ICYS International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Dear Participants of the XIIIth ICYS!

During the last 12 years ICYS became an important event which gives fantastic opportunity for prominent secondary school students to present his/her own scientific work. Furthermore ICYS gives possibility for students from several countries to contact each other. For team leaders and guests the Conference gives a chance to exchange of their experiences obtained in the preparatory work with talented students.

Stuttgart, the Capital City of German South-West-State Baden-Wuerttemberg is well known from its industrial companies Bosch, Mercedes and Porsche, as a location of scientific research given on a high level and last but not least from its rich cultural life.
Besides the scientific program of the ICYS everybody will have occasion to get to know these parts of Stuttgart also.

We will do our best to You have an interesting and pleasant stay as well as a successful Conference!

Sincerly Yours

Zsuzsanna Rajkovits
President of IOC

Alexander Urban
President of LOC

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Schedule

Identification codes:
Youth Hostel: **YH**; Independent Backpacker Hostel: **iB**; Ev. Heidehof-Gymnasium: **EHG**

Day / Time	Explanation	Location
18.4.Tuesday		
	Arrival and Check in	YH, iB
from 18.00 to 22.00	Dinner & Get-Together-Party	EHG
19.4. Wednesday		
7.30	Breakfast	YH, iB
9.00	Opening Ceremony	EHG
10.30	Coffee break	EHG
11.00	Students' presentations (sessions # 1 – 3)	EHG
12.30	Lunch	iB
14.00	Students' presentations (sessions # 4 – 6)	EHG
16.30	Reception in the Stuttgart City Hall – Dinner in the City Hall afterwards: City Walking Tour	
19.30	Free time / optional: presentation of a movie – games (chess, cards …)	YH
20.4 Thursday		
7.00	Breakfast	YH, iB
8.00	Students' presentations (sessions # 7 – 10)	EHG
10.00	Coffee break	EHG
10.30	Students' presentations (sessions # 11 – 13)	EHG
12.00	Lunch	iB
13.30	Presentation of Bosch-Company: research and development	EHG
14.15	Bus-transfer to Schwieberdingen	
15.00	Visit of the Bosch Development Center Schwieberdingen	
17.00	Bus-transfer back to Stuttgart	
18.00	Dinner	YH
19.00	Visit of the "Stuttgarter Frühlingsfest"	

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Day / Time	Explanation		Location
21.4. Friday			
7.00	Breakfast		YH, iB
8.30	Students' presentations (sessions # 14 – 16)		EHG
10.00	Coffee break		EHG
10.30	Students' presentations (sessions # 17 – 19)		EHG
12.30	Lunch		iB
14.30	Final meeting of the juries (EHG)	Free time: Sports: soccer, volleyball, climbing … different places (see special anouncements)	
18.00	Dinner		YH
19.30	Science-Quiz (teams of mixed nationalities), light entertainment program (contributions of the participants)		EHG
22.4. Saturday			
7.30	Breakfast		YH, iB
9.00	Culture program in Stuttgart in different groups: Wilhelma (Botanic and Zoological Garden); Rosenstein-Museum (Prehistoric Museum); Art-Galleries; Architectural Guided Tour; Historical Tour; Technical Tour		
13.45	Go-Kart-Race of the participants – alternatively swimming in the hot springs "Leuze"		
17.00	Snacks and drinks		Bosch Haus Heidehof
18.00	Awarding Ceremony		Bosch Haus Heidehof
20.30	Farewell-Dinner and Farewell-Party (Disco)		EHG
23.4. Sunday	**Breakfast and Departure**		

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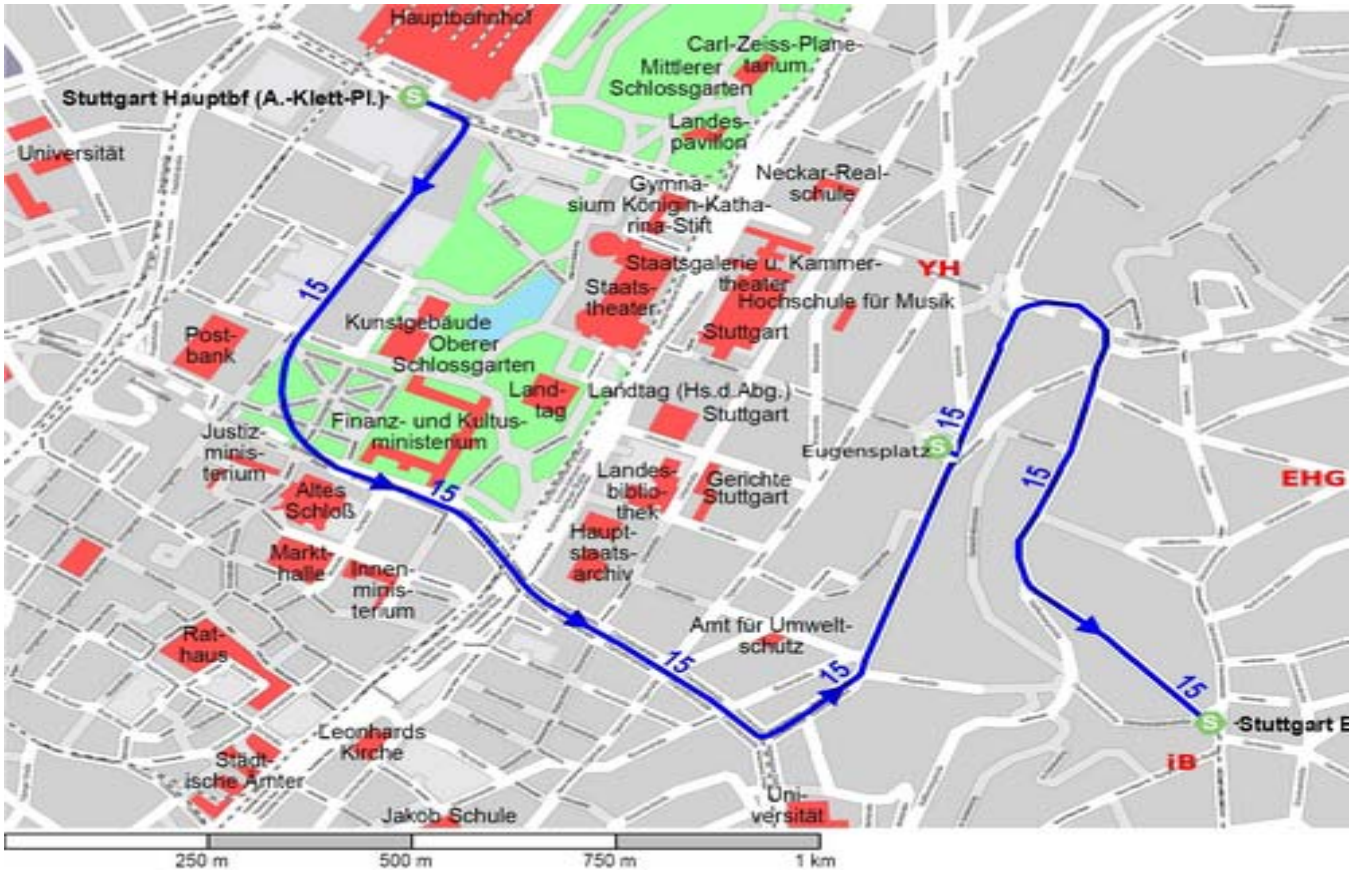
Location guide

All participants stay either in the Youth Hostel (YH) or the Independent Backpacker Hostel (iB), which are located within a small distance from each other and from the city of Stuttgart. The meetings are in the "Evangelisches Heidehof Gymnasium" (EHG), a highschool. All participants get tickets for free riding on buses, U-trains and trains in the town.

Youth Hostel
corner of Wera and Kerner Street
Phone: +49 (0)711-24 15 83
Web: http://www.jugendherberge-stuttgart.de/ (german only)
Next U15-station: Eugensplatz (3 min on foot)
6 minutes with U15 from Main Station

International Backpacker Hostel
Richard Wagner Street 2
Phone +49 (0)711-24 89 73 0
Web: http://www.jgh-stuttgart.de/ (german only)
Next U15-station: Bubenbad (3 min on foot)
6 minutes with U15 from Eugensplatz

Evangelisches Heidehof Gymnasium
Heidehof Street 49
Web: www.heidehofgymnasium.de/ (german only)
Next U15-station: Bubenbad (like iB) or Heidehofstraße (3 min on foot each)
8 min on foot from iB



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Computer Science

International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

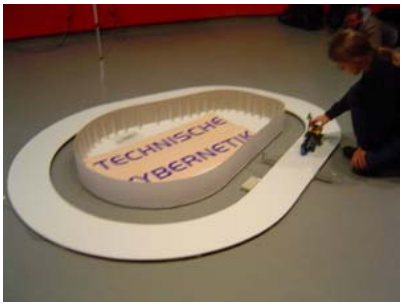
Country: Germany
Team: D-1
Name: Dieterich, Peter
ID: D1-PD-Stu
Presentation ID: CS-D1-PD
Title of Presentation: An autonomous wall-following Lego Robot

The objective

On Wednesday, 16th November 2005 there was a robotics competition that is offered each year by the faculty of cybernetics in Stuttgart.

infrared sensor

The task was to build and program a Lego Mindstorms robot that is able to keep a distance of 30 cm / 11 inch to a wall and that must not leave a 20 cm / 8 inch wide track.
The distance to the wall had to be measured with an infrared sensor by sharp which is modified to fit onto Lego bricks.



course and wall

The fastest competing robot who was to complete 2 laps without falling off the track won.

Building the robot

One of the most complicated problems our team of 6 students and one teacher encountered was the steering of the robot. In disposition of three electric motors we finally decided to use two motors for driving and one motor for steering.
In order to know the steering position we had to install a rotation sensor that measured how far the steering motor had moved. This way, we could easily adjust the direction the robot had to turn in proportion to its distance to the wall.

the robot

Programming the robot

Since the original firmware of the brick was very slow and had very few features, we decided to use an alternative open-source firmware called BrickOS. It provided a C and C++ programming environment and was a lot faster. This was an advantage because the delay of the infrared sensor was shorter and therefore the robot drove more accurate.

Country: Ukraine
Team: UA-2
Name: Kiparenko, Oleksandra
ID: UA2-Oki-Stu
Presentation ID: CS-UA2-OKi
Title of Presentation: System of the automated account of progress of pupils in High schools

One of the system of the automated calculation of student's data and progress in High Schools was created in computer Academy "SHAG".
The analysis and data processing about progress of students at school are still carried out manually at lots of schools in Ukraine. It is a very hard and complicated process. By means of the presented programme you will be able to automate the account of attendance, calculate the average and maximal student"s scores and determine a rating of the students. Simple and convenient user forms of the programme allows to use it for teachers without special computer skills. That programme is written in Delphi.

References:
1. В. Иванов "Microsoft Office System 2003 русская версия". Учебный курс. Bhv, Питер, 2003, 640 с.
2. «Microsoft Access 2000. Шаг за шагом» ЭКОМ 2000, 352 с.

Country: Ukraine
Team: UA-2
Name: Lutsenko, Olena
ID: UA2-OL-Stu
Presentation ID: CS-UA2-OL
Title of Presentation: The simulator-translator of conjugation of the French verbs, created in computer academy ‘SHAG”

The problem of using the technical facilities for teaching foreign languages is a very actual nowadays. While different audio and video materials are gaining skills in spoken speech, there are no efficient programmes automating education for orthography. The programme-simulator is intended for independent analysis of conjugation rules for French verbs, written on programming language Delphi. It has the theoretical background information, presented in suitable electronic form. The original algorithms of processing the string’s expressions have been developed there.

References:
1. Jon Shemitz “.Net for Delphi Programmers” Bhv, Питер, 2002 560 p.;
2. Alex Fedorov, Natalia Elmanova “Advanced Delphi Developer's Guide to ADO” Bhv, Питер, 2000, 640 p.
3. Jean Dubois, Rene Galane “La nouvelle grammeire du francase” Larousse 1992 260 p.

Country: Georgia
Team: GEO-2
Name: Nadareishvili, Mariam
ID: GEO2-MN-Stu
Presentation ID: CS-GEO2-MN
Title of Presentation: The poverty overcome problem in Georgia

The poverty overcome problem is one of the major problems all over the world. It is a main problem in developing countries such as Georgia, one of the former Soviet countries which fifteen years ago became independent. The population of Georgia consists of about four million people. Nearly 15% of them live in level of extreme poverty. About 50% of population's income is less then the minimal means of subsistence.

The Georgian government has worked out the poverty overcome program which will be put in motion in June, 2006. Its first level has been considered for ten years (up to 2015). Social assistance is one of the branches of this program. According to this program 15% of the people in extreme poverty should be half diminished.

As a result of census, Georgian population was conditionally separated into eight groups by their income. In the budget there is assigned definite capital for the social assistance. Also there strategy of the assistance is worked out.

Our computer model is done to implement this program. It's based on real data:
Amount of people in each group;
Means of subsistence;
Pension;
Average and minimal salary in state and in private sectors;
Value of assistance;
Mistake of receiving assistance or removing it;
Developing tendency of the country during ten years;
Factors, which define financial position of person (family).

Our computer model was offered to Social Assistance and Employment State Agency of Georgia.

Country: Georgia
Team: GEO-2
Name: Nemsadze, Aleksandre
ID: GEO2-AN-Cap
Presentation ID: CS-GEO2-AN
Title of Presentation: Search function

There are known 4 methods of function definition in mathematics: analytical, when function is definite by a formula, by a table, by graphics, by descriptions.

Last method basis on a function properties – definition range, continuity, monotony, convexity and etc. This method is seldom used because of it's difficulty. Often in many practical problems (not only in mathematics, but in economics, physics and etc) analytical view (formula) of function is not known, but there're known different properties of the function. For example, in time of some physical experiment or in time of studying some economical problem. Often, in such cases there are some difficulties to find out formula of the function (exact or approximate) to continue studying the problem.

We tried to solve this problem by using a computer program – Flash MX 2004, with ActionScript. The program algorithm includes:
– inputting random function graphically;
– accurately defining function using its properties;
– comparing final function with the standard functions (that can be definited by a formula) and determination of the difference (exact or approximate);
– outputting analytical view of final function.

Solving the problem using Flash gives us possibility of visual control step by step, and during the time of outputting a final function. This algorithm and its computer realization can be used by the mathematician and also by the other specialists.

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Country: Georgia
Team: GEO-2
Name: Gachechildaze, Mariam
ID: GEO2-MG-Stu
Presentation ID: CS-GEO2-MG
Title of Presentation: Economic Training in School

Content of the problem: In Georgia at school students learn Mathematics, Physics and etc. But they don't get any economic education. However, after graduating form school most of them continue stadying in different universities, exactly on economic departments. Such is up-to date demand on profesionals.

General part: Last summer in Georgia entrance examinations were underwayed in 109 higher colleges. From them in 52 colleges on various departments of economics. Our purpose is to give to the students minimal ammount of economic education for making their following decision more reasonable.

Methods of teaching are folowing**:**
Lecturer reads a lecture. Statement is made in Power Point.
After lecture questions and possible discusions students fill two tests:
Professional - about leacture.
Self-appraisal - of common charact.

The results of the tests are analyzed by computer program (written in FoxPro). On the basis of analysis student is given coresponding recomendation. On the first step of the execution are chosen four themes: Bank's activities, Small business activities, Accountant's activities, Insurance activities.

Every theme consists of three levels of complication. Lectures are under wayed twice a month for elder form's students. All of tests are kept as a data and any time are available for students and their parents. This method will be spreaded as in economics different fields, also in different subjects, which aren't taught at school.

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Country: Georgia
Team: GEO-2
Name: Bokeria, Levan
ID: GEO2-LB-Stu
Presentation ID: CS-GEO2-LB
Title of Presentation: New Algorithm of Sorting

The problem of sorting is among the most initial issues in everyday life (such as sorting by alphabet, price listing, etc), as well as in the sphere of computer programming. There are many methods of sorting. They are all working well and perform the task of sorting.

Stage I. We would like to present a new algorithm which we named as the Pair Sorting. Let us explained the algorithm based of the following rules: on odd steps we compare neighboring two numbers, starting from the first member of the sequence and change places if needed; on even steps we compare neighboring two numbers, starting from the second member of the sequence and change places if needed. It is easy to observe that the algorithm is well functioning and will perform sorting for any initial sequence. We also attached the mathematic proof of its correctness. The number of operations does not exceed classical methods. The algorithm itself is easy for programming realization.

Stage II. Quite often we have a problem that sounds as the following: there are given two sequences, which have to be arranged in a ascending or a descending way. We could easily make one sequence out of these two and sort it using any classical (or our) method. But if we know that these sequences do not have equal meaning (for example, there are more big numbers if the first one compared to second) it is likely to sort them separately and then unite – find the place of the first member of second sequence in the first one and last member of first sequence in second one. And so limit the area of sorting (decrease the number of operations).

Stage III. Very often we are not looking for 100 per cent result in sorting. In this case after preliminary investigation of the sequence, we can apply the method of heuristics, in other words arrange the sequence in a particular desirable probability.

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Country: Georgia
Team: GEO-1
Name: Burdiladze, Levan
ID: GEO1-LB-Cap
Presentation ID: CS-Geo1-LB
Title of Presentation: Merlin – A Student Math Assistant

This computer program can be of great assistance to students who work on a particular project and need calculation. There are some things that computers are unable to do. For example, calculations in huge numbers, but if we teach the program human way of calculation, we can get the desired result.

"Teaching" means writing a mathematical algorithm scripts in a language that is understandable for a computer and put it in our program (In our application we use the programming language Pascal).The whole program consists of small scripts that can be added by students themselves. If they need to use any of them ,they just write the name of a script or select it from a list (where these names are added automatically after writing a new script) and then write the appropriate expression.

For example let us take the simplest one an ordinary calculator. The student inputs the name "Calculator" and the expression. In order to analyze this expression, the program uses elementary methods of state machines and calculates the answer.

In our project we have a few examples of scripts, among them there are ones that calculates factorials of 100, 200, etc., multiplies large numbers, calculates expressions that uses fractions and so on.

The program has a user friendly interface based on using Microsoft Agent character Merlin.

The main idea of the project is to create a human-like calculator and eliminate the difficulties with huge numbers, but as far as students can put some other useful scripts in it, the program will turn out to be a library of mathematical algorithm scripts.

Country: Brazil
Team: BR
Name: Pontes Faria, João Felipe
ID: BR-JF-Stu
Presentation ID: CS-BR-JF
Title of Presentation: Hadron’s Energy Reconstruction Using Neural Networks in Particle Collision Experiments

In particle collision experiments to be run at CERN's (European Organization for Nuclear Research) particle accelerator, measurements of the energy of hadrons that will be generated in the events will be made by TileCal (a calorimeter consisting of several scintillating tiles). However, it is already known from “test beam” results that the TileCal's signal will yield strong non-linearity and poor energy resolution, resulting in the difficulty of data interpretation, thus making necessary the signal's reconstruction for optimal use of gathered data.

Neural networks are very effective tools for non-linear data and signal processing. In this way, neural processing is an attractive alternative for the linearization of TileCal's measurements, making possible the correct evaluation of physical properties of particles and event analysis in general.

Simulations were made training the neural network with data from "test beams", experimental sessions in which beams of known energy bearing pions were fired directly against a mount of various sensors, including a prototype of TileCal. The obtained results indicate that neural processing of the calorimeter's signal is appropriate and has great potential, bringing significant improvements in linearity and energy resolution of the measurements.

Country: Georgia
Team: GEO-1
Name: Tsotseria, Helen
ID: GEO1-HT-Stu
Presentation ID: CS-GEO1-HT
Title of Presentation: Calculation of enforcing by computer modeling

The given computer model enables to calculate the general area of enforce for right-angled section concrete constructions.

To select the inforce we need to know bend degree of concrete design, the same as bending moment, which we get from the theory of material resistance.

Existing global computer programs follow moment select enforce just monosemanticly.

For the other versions you need to make a change in program and calculate it repeatedly, or just analytically, which takes a lot of time.

Program presented by us solves and simplifies this problem. It enables us to consider various versions on basis of data's arbitrary change in a short period of time.

This program can be easily used by architects, engineers and builders. This program is already offered to one of the Georgian building company.

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Country: Russia
Team: RUS-1
Name: Dyachenko, Vasily
ID: RUS1-VD-Stu
Presentation ID: CS-RUS1-VD
Title of Presentation: BACK-IN-TIME DEBUGGER (A DEBUGGER WITH AN OPPORTUNITY OF RETURN PERFORMANCE OF PROGRAMS)

1. Statement of a problem. The significant part of efforts on development of the software is spent for debugging. However standard debuggers, such as GDB, do not allow tracing action of the debugged program in the opposite direction. By use of such debugger after occurrence of an error it is necessary to restart the debugged program anew for continuation of debugging. Absence of an opportunity to execute the program in an underside is essential lack. For example, in case of when at restart of the program to reproduce actions which have led earlier to an error, is very difficult. All existing debuggers have essential lack: they demand that the program was compiled in special bytes-codes. To take any executable file and to start work with it these debuggers cannot. The purpose of the work is to create the debugger that is capable to carry out the program in a underside but not adhered to any programming language, byte-code, the virtual machine or having any other restrictions of a similar sort.
2. The Description of program BIT Debugger. Program BIT Debugger represents a debugger under the operational system Linux, possessing the basic functions of any traditional debugger. The program is developed on the basis of widely widespread standard debugger GDB. The main feature of BIT Debugger is the opportunity of recoil of the debugged program to the previous status. Besides the standard operations inherent in an ordinary debugger, BIT Debugger possesses following opportunities:
- Restoration of earlier state of the program saved manually is direct during debugging.
- Recoil of the program back on the certain number of lines of the source code of the debugged program.

3. The Principle of job of commands of restoration of a state. The idea of restoration of the previous state of the debugged program consists in cloning of process of the debugged program by system call fork(), which exist in operational system Linux. In saving and loading of one status of the program it is possible to allocate four stages:
1. Process of the debugged program is cloned by system call fork(). For this purpose the necessary sequence of commands is inserted into an executed code of the debugged program directly at debugging. We get two processes: parent process and child process.
2. The parent process stops and waits for end of job of the child process.
3. The child process continues the performance. BIT Debugger is switched to its debugging.
4. When it is necessary to restore a former state of the program for a moment 1, BIT Debugger finishes job of the child process, and the parent at once continues job from that place in which we cloned it and have stopped. BIT Debugger it is switched to debugging the parent process.

