ToK

NANOMAG-LAB

# GLOLAB FOR MULTIDISCIPLINARY RESEARCH AND EDUCATION


**A. Maziewski[1], W. Dobrogowski[1] and V. Zablotskii[1,2]**

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UNIVERSITAS BIALOSTOCENSIS 1997

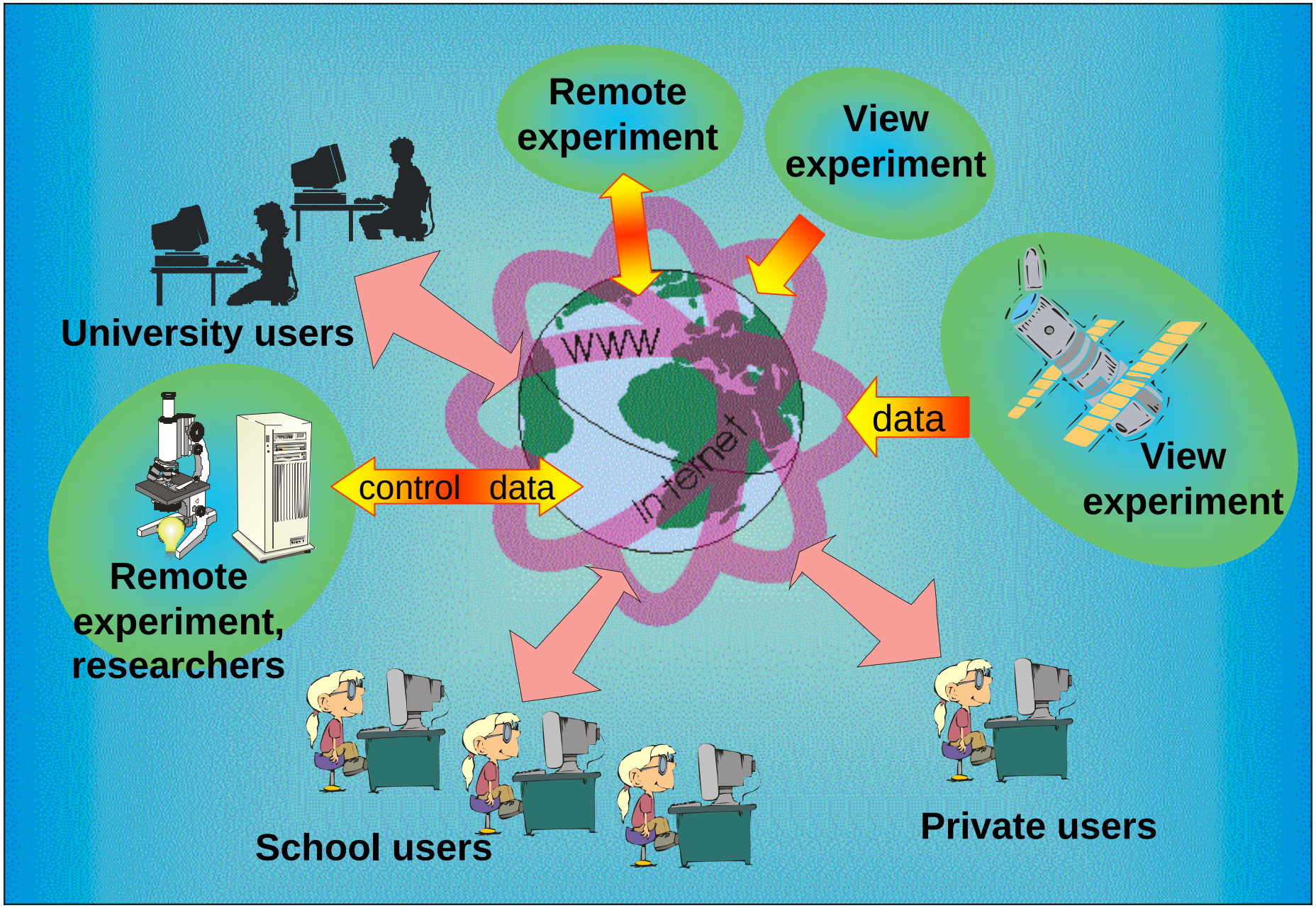
Fyzikální ústav Akademie věd ČR

**M31: The Andromeda Galaxy** by Robert Gendler (robgendlerastropixs.com)

# Plan

- What is ***GloLab***?
- Why ***GloLab*** should be created?
- Examples of the use of Web-laboratories in teaching Physics and Biology.
- Publications on ***GloLab***.
- Future of ***GloLab***, our partners and cooperation.

# Global Web Laboratory



**Marie Curie Conference, FP6, EC**

***"Making Europe more attractive for researchers"***

**Italy, Pisa-Livorno,**

**September , 2005**

**Marie Curie Conference (mc2), FP6 , EC**

***"Putting the Knowledge Based Society into Practice"***

**UK, Manchester, April , 2006**


Making Europe more attractive for researchers
Pisa/Livorno, September 28–30 , 2005
MARIE CURIE ACTIONS
Knowledge for Growth

# Knowledge is the basis of powerful economics

From reports at the conference ***"Making Europe more attractive for researchers"*** **(Italy, Pisa, September, 2005):**

- 5 Nobel prize winners are employed in **IBM**
- Nokia manager: "..we buy knowledge, we produce knowledge, we sale knowledge…"

*But knowledge do not grow in a garden...*

and there is a problem….

