Ogólnokształcące nr XVII im. Agnieszki Osieckiej. We were warmly welcomed by the students and teachers of the school and we received some nice gifts and souvenirs.

The welcoming ceremony began with a spectacular musical show performed by Polish students. There were dance performances and famous songs from the movie "Grease". The students did a great job! They were absolutely amazing! After the performance, the school principal gave a welcome speech and the winners of the dwarf hunt photo competition were given prizes.

Next, it was time for a quiz on Poland! All the countries formed teams of their own and each team was given questions about Poland. The questions were related to general knowledge of Poland, such as the colours of the flag, the population and the official languages. The Bulgarian team won the quiz!

Once the quiz had been taken, the students were mixed in three different groups. One of the English teachers of the school had prepared very nice ice breaking activities for them. First of all, the students were asked to draw a big flower on a huge sheet of paper; a big circle in the middle and petals around the circle. They were supposed to write things they have in common in the middle of

the circle and the things only individual students have in the petals. After the exercise, all the flowers were presented to the audience. It was a great

way of learning to know a bit more about one another and discovering all the things that they share!

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After this exercise the students were encouraged to let their creative juices flow. The groups were changed and then the English teacher gave each group a box of story cubes, which were dice with different symbols on each side. There were three rounds in the activity and the first two rounds were warm-up rounds. During the first round, the students were asked to roll the dice and tell so-

mething about themselves based on the symbol that faced up on the dice. During the second round they rolled two dice and were asked to invent a short story that connected the symbols to one another. During the third round, each student rolled the dice in turn and they all invented a story together as a group. One person started the story, another one continued it and so on. The story

was written down and presented to the rest of the students and teachers on stage. Some of them were tragic, others were humorous, but each group worked very well together and created original stories!

At the end of the ceremony, we had a picture taken of the whole group.

The Finnish team



School Tour and School Exhibition “Factory of Toys” - 24.04.2018



After a warm welcome, an impressive musical show and ice breaking activities, our students were given a tour of the school. What made the tour all the more interesting and lively was the enthusiasm and vitality of the students who undertook the role and responsibility as our tour guides. The school building, though old and with a long tradition, was clearly well kept and having undergone continuous renovation was in excellent condition.

The long and wide corridors and high doors were quite imposing, the clean and nicely decorated classes created a very pleasant atmosphere, while the recently renovated modern library was most impressive and welcoming of all. Of course, our students were in awe of the fact that the school's student council had a meeting room of their own!



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Following the general tour, we were led to the Physics classroom where there were on display a 'factory of toys', physics experiments based on the Physics curriculum of the school. Some were related to energy saving, Newton's laws, electric circuits and Optics.

It was a hands-on experience as all students had the chance to try out these experiments, something which was quite tempting, hence the name 'toys'. They also had to try figure out their scientific explanation. Finally, the Physics teacher gave students a spring which was

held by two students each time in the corridor to create a pulse at a steady end.

The Cyprus team

Science Activities

at the School—24.04.2018

Maths Contest



At the Chemistry Laboratory, the students were divided into pairs and were given a number of Sudoku puzzles to solve. Sudoku is a popular logic-based, combinational

number-placement puzzle. Students proved much more keen and capable of solving these puzzles than their adult teachers! They were given a time limit to solve the puzzles

and the first pair to finish were the winners. Marilena from Cyprus together with Zsolti from Hungary were the winners of this competition.

Magic and Alchemy Demonstrations

Chemistry teacher Ms Danuta had prepared some spectacular chemistry demonstrations that impressed her audience! She clearly explained the steps of each experiment and informed as well as thoroughly entertained. Of course in these experiments there was a strong element of surprise and the students were really enthusiastic and eager to participate where possible. She created a small volcano with the fusion of chemical substances and demonstrated



how through chemical reactions (using acids and bases) you can produce 'blood' – something often used in the



film- making industry.