It enables to save one state of the program and later to load it. Repeating the given operation some times, it is possible to get necessary number of restoration points. Then it is possible to restore any of saved before states of the program. Creating on a point of restoration on each line of the source code of the program, it is possible to roll away the state of the debugged program on the certain number of lines back. There is an opportunity to create such points of restoration through the big number of lines of the source code of the program.
4. Conclusions. During job the opportunity of creation of the debugger which can return to the previous state of the program for the most widespread languages is shown.

Country: Russia
Team: RUS-1
Name: Dmitrenko, Kirill
ID: RUS1-KD-Stu
Presentation ID: CS-RUS1-KD
Title of Presentation: The algorithm for course organization in distant education system

The work is aimed to the algorithm development for the control part of the distant education system. Usually such systems are organized by linear algorithm and every pupil has to pass the definite way of education that is proposed by the author. But different users have different levels of knowledge and possibly different purposes of education. So it is actual to develop the adaptive algorithm that allows to form individual course for every pupil.

As a result of the work the algorithm was developed. The algorithm is based on least-squares method. The initial data for the algorithm are the results of the user work (it is necessary to have at least 2 sequent results for beginning). The results must be converted to the digital form in order to be formalized. They are saved in the data base. The system uses all information about pupil's errors during forming the next task. After that new pupil knowledge level is calculated by use of the least-squares method. Then the task is formed that contains the most problem for this user exercises.

The algorithm was realized in the Russian language distant education system "Vedi" (http://vedi.aesc.msu.ru).

The system consists of Russian language rules set used by pupil during the work. It consists of all rules one can meet in tasks. Pupil gets the task where he has to put right letters and punctuation symbols in marked places. After doing this he gets a text with corrections of his errors. Throw following links pupil can understand what mistakes he made. There is also a page where one can find all information about his errors and success in system and maybe study new rules.

Country: Czech Republic
Team: CZ-2
Name: Smrz, Roman
ID: CZ2-RS-Stu
Presentation ID: CS-CZ2-RS
Title of Presentation: Non-linear interactive story-telling

Nowadays computer games, although called “interactive entertainment", usually fail in providing truly interactive narration even if a story is the main property of the game. A player is usually forced to follow the only way given to complete the game. Sometimes the story is divided into a few branches (which either join together again or offer few possible endings), however this is just a little of the potential computer technology has. If the authors would like to give many possibilities to the player using the classical branching system, they would have to write really huge scenario and the size of the plot grows exponentially with the number of branching decisions the player would have and still remains too large even if some branches are collapsed together. And, moreover, the player only sees a very little part of the whole scenario while playing one game.
Another way is not to fix the narration from the beginning and take a scenario as a set of scenes among which the player can choose while playing. We also introduce variables with different possible states that change while playing the game. Variables are used as prerequisites for scenes, which need some specific conditions to be played. Special care needs to be taken to provide coherent narrative, or in other words to ensure that the game can be completed no matter the decisions player take and also to the strategy of selecting scenes that are chosen by the computer.
On these principles, a game engine is constructed which can read the scenario and maintain the gameplay. It can be used either as a library or a base for a more complex program to create a game with really interactive narration.

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Country: Czech Republic
Team: CZ-1
Name: Cibulka, Michal
ID: CZ1-MC-Stu
Presentation ID: CS-CZ1-MC
Title of Presentation: The difficulties of quantum computers and quantum cryptography

The goal of my project is to warn about the problems and the difficulty of setting quantum technologies in practical life. In my work I am concerned with quantum computers and quantum cryptography, which is implemented from security point of view into this environment. The first ideas of quantum computers appeared in about 1980‘s and they are still in great development in research institutes. The experiments that led to these ideas are for example the 2-slot-experiment and also a well-known experiment with 2 beam-splitters. (We could expect that there is a 50% chance that the photon will be caught up in the detector D1 and the same chance that the detector D2 will catch the photon, but as the experiments show, the beam of photons will be caught up always in the same detector. We found out that the photon interferes with itself, so the beams will be interrupted in one way.)
Quantum computer is a device that is able to compute in parallel, so if quantum computers spread worldwide, it would mean a huge efficiency of treating the information. The methods, for example trapped ions or nuclear magnetical resonance, are used in laboratories for building a quantum computer (its main parts).
I think quantum computers contribute more to development of quantum physics than the computers themselves. But if the development makes a great progress and the troubles with the phenomenon of decoherence seem to be overwhelmed, then it would be excellent. Another part of my work is quantum cryptography.
Quantum cryptography tries to solve a problem with transmission of key between
2 communicating people. There exists a protocol for safe sending a key based on quantum mechanics. The protocol is called BB84.
The difficulty of realization of quantum cryptography consists in not only technical problems but also in verification of keys on public channel. The disturber thus can take an advantage of being a second ahead and gain secret information. The weakest parts of the realization are the developed base for authentication of public key, the velocity of transmission, which is nowadays about 2 kbit/s, and also the distance between the people communicating. This problem is serious, because the energy of photons is getting weaker and weaker and we cannot use amplifiers, because they change the polarizations of photons. Today’s record is about 122 km.
The last problem is the slight error rate caused by detectors, physical properties of transmission channel and the distance. Because of this error rate there can rise wrong polarizations and it’s hard to differentiate them from wrong polarizations, which were caused by eavesdropping. This error rate is between 0.4 and 10%.
The conclusions of my research: The difficulty of implementation of quantum technologies into practical life consists in:
In technical realization, where physical interrupting of a physical phenomenon (for example interrupting of communicating channel) can occur wherever and whenever.
In proceeding of a quantum protocol for exchanging a key (because we cannot suspend random sending of photons from hackers, which will not be seen by the group of people communicating)
The difficulties of the quantum cryptography in contemporary modern world is in transmission speed, which doesn’t correspond with high-speed transmission in optical environment (100Gb/s) and in the distances which play their role in global world.

Country: Poland
Team: PL-1
Name: Niedzwiedz, Piotr
ID: PL1-PN-Stu
Presentation ID: CS-PL1-PN
Title of Presentation: The genetic algorithms

1. The genetic algorithms are searching algorithms based on the mechanisms of: natural selection, heredity and random elements(guaranteed by the generator of pseudo-random numbers).

The way they work reminds of the biological evolution. Our algorithm creates successive generations of organisms (the sequences of bits), made of the best-adapted fragments of the previous generations representatives, and partially mutated ancestors. This mechanisms are very effective, what can be proved by numerous empiric research (including mine).

2. The elements of the genetic algorithms.

a) the way of encoding of the genotype:

-binary sequence -binary tree

b) objective function- the algorithm compares 2 organisms, indicating better of them (better-adapted). Thanks this function, we can sort the organisms on account of their adaption.

c) selection methods -they enable the optimal choice of the new organism's parents, in other words, stronger organisms are chosen parents more frequently than the weaker ones:

-roulette method- stronger organisms occupation bigger area of the circle.

-ranking method- we sort organisms with use of objective function, and the permission to reproduce is given only to the first “k” of the organisms.

d) searching operators:

- crossing
- mutation

- local evolution (connected with analytic methods)

3.Application:

NP problems (they cannot be solved by means of any algorithm working at the polynomial time). Example: finding the Hamilton cycle in graph with minimal cost (which is known better as “ the traveling salesman problem”).

searching the extremes of n-dimensional functions

finding optimal parameters of the boots which play the games(games without winning strategies)

we use them in order to solve all the problems of optimalization, as an alternative to the algorithms based on following methods:

* analytic
* randomized
* enumerical

Country: Brazil
Team: BR
Name: Figueras, Sergio Luiz Wermuth
ID: BR-SF-Stu
Presentation ID: CS-BR-SF
Title of Presentation: DNB Project

The Project is directed to computer sciences, and tries to solve health problems, caused by a disease known as LER, (Lesion by Repetitive Effort). I have two main goals: build a voice recognition free platform engine, which is compatible with new recognition techniques and error verification engines and eradicate LER (Lesion by Repetitive Effort), as an issue in the programming market.
I'm creating a programming language editor that obeys voice command. Programmers don't need to type the commands; they just need to say them, without using the keyboard at all. Market programmers affected by LER will be able to work again. Visually deficient programmers will be able to use the editor, and through voice synthesizing modules they will be able to check the codes, allowing them to create software through speech.
The engine is compatible with various computer architectures, and it relies on neural nets applications and artificial intelligence to reach a broader performance and recognition rate than current engines, improving its biometry while supporting programmers, with new methods.

International Conference of Young Scientists Stuttgart 2006

XIII[th] IYCS - 18[th] to 23[rd] of April 2006 – Stuttgart/Germany

Country: Belarussia
Team: BY
Name: Budnik, Andrew
ID: BY-AB-Stu
Presentation ID: CS-BY-AB
Title of Presentation: MODELING IN THREE-DIMENSIONAL GRAPHICS AND VISUALIZATION BY MEANS OF HARDWARE

Goals and Objectives:
The main goal of the work has been to develop an editor and a visualizer of photorealistic three-dimensional graphics by means of hardware for the modeling of the process of scenes image acquisition in the systems of architecture design. To attain the goal, we needed:

- to study the imaging process in three-dimensional graphics as well as libraries of Microsoft Direct3D, DirectSound3D, DirectInput, editors, using hardware and programming 3D-imaging tools: 3D Studio Max, Quark, editors Quake 3 Radiant, Doom 3 Radiant;
- to research the facilities of three-dimensional graphics editors;
- to study the methods of three-dimensional graphics construction;
- to study the following programming languages: Object Pascal 7.0 and Assembler in the environment of Borland Delphi, Visual C++ 7 in the environment of Microsoft Visual Studio 7.0.;
- to study the programming language of vertex and pixel shaders (symbolic language of machines manuals, addresses and data for video cards);
- application of shaders to obtain a photorealistic graphics;
- development of an editor and a visualizer of three-dimensional graphics.

Methods of solution:
A vector-polygonal method, utilizing programming and hardware tools (namely a three-dimensional accelerator), has been used to image three-dimensional scenes in real time.

Scheme of the Project Implementation:

1. Entry of the image projection data;
2. The data processing and a file composition for modeling;
3. Level updating by scaling and separate elements changing;
4. Addition of sound and light sources;
5. Imaging.

Brief description of the Program:
The present development consists of two programs: an Editor and a Visualizer which are implemented in the following programming languages: Delphi and Microsoft Visual C++.

The following facilities are implemented in the Editor:

- Development of an image projection level and a perspective image view;
- Updating of the level by means of scaling and separate elements changing;
- Addition of sound and light sources and their parameters changing;
- Copying, pasting, deletion of objects, sound and light sources;

The following facilities are implemented in the Visualizer:

- Loading of the environmental parameters from the configuration file and from the level file;
- Imaging of an object;
- Creation of shaddy volumes from the light sources for the objects, found in the field of light;
- Stereo-sound realization;
- Modeling and Control over the camera navigation process (control of impacts, gravitation);

The program in question makes use of the base of standard images and sounds;

Results of the Program Implementation:
Realization of a stereo sound and an image of the projected object with the use of textures and shaddy volumes from the light sources.

Conclusion:
An interest towards a development of complex graphical constructions with the use of PC has increased significantly lately. The theme of the computer graphics is really relevant now as never before. It's applied practically everywhere for example to create commercial films, bumpers and video clips. The present software product is easy to use and provides wide facilities in modeling for design engineering firms in such fields as mechanical engineering, architecture, building.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Germany
Team: D-2
Name: Fazlija, Arber
ID: D2-AF-Stu
Presentation ID: CS-D2-AF
Title of Presentation: Bio Sim - Technical simulation of biological organizations structures

There are a lot of different amazing behavior patterns in the animal realm. One phenomenon, for example, is the clustering of fishes or birds.
Our aim is to compare these behavior patterns of the animal realm with the behavior patterns of our five self-programmed robots.

Those robots, originally assembled more or less by chance, with the aid of distance and light sensors, have to induce to a higher organization. Those at the beginning coincidentally arranged robots have to induce, with the aid of distance and light sensors, to a higher organization.

Our ambition in this context is to set up a collective circle driving.
In many experiments we could prove and simulate such higher behavior patterns.
Thus it developed for example to a queues and circle sample.
There are no hierarchical patterns between the robots, because each of the five robots has got the same C++ program on his micro controller.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Netherlands
Team: NL2
Name: van der Berg, Freark; van der Wal, Djurre
ID: NL2-FvdB-Stu, NL2-DvdW-Stu
Presentation ID: CS-NL2-FvdB/DvdW
Title of Presentation: The Waterfall Legend

Our project ? a water cannon which, connected to a personal computer, can be controlled by a program (which was written by us as well). This program can function as a server on the World Wide Web: this way, clients from all over the world are able to use the water cannon. You can sprinkle your garden from the other side of the world, shoot at your friends (and enemies of course) from behind your personal computer… The Waterfall Legends offers great possibilities!

The goals of The Waterfall Legend were:
• To build a water cannon capable of hitting a target with an accuracy of approximately half a metre, on an acceptable distance from the water cannon (at least 5 metres (16,40 feet)).
• To write a server program designed to control the water cannon.
• To write a client program designed to control the water cannon over the Web.

As building material for the water gun we chose Technic Lego.
The programming language of the software became Delphi 7.0 (Object Pascal).

The water cannon has three major components: the basis, the rotation platform and the cannon itself. The rotation platform turns around on the basis component; the angle is measured by a 20-turns potentiometer. The program uses the returned voltage to determine the corresponding angle.

The cannon is placed on the rotation platform. The angle between the platform and the cannon ranges from -5 to 75 degrees. This angle is measured by a 1-turn potentiometer. Using data introduced by the user the program calculates the distance the water reaches at the current angle.
Computer and water cannon communicate by means of the USB-protocol. The water cannon uses an AnIn-Solutions-chip to receive and transmit its data. Hardware components are introduced to make the water cannon responsive to the commands of the computer. An AD-converter, for example, digitalizes the voltages returned by the potentiometers; two sets of four transistors are used to make the engines turn left or right and to control the RC-unit, which makes the cannon go up and down.

The program uses the data sent by the AnIn-Solutions-chip to create a schematic visualization of the water cannon. It shows its current status: the angle of the rotation platform (the targeted direction), the angle of the cannon and the distance reached by the water. An image can be placed on the background of the visualization, a map of the environment for example. By changing the scale of the map, one is able to target every spot.

A webcam is placed on the rotation platform, sending images to the server program; the images are also transmitted to the connected clients.

Both the server and client program have a messenger, making communication between each other as easy as possible.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Environmental Science

Country: Lithuania
Team: LT
Name: Grasevich, Ana
ID: LT-AG-Stu
Presentation ID: ES-LT-AG
Title of Presentation: Evaluation of exposure of pupils in P.Skorina school due to natural sources of ionising

Object.
Identification of possible sources of ionising radiation in school environment and evaluation annual dose of exposure to pupils
Survey has being performed at F.Skorina school in Vilnius 2004-2006.
Places for investigation were choosing are classroom of chemistry and school library.
Methods used for measurements:
Method used for indoor radon measurements is ion chambers with E-PERM electrets (Electret Passive Environmental Radon Monitor) for determining average radon concentrations in a room. In order to determining average radon concentrations, measurements using electrets radon detectors were carried for 4 weeks in the same place. Radon concentrations were measured in two places in school – class of chemistry and library. The concentrations of indoor radon were calculated.
Gamma dose rate were measured dosimeter SRP-88. Dosimeter SPR-88 with scintillation detector was used for indoor and outdoor dose rate measurements. Dose rates outdoors were measured close to school building.
Measurements of temporal variations of indoor radon concentrations and dose rate in class of chemistry were measured by radon monitor AlphaGuard and dose rate meter GammaTracer.
Contamination of ground with radioactive isotope of cesium (Cs-137) and activity of natural radionuclides (Ra-226,Th-232 and K-40) were measured by gamma spectrometry with high purity germanium detector in Radiation Protection Centre.
Sampling for radon in water determination is performed close to the water source for that reason that to eliminate the possible loses of radon during sampling. Sampling is done using pipette and sampled volume of 10 ml water is placed directly to the liquid scintillation solution Insta-Fluor(A Canberra Company) was used. Radon is coming to the organic layer and radium-226 is remaining in the water phase. Counting is performed using Liquid Scintillation Counter Quantulus, counting window is 25-900 keV, counting time – 60min.
Findings
Investigations of sources of ionising radiation at school environment and evaluation of exposure doses to pupils show that doses given by people at school did not exceed limits of Lithuanian hygiene norms.
Results of measurements gave possibility to understand different types of ionising radiation, their values, that it can not be equal to zero, to compare doses from natural sources with contamination with artificial radionuclides.
Measurements of radon in water showed that radon concentrations in rivers and lakes are very low (less than 0,18 Bq/l), in drinking water it vary from 7,1 Bq/l up to 4,6 Bq/l but after some time evaporate.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Ukraine
Team: UA-1
Name: Cherneha, Iryna
ID: UA1-IC-Stu
Presentation ID: ES-UA1-IC
Title of Presentation: Global ecocatastrophe simulation in the microcosm of the Bukovina Carpathian Flora

This work foresaw the comparative analysis of wood species, which are dominants in ecosystems after the influence of the global ecological crisis factors. Some visible test-signs registered on the plants in microcosm can be used for territory diagnostics with the increased level of the explored factors.

EXPERIMENTAL PART
Two-year-old trees were assembled in five-liter transparent plastic bottles together with soil. Acid rain was made of sulfate solutions and nitrate acids with the permanent pH = 2, which was controlled by a pH-meter. The short-wave UV-radiation (imitation of ozone holes) provided by the daily 30-minute radiation of the plants at the opened microcosm by the lamp DRB8-1 (E = 0,35 Vt/m^2, λ = 253,7 nm). Increased temperature as a result of hothouse effect was imitated by keeping the microcosm in a thermostat for 8 hours (t = +35^{0}C).

THEORETICAL PART
The global ecological crisis factors in microcosms selected are: withering of stems, leaves, turning black of stems and buds, emerging of moldings on stems, branches, buds and leaves, chlorosis of leaves and necrosis of different types: top-type, point-type, spot-type, marginal-type, “skeleton of fish” type and falling of leaves.

RESULTS
Acid rain: for *Caprinus betulus L.* – 60%, for *Fagus sylvatica L.* – 35%, for *Quercus robur L.* – 65%, for *Picea abies (L.) Karst.* – 57% and for *Abies alba Mill.* – 22%;
Short-wave UV-radiation: for *Caprinus betulus L.* – 8%, for *Fagus sylvatica L.* – 17%, for *Quercus robur L.* – 67%, for *Picea abies (L.) Karst.* – 8% and for *Abies alba Mill.* – 8%;
Increasing of the temperature as a result of hothouse effect: for *Caprinus betulus L.* – 17%, for *Fagus sylvatica L.* – 15%, for *Quercus robur L.* – 70%, for *Picea abies (L.) Karst.* – 5% and for *Abies alba Mill.* – 7%.

DISCUSSION
Among arboreal species which are dominants in forest ecosystems of the Bukovina region *Quercus robur L.* is the most sensible to all three factors of global ecological crisis, and the most steady is *Abies alba Mill.*
Among 15 selected test-signs which were observed at the arboreal plants during the imitation of global ecological crisis factors in microcosms, point necrosises is the most typical.

REFERENCES
1. Rudenko S.S., Kisil O.V., Mykhailyuk H.V. Doslidzhennya vplyvu kyslotnykh doschiv na ekosystemy dubovykh ta bukovych lisiv u mikrokosmakh. Zbirnyk naukovykh prats. Falzweinivski chytannya – Kherson: XDU, 2005, T.2 – p. 102-103.

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Germany
Team: D-1
Name: Gramich, Jörg
ID: D1-JG-Cap
Presentation ID: ES-D1-JG
Title of Presentation: Plasmabased cracking in the microwave

Our project intended to develop an equipment to crack cheap hydrocarbons in the microwave by a plasma. Additionally, it should be possible to analyze the gas mixture regarding the number of substances which are in it and their respective quantities. With the identification of the cracking products, it should be possible to research into the chemical reactions. Our equipment should have high flow rates, so that you can use it for industrial applications.
The equipment we developed makes it possible to crack the educt while it passes the equipment. The equipment consists of the supply of educt, the microwave, the reactor in the microwave, the portioning of gas, a self-built gaschromatograph with flame-ionization detection and a computer with a self-written analysis software.
The cracking reaction is made possible by plasma discharges between activated carbon pellets. The plasma discharges are induced by the field of microwaves.
We analysed our gas mixture with our self-built gaschromatograph. Our results were verified with gaschromatographs and GC/MS of the University Stuttgart.
The main gaseous substance which originates from the cracking reaction of longer hydrocarbons (dodecane, hexadecane, …) is methane. Further on, ethyne, propene, butene and 1-pentene arise from the cracking reaction of dodecane. By a variation of the reaction pressure it is possible to change the respective quantities of the products of the reaction.
Our suggested reaction mechanisms are radical mechanisms. Our reaction mainly proceeds by a separation of methyl and other radicals which are stabilised by hydrogen of moieties. The reaction is catalysed by the surface of the activated carbon pellets.
The developed equipment can therefore be used to recycle plastics, as laboratory equipment to produce laboratory gases and to convert longer hydrocarbons into shorter hydrocarbons which are often more important for industry. You can also apply our new technique as a universal recycling procedure, e.g. for waste oil so that you can dispose of most of it without transporting it to bigger factories.

Country: Macedonia, **Team:** MK-2, **Name:** Jovanoska, Milica; Ognjanoska, Marija, **ID:** MK2-MJ-Cap, MK2-MO-Stu, **Presentation ID:** ES-MK2-MJ/MO, **Title of Presentation:** Polluter and polluting substances in air of Macedonia

Air Pollution, addition of harmful substances to the atmosphere resulting in damage to the environment, human health, and quality of life. One of many forms of pollution, air pollution occurs inside homes, schools, and offices; in cities; across continents; and even globally. Air pollution makes people sick—it causes breathing problems and promotes cancer—and it harms plants, animals, and the ecosystems in which they live. Some air pollutants return to Earth in the form of acid rain and snow, which corrode statues and buildings, damage crops and forests, and make lakes and streams unsuitable for fish and other plant and animal life.

