Book of Abstracts

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Institute of Experimental Physics
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Invited Speakers

1. **John W. BELCHER**
   Massachusetts Institute of Technology, Cambridge, USA

   The MIT TEAL Simulations and Visualizations in Electromagnetism

   The Technology Enabled Active Learning (TEAL) Project at MIT has developed a range of 3D visualizations and simulations to foster intuition about electromagnetic fields and phenomena. In this talk we discuss the software approaches used to create these simulations, including Macromedia Shockwave and Java 3D applets for interactive visualization, passive animations created with 3ds max, and the Dynamic Line Integral Convolution (DLIC) method for constructing time dependent representations of the electromagnetic field at close to the resolution of the computer display.

2. **Wolfgang CHRISTIAN**
   Davidson College, Davidson, USA
   Francisco ESQUEMBRE
   University of Murcia, Murcia, Spain

   Modelling Science with Open Source Physics and Easy Java Simulations

   Learning science is learning to develop, test, and apply models to explain or predict natural phenomena. Wells, Hestenes, and Swackhamer point out that introductory science courses are organized around a small number of basic models that are adapted to various contexts. Constant acceleration, simple harmonic motion, Newton's universal law of gravitation, and conservation laws form the core of these models. Developing these models is closer to laboratory experiments and is more likely to provide the student with a novel perspective on the behaviour of a system but programming models can be a labor intensive task for both students and faculty. Many shy away from computer modelling with traditional programming tools. This talk describes tools that address this technical barrier. We describe how the Easy Java Simulations authoring and modelling tool enables the modelling cycle and present a collection of ready-to-use models and associated curricular material developed by the Open Source Physics Project. Examples will be distributed on CD and are available from: http://www.opensourcephysics.org/. Partial funding was provided by NSF grant DUE-0442581.

3. **Fu-Kwun HWAN**
   National Taiwan Normal University, Taiwan, Republic of China

   Integrating Java Simulations into Physics Teaching and Learning

   A computer simulation is a computer program that reproduces a natural phenomenon through the visualization of the evolution of its state. Each state is described by a set of variables that change in time due to the iteration of a given algorithm. Simulations can provide insight into the inner workings of a process – not just what happens, but also how and why. Computer-based simulations in an instructional context mean using the computer to build models, or to model real-world phenomena in order to help students gain insights into the behaviour of complex systems. Simulations not only allow learners to construct and manipulate screen

"objects" for exploring underlying concepts, they also provide learners with the observation and manipulation tools necessary for exploring and testing hypotheses in the simulated world. I have created hundreds of physics simulations for physics teaching and learning since 1996. All the simulations are freely available at NTNUJAVA web site (http://www.phy.ntnu.edu.tw/ntnujava/). Series of simulations will be demonstrated and how it can be integrated with physics curriculum will be illustrated. Some research finding on assessment with simulations will be addressed, too.

4. **Leopold MATHELITSCH**
University of Graz, Graz, Austria
Hansjörg JODL
TU-Kaiserslautern, Kaiserslautern, Germany
M. Benedict, **University of Szeged (H);** **T. Bradfield**, **Northeastern Oklahoma State University (US);** **E. Dębowska**, **University of Wroclaw (PL);** **T. Colbert**, **Augusta State University (US);** **B. Mason**, **University of Oklahoma (US);** **S. Feiner-Valkier**, **Eindhoven University of Technology (NL);** **T. Melder**, **University of Louisiana at Monroe (US);** **S. Sen**, **State University of New York, Buffalo (US);** **E. Sassi**, **University of Naples (IT);** **R. Sporken**, **University of Namur (B)**

Evaluation of Multimedia Learning Materials in Condensed Matter Physics and Particle Physics

This talk will report the findings of a joint evaluation of multimedia educational resources for Condensed Matter Physics and Particle Physics by the European working group "Multimedia in Physics Teaching and Learning" and the MERLOT/Physics Editorial Board. A list of about 100 items (one third particle physics, two thirds condensed matter physics) was collected by the Merlot group. Each group then distributed these items among several reviewers and each reviewer selected items of sufficient quality for a detailed review, according to their set of criteria as reported at earlier MPTL meetings. Hence, each item in the original collection has been seen by two independent reviewers, one from each group, but some items may have received detailed reviews from only one group. Example recommended materials will be presented with a discussion of the common characteristics of these resources and general findings of the reviewers.

5. **Hartmut SCHMIDT**
University of Applied Sciences, Darmstadt, Germany

Multimedia in Testing Industrial Products

In this presentation I will demonstrate the application of optical and physical principles to design novel industrial products. The rapid development in this area is promoted by the availability of innovative optical components. These are novel light sources like superbright LEDs, discharge lamps, lasers or special light detection systems for analysis of polarization, color or gloss. Color and gloss are certainly no physical quantities - they rely on human perception and thus are not easy to determine. The range of industrial products incorporating optical elements is wide. It extends from devices like a CD-player or a flash light to PC monitors with super high contrast. A "virtual" product for example is the optical model of a single hair or textile fiber for the realistic appearance of hair or textiles when creating a computer animated movie. A final task is the display of high contrast scenes, common in natural appearance, by high dynamic range imaging. In my talk I will illustrate the design of a

flashlight by an optical modeling program, including CAD-features. The next example will model human hair and textile fibers, where features like the classical rainbow effect, interference by thin films and diffraction from grating structures have to be considered. Another focus will be on human perception in order to understand the methods to display an image of the simulated object, which appears as close to reality as possible. Finally I will discuss some of the report systems employed in industry to make the knowledge gain accessible to all engineers in research and development.