Young Explorer Workshops



This was an opportunity for students to do their own group experiments. The students were divided into

groups where there was at least one student from each partner country. They were given materials and instructions on how to conduct each experiment. This was a wonderful hands-on experience where students had to think together and cooperate to produce the desired results and work out an explanation for each experiment.

The Cyprus team



Excursion to Krasiejów. Visit to the Park of Science and Human Evolution—25.04.2018

Science and evolution play a big role in our education and just in our life. That's why we took our Erasmus+ friends on the 25th of April to Krasiejów - where the Park of Science and Human Evolution lays - to show them how great and fascinating it could be.

The first attraction was the Tunnel of Time that's located in the Jura Park in which we witnessed the coming into being many Galactic's and of course the Earth.

Later we followed the education path (1500m) with our tour guide in which we learned about many dinosaurs and what not and took many wonderful pictures. I think that after that experience everyone can surely say that they have learned a lot of interesting facts that they can use further on in their lives.

Next was the Prehistoric Oceanarium that made us jump with the last exhibition - Megalodon. Here we could stand eye to eye with species that lived on the Earth



thousands of years ago.

Our next stop was the food canteen. We ate some delicious food and moved on to the rest of our trip.

The next stop was the Park of Evolution. We entered the main hall and received our helmets which were our tour guides for this attraction. We went on to the space shuttle and watched a short 4D movie about us time traveling to the past. After that we went

further in and explored the whole building with our helmets learning about the first people and their voyages. We also came to know about the development of dishes, the scriptures and tools. At the end we entered the space shuttle once again to travel back to our times and end the whole trip. We headed back to our bus and left to Wrocław.

The Polish team



Hydropolis - Knowledge center about water—26.04.2018

Hydropolis is an ultra-modern knowledge center about water, which is the only such facility in Poland and one of the few in the world. Here we can find a place where various multimedia technologies, interactive installations, faithful replicas and models as well as information-rich touch screens serve one purpose: to show water from various fascinating perspectives.

The group visited Hydropolis on 26 of april 2018, which begins with a 360 degree projection on the creation of water on Earth. Next, the guests of Hydropolis, following the water stream enclosed in the floor, pass through subsequent zones, dedicated to secrets that contain depths, life bustling in the oceans or water engineering. In Hydropolis, there is also the

world's only replica of the Trieste bathyscaphe, which in 1960 was submerged in the Mariański's Trench and a copy of Michelangelo's sculpture "David" made of acrylic, symbolizing that man largely consists of water. Hydropolis is located in a historic building (the so-called clean water tank from 1893) in Wrocław. It is addressed to all age groups. The exhibition area has over 4,000 m², and there are 64 interactive installations waiting for visitors in eight thematic zones.

The center of knowledge about water is an extremely interesting place, it is a phenomenal presentation about water, without which there would be no life on Earth. Hydropolis is a unique knowledge center that combines educational values with a

modern exhibition form. He discovers the processes in which water takes part - from the functions performed in the human body to the ocean currents that shape the climate on Earth. The multimedia story about life-giving water is rich and diverse. And despite the enormity of the news presented, we will not be bored for a moment. Hydropolis is a place where multimedia technologies, interactive installations, faithful replicas and models as well as information-rich touch screens serve one purpose: to show water from different, fascinating perspectives.

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In the "Planet of Water" room we have learned theories about the origin of water and its presence in the universe. We can sit faithfully recreated Trieste bathyscaphe capsule, which in 1960 two dare-devils dived to the bottom of the Mariański Rift. Don Walsh, an American officer and oceanographer, participant in the experiment, during his visit to Hydropolis, again took his place in the bathyscaphe. Walsh accepted the title of the honorary ambassador of the Center for Water Knowledge. Right next to it are presented "creatures" inhabiting the seas and oceans - from a few meters of sharks, through shoals of fish to microorganisms. We can sit on a tropical beach and listen to the soothing sound of the sea,