Pollution is changing Earth's atmosphere so that it lets in more harmful radiation from the Sun. At the same time, our polluted atmosphere is becoming a better insulator, preventing heat from escaping back into space and leading to a rise in global average temperatures. It is predicted that the temperature increase, referred to as global warming, will affect world food supply, alter sea level, make weather more extreme, and increase the spread of different disease.

We want to safe our only planet but we couldn't do that alone. We need help from all of you, to be responsible about our mother nature. The Earth provide us like human beings and only thing that she asks from us is to protect her and care about her ozone layer, green places, clean water.

We investigated air pollution in our country, Republic of Macedonia for public object and industrial places.

Country: Macedonia
Team: MK-1
Name: Jovanova, Blagica
ID: MK1-BJ-Stu
Presentation ID: ES-MK1-BJ
Title of Presentation: What can we do to shrink the ozone hole?

The problem with the ozone hole is known for a long time. However, its dimensions are enlarging each year, and the possibility of its shrinking decreases. Nevertheless, this shouldn't place us pessimism: we shall hope that there is still a possibility of the ozone hole shrinking.
The entire planet's surface can be used for both storing and delivering the electrical energy. An early Tesla's invention provided a method for producing a great amount of ozone at the bottom of the planet's ionosphere as well as the top of the stratosphere, to compensate for the lost ozone. Tesla concluded that if high-voltage alternating sinusoidal waves are injected directly into the surface of the Earth, at certain well-defined specific frequencies, those waves would travel in all directions, converge, and pass through each other on the opposite side of the Earth, exactly at the point they were injected before.
Still, his invention hasn't been implemented, because of some political as well as economical issues (probably the large amount of electrical energy needed for the apparatus). However, nuclear and other types of plants are not the only source of electrical power. As the technology goes up to perfection, they can now be replaced with devices called photovoltaic systems which can absorb and transform the Sun's energy directly into electrical, without making any noise. And the most important thing is that they are economical.
Everything needed for the creation of these waves is: a high-voltage transformer, good Earth's surface and a spherical conductor. The whole apparatus has to be set on the Antarctic, where the ozone hole problem is the biggest.
During the winter period, the photovoltaic systems cannot work. Although accumulation devices might be used, the period from May till July, when the Sun doesn't heat the Antarctic surface, is a considerably long time.
There is a solution for this problem too: if a satellite is sent in space which will have a contact with other satellites who can reach the Sun rays, this satellite would send waves into the atmosphere that will increase the kinetic energy of the electrons etc., and in this way, the process could continue despite of the winter period on the Antarctic.

Country: Macedonia
Team: MK-1
Name: Stoimenova, Dragana, Petrova, Elena
ID: MK1-DS-Cap, MK1-EP-Stu
Presentation ID: ES-MK1-DS/EP
Title of Presentation: Our school´s students: Guards of the rivers in our community

My town, my community - the community in which I live and study is called Vinica and takes place in the eastern part of Macedonia, on the base of the mountain of Plackovica. All of the three rivers: Bregalnica, Osojnica and Vinicka Reka, are flowing through its territory. We are taking samples from their water from the river beds, and by chemical procedures, approve the contamination of the water. When analyzing the results we've ascertained that the river of Bregalnica is very contaminated. After one week, we've repeated the analyses and got an attestation of the previous results.

We ask ourselves: What is a contamination? Well, that's a permanent disorder of the natural cycles' balance. We mustn't just stay mute observers to the contamination. We should do something! But what? We've invited the people from our community and presented the results from our analysis. They informed us that they had forecasted an action for decreasing the water contamination. After getting a positive answer, we've decided to take part. We've planned a campaign for the needs of the action, so now You will have the opportunity to see it. How much has it helped? A lot! THE NATURE CANNOT SURVIVE ALONE.

Country: Hungary
Team: H
Name: Takács, Marcell
ID: H-MT-Cap
Presentation ID: ES-H-MT
Title of Presentation: Radioactivity in nature

Most people fear radioactivity and don't like the word 'nuclear'. The use of nuclear weapons and nuclear catastrophes could be the main reasons of that. However, we cannot hide from nuclear radiation because radiation surrounds us everywhere. This radiation is called natural background radiation. Furthermore, our body is also slightly radioactive. Radiation is caused by decay of radioactive nuclides, which were produced long-long time ago in exploding stars and some of them are still around us in nature. The most significant isotopes are the ^{40}K, ^{232}Th, ^{235}U, ^{238}U. The last three are the starting point of the three different naturally occurring decay chains.
In this research I investigated the activity rate of the materials which surround us. I collected different samples of soil, stone and building materials. I measured the emitted gamma photons of 5 different types of sand samples, loess, forest soil, black soil, lick soil, bentonite, dolomite, pebbles and cement samples. For the measurement I used one of the low background high purity germanium semiconductor detectors of the Institute of Nuclear Research of the Hungarian Academy of Sciences. First I measured the detector background with no sample in the sample holder on the detector. After the measuring process I analysed the spectrum with a computer program called FGM and determined the peak areas of the photo peaks. Then, I identified the gamma-lines, which appeared in the spectrum with the help of an internet based nuclear database.
In the second part of the experiment I measured one by one the above mentioned samples. Each sample was desiccated, then homogenised. Sample with volume of 1,1 dm^3 was filled in a special sample holder and was placed on the detector. At least two day-long acquiring time was applied.
After measuring and analysing the spectra I compared the received data. I observed that the samples, which contain clay, are more radioactive than the others. Moreover, I observed that the ^{137}Cs isotope is present in the soil samples taken from near surface. This isotope is of anthropogenic origin, a man-made radioactive isotope. ^{137}Cs comes from the catastrophe of Chernobyl. When the nuclear reactor exploded huge amount of man-made radioactive isotopes were released into the atmosphere, such as this isotope of cesium.
The aim of the investigation was the better understanding of the origin, the sources and the intensity of the natural background radiation. I hope this investigation brings closer to us this interesting natural effect and can help to accept the safe and peaceful use of nuclear technology.

Country: Poland, **Team:** PL-2
Name: Gorecki, Sebastian; Chrobak, Wojciech
ID: PL2-WC-Stu, PL2-SG-Stu
Presentation ID: ES-PL2-WC/SG
Title of Presentation: Measuring of food radiation

26th April 1986 in Czarnobyl on the territory of today's Ukraine there was the greatest catastrophe of a nuclear power station in the world. In this disaster a lot of radioactive materials got into the athmosphere. The radioactive cloud was carried with the wind and approached Poland. The radioactive isotope iodine caused a growth in number of thyroid's illnesses and caesium got into the ground and it has been and still will be polluting it for the next 200 years. Caesium-137 is now being abosrbed by plants.

The accident in Czarnobyl and many other sources of radioactive elements have caused a severe growth of food pollution on the territory of Poland. The results of our work and investigations will be presented at the International Conference of Young Scientists 2006.

The presentation contains concept information about natural radioactivity and radioactive elements that are present in our environment. Elements such as Calcium-40 or Caesium-137 get to our bodies in many different ways. Caesium gathered in the ground is absorbed by plants, also by vegetables and grass. From vegetables this element gets directly into our bodies. Animals get ill by eating grass and people - by eating animals' meat. Also in woods there is a raised level of radioactivity. Organisms such as mushrooms or fruits like berries tend to gather the above elements.

Investigations of Polish Nuclear Agency show that after Czarnobyl's disaster the level of pollution of mushrooms and berries in the East of Poland has exceeded the normal level even by few houndred times. However, such a high level was only registered on few areas.

The purpose of our study was to carry out a comparison investigation of β-rays radioactivity of many different kinds of food. We have examined such food as: mushrooms (from different parts of Poland), dairy products and other kinds of food that tend to gather radioactive elements.

Our experiments and data gathered from them allowed us to find out that after the disaster in Czarnobyl the level of radioactivity has grown, especially in the East of Poland. However, it does not exceed the admissible values, so we do not have to worry that if we drink too much milk or we eat to much bread we will be ill. But we have to remember that food is not the only source of radiation in our environment.

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Country: Czech Republic
Team: CZ-2
Name: Bendlová, Tereza
ID: CZ2-TB-Stu
Presentation ID: ES-CZ2-TB
Title of Presentation: Transportation emissions – problems and their solutions, Cycling transport

The increase of transportation brings about various problems in social and environmental areas (impact on human health, damage to ecosystems, climatic changes, etc.). At present, air pollution caused by transportation is very serious in developed countries and it is continually growing. In this context, road transportation has the most significant responsibility for this negative impact.
In this work the types of transportation emissions and their negative environmental impacts and negative impacts on our health are discussed. I propose these possibilities on how to reduce transportation emissions:
support of the public transportation and cycling transportation
preference of environment friendly modes of transportation
improvement of transportation organization
Some observations from Norwegian transportation organization are compared with the situation in the Czech Republic.
The main part of this work is the evaluation of the self-made questionnaire regarding cycling as an alternative mode of transportation. The aim was to find out how many people would prefer this type of transportation in Prague, and to ascertain the details about their calls for improvement of this healthy mode of transportation.

Country: Indonesia
Team: RI
Name: Desy, Christina
ID: RI-CD-Stu
Presentation ID: ES-RI-CD
Title of Presentation: Recycling A Ton Of Wasted Paper And The Whole World

People use paper everyday. They use them then make them as the wasted one. After that, producers just produce the paper over and over again. They take the source, the wood, from the forests, manage them, and produce the paper. Fell the trees of the forests, and destroy the nature. We all know about this. And we have got to handle it because it is getting danger for us. Besides, there are the consequences we have to bear for our act to the nature, especially the forests, for all this time, such as floods and landslides. Some ways are found as the effort to minimize all those problems of forests damage, including the recycling way. The recycling way will be dug more here, in this scientific opus. But, the focus will be about what is the connection between the ton of wasted paper that will be recycled, to our environment, our world. And for sure this will lead you to a thought that this way is an ideal solution to face the natural disasters because of these forest's damage.

Country: Brazil
Team: BR
Name: Paolillo Neto, Victor
ID: BR-VP-Stu
Presentation ID: ES-BR-VP
Title of Presentation: EVALUATION OF THE QUALITY OF THE WATER OF WEIRS DESTINED TO THE SUPPLYING OF THE BOVINE FLOCK IN THE EMBRAPA PECUÁRIA SUDESTE

Considering the great importance of the water to the various ecosystems in the planet as well as the degradation process to which the hydro resources have been exposed, it is obvious that there is a need to find new ways to preserve the aquatic ecosystem and assure the maintenance of life.
In this project it was carried out an environmental diagnosis of three weirs: Casarini, Colônia and Mata, situated in Embrapa Pecuária Sudeste which has different uses for the water, pointing out the water supply for the cattle. The Casarini, Colônia and Mata weirs are different from each other in the land use: agricultural area, urban area and vegetative area, respectively.
In order to carry out the environmental diagnosis, physic-chemical parameters of the water of the weirs were analyzed: temperature, pH, conductivity, dissolved oxygen, water transparencies and nutrients. Toxicological tests, chronic and acute, were also carried out, using Daphinia similis and Ceriodaphinia silvestrii.
A protocol was applied to make a brief assessment of the habitat diversity in order to check the current conservation level of the weirs' ecological conditions.

Country: Brazil
Team: BR
Name: Buscariollo, Bruna Nunes
ID: BR-BB-Stu
Presentation ID: ES-BR-BB
Title of Presentation: Reuse of cartonated packages in civil construction – Social, economic and environmental solution

The destination of residues, leftovers of human activities, is an environmental problem all over the world. The cartonated packages, used to better conserve the food, are one kind of residue very common in domestic refuse.

The project's attention is related to the destiny of these packages after being consumed, as 78% of them are not recycled annually. They were reused as civil construction material with the function of thermic isolating in a roof blanket shape.

The thermic blankets were tested by experiments where the benefits they could bring were measured. A comparison was done between a wooden house with the thermic blanket, and another without it, and they were exposed under the sun for some hours. Also it was verified the behaviour of the package blanket in places with high and low temperatures, using recipients with some water to simulate the inside of the houses.

The efficience of the packages as a thermic isolating was proved. In cold places, the blanket maintains the heat inside the houses, keeping it more heated. The blanket has kept the house interior up to 12°C more heated. During hot days, the blanket reflects the solar rays and keeps the interior of the houses fresher up to 10,5°C.

The quality of thermic isolating that these packages have is due to a slim aluminium layer that composes them. This layer is able to reflect the infrared radiation.

The production of this blanket doesn't request any specialized labour, besides being very cheap. It can be utilized in schools, factories, and mainly in popular houses, where the destitute population suffers from the thermic discomfort. So the reused packages solve efficiently a social problem.

Because it has a low cost, and also for being a cheap way of treating a residue without spending a great amount from the public administrations budget, the packages blankets resolve an economic problem.

At least, they solve an environmental problem, related to the destination that this kind of residue has, and related to the impact it has on the environment.

Country: Brazil
Team: BR
Name: Ogashawara, Igor
ID: BR-IO-Cap
Presentation ID: ES-BR-IO
Title of Presentation: Study of Aquatic Macrophytes for reduction of the level of eutrophication and heavy metals in the water using a biological technique

Eutrophicantion is the enrichment of plants nutrients, mainly phosphorus and nitrogen. It can or can not be beneficial, and the eutrophication can be natural or artificial. It does not cause pollution, because an aquatic environment needs eutrophication to develop itself. Of course we are talking about the beneficial and natural eutrophication. However the bad and artificial one is rather harmful.

In Brazil, many cities don't have the basic sanitation. This leads to the pollution of underground water os the Guarani's Aquifer – one of the largest in the world. And if we pollute its water, it will take a long time to stabilize itself again. Another problem is the contamination of the water by heavy metals, which leads to diseases.

The manifestation of the toxic effect is associated with the amount and can spread to all the organism, affecting some agencies, modifying the biochemists processes and cellular membranes.

Considering these problems and also the heavy metals issue, this project aims at diminishing the eutrophication level and the level of heavy metals in the water using aquatic plants (aquatic macrophytes).

It was developed at São Carlos' International Institute of Ecology (IIE). And it used water from the Gregorio River (an important stream that cuts the city of São Carlos). I used 2 boxes of water with 500 liters of water colleted from the river. Were used that zinc capsules.

Then, 2 species of aquatic macrophytes were put in the boxes, and analyses of:

- Nutrients (phosphorus and nitrogen) by the methodology os Carlson modified by Toledo and methofology of Kjedahl;
- Metals;
- Properties of the water by the Horiba's sounding lead, were carried out.

As I had expected, the aquatic macrophytes absorbed the nutrients from the water and they actually absorbed heavy metals as well.

Country: Croatia
Team: HR
Name: Stimac, Lana
ID: HR-LS-Stu
Presentation ID: ES-HR-LS
Title of Presentation: The influence of the habitat on the quality and quantity structure of flavonoids in plants

In many cultures in the world plants are used as cure in traditional medicine. It takes a lot of hard work to explore and standardize plants. With this project we'd like to find out more in this field. The influence of habitat and location where the plants were found on the quality and quantity structure of a plant is being explored. The quality structure refers to the presence of a certain flavonoid in a plant and quantity structure to its quantity. Flavonoids are secondary herbal metabolites that have lots of positive biological influence to humans. Today they are being intensively explored, especially because of their anticancerous activity. Chromatographic analysis is a method for separation of substances used when the components have similar physical-chemical features. Using the method of a thin layer chromatographic analysis we have detected which flavonoids are present in birch-tree, elder, sage from locations at different place in Croatia. The project confirmed that there will be visible differences in the flavonoid concentration and type in the same sort of plants from different locations. It's important to write the correct information about the location where the plants were found , their habitat, structure and the way how to label the herbal products.

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Country: Croatia
Team: HR
Name: Music, Larisa
ID: HR-LM-Stu
Presentation ID: ES-HR-LM
Title of Presentation: CHARTING OF THE *LEUCOJUM VERNUM L.* , THE *FRITILLARIA MELEAGRIS L.* AND THE *MYRICARIA GERMANICA (L.) DESV*

Key words: the charting, the number, the coverage, the endangerness of the species, *Fritillaria meleagris L.* , *Myricaria germanica (L.) Desv.* , *Leucojum vernum L.*

Lack of information about the great number of vegetable species in Međimurje (the region in the north-west of Croatia) inspired us for this research. Among the species which can be found in the Red book and haven't been mentioned in the region of Međimurje , we have chosen the spring snow-flake (*Leucojum vernum L.),* guinea hen-flower (*Fritillaria meleagris L.)* and *Myricaria germanica (L.) Desv.* The research lasted from 1999 till 2005. By means of questionnaire by the survey among the students of our school, we had collected the facts about the locations and then we charted the locations of the mentioned species by GPS, estimated their number, coverage and sociability using the Braun- Blanquet method. We have charted seven locations of the spring snow-flake (*Leucojum vernum L.)* , which has been mentioned in the Red book from 1994 as a vulnerable species (VU). In the Red book from 2005 it isn't mentioned. Its number has been obviously decreased on some locations during the research period. We also searched seven guinea hen-flower locations. In 1994 it was categorized as the endangered species (E), and in 2005 it was critically endangered (CR). In our research the number of the guinea hen- flower has declined on the most locations comparing with the number of the very first year. All locations are near the river Mura and the spring Trnava. Two locations of *Myricaria germanica (L.) Desv.* which was endangeret species in 1994 (E) and in 2005 critically endangered specie (CR) have been charted. The main cause of their's disappearance is destroyment of their locations by human activities. Our data about its number on the remained locations do not prove this since on one location we measured the increase in its number.

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Country: Czech Republic
Team: CZ-1
Name: Cihlářová, Hana
ID: CZ1-HC-Stu
Presentation ID: ES-CZ1-HC
Title of Presentation: Can we stop expanding deserts?

1 billion people and more than 100 countries in the world are endangered by deserts. Africa has lost a half of its fertile soil so far. There are increasing deserts on the Earth and they are expanding. For example the Sahara expands southwards by 50 km every year. Deserts expand so fast because people cut down trees. There are three main reasons:
International indebtedness
Grazing livestock and growing precious plants
Need for fuel (wood)
People are victims of their own activities because they have got nothing to eat and every 10seconds a person dies of thirst.There are three types of deserts:
Hot and dry deserts
Cold deserts
Coastal deserts
Coastal deserts are areas along coast, however, they are often foggy. Succulent shrubs (such as aloe) manage to survive on this moisture. There are three types of plants:
Ephemerals with slight root systems,Perennials with huge root systems.
In some plants, the surfaces are corrugated with longitudinal ridges and grooves - fog is caught on their leaves and stems and water runs to root. Fog is caught on some animals as well. It condenses on the surface of their skin.
These deserts are in moderately cool to warm areas such as Nearctic and Neotropical zone. Average summer temperature ranges from 13 to 24 degrees of Centigrade, winter temperatures are 5 degrees of Centigrade or below. Coastal deserts are situated:
in Africa (the Namib and the West Sahara)
South America (the Atacama)
There are a lot of problems in these countries. People have not got work, they cannot grow plants.
My solutions are:
to remove used plastic bottles,
to stop expansion of deserts,
to fertilize soil,
to give work to people,
international cooperation.
Villages, roads and fields disappear under ground every year, because wind transfers sand kilometers far way. I think that if people build small barricades, deserts will not expand so fast. The barricades can be built from plastic bottles. There are a lot of plastic bottles but there are not any containers. There are plastic bottles everywhere and the environment is contaminated. People who live in such areas have no work, so they can fill the bottles and build barricades from them. I suppose that fog will condense on these barricades as it condenses on leaves or skin of animals. Water will run down to roots. People will plant plants in front of the barricades. Sand will be transfused behind the barricades. Students and people from other countries can help to the original population and recognize their culture. It is good for international cooperation.
Several years later the plants will overgrow the barricades.
The design and construction of the barricades:
Filled bottles build as a pyramid,
Tie together four small filled bottles and from ashlars build barricades.Cut asunder the bottles and from limb and twig build the barricades. The barricades stand opposite the wind.
These barricades will catch sand and the deserts will not expand. We can do it in hot and dry deserts. In coastal deserts we will block sand and catch fog so there will grow plants. There will be more shadow, animals will have something to eat, people will have work.People from developed countries will know in what conditions people can survive.

Country: Belarussia
Team: BY
Name: Damarad, Volha
ID: BY-VD-Stu
Presentation ID: ES-BY-VD
Title of Presentation: Osipovichi forest area monitoring

The purpose of the work is to monitor Osipovichi forest region, to inspect particular, most valuable sites, to make lists of rare and endangered species of plants and animal, and to make analysis of the findings.

To assess the forests environment we had to fulfill immense work, there was:

- there was summarized all the important about species diversity and distribution of moss-like formations and lichens depending on ecological factor, forest type and substrates;
- there was revealed species diversity of grassy and undergrowth sorts, mushrooms growing on Osipovichi region and there was made their classification;
- there was collected very important information giving proof of Osipoivichi forests being unique;
- there was established the diversity of safeguard rare plants and those enlisted in the Red Book on the territory studied and the environmental conditions;
- the people of the area were all well informed about the necessity to take care of the forests, to safeguard most valuable objects such as plants and animal enlisted in the Red Book, to real new sites of rare plants, to rationally use the forest gifts paying particular attention to distinguishing poisonous mushrooms;
- the forestry was assisted in fir-cones, seeds, acorns collecting, supplementary planting making and handing of starling-topes, in enclosing ant-hills and in many other organizational and prophylactic measures, contributing to forest protection;
- there were great activities connected to recreation forests improvement, ecologically important ancient stones decoration as well as shields and arbours.

We described geographical features of Osipovichi region, biological diversity of moss-like formations and gave their environmental analysis.

We also did research of the soil on which rare and safeguard plants grew and studied the interconnection between the soil and the plants growing on it, especially those enlisted in the Republican Red Book.

We classified and biologically described mushrooms growing in the region. In Osipovichi forests there exist 392 varietes of mushrooms, among them there are 293 (75%) species of eatable ones, 80 (20, 4%) species of uneatable ones and 18 species (4, 6%) of poisonous mushrooms.

In the work there is given ecological analysis of the forest mushrooms, and there are pointed out the mushrooms which can be uncounted only in Osipovichi region.