6. **Robert TEESE**
   Rochester Institute of Technology, Rochester, USA

Video Analysis - A Multimedia Tool for Homework and Class Assignments

Video-based motion analysis is a popular tool that is often used in introductory physics laboratory courses but not so often in other settings. The LivePhoto Physics Project is producing homework and in-class assignments for teaching introductory physics using video analysis techniques. These span a typical year-long course, including electricity, heat engines and physical optics as well as mechanics. I will describe the project and the techniques we use for producing videos that are appropriate for students to analyse.

Oral Presentations

1. **Paweł BARCZYŃSKI, Piotr SKURSKI**
   University of Łódź, Łódź, Poland

Gliding over Physics

People's dreams to fly like birds and to glide like eagles, falcons and storks are as old as mankind. Many of us living now share those dreams. The Physics of a glider's flight can be an important part of the teaching and learning process. Measurements taken during a glider's flight are interesting and can be analyzed by university students. This data is later used during classes led by students and during science fairs and other popular meetings.

2. **Sasa DIVJAK**
   University of Ljubljana, Ljubljana, Slovenia

Slovenian Experience with Development and Deployment of SCORM Compliant Courseware

Slovenian Ministry of Education granted several projects focused on development of e-learning courseware for secondary and elementary education. All projects have to fulfill several selection criteria. One of this was that the developed material should be compliant with actual official curriculums of the particular subjects. The second was that it should be enriched with interactive and multimedia elements. The developed materials should also permit reusability and adaptability to particular learning environments and scenarios. Such courseware should be compliant with most popular learning management systems which are introduced in Slovenian schools. An obvious choice was to follow SCORM standard. Since this standard is in continuous development several problems related to the incompatibility of the available authoring tools and learning management systems with this standard arise. The paper explains the experience gained and shared during the mentioned projects.

3. **Vegard ENGSTRÖM**
   Simplicatus AS, Løvenstad, Norway

SUPERCOMET 2: Teacher Training in Active Learning

This presentation aims to give an overview of the development activities carried out in the SUPERCOMET (2001-2004) and SUPERCOMET 2 (2004-2007) pilot projects funded by the Leonardo da Vinci programme of the European Union. We will also present the planned MOSEM project (2007-2009); Minds-On experimental equipment kits in Superconductivity and Electromagnetism for the continuing vocational training of upper secondary school physics teachers.

4. **Raimund GIRWIDZ**
   University of Education Ludwigsburg, Ludwigsburg, Germany

Multicoding and Interactivity with Computer Visualizations

Multicoding, i. e. using various kinds of representation, can promote flexible thinking. Especially offering different visuals can bridge the gap between theory and application support understanding what was discussed in lessons. Examples we designed with this intention are a virtual camera, a virtual machine simulating thermal waves and a revision course on waves and Plancks law. Theory, the application and further details will be outlined in the session.

5. **Hermann HÄRTEL**
   ITAP-Institute for Theoretical Physics and Astrophysics, Kiel, Germany

Use of Computer Supported Material for Better Understanding of Difficult Concepts in Physics

The term voltage indicates one of the basic concepts in electricity which at the same time is one of the least understood. A test, asking for rather basic qualitative explanations, has been administered in different countries with a common negative result. These results are presented together with first ideas how the use of computer supported material could lead to more satisfying learning results. The new approach is based on the existence of surface charges, which are an integrated part of any electric circuit. Such surface charges have first been discussed by Weber and Kirchhoff in the middle of the 19. century but never really reached the scientific community. New course material from the US show the fruitfulness of this approach, which will be adapted and enriched with computer generated animations and interactive applets.
Reference:
A. K. T. Assis and J. A. Hernandes
The Electric Force of a Current: Weber and the Surface Charges of Resistive Conductors Carrying Steady Currents," (Apeiron, Montreal, 2007), 239 pages
This book is available as pdf-file (5 Mb) under :
http://www.ifi.unicamp.br/~assis/the-electric-force-of-a-current.pdf

6. **Zuzana JESKOVA, Marián KIREŠ**
   P. J. Safarik University, Kosice, Slovakia

Videomeasurements as a Means of Physical Phenomena Visualization

In the contribution there are presented examples of videomeasurements designed for the detailed analysis of selected physical phenomena. The examples are based on the analysis of motion of different kinds of objects from everyday life as well as the analysis of motion of the objects that are difficult to analyse with the help of other measuring tools.