or go in the cloud. Each room is enclosed with multimedia boards with interesting details on the groundbreaking discoveries of the underwater world, the nature of water and the way it is used by humans. There are dozens of models of ships, boats and other floating structures in Hydropolis. We could see and touch many devices, pumps, motors, levers. More - everyone has a chance to be thunder-seated for a moment and trigger a thunderstorm with a theatrical character. A separate part of the exhibition was devoted to the presence of the theme of water and its meaning in religions and art. Yet another spectacular showcases the importance of water for the life of organisms on Earth. There are also Wrocław

threads. For example, an interactive table with maps of Wrocław, including from the flood of the millennium or the municipal water system, it attracts the attention of everybody.

The Portuguese team



Visit to ZOO—26.04.2018



Wroclaw's Zoo utilizes historical buildings from the nineteenth century and adapts them to modern requirements. We can find many thematic exhibitions of individual continents such as Madagascar or Sahara Pavilion in the area of 33 hectares. Wroclaw's Zoo works to protect endangered species and it has 4,500 animals representing over 800 species including numerous

endangered or even animals that no longer

occur in the wild.

It is member of the prestigious Aquaria (EAZA), European Association of Zoos, World Association of Zoos and Aquaria (WAZA) and ISIS (International Species Identification System for).

We were amazed by the zoo in Wroclaw. Almost all enclosures are very modern, look nice, spacious. The zoo gives the possibility to see the animals from a small distance. There's information about all species. What's more, often you can find information bo-

ards with some interesting facts about animals or the area they live in. Africarium is the biggest attraction of the Zoo. More than 250 species of animals live there.

In addition, we could observe for examples: hippos, sharks, African penguins, crocodiles, butterflies, spiders, snakes, turtles, giraffes, bears and other animals.

The Hungarian team



Dinner at “Pod Fredrą”-26.04.2018

On the 26th of April our Erasmus+ team went out in an official dinner. We gathered at the restaurant at 8pm. Mrs Iwankiewicz and Mrs Bartnik - the principal and deputy to principal of High School nr XVII joined us and with their arrival we started our feast.

Many different dishes were delivered to our tables. The first course was barszcz biały poured into buns instead of normal bowls. The second

course consisted of a variety of foods like: rabbit meat, pork meat, fishes, side dishes and so much more! As one of the participants of the dinner I can promise you no one came out from there with an empty stomach! At the table everyone laughed and talked a lot about their countries, hobbies and whatnot. We had a perfect opportunity to get to know each other a lot more even though it was our last night together. At the end

of the night when everyone finished their food and was full we thanked for the delicious dishes and went back to our homes and hotel rooms. It was a really nice night and I think that some of us will remember it for a long time.

The Polish team

Strategic games at Skybowling—27.04.2018



round indoor viewing point on the 49th floor. At a height of 200 metres, this is the highest panoramic view point in Poland. There is a shopping mall in it where we went to the bowling club.

We got on really well and I enjoyed speaking English with people from different countries.

The Hungarian team



On Friday we visited the Sky Tower. The tower was built in 2012. This is the tallest building in Poland, which rises 212 meters into the atmosphere. As the city's only skyscraper, Sky Tower literally looms alone over the city centre, and its vertical thrust can be seen from many miles away. More over its 50 floors, tourists have plenty of reasons to come and see this modern building, for example it has the largest pool hall, a 24-lane bowling alley, an over-sized Salvador Dali sculpture, and an amazing interactive installation of 60 screens that react to the movement of visitors as they engage the 40 square metre exhibit. The highlight, however, is the year-

We formed groups of five with students and teachers from different countries. Each 'country' got a locker to put their shoes in because for bowling we had to wear special shoes.

In my team there was a boy and a girl from Poland, two Hungarian boys, and me. We were having fun although some of the boys were not very good at bowling.

We were chatting in English, me and the Polish boy instructed the Hungarian boy how to strike all the pins for the first time.