The work is supplied with 3 maps of mushrooms collecting routes of the region. On the maps there are pointed out all sites of allowed mushrooms collection, medical emergency spots. There is also applied an interesting material about the Byelorussian and Latin mushrooms names origin.

We also have a collecting of mushrooms naturally growing on Osipovichi forests territory.

All the collected findings were proved correct at the Academic Environmental Botany Institute named after V.F. Kuprevich.

This work is summary based on the material studied for many years in the course of ecological expeditions, hiking tours with the help of the Osipovichi region foresters.

In the Osipovichi forest there can be find 8 species of the plants save guarded in Europe.

The material collected gave the opportunity work out the ecological tourism routes in Osipovichi forest. That region takes particularly important places in the natural environment of Belarus. That's why this region there was organized in ecological camp for most gifted young ecologists of the Republic.

The most attended mushrooms sites observations in Osipovichi district showed the usual number of mushroom species, but the mushrooms crops became less rich.

Thanks to special equipment of the Republic recreation places the number of spontaneous harmful fine-places became less and illegal places of litter were abolished. We made the conclusion that active but sometimes unnecessary human envolement into the environmental affect the mushroom roots most unfavorably, which in its turn lead to the disturbance in eco-system.

At the risk of the repeating myself I must say that it's necessary to rationally use the forests gifts to explain the rules of behavior when at rest in the forest and while mushrooms collecting. It is prohibit abolishing overripe and worm-affected mushrooms not to allow the breach in the eco-system.

When picking up mushrooms do it with the help of a knife cutting the mushroom at the base very carefully trying not to disturb the roots.

Sticking of these rules will help preserve the natural forest recourses.

Our findings can and should be used at the school lessons of botany and ecology.

An important addition to what I've said must say that Osipovichi region timber is exported to many European countries such as Russian, Poland, Germany Belgium, Netherlands, Italy and Czech Republic.

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Life Science

Country: Lithuania
Team: LT
Name: Volchiok, Dasha, Gribovskaia, Svetlana
ID: LT-DV-Cap, LT-SG-Stu
Presentation ID: LS-LT-DV/SG
Title of Presentation: Biomonitoring of the Basin of the River Suderve

The purpose of the research is evaluation of the quality of the water in the river Suderve. From 2003 till 2006 there was carried out a biomonitoring of the quality of the water in the river Suderve in respect to the presence of bioindicators. Bioindicators of the quality of water are macroinvertebrates (mollusks, circular worms, crustacea and insects). To achieve the purpose several school expeditions were organized during which a biological composition of the water and dominating species of the macroinvertebrates were determined.

Also the width and the depth of the river section were measured. The current velocity was measured by the method of surface floats. Then we studied the types of the riverbed soil-sampling rig, type of the riverbed, types of the banks, the character of the riverside vegetation.

The composition of the riverside vegetation is characterized by the domination of Cyperaceae and Umbelliferae families. The main kinds of vegetation are Juncus Effuses, Polygonum Hydropiper, Sium Latifolium. There are also Sagittaria Sagittifilia, Equisetum Fluviatile, Polemonium Coeruleum.

To determine the quality of the water we used Mayer's method. A biotic index was applied to evaluate the quality of the water. On the base of the received results we made up a list of the specific composition of the organisms of the macrozoobenthos.

The research showed that the specific composition of the organisms of the macrozoobenthos is not varied.

The results of the biomonitoring showed that the quality of the surface waters of the basin of the river is deteriorating due to high anthropogenic influence.

Among the factors of the anthropogenic influence we singled out the contamination by domestic wastes, construction wastes, diffusive wash-out of organic and mineral substances at the places of ploughing, pollution by oil products, strong recreation influence. In the periods of spring tides and rain freshets the quality of the water becomes worse due to the surface flowing from the territories developed by man. The influence of these factors tells upon the composition of the organisms of the water.

Country: Germany
Team: D-2
Name: Merkert, Olaf
ID: D2-OM-Stu
Presentation ID: LS-D2-OM
Title of Presentation: waterstrider

The waterstrider is a long-legged insect dwelling on the surface of the water. Its speed of propulsion on the fluid is considerable, making it hard to track with human eyes.Those small, wiry animals evoked my fascination, and I wanted to find out what makes their existence possible. How does this creature avoid drowning, how does it gain its astonishing speed? What are its favourite environments, and why?
As I am particularly interested in physics and mathematics, my aim is to answer these questions by describing what I perceive, with the aid of equations and formula. My explorations focus on the motion of the strider and its interaction with the water, looking on the surface, but also investigating what happens below the surface.
By means of video and image analysis, I then try to verify the theoretical assumptions and to understand why the waterstrider prefers certain locations.

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Country: Germany
Team: D-1
Name: Kunzmann, Romy
ID: D1-RK-Stu
Presentation ID: LS-D1-RK
Title of Presentation: Investigations of the spread of infection due to Staphylococcus aureus in special consideration of MRSA

This is an account of the increasing resistance of *S. aureus*, the spreading of the germ and its resistance appearing as well as its increase in recent years. In the presented work, the frequency of its appearance is examined by 148 students of the urban C.-F.-Gauss-Gymnasiums by three nasal deduction test takers. It is ascertained that in the sample population no test person with MRSA was discovered. Though, a several time resistant *S. aureus* could be found. Because the presence of the germ shows a condition to be selected if necessary to a MRSA, it is shown under which general living conditions within the cohort the occurrence is to be registered by *S. aureus* more often. In addition, the dependence of the settlement on age, gender, frequent drug application, contact with nursing homes or hospitals, residential surroundings, physical activity and susceptibility to infection of the upper airways or abuse of nicotine was examined. It could be determined that being medication, the abuse of nicotine and strenuous exercise four times per week leads significantly to a higher settlement with *S. aureus*. The application of influenza protective inoculations, immune illnesses show a trend towards higher contamination with *S. aureus*. A special place of residence, the keeping of pets, food, liquid admission as well as raised contact with medical practises, hospitals or nursing homes explain no favoring factors in relation on the population likelihood with *S. aureus*. Whether in a group with concurrent appearance of favoring factors the contamination frequency rises further and if necessary by other circumstances with additional selection pressure.

Country: Brazil
Team: BR
Name: Okado, Jessica
ID: BR-JO-Stu
Presentation ID: LS-BR-JO
Title of Presentation: Ambient impact of the sugar cane culture and alternatives

Sugar cane (*Saccharum sp.)* possesses great quantity of sacarose and an immense energetic potential, is largely used in fabrication of sugar and alcohol, being produced around 80 countries. The manner that is made the culture of the plant can generate serious consequences to the environment and to local and neighbor populations. In countries as Brazil, world's main producer of sugar cane, the practice of burning to pre-harvest is plenty used, because it reduces costs. This technique is justified by the one who uses it by maintaining the remainder of carbon dioxide null. With the burning of the straw are issued tons of polluters that, apart from aggravating the greenhouse effect, harms environment and human health. no matter how hard derived alcohol from the plant reduces in until 93% the issues of fossil fuels and sugar cane cultivation during the plant's growth absorbs an equal quantity of carbon dioxide issued in burning, it does not perform the same to the other liberated gases; the project seeks diminish environmental impact, which does not reduce merely in quantity of liberated gases.
The project's purpose was to recommend lucrative alternatives that could diminish the impact caused by sugar cane culture, such as raw-cane harvest (especially the manual one); the substitution of the fuels in the agricultural machines and transportation sector by bio-fuels, such as bio-diesel and the utilization of the straw to generate energy through correct burning of the biomass. Manual harvest was chosen although it makes the production decreases around 5%, because in developing countries it employs many persons in cane agriculture. The mechanized harvest, which would be better, would increase unemployment index, since these countries don't possess infrastructure enough to absorb all of the rural workers.
By substituting the conventional culture and with application of the project's purpose, there is reduction of the expense in agricultural necessities, which reduces significantly the issue of polluter gases and increases the production of clear and efficient energy, with the alternative of energy coming from biomass burning, and makes possible the commercialization of carbon credits, which brings to the country good image in world scenery.

Country: Croatia
Team: HR
Name: Zvorc, Maja
ID: HR-MZ-Stu
Presentation ID: LS-HR-MZ
Title of Presentation: Determining aerobic-anaerobic threshold of athletes and non-athlets using Conconi test

Key words : aerobic-anaerobic threshold, Conconi test, vital capacity of lungs, heart frequency, physical condition

In the western countries, due to the education of population, in last ten years the lethality caused by cardiovascular diseases has been decreasing, in Croatia it has still been increasing. Therefore, with this research we wanted to determine the physical condition of our students by measuring their pulse and vital capacity of lungs along with determining the aerobic-anaerobic threshold using the Conconi test, and in this way contribute to their knowledge of the importance of physical activity in preventing the diseases of cardiovascular system. In this research students athletes have been included (according to the type of the sport they train) and non-atheletes. As smoking increases the posibility of developing cardiovascular diseases, smokers have been included in this research as well. In measuring all of these parameters, we were using a sport Tacx bicycle Excel Ergotrainer with the P5 program (Conconi test), POLAR pulsemeter, and a spirometer. The results of measuring the aerobic-anaerobic threshold, the vital capacity of lungs and pulse showed that physical activity, above all aerobic sports, directly affects vascular and respiratory system and the entire physical condtion at both male and female students, although the students achieved results above average in all measured parameters. People with better physical condition have already without any physical activity lower heart frequency, and after physical activity their pulse calms down sooner than average. Regardless to the gender, measurements show the physical predispositons of the students that were involved in the research. Smoking negatively affects our physical conditon and organism in general, and this fact is affirmed by the results of smokers, which, in all measured parameters, fell behind the results of non-smokers. On everything previously mentioned, our results have shown that any kind of physical activity, specially aerobic sports, positively affect the vascular and respiratory system and the physical condition in general, while results of smokers are far worse because of bad and harmful aspects of smoking.

Country: Czech Republic
Team: CZ-1
Name: Roženková, Klára
ID: CZ1-KR-Stu
Presentation ID: LS-CZ1-KR
Title of Presentation: Gaucher disease - analysis of DNA

In my project I have been studying issues of Gaucher disease and its diagnosis.

Gaucher disease is an inherited, enzyme deficienty, disease, which expresses itself by failures of metabolism process in cells. It is caused by a deficiency of the enzyme glucocerebrosidase, leading to an accumulation of its substrate, the fatty substance glucocerebroside. This disease occurs very rarely in a very small group of population and its clinical symptoms can appear at anytime. According to the character of its manifestation the disease we can be classify 3 basic types of this disease. They don't differ only among themselves, but some differences can be found even within one type of Gaucher disease.

The aim of my work was to learn the fundamental methods of molecular biology. And afterwards to analyze DNA samples of two patients with Gaucher disease and to find the locations of the mutation in a gene for glucocerebrosidase using the fundamental molecular biology methods. Then on the basis of gained results to confirm or to disprove Gaucher disease, in case of confirmation to determine the type of the disease and to compare the clinical symptoms with the found mutations.

I achieved the aim I had chosen. I diagnosed the Gaucher disease on DNA level in both cases. I found the mutations in gene for glucocerebrosidase. The first patient had a mutation N370S/N370S, N370S/84GGins, which means that he suffers from a disease type 1 and that his mutation is the most common one. On the contrary the second patient had a rare mutation 84GG, which has been found only in Jewish population so far. The clinical symptoms of both patients correspond with the mutations found.

The knowledge of the mutations serves to subsequent diagnostic and prenatal consultancy in families of the patients. From the knowledge of the mutation we can also predict the course of a disease; this enables an initiation of suitable treatment and it also leads to improvement of patients' lives.

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Country: Netherlands, **Team:** NL1, **Name:** van Duin, A.F.; Ligthart, W.S.M.,
ID: NL1-AvD-Stu, NL1-WL-Stu, **Presentation ID:** LS-NL1-AvD/WL
Title of Presentation: Toothpaste and bacteria in dental plaque

In the world nowadays, there are more sugar and other teeth-damaging ingredients in the food we eat in comparison to 20 years ago. Strong and healthy teeth are still very important. There is an enormous variety in toothpastes. However, the question is which is the most effective and do they realise what is promised on the packaging? The experiment was performed to check if toothpaste does really stop the growth of bacteria in dental plaque. The problem definition is: In what way is the growth of bacteria in dental plaque influenced by different types of toothpaste and Chlorohexidine?

This was tested on 25 Petri dishes with a culture medium. A broth with bacteria of dental plaque in it was prepared. In the culture medium in each dish five spots with toothpaste or Chlorohexidine were prepared and five Petri dishes were used for each toothpaste brand. Then the broth with bacteria was spread out in each dish. After five and seven days the radius of the circles without bacteria around the spots with toothpaste or Chlorohexidine were measured.

The measurements are presented in diagrams and according to the measurements we made, the conclusion is that toothpastes do not always work in the same way as is said on their package. If it is assumed that the effect of toothpaste has a linear correlation with time, and all the types of toothpaste dissolve in the same way in the culture mediums, then the following conclusions may be drawn from the results of the measurements of the radius. Looking at the differences between the average radius as a function of time and the standard deviation for the different types of toothpaste, the conclusion could be that Elmex (which is said to be working against bacteria in dental plaque) has the same good results in the test as Colgate (which is also said to be working against bacteria in dental plaque). The standard deviation of the mean values of the results of Elmex and Colgate are too large to claim a significant difference. The conclusion can be drawn that Sensodyne and MacLeans (both kinds of toothpaste which are not said to be working against bacteria in dental plaque) have the same effect in the test as Chlorohexidine (a liquid kind of medicine which is used after dental surgeries and said to be one of the most effective remedies against bacteria in dental plaque). Chlorohexidine, Sensodyne and MacLeans form one group without mutually significant differences. However, in this test all toothpastes in this group have a significantly better effect than Elmex and Colgate.

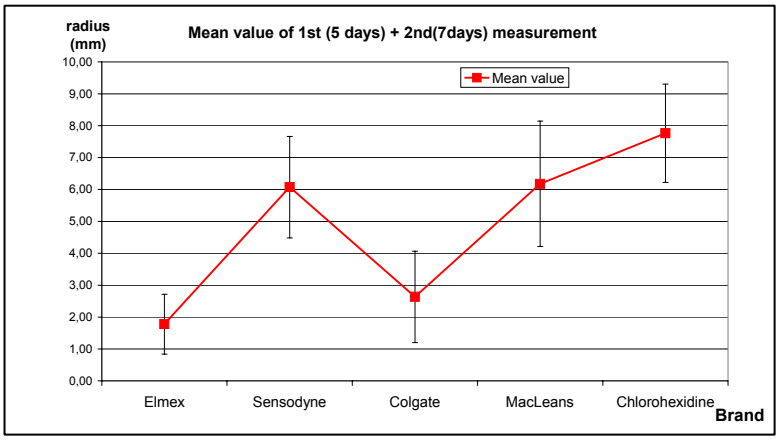

Figure. *Overview of the mean values of the radii of the circles with standard deviations of all combined results of the measurements. The bigger the radius the larger the bacteria killing effect is.*

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Country: Netherlands, **Team:** NL1, **Name:** Mengens, Mandy; Konijnenberg, Albert,
ID: NL1-MM-Cap, NL1-AK-Stu, **Presentation ID:** LS-NL1-MM/AK
Title of Presentation: HPU (Hemopyrrollactamurie): the mystery of women's complaints?

Introduction
Women with HPU suffer from a variety of hard to explain complaints concerning joints, muscles, gastro-intestinal tract and menstruation. The diagnostic criterium for HPU (also known as the 'mauve factor') is a high concentration of HPL (hemopyrrollactam, hydroxyhemopyrroline-2-one) in urine samples. Dr. Kamsteeg, biochemist and director of the KEAC institute, has found 10% of mature women with concentrations HPL ≥ 1.0 micromol per liter urine using a diagnostic test developed in the KEAC institute. Women with high HPL concentrations in the urine showed HPU associated symptoms more often than women with low HPL concentrations in the urine. According to Kamsteeg the HPU associated symptoms are explained by a shortage in the essential trace elements Zn^{2+}, Mn^{2+} and Pyridoxal-5-phosphate (the active form of vitamin B6). Urinary excretion of the HPL-Zn^{2+}-P5P-complex is said to be the cause of removal of these substances **[1]**. The existence of the HPL-Zn^{2+}-P5P-complex is disputed, however **[2]**. We investigated if high levels (≥ 1.0 µmol/liter) of HPL can be detected in the urine of pupils (age 16-18) using KEAC diagnostic tests. We examined if pupils have HPU associated symptoms and chronic fatigue and if these symptoms are associated with these high levels of HPL.

Materials and Methods
From the population of pupils at Stedelijk Gymnasium Nijmegen we randomly selected a group of 100 pupils (age 16-18). These students were asked to collect midstream urine. Collected urine was numbered and send to the KEAC institute for analysis of HPL-complex using the HPU-testkit®. Every testkit was linked to a questionnaire to address HPU associated symptoms (based on research by dr. Kamsteeg) and chronic fatigue (the 'Shortened Fatigue Questionnaire' (SFQ) as defined by Alberts *et al*.**[3]**). Chronic fatigue threshold values were set at 21 points. We and the KEAC performed double blind analysis of urine samples and questionnaires. We eliminated those test persons that took nutritional supplements, leaving us with 77 pupils (44 boys and 33 girls) in the final study.

Results
23% of male pupils and 36% of female pupils tested positive (≥1.0 µmol HPL per liter urine) in the HPU-test®. We found no difference in most HPU-associated symptoms between pupils with high and pupils with low HPL-levels. In our study 25% of pupils scored higher than 21 points in the SFQ-test. We found that 22% of pupils with low concentrations HPL and 32% of pupils with high concentrations HPL suffered from chronic fatigue.

Conclusion
We were surprised to find high percentages of pupils with positive HPU-tests because Kamsteeg finds only 1% of male adults and 10% of female adults with positive HPU-tests. We found that high levels of HPL in urine were correlated with chronic fatigue but not with other HPU associated symptoms.
Based on these findings we suggest that the present HPU theory needs adjustment. Further study is necessary to determine in what way.

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[1] J. Kamsteeg, *HPU, en dan…?*, 2004 Keac, Weert
[2] J. Hessels, van As, Hoe Poriforineonderzoek Uitdehandliep
[3] Alberts *et al*, 'Abbreviated fatigue questionnaire': a practical tool in the classification of fatigue, NTvG 1997 Aug 2;141(31):1526-30.

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Country: Netherlands, **Team:** NL2, **Name:** van der Hoek, Marit; van Zelm, Veronique,
ID: NL2-MvdH-Stu, NL2-VvZ-Stu, **Presentation ID:** LS-NL2-MvdH/VvZ
Title of Presentation: Wake Up And Smell The Pheromones!!!

On our school we often see youngsters fall hopelessly in love with each other. It isn't unusual for their friends or classmates, to wonder what in the world could those people find attractive about each other.
The Austrian scientists Karlson and Butenandt had some idea as to what could be behind these sudden and strong attractions between humans. In 1959 they came up with the term pheromones. "Pheromones are substances excreted by an animal to the external environment, which trigger a specific reaction in a receptive individual of the same species; this reaction consists of either a physical change, or a specific behaviour."
We wondered if this could explain those unlikely school romances. We wanted to know if pheromones could play an important role in the way a person judges someone of the opposite sex. This led to the hypothesis; subjects will judge unknown models more positively after exposure of a high level of pheromones.
In our experiment we chose 54 male and 34 female students in the age of 14 to 16 years. Subjects where restricted from the use of deodorant and had to run several hundred meters. They both had a piece of gaze in their armpits. As pheromones are excreted through the skin and detected by a tiny organ in the nose called the vomero nasal organ, we would make our subjects smell the sweatgases with pheromones. Each male had to sniff three gases worn by the opposite sex and vice versa.
We presented each subject with randomized pictures of unknown models of the opposite sex extracted from internet. The subjects had to fill in a questionnaire of 8 questions on a five point scale, ranging from very negative to very positive. This allowed us to derive a score from the questionnaire for each model. We repeated this test after 55 days without the gases containing pheromones.
So in what way does a young person judge a person of the opposite sex differently when exposed to a heightened concentration of pheromones? From our data we may conclude that exposed subjects judge the models more positively. Boys and girls alike judge models of the opposite sex more positively after exposure to a higher concentration of pheromones. Girls however are more receptive to the effect.
This is in accordance with the research of Justin Benore of the Colorado State University who wrote, "From the compounds listed in my paper, it is interesting to note that all naturally occurring pheromones appear to be targeted towards females. This could be seen simply as part of the process of selecting a suitable mate. These cues may have been (and continue to be) necessary for a woman to accept the sexual advances of a male."

A fun detail is the effect pheromones had on the girls' answers to the question "would you laugh if this person made a stupid joke" Girls exposed to a high level of pheromones where significantly more willing to laugh at stupid jokes made by boys then they normally would.

So if you're not particularly skilled at making girls laugh; it may be a good idea to jog to your school or job and maybe to shower less often...

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Germany
Team: D-2
Name: Vögele, Martin
ID: D2-MV-Stu
Presentation ID: LS-D2-MV
Title of Presentation: Potent trees – electric potentials: energy for the future?

For decades mankind is looking for new sorts of renewable energy in order to become independent from fossil sources of energy. At the same time, rainforests are destroyed – often only to gain firewood. So we were looking for a method to gain energy from trees without chopping them down.
We discovered that if two needles are put into the xylem of a tree and are connected by a conductor, we can measure small voltages. The aim of our further experiments was to find out, under which environmental conditions there are the highest voltages and by what they are caused. For this we mainly used a six years old spruce. We found out that the highest voltages can be measured under hot, dry and light conditions and we noticed that the graph of our results shows a one-day cycle. We also noticed that the farther the two needles are from each other the higher is the voltage.
From the results of our experiments we conclude that the voltage depends mainly on the transpiration, by which anions and cations in the xylem sap could be separated, what would cause the electric potential.
But the voltages we have measured by now are not high enough for commercial utilization.