7. **Anna KONIECZNA, Robert KONIECZNY**
   Wrocław Interactive Educational Centre, Wrocław, Poland

Wrocław Interactive Educational Centre

The presentation describes MultiCentre - an Interactive Educational Centre, the first of that kind in Poland. The centre offers educational workshops of a wide range of topics to various age groups. The topics offered to be worked over include renewable sources of energy, industrial processes management, portable laboratories, robotics, automatics, mechanics, hydraulics, music and art. The aim of the institution is: to complement the more traditional methods of teaching and learning, to educate for the information society, to develop music, artistic and designing skills, as well as to cooperate with Wrocław schools, community centers and teachers' education centres. The presentation describes widely the activities of the institution - lectures, workshops, cycle meetings of interests circles.

8. **Libor KONIČEK**
   University of Ostrava, Ostrava, Czech Republic

Impact of Multimedia Program Supercomet 2 on the Teacher and Pupils

The SUPERCOMET 2 program was tested on secondary schools. The conclusion questionnaire was prepared one for physics teachers and second one for pupils. Knowledge of superconductivity was tested at the end of using this program. The results of this investigation will be presented. The efficiency of multimedia program will be discussed from the point of view of pupils and physics teachers.

9. **Gerd KORTEMEYER**
   Michigan State University, East Lansing, USA

LON-CAPA: Opensource Course Management and Assessment System

LON-CAPA is an opensource freeware course management and assessment system for the sciences and math. Besides providing basic course management functionality, the system enables instructors to give sophisticated randomized homework including randomized formulas, graphs, and symbolic math manipulations. LON-CAPA has a shared content pool of currently over 275.000 online resources, including over 100.000 homework and exam problems. The network connects more than 100 institutions, including high schools, community colleges, four-year institutions, universities, and publishing companies. We will discuss experiences regarding resource sharing between courses and institutions, as well as experiences and research results regarding the use of online components in undergraduate introductory physics courses.

10. **Lech MANKIEWICZ**
   Polish Academy of Science, Warsaw, Poland

Hands-On Universe. Bringing Modern Astronomy to Teachers

Hand-On Universe helps teachers and students to develop basic skills using hands-on approach and tools derived from modern astronomy. I will describe basic methods and tools

of the program, such as school observatories, didactical software, remotely controlled educational telescopes and radiotelescopes and classroom activities.

11. **Włodzimierz NATORF**
    WSiP S.A., Warsaw, Poland

Between "paying attention" and "hands-on" Learning

Two examples of using educational software in class or at home are discussed. The first one concerns teaching about the Rutherford experiment. The computer program presented here is a specific simulation of an alfa-particle colliding with a nucleus. It helps 18-year old pupils to understand various aspects of such collisions. The second example relates to teaching kinematics. The software includes stroboscopic pictures, generated by a digital camera. The pupils are encouraged to measure and to analyse the time dependence of the position of a moving object. Experimental values of speed and acceleration may be determined.

12. **Franz SCHAUER**
    Tomas Bata University in Zlin, Zlin, Czech Republic
    M. Ozvoldova
    University of Trnava, Trnava, Slovak Republic
    F. Lustig
    Charles University in Prague, Prague, Czech Republic

Real Interactive Physics Experiments with Data Collection and Transfer Across Internet

The set of remote interactive physics experiments using the common web services (as web browser) across the Internet are presented. First, the computer oriented experiments were built using available measuring hardware and software kit system for data collection with corresponding sensing units and also signals generation with their subsequent recording and evaluation - ISES (Intelligent School Experimental System) and, second, subsequently easily transformed to the remote interactive and real experiments across the Internet with the data transfer and the possibility of their processing by the remote client utilizing the software ISES-kit. This approach is demonstrated on the example of the teaching unit Oscillations, Waves and Optics and corresponding remote experiments Forced oscillations and Diffraction on microobjects (Heisenberg principle of uncertainty) with data evaluation and for the first time also their comparison with the data outputs generated by the applets. Other experiments, operated round o clock are : Controlling of the liquid level , Monitoring the environment in Prague, Electromagnetic induction , Driven oscillator, Characterization of the photovoltaic device, Diffraction of microobjects, Heisenberg principle of uncertainty. These new technologies, at present rapidly developing, enable to introduce the method of complex study of real world phenomena based on the data collection, their processing and evaluation and comparing with the models given by the physics laws, forming the basis of a new educational strategy so called Integrated e-Learning.

13. **Frank SCHWEICKERT**
    University of Amsterdam, Amsterdam, The Netherlands

Data Logging for Primary Schools

"Science is Primary" is the motto that is increasingly emphasised by European Academies of Science in recent years. Primary school curricula are being revisited in many countries in

order to motivate and to foster scientific thinking in young children. Computer measurements with sensors have proven to be effective in secondary science teaching. But what can data loggers contribute to the earliest steps in inquiry based learning? EuroSense and EuroLab are computer interfaces by the AMSTEL institute that are specifically designed for primary pupils. As as a partner in the European project POLLEN (FP6) we are developing learning activities as well as training for primary teachers and teacher students. This talk will give an outline of the material and discuss some key issues in respect to their propagation.