Finally, the other Hungarian boy won the first game, and the Polish student won the second one.



Steamboat route on Odra river-27.04.2018



Oder river, Polish and Czech Odra, river of east-central Europe. It is one of the most significant rivers in the catchment basin of the Baltic Sea. For the first 112 kilometres from its source, it passes through the Czech Republic. For a distance of 208 km its middle reach, it constitutes the boundary between Poland and Germany before reaching the Baltic Sea via a lagoon north of the Polish city of Szczecin.

Wrocław's designation as "Poland's Venice" wasn't just pulled out of a hat during a meeting of the local tourist bureau. Built on 12 islands, the city of Wrocław features well over 100 bridges and the surrounding rivers and canals play an important role in the city's identity, as well as the leisure time of its citizens. What's the best way to take in the "Venice of Poland?" That's a no-brainer: From the water! Explore the charm and beauty of Wrocław via the many canals that cut through this gorgeous city. Take one

of the regularly departing city cruises, escape farther on an Odra (Oder) River cruise.

On 27 of april 2018 we took a 45 minute panoramic trip with a boat cruise provided by "Wiktoria", an unforgettable experience. Our group had a chance to see the Przystań Kardynalska (Kardynalska Marina in Piasek Island) - Muzeum Narodowe (National Museum) - Most Pokoju (Peace Bridge) - Urząd Wojewódzki (Governor's Office) -

Most Grunwaldzki (Grunwaldzki Bridge) - Wieża Ciśnień (Water Tower) - Jaz Szczytniki (Szczytniki Weir) - Przystań ZOO (ZOO Marina), Rurociąg Gazowy (Gas Pipeline) and Wyspa Opatowicka (Opatowicka Island)

We were lucky to have beautiful weather that afternoon.

The greenery and sounds of birds chirping set a calm mood for everyone on board.

While most students preferred to stay up to for the

riverside views, a lot of us also enjoyed exploring the inside of the cabin.

We really enjoyed our time, was very relaxing!

The Portuguese team



Didactical material from the meeting in Finland—Amathsing race - the mixed group of the students' competition - PART 3

PART 3

Checkpoint 5 – Half measures Instructions for the guide

The guide reads out loud (and shows out what is to be done at the same time):

In this checkpoint you will do estimations on measurements.

This checkpoint consists of 2 parts, both of which you will try to get as close as possible to the full size. You should get as close as possible, but be very careful not to go over the limit. Whichever team is closer, gets 5 points, but if you go over, you will get 0 points. If both teams stay within the limit, then the closer one gets 5 points and the other team 3 points.

In the first part, you will have to estimate volume. There are identical champagne glasses, you will get 2 of them. The plan is to fill it as close to HALF VOLUME as possible. When you think you have reached it, then tell me and we will continue after both teams have done it. Use the water in these glasses to fill up your champagne glass.

Now you will get another glass, and fill it identically to your half full glass.

Now we will check which team

got closer!

In the second part we will measure length. This jar is the base of your measuring, but you may NOT TOUCH IT. Here's some books. Form a stack with your books, so that it is the same height as the length of the side of the jar.

Again, if you make too tall a stack, you will get 0 points, but try to make the stack as tall as the length is. The stack which is closer to the right length gets 5 points and the other team will get 3 points. You may start.

Now, let's check if you got it right!

The white team will go to checkpoint 4

and the blue team will go to checkpoint 1

AUDITORIUM COMPETITION

In the last competition there are 10 questions, which give 2 points each.

Only the quickest team will get the point, but a wrong answer gives -1 point!

If the answer is wrong, other teams may try to guess too, except in the last question.

1. Equilateral triangle is a triangle, in which all the sides have the

same length.

What is the size of the angles?