International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Mathematics

Country: Russia
Team: RUS-2
Name: Shelepko, Yaroslav
ID: RUS2-JS-Cap
Presentation ID: MA-RUS2-JS
Title of Presentation: The homology of tensor product of N-Complexes of Abelian Groups and it´s description

Modern homological algebra allows to describe the homology of tensor product of two chain complexes rather well. One of the ways is the Kunneth's formula , which describes the homological groups of complex $K \otimes L$ in terms of homological groups of complexes K and L.
For example, it can be used in topology for the description of homological group of Decart's product of topological spaces.
The main aim of this work was the generalization of the Kunneth's formula for the arbitrary number of chain complexes of abelian groups. This generalization is based on the examination of some special sequences of isomorphisms, which were successfully built for the arbitrary number of chain complexes of abelian groups.
As a result, such sequences of isomorphisms for the arbitrary number of abelian group complexes can be transformed in the following way, applying some specially built derived functors (Tr_n):

$$H(K_1)\otimes H(K_2)\otimes\ldots\otimes H(K_n)\cong S_1,$$

$$Tr_n\left(H(K_1)\ \ldots H(K_n)\right)\cong S_2/S_1,$$

$$Tor_n\left(H(K_1)\ldots H(K_n)\right)\cong S_3/S_2,$$

Where $S_1\subset S_2\subset S_3=H(K_1\ldots K_n)$.
The result, which was received in the work, can be applied in the homological algebra and algebraic topology to calculate Decart's product homologies of arbitrary number of topological spaces, which shows it's value. Besides some results of the work can be used in construction of new derived functors in the theory of homology.

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XIII[th] IYCS - 18[th] to 23[rd] of April 2006 – Stuttgart/Germany

Country: Russia
Team: RUS-2
Name: Neshitov, Alexander
ID: RUS2-AN-Stu
Presentation ID: MA-RUS2-AN
Title of Presentation: Birkhoff Semi-Group on the Category

Introduction. Birkhoff operators are of great importance in the theory of algebraic systems.Let us recall, that in the case of the category of the semi-groups the Birkhoff operators are the following operators: *H* - operator of the taking of homomorphic images, *S* - the operatorof the taking of sub-objects and P - the operator of the taking of direct multiplications. They are considered as functions on the classes of semi-groups. Relative to composition they form semi-group, by the called classical semi-group of Birkhoff. In 1972 Italian mathematician Pigozi proved the extremity of this semi-group and found its structure. However, he did not succeed in building Caly table for this semi-group and answering some most important questions, for example, to prove existence of the final basis of identities from two variables,
carrying out in this semi-group. There is special interest in the examination of this type of structure on the category, i.e., the construction of Birkhoff's semi-groups on the categories. At least, it is desirable to find sufficient conditions to the category, so that the semi-group of Birkhoff constructed on this category would possess the properties of the classical semigroup of Birkhoff. In this article the answers to all these questions are obtained.
Basic determinations. Let us examine S- category with the multiplications, in which are isolated a certain monic class M and the epic class E. On these classes it is constructed *HE*-operator of taking of images with epics from E and *SM*-operator of taking of protoimages with monics from M. Also let us introduce P - operator of the taking multiplications. We will consider these operators as functions on the classes of the objects of category S. Let us name these operators Birkhoff's operators. Relative to composition they form semi-group, called the semi-group of Birkhoff on the category S.
In the case, when S - category of semi-groups; M- all monics, and E - all epics, *HE* becomes the operator of the taking of homomorphic images, *SM* - the operator the taking of subsemigroups and isomorphous to them semi-groups, and P - the operator of the taking of direct multiplications. In this case we will be to call semi-group, formed by them, by the classical semi-group Birkhoff. Further in this article we will examine category S, possessing the following properties:
(1) exists monadic functor funktor *G*: *S* -> *A;* where *A* is category;
(2) in *A* exist limits;
(3) in category *A* all monics are split;
(4) epic class *E* = {g|G(g)-is split};
(5) monic class *M* = {f|G(f)-is split}*;*
It is known, that the monadic functor creates limits [1]. In the work were obtained the following results for Birkhoff's semi-group, built on the category of this form: was proven the extremity of semi-group, was found it's structure , was built the Caly table, was proved existence of the final basis of identities from two variables.
Basic results. Birkhoff semigroup B, built on the category S is final and*:*
B = {H; S; P; SH;HS; PH;HP; PS; SP; PSH; PHS; SPH;HPS; SHP; SPHS; SHPS;HSP}*;*
where H = HE, built on the class E (4) and S = SM, built on the class M (5)
Birghoff semigroup structure, built on category S, and it's Caly table were received in the work.
Forgetting functor from the category of vector spaces is monadic.
Category **Sets**[Sets] has examining properties.*Birkhoff semigroup possesses the final base identities from two variables.*
Literature
[1] Saunders Mac Lane "Sheaves in Geometry and Logic" Springer Verlag.
[2] Saunders Mac Lane "Categories for the working mathematician" Springer 1998.

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Country: Russia
Team: RUS-2
Name: Mikhaylovskiy, Fedor
ID: RUS-FM-Stu
Presentation ID: MA-RUS2-FM
Title of Presentation: α-Compact Topological Spaces

One of the aims of the paper is to study some properties of topological spaces, to create a classification of sequentially-compact (but not compact) spaces. To solve this problem there was introduced the notion of $\alpha-$compact topological space (where $\alpha-$ cardinal number). It generalizes the notion of sequential compactness for countable α. It is necessary to note that a space is compact if and only if the space is $\alpha-$compact for all α. We suggest to use $\alpha-$compactness to classify sequentially-compact (but not compact) spaces.
Then we have proved some statements about $\alpha-$compactness of space which are analogous to classic statements about compactness (such as the Tikhonov theorem and the theorem about continuous image of a compact).
Very often it is necessary to solve the problem to go over from arbitrary space to compact one. The Stoun-Cech theorem proves the existence of such solution. We have constructed $\alpha-$compactification of normal space. For constructed $\alpha-$compactification we have formulated and proved statements analogous to main thesises of Stoun-Cech theorem. Then there was constructed a common compactification too. But unlike Stoun-Cech we suggest a compactification in an explicit form.
Let's give typical examples of definitions and theorems:
DEFINITION 1.Let's denote Φ - the set of filters where basis consists of closed sets.
This set is inductive so we can determine:
DEFINITION 2. Let's denote $X^{"}$ - the space of maximum filters from Φ.
DEFINITION 3. Let there is a point $x \in X$. Then $\varphi(x)$ is ultrafilter in X, with basis $\{x\}$.
DEFINITION 4. Filter F is $\alpha-$filter, if there is a basis with power α of closed sets.
DEFINITION 5. The space is $\alpha-$compact if every $\alpha-$filter in it has a limit point and this space is hausdorf.
DEFINITION 6. Let's denote $X_{\alpha}^{"}$ - the space of filters from $X^{"}$ having $\alpha-$basis.
THEOREM 1. If f is continuous reflection of $\alpha-$compact space X to topological space $X^{'}$, then the set $f(X)$ is $\alpha-$compact.
THEOREM 2. Every multiplication of $\alpha-$compact spaces is $\alpha-$compact. And ,on the contrary, if a multiplication of non empty topological spaces is $\alpha-$compact, then every its space-multiplier is $\alpha-$compact.
THEOREM 3. The space $X_{\alpha}^{"}$ is $\alpha-$compact.
THEOREM 4. φ is homeomorphism of the space X over everywhere dense space $X_{\alpha}^{"}$.
THEOREM 5. For every continuous reflection f from space X to compact space Y there exists only one continuous reflection $g: X_{\alpha}^{"} \to Y$ such as $f = g \circ \varphi$.

Bibliography:
N.Bourbaki "Obshaya topologiya. Osnovnie structuri", M., 1968.
A.Frelikher, V.Bucher. "Differentialnoe ischislenie v vectornich prostranstvach bez normi", M., 1970.

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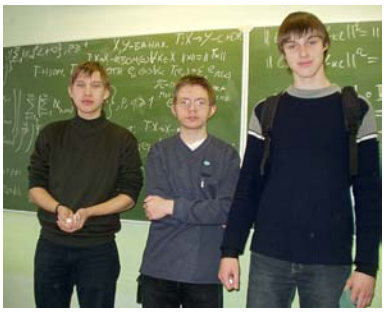

Country: Russia
Team: RUS-2
Name: Zinatulin, Roman; Kormanovsky, Dmitry; Lepkin, Alexander
ID: RUS2-RZ-Stu, RUS2-DK-Stu, RUS2-AL-Stu
Presentation ID: MA-RUS2-RZ/DK/AL

Title of Presentation: RESEARCHING SPACES ℓ_p AND $\left(\sum \ell_p\right)_q$

Introduction: isometries- that is reflections saving the norm, are intensively being investigated during the last decades. If the isometric vector spaces classification is still far from the completion, the isometric bijecting reflections of classical spaces have already been investigated. This work is devoted to the linear operators isometry spaces description, that is ℓ_p & $\left(\sum \ell_p\right)_q$.

Rather interesting facts, having the great significance for the further investigations in area of functional analysis, have been received by the investigating these spaces.

The following have been received by solving this task:
Theorem 1. (Bijective isometeries in spaces characteristic). All bijective isometries in space ℓ_p when $p \geq 1 p \neq 2$ are simple.

Theorem 2. Bijective reflection $T:\left(\sum \ell_p\right)_q \to \left(\sum \ell_p\right)_q when\ q > p > 2$ or

1 ≤ *q* < *p* < 2 is space isometry only when $T(e_{nm}) = \varepsilon_{nm} e_{\pi(n)\omega_n(m)}, where\ |\varepsilon_{nm}| = 1,$

e_{nm} – standart basis, and π, ω_n -some natural numbers changes.

Theorem 3.Operator T: $T:\left(\sum \ell_\infty\right)_1 \to \left(\sum \ell_\infty\right)_1$ is isometry, only when for any element $x \in \ell_1\left(\ell_\infty\right)$ done

$T(e_{nm}) = \varepsilon_{nm} e_{\pi(n)\omega_n(m)}$ where $|\varepsilon_{ij}| = 1,\ i,\ j \in \square,\ \pi,\ \omega_n$ - some natural numbers changes.

Conclusion: Thus, isometries spaces ℓ_p and $\left(\sum \ell_p\right)_q$ classification has been received and investigated, for any p и q, where q > p > 2 or 2 > p > q ≥ 1.

Next we are going to investigate isometry in space ℓ_2 and particular cases for space $\left(\sum \ell_p\right)_q$.

Country: Georgia
Team: GEO-2
Name: Varamashvili, Levan
ID: MA-GEO2-Stu
Presentation ID: MA-GEO2-LV
Title of Presentation: Interesting things in Multiplication table

All of us know about multiplication table from childhood and we use it often in our life. We tried to look at multiplication table with more attention and we found many interesting properties, which rise problems of great interest. We have found many interesting properties which some have already been discovered and some, in our opinion, are new. Of course, most of them are very simple, and we may say that they are easily seen and come from multiplication rules. But there are some properties, which aren't seen at once, but may interest a lot of mathematicians, first of all the specialists of numeral theory. For example, we can point the place of any perfect number in the multiplication table, by its indexes.

We also have been working on three-dimensional multiplication table and found several properties that, in our opinion, are rather interesting and deserve to be discussed.

I had written a program about these problems in Pascal programming language, which gives many properties of selected number chosen from multiplication table.

Country: Romania
Team: RO
Name: Kész, Borbála
ID: RO-BK-Cap
Presentation ID: MA-RO-BK
Title of Presentation: Divina Proportio

Why is it exactly as large as it is? This was the question that occurred to me one day when I was walking in the nature watching the dimensions of a tree. When I searched a bit in order to discover the answer I found some really interesting data and connections, all related to the golden section and the Fibonacci numbers. Being interested in this theme, I set out to present the scientific, mathematical, artistic and historical characteristics of this divine ratio.
The golden ratio is the division of a line segment at a unique point where the ratio of the whole line to the large segment is the same as the ratio of the large segment to the small one, the value of this ratio, named phi, being 1,618.... The connection of the golden section to the Fibonacci numbers is that the ratio of each successive pair of numbers in the series approximates phi. The above mentioned numbers are part of a mathematical series, which starts with 0 and 1, and each new element in the series is simply the sum of the two preceding it.
Up to this point it seemed that my essay presents just an ordinary mathematical ratio and series, but this is not the case: the golden section and the Fibonacci numbers can be found almost everywhere in the structure of the world. This divine ratio has an important role in the placing of leaves on the branches; the periods of the heart's systoles and diastoles; in the blood pressure variations; in the proportions of the human, and the animal body; in the flowers colors, and dimensions; and so on. It can also be observed as a conscious application in some artistic works: statues, paintings, songs, poems, buildings because it suggests harmony, naturalness and beauty.
What captured me most in this golden proportion is its unintentional occurrence in the nature and the human body. We cannot say that the world is based on the golden proportion but we can state that it endeavors to it. But the real question is: why does every living creature hold this divine proportion in its structure? I think there can be many answers to it, however, finding out the real cause of this frequent occurrence is a great possibility of research. Was it God who created the world this way, are we the results of a really good plan made by aliens, or is it caused by the magnetic radiation of the Earth? The aim of my research is to provide answers to the questions above mentioned as well as to give explanations to some dilemmas of the history of mathematics.

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Country: Georgia, **Team:** GEO-1, **Name:** Meskhishvili, Lado; Mikhadze, George;
ID: GEO1-LM-Stu, GEO1-GM-Stu; **Presentation ID:** MA-GEO1-LM/GM
Title of Presentation: Impossibility of construction of triangle by using three bisectors;

Geometric construction is a construction of a geometric figure using only straightedge (unmarked) and compass. Such constructions lay at the heart of the geometric problems of antiquity of circle squaring, cube duplication, angle trisection and billiard problems. The Greeks were unable to solve these problems, but was not until hundreds of years later that the problems were proved to be actually impossible under the limitation imposed.

In our project we investigate triangle's construction problem if are given:

1) Three medians 2) Three altitudes 3) Three bisectors.

We use the following method:

Suppose construction of some figure is possible by using P_1, P_2,……, P_n data. For constructions are given - Q_1, Q_2,….,Q_n data. If possible to express each P_i by using finite number of simple operations under Q_i, then construction is possible.

Under simple operations are considered addition, difference, multiplication by rational number division, product and extraction of a square root [1-2].

We prove the following propositions:

Proposition1. Construction of triangle is possible by using three medians.

Proposition 2. Construction of triangle is possible by using three altitudes.

Constructions in both cases are done in case of bisectors we get opposite result:

THEOREM: **Construction of triangle is impossible by using three bisectors**.

Cases of medians and altitudes were known [3] but our result about bisectors we have not seen before.

Even in case of isosceles triangle, we get sextic equation which is not soluble in quadratics.

The problem is insoluble using compass and straightedge because the expression for square of triangle side contains extraction of a cube root like above-mentioned cube duplication [4] angle trisection [5] and billiard problems [6].

References

Bold B. "Achievement of the Ancient Greeks" and "An Analytic Criterion for Constructability". New York: Dover, pp.1-17, 1982.

Courant R. and Robins H. "Geometric Constructions. Algebra and Number Fields" England: Oxford University Press, pp.117-164, 1996.

Прасолов В.В."Задачи по планиметрии " Москва, Наука, 1986.

Conway J.H.and Guy R.K."Three Greek Problems". New York: Springer-Verlag, pp.192-194, 1994.

Bogomolny A. "Angle Trisection" http://www.cut-the-knot.org/Pythagoras/archi.shtml.

Neumann P.M. "Reflections on Reflection in a Spherical Mirror. " Amer. Math. Monthly 105, pp.523-528,1998.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Georgia, **Team:** GEO1, **Name:** Gigashvili, Nick; Soidumati, Zauri,
ID: GEO1-NG-Stu, GEO1-ZS-Stu, **Presentation ID:** MA-GEO1-NG/ZS,
Title of Presentation: Factorisation by using the difference of perfect squares

There are a lot of mysteries connected with the name of well-known mathematician Pierre Fermat. Our project is about one of those mysteries that were solved by Fermat. He was sent a letter with 12 digit number. Fermat solved task and proved that it was in modern language RSA number, and was a multiple of two 6 digit prime numbers.

RSA numbers are composite numbers that have exactly two prime factors (i.e. so-called semiprimes) that have been listed in the factoring challenges of RSA security and have been particularly chosen to be difficult to factor.

On most computer systems, 8 digit primes can be obtained quiet quickly. In prime number theory developed the task of finding the largest prime number. The largest currently known prime is Mersenne's prime which was discovered in December 2005 and has 9152052 digits, but this doesn't mean that every prime that are before that number are known. If it was like that there wouldn't be any RSA challenges, we would find 617 digit semiprime by multiplying two primes that would give in product number with 617 digits. The largest known RSA contains 200 digits.

While RSA numbers are much smaller then the largest known primes, their factorization is significant because of the curious property of numbers that proving or disproving a number to be prime ("primality testing") seems to be much easier then actually identifying the factors of a number ("prime factorization"). Thus, while it is trivial to multiply two large numbers p and q together, it can be extremely difficult to determine the factors if only their product pq is given. With some ingenuity, this property can be used to create practical and efficient system for electronic data.

RSA laboratories sponsors the RSA factorizing challenge to encourage research into computational number theory and the practical difficulty of factoring large integers, and because it can be helpful for users of the RSA encryption public-key cryptography algorithm for choosing suitable key lengths for an appropriate level of security. A cash prize is awarded to the first person to factor each challenge number (for e.g. prize for finding above-mentioned 617 digit RSA number is 200000 $ cash).

By using modern computers we are able to find quiet large RSA numbers, but how could Fermat solve task isn't known. In our project we give the new way of factorization which we called "Factorization by using the difference of perfect squares". With this algorithm we can factorize number that was given to Fermat without any calculating machine. We think of using this algorithm for larger numbers.

Country: Russia
Team: RUS-1
Name: Todorov, Dmitry
ID: RUS1-DT-Stu
Presentation ID: MA-RUS1-DT
Title of Presentation: Regularity property of random walks

Random walks are used in physics, chemical kinetics and mathematics. They are related to algebra, functional analysis, ergodic theory and probability theory. We study its properties in the context of probability theory.

This paper is the first in the series of works describing some properities of random walks with deviation equal to $\sqrt{m}$. There is such a property of random walks as "regularity property". Using this property in [1] an essential for ergodic theory theorem about an isomorphism of the endomorphisms has been proved. Random walk can be defined as a sequence of elements of n-dimensional cube. n_0 regularity of the almost all of the random walks means that for most of the pairs of random walks b и b' there exists a number h' between the h and h^2 for which both b и b' have deviation less than $101\sqrt{nh'}$ for all $h > n_0$.

In [1] this result has been obtained only for $n = 1$. We give the definition of the n_0 regular random walk which provides the same particularities for any n. For $n = 1$ this definition is equal to definition of regularity given in [1].

The results obtained in this work could be used as an important tool for researches related to iterated metric on the sequences of the pasts of the Kalikow's endomorphism. Also using these results some new examples of measurable partitions of the measure space with the polynomial scaling can be obtained. The existence of such examples gives an answer on some questions put by world-famous mathematicians.

References

[1] D. Heicklen, C. Hoffman, D. Rudolph. Entropy and dyadic equivalence of random walks on a random scenery, Advances in Mathematics, Vol 156, No. 2, 2000.
[2] W. Feller. An introduction to the probability theory and its applications, Vol 1, New York, 1957.
[3] P. Halmos. Measure Theory, New York, 1950.
[4] P. Halmos. Ergodic Theory, New York, 1956.
[5] A. Gorbulsky. σ-algebra of the pasts of random walk on the orbits of the Bernoulli action on group Z_d, Zapiski Nuchnih Seminarov POMI, Vol 325, 2005.
[6] D. Heicklen, C. Hoffman . T, T^{-1} is not standart. Ergod. Th. Dynam. Sys. 18, No. 4, 1998.

Country: Poland
Team: PL-1
Name: Ściążko, Anna
ID: PL1-ASc-Cap
Presentation ID: MA-PL1-ASc
Title of Presentation: Polynominal Interpolation

One of the most important topics of the wide branch of mathematics which is Numerical Mathematics is interpolation. According to the definition in the Dictionary of the Polish Language issued by PWN: *"interpolation is recovering a function in some interval which takes definite values for some given points in that interval".* Interpolation can be understood as an inverse of the process of tabularizing functions, which means that by using the analitical form of functions a table of values is created. Interpolation, in turn, allows to find an analitical form of a function if its values for certain points are given. This is exactly the problem this dissertation focuses on.
The first chapter is devoted to describing numerous methods of constructing interpolation polynoms - formulas of Lagrange and Newton. There is also an analysis of polynoms behaviour for various ways of choosing interpolations nodes, the points for which the values of the function are given. Showing ways of building interpolation polynoms, algorithms for computing the coefficients are given and a method of creating tables of values for difference ratios and finite differences showed.
The further part of the dissertation concentrates on the remainder of interpolation, which is the accuracy of this how a polynom estimates a given function. This is a very important aspect of interpolation, because the exact interpolation holds only in the nodes. In other points there are differences between the exact value and the value of interpolation polynom.
In the chapter devoted to aplication of interpolation I show how the remainder of interpolation behaves when equidistant nodes are used and how it is in the case of Chebyshev nodes.
The chapter 'Examples and Applications' contains solutions of some of the problems connected with the methods presented. It shows how one can compute the sum of squares of cubics of a series of consecutive positive integers. There is also a description of the Runge Effect illustrated by the presentation of polynoms interpolating the function $f(x) = \max\{1, 1-x\}$ for various numbers of nodes. I depict the effect on numerous graphs which shows the accuracy of described methods.
This dissertation is an attempt to show how important the Numerical Mathematics is. Sciences like Economics, Physics, or Biology demand answers to questions which can not be answered precisely, however with the use of interpolation and other methods of Numerical Mathematics to estimate solutions with a desired precision it is closer to possible.

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Country: Poland
Team: PL-1
Name: Socala, Arkadiusz
ID: PL1-ASo-Stu
Presentation ID: MA-PL1-ASo
Title of Presentation: Mathematical modelling of animal coat patterns formation.

It is impossible not to be fascinated and enthralled with the richness, diversity and beauty of pattern in biology.

My work is devoted to mechanisms which can generate spatial pattern, and which have been proposed as possible pattern formation processes in a variety of morphogenetic situations. To obtain the dependences of quantity of morphgen in a particular point on the skin I used some differential equation. In my work I took into account four different models for various number of colours.

The detailed presentation discusses some of the mechanisms which have been proposed and gives an indication of the role of mathematical modelling in trying to unravel the underlying mechanisms involved in morphogenesis.