14. **Wiesław, Tłaczała, Marek SZYMAŃSKI, Gabriel Gorghiu, Alfred Zagórski**
    Warsaw University of Technology, Warsaw, Poland

Virtual Physics Laboratory – Selected Topics

In the paper we present the set of eight experiments developed for the VccSSe (Virtual Community Collaborating Space for Science Education) project and devoted to heat conductivity, Curie temperature determination, electrical resonance, gamma rays absorption, horizontal component of the magnetic field determination, and gas laws. The presented set of the simulated physics experiments are included in a specific module for training, dedicated for the in-service teachers training, in the frame of a recent approved European Socrates project: 128989-CP-1-2006-1-RO-COMENIUS-C21. The presented experiments can be also useful for students for the training before entering the real physics lab.

15. **Józefina TURŁO**
    Nicolaus Copernicus University, Toruń, Poland

Multimedia versus Microcomputer Based Laboratory Methods and Tools in Science Education

Together with colleagues from EU countries we are actually working on the SOCRATES COMENIUS 2.1 Project Effective Use of ICT in Science Education. The questionnaire made within Project showed, that despite the growing number of schools in Europe which have broadband access to the multimedia, there is no essential improvement of the quality of education, especially science education. The question arises: what kind of ICT methods and tools should be used to aid interactive and effective learning? In this paper we are trying to characterize the educational value of different types of multimedia (including streaming media) and compare them with the most important features of MBL experiments. Based on the theory of cognition (constructivism) we identify, whether the CBL methods consist only in presentation (visualization) of information (as in the case of Internet or Multimedia) or rather information (virtual or real) can be transformed or processed as during modelling or MBL. The examples of MBL experiments elaborated by us and the teachers collaborating with us will be presented.

16. **José M. ZAMARRO**
    University of Murcia, Murcia, Spain

Learning Quantum Physics Building Simulations

Our experience on teaching Physics at the 1st course of the Physics career at Murcia University using computers to build simulations, particularly some examples about Quantum Mechanic, is presented. Our students develop a systematic series of physics models covering different topics dealt with in the General Physics course. At the same time, the basics of

building models with a computer is introduced along with the necessary numerical techniques involved. In this communication we shall present the way we use computers to teach Physics at this introductory level and some examples done by students about quantum mechanics, a particle in an infinite box, a particle within a finite potential wall, time dependent function state.

Interactive Posters

1. **Aleksandriya ALEKSANDROVA, Nadezhda NANCHEVA**
   University of Rousse, Rousse, Bulgaria

E – Test with Physics Video Demonstrations

Preparation of a comprehensive, engaging, thematic, problem- based learning model of physics should contribute the mental strategy "Understanding vs. memorizing". This article presents e-multimedia test, integrated in the LMS "Moodle". For preparation of the test questions with integrated video clips the test generator called "Hot Potatoes" has been used. The created e-multimedia test can be used by students to make connections between concrete, real-life phenomena and the abstract ideas and models of physics, to understand basic principles and concepts. In so far as learning is structuring and restructuring memory, the students have to explore the real physics world and organize, represent and link received knowledge. Students have to learn not only the applications of laws, principles and facts but also, the most important, they have to learn to think, to understand and explain the phenomena. Presumably, applying instructional model "engage, explore, explain, elaborate and evaluate" should increase the student's interest of study physics and achieve the educational goals. The distant learners, who have often null opportunity to observe the real experiments in the university, can also use it for self- learning.

2. **Sergey AVERKOV, Olga IGNATOVA, Alexander KAZACHKOV**
   V.N. Karazin Kharkiv National University, Kharkov, Ukraine

Using Animation in Excel in Order to Solve Physical Problems

A lot of students working in Excel don't use a huge potential of this application. In our work are shown advantages of using macro, which are created and edited by Visual Basic for Application. We have studied some kind of problems from the course of General Physics, in particular, very interesting pursuit problems (in kinematics, two-dimensional motion). Thus, such method of computer animation in Excel stands out from others methods by its simplicity. Students can in real-time observe how changing of the parameters of the problem effects the behaviour of the simulated systems and make essential conclusions even if their training in programming is limited.

3. **Saulius BAGDONAS, V. Karenauskaite, G.Dikcius, R. Rotomskis**
   Vilnius University, Vilnius, Lithuania

Applying Innovative Technologies in the Biomedical Physics Courses for Health Care Specialists

The presentation will discuss the implementation of ICT in biomedical physics courses as well as an e-learning environment in the teaching and learning processes of medical students and working medical professionals in order to ensure learning opportunities at the most convenient time and place. The e-learning system is based on a module of general physics knowledge for university students. Applying the principles of flexibility and variety, it is possible to construct the different biomedical physics modules for medical professionals and college studies programmes.

4. **Wolfgang Christian, Mario Bellini**
Davidson College, USA
Francisco Esquembre
Universidad de Murcia, Spain
Doug Brown
Cabrillo College, USA

New Curriculum Material for Teachers, Authors, and Developers

Although there are many computer-based resources for teaching physics, few are based on physics-education research (PER) and few are built using an object-oriented open source code library. What is needed by the physics education community is not another computer program (although programs are essential), but a synthesis of curriculum development, computational physics, computer science, and physics education research that will be useful for students and adaptable for teachers wishing to write their own simulations and develop their own curricular material. The Open Source Physics (OSP) project was established to meet this need. OSP is an NSF-funded curriculum development project that is developing and distributing a code library, programs, and examples of computer-based interactive curricular material. This poster will report on new upper-level physics curriculum packages, the Easy Java Simulation modeling and authoring tool, and the Tracker video analysis tool. Examples will be available on CD. The Open Source Physics code library, documentation, and sample curricular material can be downloaded from http://www.opensourcephysics.org/. Partial funding for this work was obtained through NSF grant DUE-0442581.