60 degrees (or $\pi/3$ radians)

2. If a triangle has sides of length 5 and 9, what can the length of the third side be? 4 - 14 (Any answer between those numbers will be okay)

3. A square has a side of the length 1. Diagonal is a line segment that goes from corner to the opposite corner. What is the length of the diagonal?

$$\sqrt{2}$$

4. A cube has a side of the length 1. What is the length of the diagonal?

$$\sqrt{3}$$

5. A certain bacterium doubles its amount in one hour. A scientist puts one of these microbes in a petri dish. After 1 hour there are 2 microbes in there, and in 2 hours there are 4 microbes there. In 48 hours, the petri dish is exactly full of these bacteria. How many hours does it take to fill the petri dish exactly half of its volume? 47 hours

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Didactical material from the meeting in Finland

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If 5 men dig 5 holes in 5 hours, how many hours does it take for 100 men to dig 100 holes? 5 hours

5% of the population support the green party. After a great campaign, the popularity of the greens rose by 20%. How large percentage of the population supports the greens

now? 6%

Map has a scale of 1:20 000. The distance between A and B on the map is 7 cm. How many kilometers is it in real life? 1.4 km

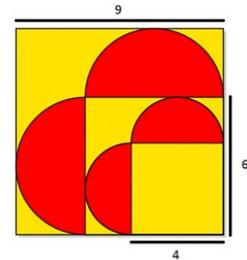
At midnight, the hands of the clock touch each other. How many times have the hands of the clock touched each other by 6 a.m.? 5 times

Which of the colored areas

is larger, the red or the yellow?

-red

Antti Pekkala, Finland



Didactical materials from the meeting in Poland

Experiment no.1.

Ship in a bottle

Ingredients:

a tall glass vessel flat-bottomed dish
candle (small enough to fit into the tall glass vessel)
water
matches

Instructions:

Pour about 1.5 litre of water into the flat-bottomed dish.

Put a candle on water surface so that it floats. (You've just made your ship)

Light the candle and cover it with the glass vessel.

DO IT DIFFERENTLY Try to carry out the same experiment using a different number of matches stuck into the candle and set on fire instead

of the wick

QUESTIONS

What happened to the candle? What happened inside of the vessel which you'd covered the candle with?

Look carefully at vessel walls. What do you see? What does combustion reaction consist in? What is the effect of it?

Experiment no.2.

Chemical yo-yo

Ingredients:

tall, transparent vessel
transparent vessel (it can be smaller than the previous one)
pipettes
cooking oil
vinegar
baking soda

Instructions:

Pour a layer of baking soda (ca. 1 cm thick) on the bottom of the tall vessel. There should be no baking

soda on vessel walls.

Pour oil to the same vessel – up to 3/4 of the capacity. Do it carefully so that oil doesn't mix with baking soda.

In the other vessel, mix vinegar with colorant (you can use two different colors in separate vessel)

Using a pipette, add a few drops of colored vinegar to oil. Try to add drops in different ways – keep the pipette just above or beneath the

oil surface.

Observe vinegar drops – their reaction in oil and after they touch baking soda.

QUESTIONS

- 1.How do vinegar drops react in oil?
- 2.What happens when a vinegar drop touches baking soda?

Experiment no.3.

Non-newtonian fluid

Ingredients:

1 cup of water
1 1/2 to 2 cups of potato flour
(Any ratio of about 1 part water to 1.5 to 2 parts cornstarch will work.)

Instructions:

Add the water to a bowl.

Rub some potato flour between your fingers before you add it to the water. The potato flour has an interesting, silky feel.

Gradually add the potato flour to the water and mix with a spoon

(or your hand).

Once you've added 1 1/2 cups of potato flour, add some more slowly and start mixing with your hand so that you can feel when the non-newtonian is ready.

Squeeze the non-newtonian as you add the potato flour. If it forms a solid ball as you squeeze and then liquefies when you stop squeezing, it's ready to use.

If you make a mistake during mixing, add extra water or potato flour until the non-newtonian forms.



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