Country: Czech Republic
Team: CZ-1
Name: Šotola, Jakub; Koščák, Jan
ID: CZ1-JS-Cap
Presentation ID: MA-CZ1-JS
Title of Presentation: The queen of sciences

The year 2005 was the Year of Physics. What do I mean by this? The popularization of physics is on a high level, but where is mathematics, the queen? The popularization of mathematics, at least in Czechia, does not exist.
This project is aimed at filling this gap. We try to reveal the beauty of curves, fractals and other geometrical figures, the fun hidden in mathematics, the mathematical principles of some risky, logical and strategical games and puzzles, some interesting facts connected with mathematics, but also the practical use of mathematics, the connection with other disciplines (as sciences, as humanities), the history and great personalities of mathematics.
We present these mathematical interests in form of interactive talks, connected with solving tasks and touching some models. We cooperate with our school – Mendel Grammar School, Opava and with Old People‘s Home, Opava. We also plan to ask Silesian University and some Opavian primary schools to cooperate.

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Physics

Country: Germany
Team: D-2
Name: Sojc, Ursula
ID: D2-US-Stu
Presentation ID: PH-D2-US
Title of Presentation: The whistling pipe

The objective of our project investigation “The whistling pipe” was the examination of sound that is produced by a rotated corrugated-pipe.
We realised that our pipe doesn’t produce only one tone but several corresponding to the velocity the pipe was rotated.
According to our hearing capabilities, the constant tone intervals that can also be found in a tone scale could be identified only approximately.
Our aim was to develop an experimental setup which allows recording and analysing of sounds precisely. Rotating the pipe was done by using a remodelled bicycle. The investigation of sound we managed by an interface, a laptop and Fourier analysis.
We established a theory for a cylindrical air column with both ends open and we could explain why corrugation and rotation is essential for stimulation of sound.
In many aspects the results of our measurements and theory were in good agreement.

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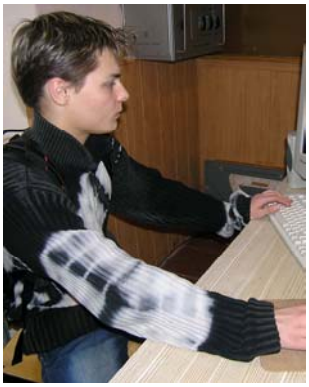
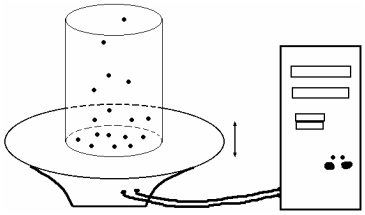


Country: Ukraine
Team: UA-1
Name: Zemlyankin, Anton
ID: UA1-AZ-Cap
Presentation ID: PH-UA1-AZ
Title of Presentation: The inelastic bouncing ball

The goal of the work was to investigate the behavior of small elastic particles bouncing on a horizontal vibrating plate and the interrelation between the height of the jumps and the mass of the particles, the frequency and amplitude of the vibrating plate.



Experimental part

We attached a piece of paper to the loudspeaker to make an even vibration surface, and put some small particles on this platform. The frequency of the harmonically vibrating surface ranges from 10 to 20,000 Hz.

Theoretical part

The investigated system consists of some small particles jumping on a harmonically vibrating platform such as a loudspeaker. The height "h" at time "t" is given by

$h(t) = A \sin(\omega t)$ (1)

The exact mapping for the case of a completely inelastic ball can be easily derived from Newton's equation:

$$A(\sin\omega t - \sin\omega t_k) + \frac{1}{2}g(t-t_k)^2 - (A\omega\cos\omega t_k)(t-t_k) = 0\ , \qquad (2)$$

where g is the acceleration of free fall. If the particle is launched by the platform at time t_k the bouncing condition $A\omega^2 \sin\omega t_k > g$ being obeyed, it will land at the first time $t > t_k$ which fulfills Eq. (2). The ball will then be re-launched as soon as the above bouncing condition is satisfied, namely, either immediately or in the beginning of the next vibration cycle.

Results

For the investigated particles $H_{max} = 18\,mm$ and their motion frequencies vary between 100 and 1000 Hz. The coefficient of restitution equals to zero in ¾ of platform moving period, and at the last ¼ of the period it was 0<α<1. The time while the particle is out of platform is: $T = 2\sqrt{2H/g}$, (in our case T = 0.12 sec.)

Discussion

1. The collisions of the particles and the vibrating platform where mostly inelastic.
2. The interrelation between height and frequency shows an evident resonance character.

References

Piotr Pieransky, "Direct Evidence for the Suppression of Period Doubling", Physical Review Letters, Volume 37, #5, March 1, 1988.
Enrico Fermi, "On the Origin of the Cosmic Radiation", Physical Review, V 75, # 8, April 15, 1949

International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Ukraine
Team: UA-1
Name: Pshenychka, Yuliia
ID: UA1-YP-Stu
Presentation ID: PH-UA1-YP
Title of Presentation: The Leyden Jar investigation

The purpose of this research is to investigate why the first capacitor was built independently by several researchers in the shape of a jar. We are asserted that this choice was not done accidentally.

EXPERIMENTAL PART

With the purpose to study the above subject I made my own Leyden Jar. A contemporary capacitor consists of two metal plates made of lags of foil (the capacitor coatings) and an insulator (paper, sodden by the paraffin) between them. I used a plastic jar and aluminum foil. The capacitance of the capacitor is approximately 40 pF, and after 20 loadings the voltage of the self-made jar reaches about 8,000 V.

THEORETICAL PART

Nowadays capacitors are used mainly in electronics and many other devices concerned with electricity. All pixels in the CCD-matrix are capacitors. The first capacitors were made in the form of glass jars filled with water. It was water that served as the first capacitor. The experimenter's palm which touched the jar's bottom served as the second coating. In 1745 a cheap and convenient source of electric sparks was invented by Pieter van Musschenbroek, a physicist and mathematician from the Leyden University, Netherlands. Ewald George von Kleist, a German cleric, independently developed the idea for such a device, but did not investigate it as thoroughly as did Musschenbroek.

RESULTS

Benjamin Franklin on the basis of his researches argued that electricity consisted of two states of one fluid, which is present in every thing. A substance containing an unusually large amount of the fluid would be "plus", or positively charged. Matter with less than a normal amount of fluid would be "minus", or negatively charged. Franklin's one-fluid theory dominated the study of electricity for 100 years. Du Fay's two-fluid theory contended that there are two different electrical fluids – the "positive" and "negative" one. However, both these theories are right in some ways.

DISCUSSION

Our thesis states that the first capacitors were made independently by several investigators in different countries exactly in the form of a jar because the electricity was thought of as some special fluid at that time.

REFERENCES

1. Hans Backe, Rund um die Physik. Der Kinderbuchverlag, Berlin.
2. Bleyer J M. Galvanism. In Bigelow H R (ed). An International System of Electro-Therapeutics. Philadelphia, PA, FA Davis, 1898, A185-A223

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Ukraine
Team: UA-2
Name: Kapustnyk, Oleksij
ID: *B.M.Valiyov* the Head of the Physical Laboratory of V.N.Karazin Kharkiv National University
Presentation ID: PH-07
Title of Presentation: Educational Physical Experiment: Temperature and Pressure Influence upon Physical Processes

"I think that we, scientists, can
say: the theory is a good thing, but
the correct experiment remains forever
P.L.Kapitsa

The given work is devoted to one of the most important and complicated topic in physics teaching – the methods of educational physics experiment.

Nine modified experiments from the "Molecular Physics and Thermodynamics" have been modernized and developed.

1. Demonstration of liquid motion using the Franklin's "boiler".
2. Demonstration of liquid motion by means of the well known toy called "Drinking bird".
3. Demonstration of liquid boiling under low pressure.
4. Demonstration of reaching the "triple" point of water. freezing of boiled liquid.
5. Demonstration of freezing of water by means of pumping-out the air.
6. Demonstration of filling the flask turned upside-down.
7. Demonstration of " geyser" in action.
8. Demonstration of the action principle of the simplest volume control.
9. Demonstration of the volume change using a metal tin.

All the experiments mentioned above show the temperature and pressure changes occurring due to the heating, cooling, evaporation, condensation, etc.

The work considers methods, contains detail descriptions, safety measures, practical recommendations making possible to carry out these not always easy, but at the same time wonderful and amazing experiments by your own hands.

The experiments mentioned above have impressed students very much (and we have made sure of it not once!). They can be used in physics teaching process to formulate the research problem; in general physics course as spectacular and instructive demonstrations.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Ukraine
Team: UA-2
Name: Kazachkov, Andrij
ID: UA2-AK-Stu
Presentation ID: PH-UA2-AK
Title of Presentation: My first Hands-On Experiments in physics

How to make physics lessons much more exciting?
Why hands-on activity is so important for students?
Using the simple devices and things which are used everyday some well known physics demonstrations and experiments have been improved and developed. They all can be successfully used in teaching process to make physics lessons much more understandable.

Country: Ukraine
Team: UA-2
Name: Kazakov, Oleksandr
ID: UA2-OKaz-Cap
Presentation ID: PH-UA2-OKaz
Title of Presentation: Educational physical experiment: vibrations and waves

Several educational physics experiments in section “Vibrations and Waves" have been presented in this work.

Studying vibration processes is undoubtedly topical part in physics even today. Practically everything in the word is submitted to vibration and wave processes: For example a human heart is beating, strings of musical instruments and telephone membranes are vibrating, stars with cycling nuclear reactions are pulsating ; high and low tides on Earth and even human's psychology are also subjected to vibrations, etc.

Without analyzing in details the known vibration systems, some physical experiments which are of our special interest have been considered. With the help of sound waves they can not be only heard, but also seen using visual and at the same time being easy to receive pictures of standing elastic waves on Chladny plates. There is a short historical excursus: a method of obtaining unique figures belongs to Ernst Chladny, a German physicist, one of the foreign members of St.Petersburg Academy of Science (Russia, 1794). His works carried out in 1787 for investigating into the plate vibrations during which there have been formed beautiful delicate Caustic figures" (Chladny figures) obtained as a result of a plate vibrations strewn with sand are widely known. It was he who found for the first time the possibility of visualizing these waves which can be excited in metal, glass and other plates of practically any configuration and even in an usual wooden lifting laboratory table in a classroom for physics classes.

Experiments with a singing" glass as well as a ringing bell" are also considered in this work.

Country: Georgia
Team: GEO-2
Name: Gachechiladze, Giorgi
ID: GEO2-GG-Stu
Presentation ID: PH-GEO2-GG
Title of Presentation: Optical Black Boxes Method

It's especially important and useful to use various types of experimental work, while studying physics. Among the wide varieties of different experiments, "black box" is particularly interesting as transformed into a computer game.

The "black box" can be any closed system, contents of which are unknown in advance. Researcher only knows the input and output information, that is been changed while passing through the black box.

According to the above mentioned ray-tracing the researcher has to judge and guess the content of the closed system. Among the big range of black boxes, all of them are represented as untransparent rectangles with corresponding input and output rays of light.

The optical black boxes can contain many different components, such as, plane, concave and convex mirrors, prisms, lenses and so on. During the work with black boxes the idea was born to create a computer teaching game "black box". Such a game gives us possibility to create many different and interesting problems and to analyze "black boxes" using only computer, without any tools.

"Black box" teaching game is realized by using Multimedia Technologies. It is rather interactive and seems to increase level of interest in subject among students.

Country: Hungary
Team: H
Name: Laki, Andrea
ID: H-AL-Stu
Presentation ID: PH-H-AL
Title of Presentation: Introduction into the World of Bubbles

Although aqueous foams have been the subject for scientific investigation since the 17[th] century, much remains to be learned about these complex chemical and physical phenomena.

Aqueous foam is the impermanent form of matter in which air is dispersed in an agglomeration of bubbles. Water, contained soap-like surfactant molecules is suitable to produce foam. In this kind of foam bubbles are separated by soap films. Aqueous foams are typically 95 percent air and only 5 percent liquid.

The stability of soap films are determined by the amphipatic ions in the surface of the film. The stability of foam depends on the lifetime of the liquid films formed it. The stabilizing effect was first observed by Marangoni. Marangoni effect occurs under the conditions in which amphipatic ions from the bulk fluid are being adsorbed into the surface during the local deformation of the surface.

Suspended solid particles influence strongly the stability of aqueous foams too. The stability and the structure of foam was investigated by addition of particles in three different size (0.08 μm > 1.9 μm > 2.3 μm) to the soap solution. Change of the thinning process in particle-loaded foam was expected. The interpretation of the changing of the processes in these foams was searching in the capillary forces acting between the particles inside the films. Capillary forces are responsible for the self-assembly of macroscopic and microscopic particles in/on an interface (Fig.1).

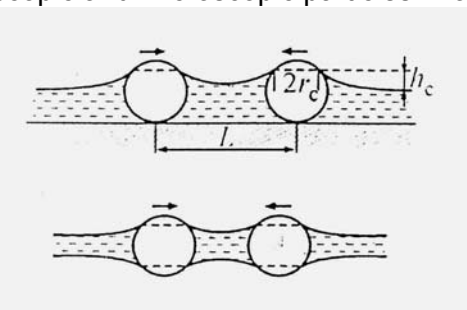

Fig. 1

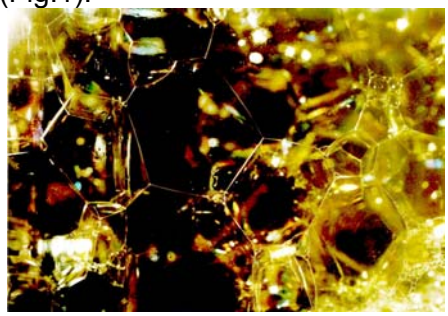

Fig. 2

For making several foams solutions with different concentrations of $CaCO_3$ were used. The morphology of the foams also was investigated. The final, polyhedral cell structures, i.e. shape and average size of cells, were affected by the suspended particles (Fig.2).

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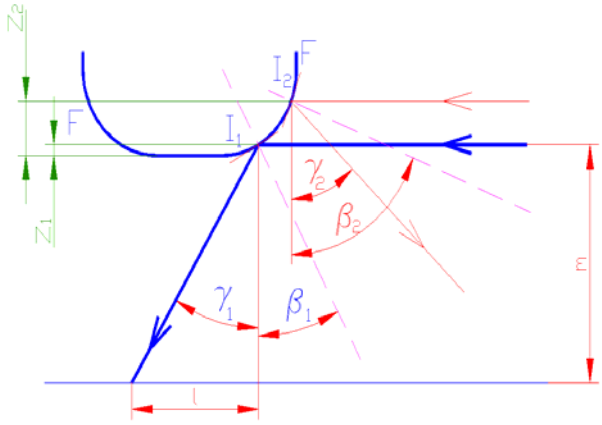
Country: Hungary
Team: H
Name: Zsidó, András
ID: H-AZ-Stu
Presentation ID: PH-H-AZ
Title of Presentation: Surface tension and its measurement

It is not easy to measure surface tension with good accuracy. Because of this, **Loránd Eötvös** was adviced to deal with this problem when started his career. He introduced his method 130 years ago, and then worked on the problems of surface tension for 15 years. His measurements were fairly precise, of about 3% error only.
To determine the surface tension of a liquid, he used a **beam reflection method**. Two convergent light beams were pointed to the meniscus of a liquid in contact with a vertical glass wall. These beams reflected from the curved surface horizontally; the vertical position of the reflected beams were determined by a cathetometer. As it is illustrated in the Figure, using the $z_2 - z_1 = a\sqrt{2}\left(\sin\frac{\beta_2}{2} - \sin\frac{\beta_1}{2}\right)$ equation, by measuring Z_2-Z_1, γ_1 and γ_2, the surface tension could be determined.



In my work I determined **the surface tension** of two materials (water and mercury) with **Eötvös method,** using modern tools: a **CNC milling machine** of precision 0,01 mm and **a laser.**
By moving the miller's desk, I could shift the horizontal laser beam in small steps in vertical direction. I measured the γ angle of the reflected beams with respect to vertical - in case of water (which wets the glass wall) downwards, whereas in case of mercury, the light beam was reflected towards the ceiling. The curved surfaces of the liquids – as convex mirrors – would make the beams divergent. To avoid this, by using a lens of 1 cm focal length I made the beam parallel. Thus focusing of the beam played a central role in this experiment.
I measured surface tension of mercury, distilled and tap water with a surprisingly low, 5-10% error only. As the measured surface tension data are close to the literature data, I guess this measurement could be used as demonstration experiments at the physics courses - obviously with smaller and simpler tools, like laser pointer and screw micrometer.

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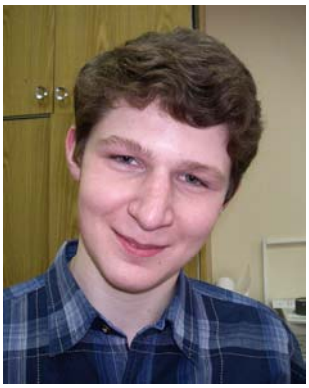
Country: Hungary
Team: H
Name: Kőrösi, Márton
ID: H-MK-Stu
Presentation ID: PH-H-MK
Title of Presentation: Liquid column oscillation in vertical U tube

A well known physics experiment is the following: When a water column with length L in a vertical U tube is pushed harmonic oscillation is obtained. The period time $T = 2 \cdot \pi \cdot \sqrt{\frac{L}{2 \cdot g}}$

It is interesting that the period does not depend on the cross section of the tube and the quality of the liquid. But what is the reality? I would like to examine this motion experimentally.
The length of the tubes was 3m, with different diameters. It seems that the internal friction of the liquid is not negligible, however the diameter of the tube influences water oscillation..
I used the theory for laminar flow, from which the friction force in the liquid is: $F = 8 \cdot \pi \cdot \eta \cdot L \cdot v$, where η is the viscosity of the liquid, v is the average velocity of the flow, and L is the length of the water column.
The equation of motion:

$$\frac{d^2x}{dt^2} + \frac{8 \cdot \eta}{\rho \cdot r^2} \cdot \frac{dx}{dt} + \frac{2 \cdot g}{L} \cdot x = 0 .$$

describes damped oscillation, which has an analytical solution. In that case, the amplitude of oscillation decreases exponentially. During my experiments I have found that the used theoretical model is valid only if the radius of the tube is small.
The viscosity of the water can be determined with an accuracy of about 5-10%.
If I used liquid with high viscosity (for instance shampoo) the oscillation became aperiodic. In this case, the deviation decreases exponentially with time. The viscosity of the shampoo was also measured as a function of temperature.
I was curious on how the period of the oscillation changes, when one end of the U tube is closed by a flacon. In that case the period changes significantly, the compression and the expansion of the air in the flacon considering politropic.
Heating the bottom of the U tube by a flame, the oscillation becomes chaotic. The reason for this strange behaviour is the collapse of the rising vapour bubbles.



Country: Russia
Team: RUS-1
Name: Voloshin, Andrey
ID: RUS1-AV-Cap
Presentation ID: PH-RUS1-AV
Title of Presentation: Stabilization of unstable equillibrium states of physical pendulum

This work presents different ways of stabilization of inverted physical pendulum.
Physical pendulum consists of an object allowed to rotate freely around some axis. Oscillation of such body is caused by gravity or any other external force field. Stable positions of pendulum are the locations, where potential energy has minimal values.
First this problem was solved in 1951 by Russian scientist P.L.Kapitsa. He researched stabilization of inverted pendulum. He constructed special device to stabilize the physical pendulum in the unstable position by use of vertical oscillations of the suspend point. We repeated his results and stabilize the pendulum in upper position. Then we investigated conditions of stability of the inverted pendulum with vibrating point of suspend were determined both theoretically and experimentally.
Then we investigated dynamic stabilizing system. It fixes changes in pendulum position and moves point of suspension. Some algorithms for such a systems were developed.
Also it turned out that it is possible to stabilize more complicated system in unstable positions. For example, double inverted pendulum was stabilized in different positions. Moreover we managed to stabilized triple pendulum.

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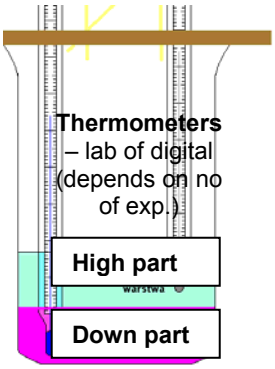
XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Poland, **Team:** PL-2, **Name:** Pjanka, Patryk; Kopoczynska, Magdalena,
ID: PL2-PP-Stu, PL2-MK-Stu, **Presentation ID:** PH-PL2-PP/MK
Title of Presentation: Immobile ply of hot water – myth or reality

In our work, we have investigated a strange property of liquids which is boiling in the utensil. We could see the bubbles of water steam near the glass, when the temperature of liquid was near 85 Deg. Of Celsious. The idea of problem has born during the work about 17th IYPT2005's problem „Solaris Ocean". We had there to investigate effects occured on a bound between saturated salt solution in water and clean water in two – parts' liquid. Because they depend on liquid boiling, the before-time boiling was observed and we made an assumption about ply's existance. Of course, there can be many of others parameters, which can make these results in temperature. Our exercise was make ply's existance sure.