5. **Agnieszka CIŻMA, Piotr GOLICZEWSKI, E. B. Radojewska, R. Poprawski**
Wrocław University of Technology, Wrocław, Poland

On-line Multimedia Support for Student Experiments in Ferroelectric Physics

The presentation gives an example on how expression media such as images, animations, video stream and plain explanations can support a teaching process in experimental physics. Our on-line site aims to support studies of the spontaneous polarization in ferroelectrics prior to the experimental work students are to do. The method that the students can learn and see earlier what they will be undergoing at the laboratory is suitable also for other experimental branches. With a minor modification, such multimedia sites can be used in a long-distance teaching.

6. **Jan DEGRO, Peter Marton**
P. J. Safarik University, Kosice, Slovakia

Mechanical Oscillations and Waves

In this article we present our educational multimedia program and also we show some practical experience using it in practice at secondary school.

7. **Wojciech DOBROGOWSKI**
   University of Białystok, Białystok, Poland

Markup Languages for Creation Reusable Learning Objects

Document Type Definition (DTD) and XML Markup Languages were used to create physics laboratory instruction. The several form of outputs i.e Web Page, Printed Form or Multimedia Presentation make easy to use the same material in different pedagogic situations. The RELOAD tool and the SCORM standards were used for creation E-course. The developed material and the used procedures will be presented online.

8. **Piroska DOMOTOR, M. Benedict**
   University of Szeged, Szeged, Hungary

A Multimedia Course for Teachers of Physics and Science

We have organized a training course for teachers of physics and science on the use of MM in teaching and learning. The course was partly a satellite program of MPTL11 in Szeged. We give an overview of the lectures we offered them. In the end, the teachers had to present their own material and fill out an interactive test to prove their ability to navigate on physics related pages of the internet. They also answered a questionnaire how were they satisfied with the course.

9. **Agnieszka DRZAZGOWSKA, Ewa KUREK**
   WSiP S.A., Warsaw, Poland

Simulations and Visualizations in Teaching Physics and Nature at School

Various forms of educational software are presented. The software is intended for both teachers and pupils at the primary and secondary school level. Software for teachers includes programs that can be used during classes to show sophisticated experiments - difficult to conduct at school, to simulate phenomena or processes. Other programs are useful in preparing lessons (teachers can get advice on preparing their lessons, they can create their own tests, etc.). Educational software for pupils is also varied. Some programs are ideal to revise before tests or exams, others can be used as homework.

10. **Vegard ENGSTRÖM**
    Simplicatus AS, Løvenstad, Norway
    Pernilla Molander, Anna Kristensson, Monica Lindberg
    BRIGHT AB, Sweden

Interactive hands-on and visualization materials based on Bohr's atomic model

Two Swedish teachers working with visually impaired students decided to develop hands-on materials in order to allow these students to experience first-hand the Bohr atomic model in chemistry and physics. The success of the prototypes in science classes also for regular students led to the development of the commercial version which is now marketed under the name "BRIGHT Atom". There is also a "BRIGHT Science Kit" which includes an oversized magnetic version for display on whiteboards, as well as student worksheets. Simplicatus considers including this material in the new collection of materials to be developed in the

MOSEM project (Minds-On experimental equipment kits in Superconductivity and Electromagnetism for the continuing vocational training of upper secondary school physics teachers), and wish to inform the rest of the MPTL community about these Swedish materials. A hands-on atomic model gives science teachers a visual tool to present the concepts of electron shells, isotopes and ions in a concrete way. The students can work with these concepts and use their hands in the learning process. The included worksheets have been successfully tested in upper secondary schools in Sweden. The models are limited to the Bohr paradigm and as such are not suited for more advanced explanations of electrons' orbitals and the real structure of atoms and ions. Just like other simplified visual representations of atoms, the proportions are also off by several orders of magnitude. It is therefore recommended to use these materials in conjunction with other teaching aids and learning approaches, as part of a well-balanced collaborative active learning style, as promoted in the SUPERCOMET 2 and MOSEM projects. E.g. taking the students into a large playing field to experience the 5 orders of magnitude between the typical size of a nucleus and the typical size of electrons' orbitals is a very good activity that should be combined with the use of good hands-on materials in science, chemistry and physics classes. Simplicatus sees the possibility and necessity of developing more teaching and learning activities with these hands-on materials in order to utilize their full potential in connection with the other activities and experiments to be developed in MOSEM. The materials can be useful not only in upper secondary school but also in lower grades, in order to allow pupils a first-hand experience with atomic structure and key concepts from the particle model of matter.