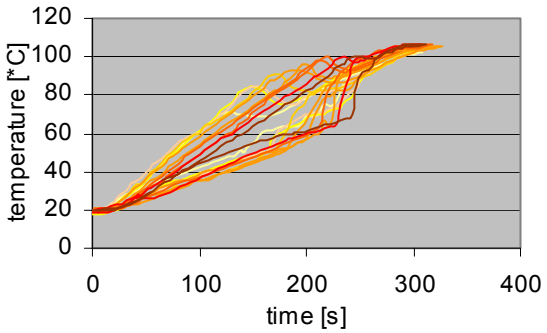


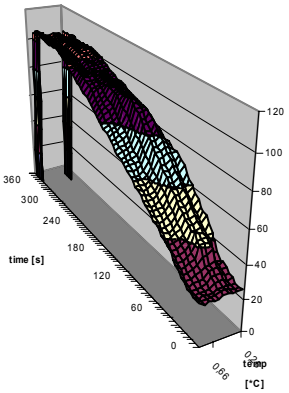
We deduced some facts from effects' in „solaris ocean" clear – up with hot ply and we checked it in practise:
When the height of down part of liquid increases and all liquid's height is constant, the temperature of effects' show starting increases and the mixing process is shorter
When the all liquid's height increases and relation between part's heights is constant, the temperature of effect's show starting is higher
For bigger utensil's radiouses the temperature of effect's show starting is bigger
For small powers of heating, the effects shouldn't be occured

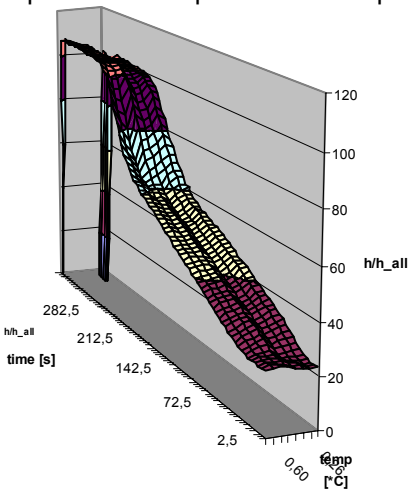
Power source – gas burner or electric heater

The ply's existance can be replaced by utensil's defects (like cracks), but the ply near the glass makes very near effects and it makes the abstraction easier and problem more mathematical – we can take it as mathematical model of defect's influence.
Using all the experiments (near 400), we can make dE/dt 3D plots for all parameters of liquid. But there's not influence of a ply. So if we can see there an aberrations from a constant power of heating (approximate), the ply's existance is proved in this case. To connect all results T(t) to one plot (the series was repeated near 10 times for one parameter, so for one 3D plot we had from 64 to 128 points depends on investigated factor), we will use weighed average for all points to take the point position, when the weight is a path between points on the top – view of a plot.

T(t) depends on Hdown/Hall relation







Results from 15 (2D) and 128 experiments (3D) shows allowed differences for 1st group.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Indonesia
Team: RI
Name: Haryanto, Marko
ID: RI-MH-Stu
Presentation ID: PH-RI-MH
Title of Presentation: The Mystery behind the Motion of the Falling Shapes

This paper is written because of the curiosities of the writer about how a plane can fly. After learning about this matter in detail, the writer found many factors that can make a plane fly and land well. One of them is the shape of the wings. If we notice every shape of the wings, they have specific shapes that influence the standard speed wanted, by this paper, the writer wants to make an experiment about the relationship between the shape of something with the speed and the pressure resulted. Does the aerodynamics only happen on the wing shape or any other shapes?

With this paper the writer has tried many new shapes by his own experiment and existed theory and comparing the conventional shapes with the new shapes and existed shapes around us. With this experiment the writer found that every shape surround us gives different motion of landing.

Country: Indonesia
Team: RI
Name: Hakim, Zulfikar
ID: RI-ZH-Stu
Presentation ID: PH-RI-ZH
Title of Presentation: The Dynamics of Rising Bubbles in the Liquids

We all accustustumed bubble air. It has its own charactertics. From its innocent face when it was rising in the liquids to its collapsing which can cause servere injury. But, the main bubbles characteristic which the writer will describe in this paper are about dynamics of the bubbles in the liquids. The bubbles which diameter is less than 0.8 mm will make the straight-line movement while the bubbles which diameter is more than 0.8 mm will make the spiral movement in its journey to reach the upper level in the liquids. The reason of these case hasn't been studied yet. Our hypothesis now is the factor of turbulent liquid flow, the bouyant force and the Stokes friction force are playing the important role at the bubble's characteristic.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Indonesia
Team: RI
Name: Maura**,** Natasya
ID: RI-NM-Cap
Presentation ID: PH-RI-NM
Title of Presentation: Do You Know Why Mackerels Can't Escape from Sharks ?

It is not surprising thing that on land, some small animals can eat lagrer animals. For example there is certain kind of snake (Sawa snake) that can eat a buffalo. Crocodile can also eat a rabbit. However in water community, the food chain consits of links, it is begins with microscopic plankton and ends with relatively small members of giant carnivores, like the sharks. Every body knows that a shark always catches a mackerel if, of course, the mackerel has no place to hide. Moreover, it catches not only a mackerels but any small fish. But why does a large fish have a greater speed than a small one?

Locomotion of fish influenced by its shape (streamlined body) and size (Length and cross section). When fish swim thy undulate their bodies in an S-shaped wave. This kind of wave motion begins at the head and travels down the body toward the tail. The body and tail movements crates backward directed jet of water which propels the fish forwards. The eel uses its body movements to "push" against the water and move forward (because small pectoral fins are useless for swimming).

We analyzed forces parallel to the fish motion track, those are: drag force, and propulsion force.Propulsion force is the reaction of muscle force that displace some amount of water backward.Drag force is consists of cross section and velocity.

We would obtain the relation between fish velocity and its size, and by comparing two fish of the same body shape, we will predict the power of velocity in the drag force formula.

We make an experiment to find the value by comparing the velocities of fish movement with different length, but for the same body shape. We can calculae the velocity by using stopwatch to calcuate the time. And analyzing (from the literature) the relation between muscle volumes and the maximum power, by predicting it from the structure of micro muscle, and micro muscle contraction process. So we can make the formula prediction of force resistance in fish body as the function of the velocity. This will gives us an idea why sharks will always catch a mackerel.

Keywords: Resistance force, muscle volume, maximum muscle contraction, micro muscle structure, micro muscle contraction process, velocity, area, fish length.

Country: Germany
Team: D-2
Name: Weigele, Jakob
ID: D2-JW-Stu
Presentation ID: PH-D2-JW
Title of Presentation: Underwater sound spectrum of rain drops

Rainfall in oceans is usually measured by hydrophones. The hydrophone, which is a kind of underwater microphone, measures the sound of a rain drop under the surface. The amount of rainfall can be analysed by the sound spectrum of the recorded data.

In our project we want to determine the size and impact velocity of a single water drop. This drop falls down from the height of 1 metre while the hydrophone is placed approximately 8 cm underwater. The received signals of the hydrophone are recorded with a computer. The results are displayed in a voltage- and frequency-graph. These graphs are necessary to determine the size and impact velocity of a rain drop. The whole procedure is filmed with a high-speed camera to visualise the attitudes of the water drop and to compare it with the data in the graphs.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Germany
Team: D-1
Name: Frei, Maxi
ID: D1-MF-Stu
Presentation ID: PH-D1-MF
Title of Presentation: Unpredictable phenomenon? A geophysical investigation of waves

Men have been fascinated by any sorts of waves for thousands of years. The Flood, the Greek mythology or the flood disaster in southeastern Asia 2004 are only examples, which inspired our research, too. In order to conduct experiments in a well-controlled environment, we have constructed a 3m long wave channel together with a pneumatic wave generator. Using this wave channel, we were able to transfer wave phenomena from all over the world into the laboratory:
Tsunamis: propagation on open sea, behavior in shallow water and different ways of generation (sea quakes, asteroids, volcanoes)
Surf waves in Hawaii: reasons on how and why there are the best surf waves in Hawaii
Coastal protection: different dike forms from 1600 to today, influence of mangroves on wave behavior
Pororoca: Imitation of the world's largest river wave
Interference as seen at the Cape of Good Hope and the Cook Strait (New Zealand)
By studying them with a program for analyzing videos called "Galileo" we have learned and understood a lot of their physics and special features in nature. Now our future goals are investigations on further details of the phenomena above, e.g. energy loss mechanisms in breaking waves and construction of the future dike, as a respond to the global warming and the rising sea level.

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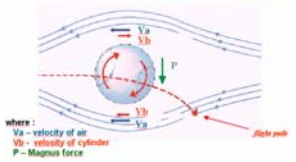
XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

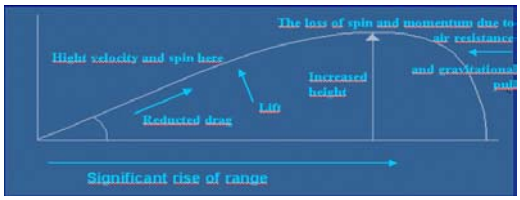
Country: Poland
Team: PL-2
Name: Oracz, Joanna, Janczak, Bartlomiej
ID: PL2-JO-Cap, PL2-BJ-Stu
Presentation ID: PH-PL2-JO/BJ
Title of Presentation: Physics in sport, that is how to score from corner?

Oracz, Joanna Janczak, Bartlomiej

In this work we will investigate the motion of a spinning ball.We would like to discuss the forces influencing the ball – including Magnus force and aerodynamic resistance, and then we will tell about the flight path, then our experiments, results and our conclusion.
While the ball moves in the viscous medium it is influenced by gravitational force and the aerodynamic resistance.While the same ball starts rotating in the air it is influenced by specyfic force, called the magnus force, which curvates the path.



Very interesting fact was observed by golf players. The aerodynamic resistance of golf ball much differs from the drag of smooth ball. When the ball has hollows, air comes off far later from the ball, which causes lower pressure density and thereby lower force, which push the ball aside. The speed of coming of the layer of air which is closest the ball determines the size of vortex.In classic oblique projection , we can easily find bodies coordinates in every moment t, and thereby the motion equation. The flight path depends only on the initial throwing angle and initial value of velocity.



When the ball is rotating the issue is much more complicated, howevert he effect is amazing. The range of rotating golf ball can be 5 times longer !
To do the research into that problem, we made 3 experiments. The aim of the first one was to examine the influence of medium and angular velocity on the flying path curvation. The second one shows the dependece on the ball parameteres and the last the dependence of drag force and magnus force on ball velocity. The third experiment we made in Warsaw University of Technology in wind tunnel.

International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Belarussia
Team: BY
Name: Sakalou, Yauheni
ID: BY-YS-Cap
Presentation ID: PH-BY-YS
Title of Presentation: Acoustic figures on sand and dust

The purposes of this work are:
1) Get the visual picture of pith dust distribution in the tube and geometrical pattern from sand and salt on the surface of plates under influence of sound waves
2) Define the reasons of distribution of loose substances in the tube and on the plates in dependence of various factors.
3) Determine the sound waves characteristics using given methods
4) Observe the attenuation of sound waves in a tube with dust using oscillograph.
5) Application of the given effects
While researches the experiments getting the visual picture of pith dust distribution in a glass tube and geometrical pattern from sand and salt on the plates under influence of sand waves were held.

1. The plates of different sizes, shapes and materials for observing the patterns from sand and salt on the plates were made. The stimulation of oscillations using bow or sound waves generator was carried out. For obtaining the various patterns from the sand depending on sound waves frequency a good number of experiments were held. The experiments by forming the acoustic figures in dependence of the place of fastening of the plate in the form of violin, rectangular and circle were made. Sand of various fractions and colors was applied to improve the presentation of the image. The theoretical explanation of the phenomenon was given.

2. The experimental plant for getting the distribution of dust in the tube consist of glass tube, a piston with build in microphone inside the tube, the sound wave generator with speaker phone and oscillographs. The movement and distribution of dust in the tube illustrates the periodicity of the process in the air and remained us a stationary wave. By means of mobile piston movement, the length of the air column can be changed, and several types of dust distribution can be observed.

If there are enough fast air streams in the tube, the whirlpools occurs. In those places where two neighboring whirlpools rise and fall simultaneously, it is postponed less dust. At the certain frequency of oscillations the loops are designated by characteristic whirlpools and then by sharp congestion of pith dust. The researches of whirlpools at different frequencies were held. It gives us the picture of air state in the tube. Using two oscillographs, connected to microphones, one of which is located in the entrance of the tube and another one is mounted in the piston, it is possible to estimate the degree of sound wave attenuation.

Application of the given effects is offered.

For improvement of visual perception and understanding of work the computer presentation accompanying and evidently supplementing performance is constructed.

The used literature:

1) D. Walker « Physical Fireworks »
2) V. P. Orehov « Fluctuations And Waves In the Course Of Physics In the High School»
3) G. S .Landsberg « The Elementary Book Of Physics »
4) N. N. Evgrafova, V. L. Kagan « The Course of Physics »
5) Magazines "Quantums"

International Conference of Young Scientists Stuttgart 2006

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Technical Physics

Country: Indonesia
Team: RI
Name: Wicaksana, Rachmad Vidya
ID: RI-RW-Stu
Presentation ID: TP-RI-RW
Title of Presentation: The Analysis of Basic Flying System in Dragonfly

Dragonfly is one kind of Insect that can fly. Dragonfly, common name for any member of an order of predaceous aquatic insects. Its characteristic by an elongate body, agile flight, and two roughly equal pairs of membranous wings. It can fly like bird, but it has unique flying system. This flying system is also supported well by its good body structure. In this chance, we analyze its basic flying system. The analysis consists of:
go up (take off) motion
buoyant motion
forward motion in the air
backward motion in the air
turning motion
go down (land on) motion
For the analysis, we use two kinds of physical law. They are:
Bernoulli's Law

$$P_1 + \tfrac{1}{2}\rho v_1^2 + \rho g h_1 = \text{constant}$$
$$P_1 + \tfrac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \tfrac{1}{2}\rho v_2^2 + \rho g h_2$$

The 3rd Law of Newton (Action-Reaction)

$$F_{action} = -F_{reaction}$$

The dragonfly's motions give inspirations of air vehicles, especially helicopter.

Country: Czech Republic
Team: CZ-1
Name: Solný, Pavel
ID: CZ1-PS-Stu
Presentation ID: TP-CZ1-PS
Title of Presentation: Alfa spectrometry with scintillation detector YAP

Alfa spectrometry with scintillation detector YAP was worked out in order to introduce a new possible type of radon detection which I was studying at FJFI institute in Prague. I did this research because of a higher radon occurrence in the village I live in. I have been interested in radon problems for several years because radon and its daughter products, which arise after radon decays, are quite dangerous for us if the are in a higher concentration. These matters are responsible for many health problems so that we need a good radon monitoring system in order to prevent unnecessary irradiation of our bodies. The development of new detection technology is necessary also because some of the recently used detectors are quite expensive and the others are unable to do continuous measurements in the range as we need nowadays. So I managed to take place in FJFI research and I did there some measurements necessary for the next research.
FJFI institute also cooperates in its work with the biggest producer of scintillation technologies in the Czech Republic CRYTUR. In terms of this work I was studying scintillation detector from YAP crystal ($YAlO_4$). I studied mainly these parameters:
Detector efficiency
Spectra discrimination ability for particles with energy 5,485 MeV
Energetic alpha particles calibration
I measured these parameters using MC 1256 analyser for measuring surface source (ethalon) of alpha particles ^{241}Am in laboratories of FJFI. I used mathematical figures mentioned in theoretical and practical part of the work I have published as a special technical activity. According to the measurements I determined detector efficiency (42.2%), spectra discrimination ability (19.8%) and I made a calibration of the system I used. It results from measuring activity of a real sample of radon and it is necessary to do more measurements with real radon and compare the results with others detectors.

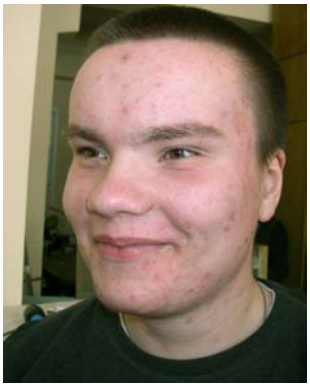
Country: Russia
Team: RUS-1
Name: Baskakov, Oleg
ID: RUS1-OB-Stu
Presentation ID: TP-RUS1-OB
Title of Presentation: The device for the visualization of stream around body

The purpose of the work was to create the installation for the vizualization of the flow around the body being introduced into the flow. Usually this problem is solved by use of complex mathematics or numeric calculations. As a result the itog is not convinient for the discription of all the phenomena.

The developed installation works by the next way. The soap film moves along two guides under influence of gravity force. The velocity of the stream can be controlled. The model body is introduced to the stream. By changing in definite ranges velocity, viscosity of the stream and sizes of the body we can change the Reynolds number. The picture of flow with different objects such as eddies and turbulence can be easily seen in a projection to the screen behind the installation.

More difficult task is to take a photo picture due to the problems with small contrast and object moving. The task was solved by the “dark field” method.

The installation can be used for visualization of the stream picture for bodies of any shapes. It can be used for different hydrodynamics problems with Reynolds number from hundreds till thousands. The work of the installation is illustrated by different examples.
Advantages of the method are the simplicity of experiment and presentation of results.



Country: Russia
Team: RUS-1
Name: Kviatkovsky, Alexander
ID: RUS1-AK-Stu
Presentation ID: TP-RUS1-AK
Title of Presentation: Noncontact electric pump

The general idea of the research is to organise the movement of the conducting fluid without any mechanical impact. The movement can be organized with the help of the electromagnetic field. The electric field is used to provide an electric current and together with the magnetic field is used to make the flow.
We investigate 2 configurations of our system. Direct current and constant magnet were used. Magnetic field is supposed to be homogenious.
First we put flat vessel with salt solution between poles of the magnet. Two opposite directed eddies appeared in this case were described. Also we used cylindrical vessel with one electrode in the center and the other is the ring in its surface. In this case a rotating flow appears. Kinetic energy of this flow is transformed to the potential one of the lifted liquid. Mathematical description of this flow is developed. It involves such parameters as geometrical parameters, density, viscosity, electric current and magnetic induction. For fixed values of the current and magnetic induction maximal height was calculated and obtained experimentally.

Country: Germany
Team: D-2
Name: Fischer, Manuel
ID: D2-MF-Cap
Presentation ID: TP-D2-MF
Title of Presentation: Windcar

Last year I presented at ICYS different vertical rotor systems especially measurements with a special wind rotor called “Savonius Rotor”. Now I had the idea to use this rotor for the drive of cars. So you would be able to reduce the emission of smoke, causing damage on the environment.
Together with two friends we constructed two prototypes of cars which are driven only with the energy of wind.
We made measurements and tests under natural and laboratorial conditions.
We are going to construct a car which will be driven only by different types of regenerative energies so it would be independent of fossil petrol.
Perhaps this car could become one possibility for our future way of mobility.

Country: Germany
Team: D-1
Name: Herold, Christian
ID: D1-CH-Stu
Presentation ID: TP-D1-CH
Title of Presentation: Measuring of thin layers by using XPS

In modern semiconductor technologies, more and more special treatments for materials are used to reach specific advantages. Espescially the miniaturization of modules as usual represented by the microtechnologies needs very thin layers.

Basing on the idea to improve methods to quantify the thickness of thin layers of specific materials, the IHP (Innovation for High Performance) nearby Frankfurt (Oder) gave the chance of an apprenticeship for students. During the time of this work, pupils are integrated in some researches concerning measuring of thin layers.

Our project is a possibillity to examine the thickness of very thin layers by using the XPS, the X-Ray Photoelectron Spectroscopy. These layers are especially metal oxydes on silicate which is used as the base ressource in semiconductor technologies.

The general base of our work is the phoelectric effect found by EINSTEIN. We are able to get the thickness of the examined layer as a result of observations on the emitted electrons.

To know the exact stacking rate of the engines may allow to produce more efficient gadgets basing on the usage of thin layers in future.

Country: Croatia
Team: HR
Name: Vucovic, Stjepan
ID: HR-SV-Stu
Presentation ID: TP-HR-SV
Title of Presentation: Electrostatic pendulum

I was studying oscillating of an electrostatic pendulum, which is consisted of metalized ball hanged on nonelastic thread and it is moving between two parallel metal plates, which are connected on constant voltage. The general idea of this experiment was to analyse the moving of electrostatic pendulum (theoretically and experimentally) and to consider its possible applications. In theoretical part of my work, on the ground of the second Newton's law, I developed theoretical model for an oscillating period of the electrostatic pendulum, supposing that amplitudes are small. The model predict that length of thread (*l*), mass of the ball (*m*), distance between metal plates (*d*), voltage on which plates are connected (*U*) and radius of ball (*r*) affects on the oscillating period:

$$T = 2 \cdot \sqrt{\frac{l}{g}} \arccos \frac{4\pi\varepsilon_0 r U^2 l - mg(d-r)^2}{4\pi\varepsilon_0 r U^2 l + mg(d-r)^2}.$$

In experimental part of my work, I have checked theoretical predictions of developed model by measuring the oscillating period of the electrostatic pendulum. I have also studied how parameters that are described above affect on the oscillating period, using the different values of these parameters in the measurements. For measuring the oscillating period, I have been using computer and microphone. When ball touches the plate we can heard a sound. I was recording those sounds with microphone and used program for analysis of sound. I could read the value of oscillating period from this program and those values of the oscillating period were noted in tables.

My conclusion is that theoretical (calculated by model) and measured values of the oscillating period are very close. Average deviation between theoretical and measured values of period is 5% that is about 0,01 second. These small deviations exist because of air resistance and separation of charge on the ball in homogeneous electric field.

This pendulum we can use for detecting and measuring electric fields. We can also construct a clock, which can work at the same way as the other clocks with pendulum.

Country: Macedonia
Team: MK-1
Name: Osmanova, Eliza
ID: MK1-EO-Stu
Presentation ID: TP-MK1-EO
Title of Presentation: Improving the quality of the Drinking Water

The increased expenditure of the water, and at the same time the reduction of its quality natural supplies (the springs), are the main reasons for a greater usage of the surface waters. However, when it comes to purification of these waters, their pollution leads to more complex procedures. The problem of pollution, the protection of the surface waters as well as their treatments is among the main goals of almost every country.

The purification results depend mainly on the familiarity of their physical and chemical characteristics. The quality of the “purified” water must also be taken in account.

Because the concentration of suspended and colloidal dispersed materials in these waters is high, and even more, the natural deposit is difficult, these waters are usually succumbed to a process of coagulation and flocculation. By adding chemicals, coagulates and flocculates it is very likely that the process of deposit will be boosted.

When choosing these substances, the possibility of their obtainment i.e. the economical conditions will have some influence. The condition of the surface waters may change in one year, but it may also change in just one day. So this must be considered as well.