11. **Fernande FRISING, R. Sporken, P. Thiry**
University of Namur, Namur, Belgium

Videos of classroom physics demonstrations

The main goal of this project is to give introductory physics students the opportunity to review classroom demonstrations. A set of videos has been realized in the fields of mechanics. In addition to standard experiments such as elastic and inelastic collisions on an air track, bicycle wheel and the rotating platform, the ripple tank, we added experiments which are not done during the lecture course because they are time consuming or too elaborate. It is the case of demonstrations about rotating frames: different experiments have been designed to show trajectories in a rotating platform. Moreover, videos are edited: graphics, formulas and comments are included in the movies. Videos will be placed on the web in September. Students will be encouraged to review them on their own. In order to promote the use of this material, we plan to develop multiple choice questions relating to the videos topics. For example, students should be asked to predict the outcome of demonstrations. We hope that students will be actively engaged with this material and will think more carefully about demonstrations. Professors and assistants who are involved in teaching of these topics will also be asked to provide feedback on this material. Several video clips will be presented at this workshop.

12. **Marek GODLEWSKI, Marcin KLIMEK**
ZamKor, Cracow, Poland

Animation as a Very Effective Multimedia Tool for Easier Explanation of Physical Phenomena

Animation is a very effective multimedia tool making explanation of different physical phenomena to high school students much easier. It is a big challenge for physics teachers to

explain students the connection between forces, velocity and acceleration in motion. We present and discuss the animation of elastic ball falling on the floor. It is fascinating, how many different kinds of linear motion can be observed in such a simple phenomena. This animation can make explanation of velocity and acceleration changes in different kinds of linear motion much easier.

E-Learning Course Based on Programming Learning Technique

We present the course of kinematics and dynamics, placed on ZamKor e-learning platform and accessible via internet. On the example of this course we discuss "e-learning implementation" of programming learning technique first proposed by the behaviorist B. F. Skinner.

13. **Tomasz GRECZYŁO, Tadeusz Lewowski**
    University of Wrocław, Wrocław, Poland

Ice Crystals Exhibit Great Beauty

The interactive poster presents real time experiment on ice crystallization. Natural ice on Earth exhibits a hexagonal structure and crystallizes frequently in delightful, geometrical forms, such as in snowflakes and hoarfrost found on windowpanes. During the presentation the authors intend to show their 'live' observations of the kinetics of the growth of ice microcrystals, for water, Pepsi-Cola and beer employing polarized light. The authors will also discuss the experimental procedure with the use of digital camera transformed into a polariscope, computer and home made, easily accessible set-up. The accurate description of the experiment was published in "Physics Education" vol. 41, No. 4 2006.

14. **Anna HAJDUSIANEK**
    Wrocław University of Technology, Wrocław, Poland

The Short Films in Teaching of Physics

The short films (1-5min) are very important in teaching of physics. Showing the short films and experiments make lectures more interesting and exciting. It is very important, especially for the younger students. Some experiments are very long and take a lot of time. Some are to complicated and not convenient to doing and showing to students, and some are to dangerous for the audience. Instead of this experiment we can show the films and take students in world of physics. Showing films with the experiment in the same time is a good idea for lectures. The short films are very useful to teacher and helpful for the students to make physics more friendly. Today e-learning seems to be very popular and one of the important way to teaching, therefore the short films are necessary and the only way to show experiment in e-learning system.

15. **Jozef HANC**
    P. J. Safarik University, Kosice, Slovakia

Simple Quantum Approach to Electromagnetism and Optics

The contribution deals with a gentle introduction to Feynman's quantum theory ideas describing quantum electrodynamics, which together with powerful symmetry principles and interactive software based on EJS (Easy Java Simulations) can allow us to derive e.g.

Coulomb's law about interactions between electric charges or postulate about constant speed of photons. Thanks to PC, mathematics needed in our instruction is only at high school level. Physics used in the examples provides a nontraditional look at the classical electromagnetism and optics.

16. Hermann HÄRTEL
ITAP-Institute for Theoretical Physics and Astrophysics, Kiel, Germany

Nickels-an Open Source e-Learning Platform

Based on WEB-technology the e-learning platform Nickels has been developed in Germany and is used at different German universities in quite different environments. The platform offers the usual facilities for user administration, authoring, templets for testing and learner feedback, manoeuvring support, discussion platforms a.o. Special care has been taken to facilitate the translation of user interface and content to other languages. The major features of Nickels will be presented and discussed in comparison with other platforms.

Reference: http://www.e-learning-service.de/

17. Fu-Kwun HWANG
National Taiwan Normal University, Taiwan, Republic of China

Enjoy the Fun of Physics with Java Simulations

Several hundreds of physics related java simulations in different topics are freely available at NTNUJAVA Virtual Physics Laboratory web site (http://www.phy.ntnu.edu.tw/ntnujava/). Registered users, who logins to the forum, will find "Get files for offline use" button while browsing the simulation web pages. User can choice either download file directly or let server send files in ZIP format to user's email account. There are two different types of java applets on our server: 1. TNUJAVA simulations: This refers to simulations I have created between 1995-2000 with JDK1.0.2. There are 88 mirror sites (28 countries) host the same applets around the world. You might have seen some of those in CDROM distributed with physics textbooks. You are welcomed to translate strings in the simulation into local language format. Please send us copy of translated work so that we can share it with more users. 2. Simulations created with Easy Java Simulations (EJS): EJS is a modeling and simulations generating tool created by Francisco Esquembre. I used EJS to create all the simulations after I had found this great tool. There are many new features when viewing simulations generated with this tool on our server. a) Click 'snapshot' button will generate snapshot image of the simulation on a popup window, and the same image file will be sent to user's email account at the same time. Teacher can use this feature to find out how student is playing with simulations on our server. b) Click 'save simulation state' will save the current simulations variables on our server. When you click 'setup' button, all the saved records will be listed as URL links. The simulation will be restored to the previously save states when you click one of those links. c) You can also find out how the simulation was generated with EJS (i.e. find out the physics model behind the simulations: defined variables with initial values, relations between variables…etc.). However, you will need to allow browser to load EJS into your browser as a signed applet. You can save EJS source code (as xml file) locally. You can also modify model or view (GUI elements) in the simulation and generate new simulation with your browser. The only requirement is your browser need to support Java Run Time. If you need a new simulation which is not available on our server, please describes it in detail and we will try to create one for you! I hope you will enjoy the fun of physics while playing physics simulations on our server.

18. **Hansjörg JODL**
    TU-Kaiserslautern, Kaiserslautern, Germany

Demonstration of new RCLs

An RCL (remote controlled lab) is a real experiment , which is set up at location A , which can be performed via internet , where the user is at location B (have a look at our web-site http://rcl.physik.uni-kl.de). We will present new recent RCLs , such as Rutherford experiment, optical CT, world pendulum, Biot-Savart law, etc. In addition we will show a user-time-management system by which one can book one specific RCL for a wanted time interval.

19. **Radu JUGUREANU**
    SIVECO Romania, Bucharest, Romania

A Nationwide eLearning Project Vision

Information society has led to the use of IT&C as a reference point for systemic changes in educational systems, and challenges have been shaped on three major directions, having as starting points the Lisbon and Feira Summits: equipping schools, training teachers and providing the necessary resources. Subsequently, by intersecting other prioritized directions, such as ensuring quality of education, continuous learning, developing the profession, these directions were detailed and updated. Now we are talking of an acceleration of the process, from the angle of the need to substantiate it theoretically, psychologically and pedagogically, to forming transferable competencies and building structures and mental operations, to rethink teaching-learning strategies and the educational system itself.

20. **Alexander KAZACHKOV**
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Animation and Virtual Experiments in Excel

An idea to animate in electronic sheets shared at MPTL 11 by Tomasz Greczylo proved its efficiency in a variety of problems of educational Physics. After initial practicing it in creative students projects we developed programs in the university course of General Physics and special courses for majors in Physical Pedagogics. Presented are animations in Excel (corresponding macros created by students) of several regular and advanced problems of kinematics, dynamics and geometrical optics. For some systems live and virtual experiments were combined (water-jet and glass-plate light guides). Intriguing "pursuit" problems were solved numerically (by Euler's method), animated and analysed.

21. **Marián KIREŠ, Zuzana JESKOVA**
    P. J. Safarik University, Kosice, Slovakia

Analysis of the Young Physicists Tournament Problems Supported by Multimedial Tools

In the contribution there is a physical analysis of the selected experimental problems of the Young physicists' tournament presented. The analysis is realized with the help of videoclips, animations, JAVA applets and computer-based measurements. The complex use of these tools enables students' deeper understanding of the examined problems. At the same time it is an

efficient means for students to present and argue for their own solutions within the competition.

22. **Marcin KLIMEK, Marek GODLEWSKI**
    ZamKor, Cracow, Poland
    Lucjan Pytlik
    AGH University of Science and Technology, Cracow, Poland

Complementary Role of Remotely Controlled Experiment

Each year access to internet becomes easier for both teachers and students. As a consequence, it is sensible to create e-learning physics courses and develop distance learning techniques. But physics is an experimental science therefore it is impossible to teach and learn physics without experiments performed by students. In such a situation very important complementary role can (should) be played by remotely controlled experiments. We present an example of remotely controlled experiment and discuss its role as an important supplement to high school physics textbooks and distance learning courses in physics.

23. **Bruce MASON**
    University of Oklahoma, Oklahoma, USA

Digital Libraries for Science Resources

The dissemination of online and multimedia educational resources through the web is aided by organized and coordinated digital libraries. This poster outlines the efforts of several of these projects in the US - the MERLOT project covering a broad spectrum of topics, from Physics to History; the National Science Digital Library with coordinated efforts in many fields of science, mathematics, engineering, and technology, and the ComPADRE digital library for Physics and Astronomy resources.

24. **Maciej MATYKA**
    University of Wrocław, Wrocław, Poland

The Soft Body under Pressure - a Simple Model of Complex Behaviour

Simple computational model of soft body animation in two and three dimensions is introduced. The model is based on fundamental principles: Newton's Laws, Hooke's Law and Ideal Gas Law. The simulated body consists of material points connected by springs. Additionally, pressure force on the body surface is applied. An equation of motion for each point is solved. The advantages of the model for educational applications are: it is based on fundamental physics laws; it is very fast and allows for an interactive simulation on home PC; its concept is simple enough to be understood by students. The model may be used as a representative example of physically based modeling in computer graphics and animation.