Country: Croatia
Team: HR
Name: Baric, Hrvoje
ID: HR-HB-Cap
Presentation ID: TP-HR-HB
Title of Presentation: Holography

Holography is a relatively young and quite popular field of physics, which besides being attractive has its value in being more and more used in making various gadgets and devices, which are being used not only in the field of scientific research, but in every day life as well. Although, theoretically, it sounds pretty much «SF» and to wider, non-scientific masses strange and impossible, holograpy is more and more becoming a part of every day life and the things considered to be possible only in movies and SF books are today performable in humble, school surroundings. Holography enables the production of a genuine, threedimensional reconstruction of a recorded object, which, with a quality gear and well made shots, looks identical to the object. The work is divided into three bigger parts, apart from the introduction and the conclusion. The first part of the work deels with the theory of holography. Fundamental physical laws, upon which holography is based, formulas according to which processes necessary in holography are described in it. In the second part the practicall part of holography is brought up, i.e. the object of the work itself. This part is furthermore divided into two parts. In the first, the material used is described, i.e. the preparation of the field for the shooting, asssembling the equipment etc. The second part describes the procedure of shooting and developing the reflection and transmission holograms. The third part of the work, named «Result and discussion» speaks, through a line of statistical data, comparisons and analysis, about the success of the work. Problems which occured due to the lack of funds, especially due to the humble, unprofessional conditions. The work shows, given in short lines how physics can be fun, educational and useful and at the same time serious even in these inadeqate, school conditions. By using a relatively simple and accesible terminology, physical basis of holography and the process of making a hologram are described. In between these short and brief thirty pages, holography, as a not so far every day life, is described.

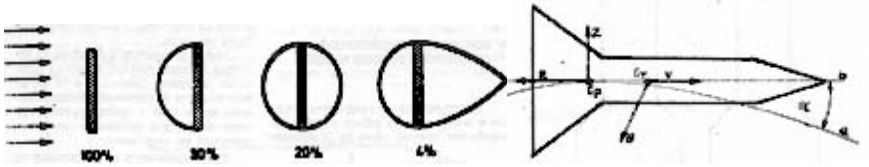
Country: Czech Republic
Team: CZ-2
Name: Sedlak, Frantisek
ID: CZ2-FS-Cap
Presentation ID: TP-CZ2-FS
Title of Presentation: An investigation of basic physical principles of energy separation in a vortex tube

The Rangue – Hilsch vortex tube is a simple device without any moving parts, which can separate a gas stream into two flows with different temperatures. I studied this separation to obtain an elementary physical model, which gives a satisfactory explanation of this effect. The physical model was based on experimental research of heat transfer characteristics of counter - flow type vortex tube (high and low pressure air as a working medium) and numerical simulations of flows. This data has been compared with present qualitative theoretical models of energy transfer (such as turbulent heat transfer, compressing of working fluid, acoustic streaming process). Experimental and numerical results indicate effects of vortices and 'fluctuations' of fast rotating working fluid, but for a final explanation further experiments should be done, which simulate Hilsch effect by another way (investigation of flows in fast rotating cylinder, using sound generator to stimulation of heat transfer in slower air streams in Hilsch tube).

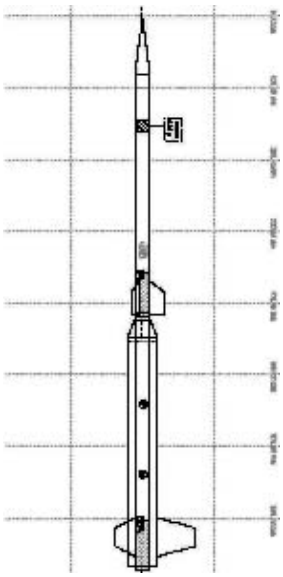
Keywords**: vortex tube, Rangue-Hilsch tube, energy separation, heat transfer characteristics**

Country: Macedonia
Team: MK-2
Name: Dzidzaleski, Vladimir
ID: MK2-VD-Stu
Presentation ID: TP-MK2-VD
Title of Presentation: Two stage rocket

My idea to construct the model of two stage rocket is to take part of the space. For that purpose I applianced the laws for reactive motion, for observe of impulse, the powers that affect of rocket in flight and researching in domain of aerodynamics.



The plan is made M1:10.475.



Realisation and characteristics

Centre of gravity Ct= 478.04 mm
Centre of pressure Cp= 636.65 mm
Area of fin Ps= 2152.75 mm^2

Slenderness degree of fin λs= $\frac{2ls^2}{2Ss} = \frac{54^2}{2152.75} = 1.354$

Ls-width of fin
Ss-area of fin

Front section of rocket A= $\frac{d^2\pi}{4} = \frac{1600\times3.14}{4} = 1256\text{mm}^2$

Coefficient of uplift of tube Czt = $\frac{\alpha}{57..3} = \frac{3}{57.3}$ =0.0523

Coefficient of uplift of fin

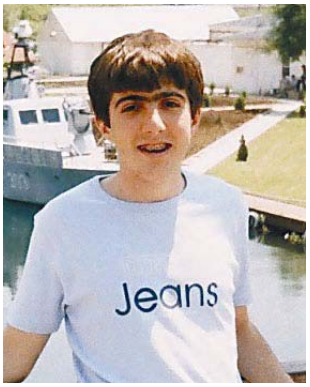
Czs= $\frac{1.84\times\pi\times\lambda s\times\alpha}{2.4+\lambda s}\times\frac{2Ss}{A} = \frac{184\times3.14\times13.54\times3}{2.4+1.35}\times\frac{22152.75}{1256} = 623.162\times3.427=$
=2135.57

Coefficient of uplift of tube Czt= $\frac{\alpha}{57.3}$ α =3...5

Coefficient of uplift of rocket Cz=Czt +Czs=0.0523+2135.576=2135.628
Distance between centre of gravity and centre of pressyre
e=Xcp–Lct=636.65-478.04=158.61mm

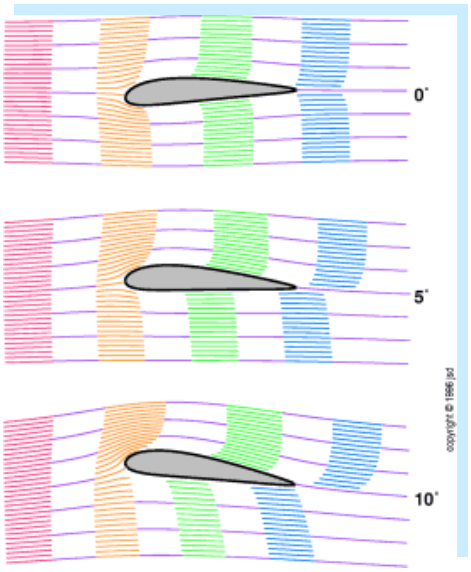
Degree of stabiliry f= $\frac{e}{Lr}\times100 = \frac{158.61}{774}$ =20.49%

Lr-length of rocket
For drive fuel I used model rocket engine:
For the first stage with impulsiveness of 10 N;
For the second stage with impulsiveness of 5 N;
The test of fly was successful. It succeeded to separate the first and the second stage and the height of 320 meters per 5 seconds on an average speed of 64 m/sek. This rocket can be used in meteorology to checkind up the acidity of air on certain height in the sky.



Country: Macedonia
Team: MK-2
Name: Stevanoski, Ilija
ID: MK2-IS-Stu
Presentation ID: TP-MK2-IS
Title of Presentation: Hydrofoil boat

My interest is construct a boat with a greater speed than that of standard boats. 2 factors have influence on this purpose, the fist one is being the bigger thrust of propeller and the second one is hydrodynamic coefficient of boat, which influence on force of the resistance. My aim was to build a model boat, which will give as small as possible resistance on the same thrust, you can see on this image. For this reason I installed wings under the model, which will help it lift almost on the surface of water. In this way, the resistance decreases while the speed of the boat increases. In addition, I succeeded to increase the speed of the boat with the same thrust force for 40%, because of the resistance decrease. While moving, 60% of its weight is transferred on the wings. Therefore, the boat with wing lifts 2.5cm more than the one without wings, keeping the same stability at the same time. So, the model's speed of 0,3m/sec increased on 0,4m/sec. This means that I achieved my aim. Also the special design of my model-boat helped me a lot. Hydrofoil boats can have variety of application, especially when the increased speed of the boat is essential. This type of construction saves energy and increases the carrying load of the boat.



-Forces which influence on the wing-

***-Resistance of the water while moving the* object-**

-Force of resistance of the wing-> $Fo = Cx \times S \times \frac{\rho \times \upsilon^2}{2}$

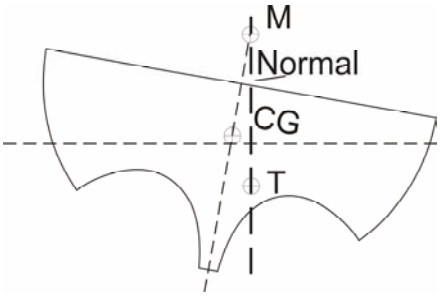
-Bernoulli theory-

-Lift force-> $F_l = C_l \times S \times \frac{\upsilon^2 \times \rho}{2}$

-Thrust force-

-Arhimed's force-> $Fa = \rho \times V \times g$

$\rho \times V = m_v$



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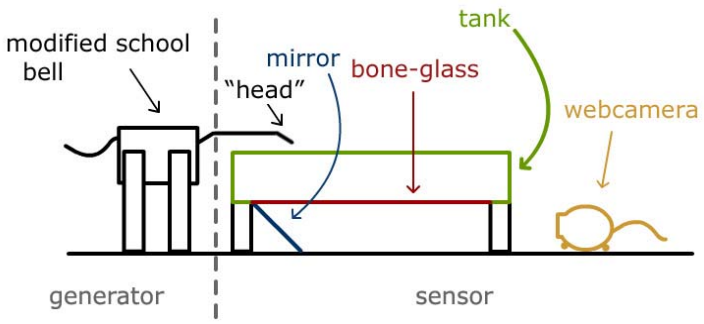
Country: Hungary
Team: H
Name: Vajda, Ákos
ID: H-AV-Stu
Presentation ID: TP-H-AV
Title of Presentation: Computer controlled wavetank

The old wavetank of my school uses a stroboscope and huge mirrors to show the waves and their properties, and because of these parts the cost of wavetanks like that is extremely high. I have started my project to build a wavetank in a less expensive way using modern technology. I replaced the high-priced components by electric circuits, a webcamera and computer control.



My wavetank is constructed from two parts: one part is the wave-generator, and the other is the sensor. I started my work by constructing the generator. It is an adapted school bell with an electric circuit added to the coil. The transistors are protected from the coil's self-induction by a built-in diode. Because of this circuit the generator can be controlled by a computer program which was written in Visual Basic, and it uses the parallel (printer) port of the computer. It controls how many times the metal stick falls down within a period of time. I made the "head" of the generator replaceable, because during the experiments there is a demand for several types of heads.

After that, the making of the sensor was an easy job. The main part of the sensor is the glasstank filled ink-coloured water plus a bone-glass under the tank. The view of the waves coming from above is reflected on the mirror, then it reaches the lens of the webcamera. Therefore the video can be modified or stored on a computer depending on personal demands.

With my wavetank it is possible to analyse the properties of waves (how they disperse, how they are reflected from objects, etc.) Furthermore, we can make experiments about the interference and the Huygens-Fresnel-principle.

To conclude, I think the wavetank I designed is very useful because it could be constructed from the fraction of the old model's price. What is more, all the experiments we can make with the old model that can be made with this one. For the future I have plans with this project, I am going to make a new one in a smaller form, because I have recognized that the tank is bigger than it needs to be. Besides, I am going to try a new type of generator that is based on a certain type of computer speaker.

Country: Poland, **Team:** PL-1
Name: Janczak, Karolina; Michalska, Aneta, **ID**: PL1-KJ-Stu, PL1-AM-Stu,
Presentation ID: TP-PL1-KJ/AM, **Title of Presentation:** Physics in the world of toys

This is the title of second part of 28th Physics Team Tournament for the Cup of the Youth Palace Director in Katowice. Since a couple of years, in the second part of the tournament every team constructs its own toy which is in fact a scientific model which is epitomised with the following watchwords:
They like unusual toys
There are lawsof nature that work here, not magic
They like to know how something works
They like to know why something works in that way

In the tournament toys have become an extraordinary way of showing the possible use of physic laws. Futhermore, this is also demonstration of school's work and the basis of relations between the student, the teacher and the school principal.
Few years ago, prof. V. Zanetti form University in Trident organised the tour exhibition of toys. In Poland similar exhibitions have been organised in several cities, also in the Youth Palace in Katowice.

The toys presented by the teenagers during the tournament are constructed mainly by themselves, by means of items and materials of everyday use. The toy becomes the property of the physics laboratory and is used as a practical and useful didactic means of teaching.

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Country: Indonesia
Team: RI
Name: Paramamarga, Musa Maria
ID: RI-MP-Stu
Presentation ID: TP-RI-MP
Title of Presentation: Behind The Screen of Snake Shot

For many people, billiard may be just a game, just for fun. There are many kinds of billiard games and one of them is the trick shot game where the player must perform his best trick. It will be measured from its origin, degree of difficulty, and success. Has it ever reached our minds to find out how is it possible? What makes the balls seem like they are alive? How could man kind invent such a thing? Of course, there are physical laws that work behind this game and make it possible.
Basically everything in this scientific paper wants to show that there is nothing to be scared about in learning physics, especially for teenagers all over the world because behind everything amusing, behind everything we love to do there are always physics and we could learn from it, from things we like.
This scientific paper explains about the snake shot, one of the simplest trick shots done by the players and the physics laws that happen behind it. Snake shot is a shot which has a snake's character. In this case, a 15-ball combination shot. There are combinations of physics laws such as Newton's laws, friction, torch, rotation, translation, vector, and energy that enable this shot to happen. As a result we can get a minimal entity of speed required for the last ball to get into the hole and prerequisite elements to do an effective snake shot.

Keywords : Newton's laws, Vector, Velocity.

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Country: Poland
Team: PL-1
Name: Szlezak, Bartosz
ID: PL1-BS-Stu
Presentation ID: TP-PL1-BS
Title of Presentation: What is neutrino oscillation and how it has been proved?

We have got early 1990s. In those days neutrino oscillation was one of several hypothesis witch is tried to answer the question: Why did scientist catch only a 1/3 or 1/2 of calculated solar neutrino? This theory born was when the Kamiokande experiment saw the deficit of muon-neutrino produced in atmosphere. But what is neutrino?
Neutrino is a very unusual “creature”. In the early 1990s physicists know that neutrino is a stable elementary particle with (probably) zero mass and spin equal ½. It was discovered in 1930 by Wolfgang Pauli. Neutrino doesn't react with normal matter, and pass it through as it even doesn't exist. But I want to say something about neutrino oscillation. It’s phenomenon a very difficult to understand and extremely hard to describe. However I will try.

So neutrino oscillation is a ... Wait a moment.
I almost forgot to say about one the most important thing. We know that there are three types of neutrino: the electron-neutrino, the muon-neutrino and the tau-neutrino (this last one not been observed yet, but its existence is inferred by analogy).
So neutrino oscillation is changing one type of neutrino into another. This means that the electron-neutrino traveling through space is no longer a "pure" electron-neutrino but might be partly electron-neutrino and partly muon-neutrino. As the neutrino continues to travel, the proportion of each varie with distance, so it is said that neutrinos oscillate from one state to another. It’s not some kind of black magic or we want to call that quantum mechanic. Oscillation based on very small difference of weight particle and those particle changing one to the other periodically in time. As one can see, it is absolutely necessary that for this property to be visible that neutrinos must have more than one mass state (that is, neutrinos must be massive and the masses of each of the mass states must be different).
So it was a several experiment which tries to prove that neutrino can oscillate. But I will say about the three most important ones.
The first was the LSND experiment in Los Amos. In this center scientists tried to find the anti electron-neutrino which comes from decay of pion. We know that pion decays to muon and anti muon-neutrino. So if the scientist catch the anti electron-neutrino which comes from those reaction, they will prove that neutrino can oscillate. But there was no consent among the scientist and that’s why the experiment wasn’t fully trustworthy. The other experiment was Super-Kamiokande. It was based on detecting neutrino with the aid of czerenkow radiation. Based on measurements made in this detector scientists published the results of their work. It was 1998. The detector proved that neutrino can oscillate and have very small weight but didn’t catch all three types of neutrino. That was done in another experiment. It was SNO experiment (Sudbury Neutrino Observatory). The detector caught all neutrinos (tau neutrino too) with the aid of heavy water (heavy water is excellent to react with all types of those particles). In 20 IV 2002 scientist published the results of analysis of detectors working and said: Now we know that neutrino has very, very small weight and they can oscillate on the way from the Sun to the Earth.
So the legendary phenomenon of neutrino oscillation has been proved!

XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany


Country: Netherlands, **Team:** NL1, **Name:** van Iperen, Nadine, Fest, Lisanne
ID: TP-NL1-NvI, TP-NL1-LF, **Presentation ID:** TP-NL1-NvI/LF
Title of Presentation: Mosalase; about instrument building, overtones and Fourier analysis

For our final paper in the last year at school, we built a musical instrument. We called this instrument the “mosalase”, which means ‘triangular’ in Persian. We had several objectives in mind. Firstly, we wanted to design and build a new stringed instrument by ourselves and subsequently wanted to make an improved version of this prototype. Besides that, we intended to take measurements of this stringed instrument, in order to compare instruments with each other and with our instrument. In doing so, we also wanted to find out whether our instrument had improved with regard to the prototype or not. Below we will tell how we arrived from the prototype to the definitive version and which measurements we took. First we took measurements on a violin, a cello, two guitars and a bass guitar, by measuring the distances between the bridge and every half note. From the results of these measurements we constructed a table and a graph. Then we constructed a power function in the form of $y(x) = a * g^x$, where a is the maximum string length and g is the growth factor. With the help of the parameters of this function for the guitar ($650 * 0{,}944^x$) we calculated the string lengths for our instrument and chose the shape of it.

Based on this, we made a construction plan for the mosalase and we built it. We added bass races, a sound post and a bridge to the last version.

With the help of the IP-coach, a programme to measure sound signals, among others, we took measurements on several stringed – and wind instruments. We used the measured sound signals to make a Fourier analysis, in order to find out the number of overtones and the frequency and the intensity (timbre) of each overtone. Overtones have a frequency of *n* times the frequency of the fundamental tone. Within our measurements this turned out to be not true always, which is perhaps due to the inaccuracy of our measuring arrangement or to the inaccuracy of IP-coach.

With regard to measurements of the reverberation time, we found out that our instrument could be improved by changing the nylon strings into steel strings, because steel strings have a longer reverberation time.

We took measurements to find out the off-pitch time of the mosalase. The result of these measurements was that the frequency of the string under scrutiny decreased with a frequency of almost 0,9 Hz a minute. For these measurements we could not use IP-coach, as the program was not accurate enough.

Our conclusion was that the new version of the mosalase is an improvement compared to the prototype we made, because of the higher number of overtones, the longer reverberation time, and the improved tonal stability. These improvements were the result of the addition of steel strings, the table top, the bass races, the sound post and the bridge, which allows the sound of the strings to be amplified by bringing the air in the resonance box into vibration.

Our investigation taught us to be creative, not to bother to ask help of specialists, like violin builders and mathematicians, and you have to have an open mind towards changes during your investigation. In the future we hope to keep our open-mindedness, our curiosity in science, and to improve our scientific competences.

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XIIIth IYCS - 18th to 23rd of April 2006 – Stuttgart/Germany

Country: Netherlands
Team: NL2
Name: van Iperen, Nadine, Fest, Lisanne
ID: TP-NL2-JD, TP-NL2-SS
Presentation ID: TP-NL2-JD/SS
Title of Presentation: The Flyer Project

Some months ago we found an article on the internet about a certain kind of planes. These ”planes” could fly without any moving parts, only by means of a high potential difference. We thought this could be a suitable subject for our school project.
Around 1992, when Thomas Townsend Brown went to university, he found a force that worked on a ‘Coolidge’ tube (the first X-ray tube). This force is produced when a high voltage is put on the tube. A little later he discovered that all asymmetrical capacitors produce a force when they are connected to a high voltage source.
Brown took out some patents on his discovery in the United States and some in England.
The effect is called the Biefeld-Brown effect because it was discovered by Thomas Townsend Brown while studying/ doing his research under the guidance of Dr. Paul Alfred Biefeld at university. While it is generally accepted that an asymmetrical capacitor produces a force, there is no clear cause for the source of this power. The NASA did research on this effect in 2002.
You can find a lot information about these Biefeld-Brown Flyers, most are not useable because of the crazy thoughts behind them. From black- and zero point energy to anti-gravity. But there were also some interesting articles about Brown’s experiments.
We decided to make our design as simple as possible. After some thinking we decided to use a triangle design. A triangle is easy to build so that we could test different Flyers and it wouldn’t matter if some would break down. Our first step was to find out if we could get them from the ground into the air at all. If we could make this happen we would build a better model and do some measurements.
After trying our design a couple of times we got one Flyer into the air, so we could begin to test. We have tested whether or not the Flyer could produce an (upwards) force in vacuum. With this test we could see if there is any form of anti-gravity being produced. We also changed the positive and negative poles to see whether or not this would make a difference. From these tests we found that the Biefeld-Brown effect was based on ion-wind. Ionised air-molecules are being accelerated by the electric field. We have deduced a formula for the lift force and with this formula we could predict the force the Flyer would produce. The predictions made by means of this formula agree with the measured lift force.
We have also thought about future applications and about the power supply of these vehicles. Biefeld-Brown engines have a high efficiency so they could be used for different purposes. The engines could, for example, be used to lift a rocket during take-off. The engines could produce a force to lift the rocket during the first phase of take–off so that the rocket would need less fuel on board and weight could be saved for extra cargo. The energy that the Biefeld-Brown engine would need could be transmitted through microwaves from the earth to the rocket.
So perhaps in fifty or seventy years we are all having a Biefeld-Brown engine in our vehicles…

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Country: Czech Republic
Team: CZ-1
Name: Janečka, Adam
ID: CZ1-AJ-Stu
Presentation ID: TP-CZ1-AJ
Title of Presentation: Quantum dots

Semiconductor nanostructures are such structures where at least measure dimension is comparable with the wave length of an electron in semiconductors. If only one dimension is limited, we talk about so called quantum wells, if two dimensions are limited then it is a quantum wire and finally, if all three dimensions are limited, we talk about quantum dots. Quantum dots have some very interesting properties. In my project, I describe some methods how quantum dots can be grown and how to observe them then. But the main aim of this project is to perform a luminescence measurement on InAs quantum dots and conclude my own results.