25. **Angela MILAZZO**
    University of Calabria, Calabria, Italy

Early Results about a Multimedia Material Experimentation with University Students of Calabria

In this communication we briefly report the results obtained in an experiment with university students, enrolled to the first year of Engineering, to which we have submitted the lesson on projectile motion with and without multimedia tool. The results show that the multimedia lesson is more effective than the classical one.

26. **Grzegorz OSIŃSKI, Grzegorz Karwasz**
    Nicolaus Copernicus University, Toruń, Poland

Multimedia Libraries in Physics Education

The present day multimedia resources play a more significant role in physics education on different levels of school practice. But the major problem in effective using of these resources is a different types of the resources. In our work we take attempt to collect a different type of resources in one multimedia library with external web publication. The catalog of our CDROM`s collection, commercial as well as created by us, will be presented. The samples of multimedia internet resources such us: simulation software, java applets, internet distracting projects and 3D simulations accessible in our web page will be shown.

27. **Miroslava OZVOLDOVA**
    University of Trnava, Trnava, Slovakia
    Franz SCHAUER
    Tomas Bata University in Zlin, Zlin, Czech Republic

Real Interactive Physics Experiments with Data Collection and Transfer

The set of remote interactive physics experiments across the Internet, controlled by the web services (as web browser) are presented, using commercially available hardware and software measuring system 'ISES' (Intelligent School Experimental System) with sensing units for data collection, recording and evaluation and the software 'ISES-kit' for the establishing the server-client connection. This approach is demonstrated on the example of the teaching units: Oscillations, Waves and Optics and corresponding remote experiments Forced oscillations and Diffraction on microobjects with the data output and comparison with the data generated by the applet (http://www.ises.info/vzdal_exp.html).

28. **Tatjana SAPTSINA**
    Lebedev Physical Institute Samara Branch, Samara, Russia

Homemade Experiments on Optics

Multimedia manual for homemade experiments on optics realized with available items is presented. Being easily performed the manual can be used as an instruction for independent experiments. The manual contains photos and videos that could be illustrations for lectures on optics. Students can use this work as an example for recording of their labs. Spectrum

observation with modified CD, testing the structure of the holographic packagings and the markings by means of diffraction, studying of the Poisson effects, diffraction on a bird feather is included. The work is the experience review of the research study with the pupils of physical-mathematical secondary school.

29. **Gheorghe-Dorin STOICESCU**
    Lucian Blaga University of Sibiu, Sibiu, Romania

What we Expect by Multimedia Using in Physics Teaching

The paradigm of Physics teaching is the experiment. Without the experiment teaching of Physics is quite impossible. Physics is a genuine experimental field of human knowing and in the field of youngsters formation of a concept about this world. Physics is the excellent way to learn the causality principle, the connection between phenomena and, finally, the functionality of our world. The Physics colleges and universities labs are, nowadays, places where the youngsters can make almost all Physics experiments. But it does exist a lot of experiments of Physics impossible to make in lab, especially in Physics of micro cosmos and macro cosmos. For these situations, the MM is extremely useful in order to understand and teach these phenomena. But, due to the gorgeous extension of PC applications it exists now a lot of programs for simulation of almost all Physics experiments. Are these programs all useful? Can these programs really help the student? How these programs and simulations by PC help the student in difficult process of building his own thinking system? And, finally, in our global society, the individious is more and more alone; does this situation affect the personality of young people in formation of their personality? If the answer is YES, than where is the limit of PC-s application to the Physics experiment?

30. **Ksenia SUOMOLAINEN, Yakovleva Natalya Mihailovna**
    Karelian Teachers Training University, Karelia, Russian Federation

Educational Resource "Quantum Physics" for Students of Karelian Teachers-Training University

Educational resources are important components of education. Substantial, well formed web educational resources are able to simulate a process of self-education of students, and, thus, are able to increase the efficiency of all system of education. There are very few educational resources (ER) of quantum physics in Internet, especially in Russia. ER 'Quantum Physics' consists of on-line educational materials, which include selected lectures on some themes of this course ('Blackbody Radiation', 'X-rays', etc.), problems' collection, information on great physicists. ER is used by students of 3rd and 4th courses at Physics and Mathematics Faculty KSPU during studying quantum physics.

31. **Wiesław Tłaczała, Grzegorz Grajner, Marek SZYMAŃSKI, Marcin Zaremba**
    Warsaw University of Technology, Warsaw, Poland

Simulated Experiments in the Virtual Nuclear Physics Laboratory

This paper describes a set of five simulated nuclear physics experiments devoted to studies of the statistical character of nuclear decay, beta and gamma-rays absorption, determination of the gamma-rays energy, and learning Mössbauer effect. The experimental set-ups of these experiments are completed with a virtual instrumentation. The instruments not only allow users to conduct measurements but also present fundamental theory in brief of physics

phenomenon, provide full information concerning experiment, (for example, how to switch on instruments, set correct parameters and run experiment, how to collect and analyse data and verify obtained results, etc).

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