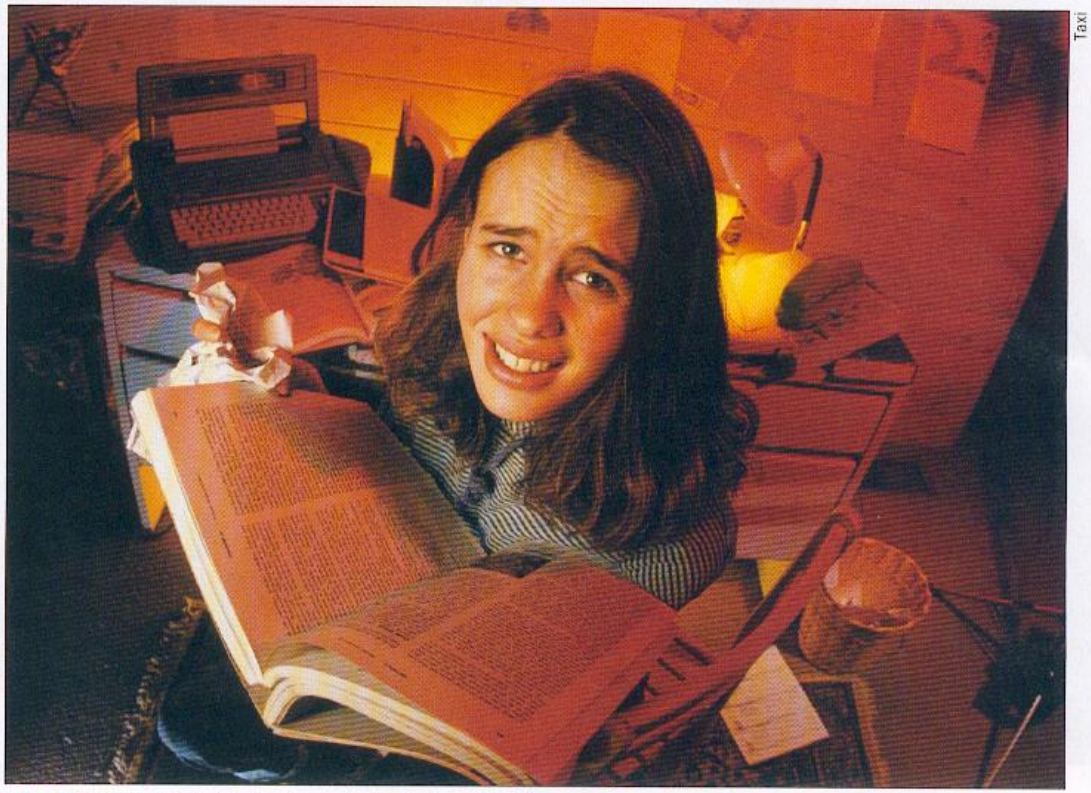
# Important problem for natural science

# Putting children off physics

**Ian Glynn** believes that inadequate textbooks are partly to blame for the steady decline in the number of pupils taking physics at school

About a year ago my 15-year-old granddaughter asked me to explain something in her physics homework. The previous time she had sought my help she had wanted to know how far individual electrons in the AC mains moved backwards and forwards; this time she was less demanding. But it was more than half a century since I had been a 15 year old doing physics homework, and having spent the bulk of my career as a research physiologist, I thought I ought to find out what 15 year olds are meant to learn today.

I therefore bought and read copies of the five GCSE physics textbooks that were on the shelves of two of Cambridge's biggest bookshops. These books are aimed at pupils in the two years before they take their GCSE exams



Taxi

**Help me** Many physics textbooks order topics in unfamiliar ways.

***Physics World***, 2005, November

"*More problems with textbooks*" a letter to Editor of the Physics World, February, 2006

# New tendencies in development of educational process

- *Global Web-Library* (creation was started by Google )
- *Global Web-Encyclopedia* (creation is started by the leading companies)
- *New portative devices coming* (e.g., announced by *B. Gates* in November, 2006 (laptop with flexible screen + phone +wireless connection+..??), 24 hours ready for educational purposes. These will replace all the textbooks…( because of low prices).. ?

❑ **Are we ready for coming drastic changes of educational process?**

❖ *GloLab* for transfer of knowledge (**we have started its creation**)

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*In October, 2006 the Internet celebrated 15 years*

# Example: magnetism by Internet

http://physics.uwb.edu.pl/exp/domeny/

HOME Descriptions Experiments Links Vocabluary

## Explore Magnetic Domains with the use of the *INTERNET*

EXPERIMENT *ON-LINE*

### Why by *INTERNET*?

Working from any point in the World with a simple personal computer on the INTERNET, now one can obtain data from an experiment by remote control. This solution has been known in a scientific research for many years. Recently with the appearance of the new, "INTERNET" accessible laboratories for students at school/university or at home. Complicated setups a long with expensive equipment, are now connected to the most popular medium - **the INTERNET**. This is an excellent way to promote a Physics idea to many users who can use the experimental setup on different levels. **this is a REAL EXPERIMENT !!! No simulation !!! No Java Applets !!**

*Since the beginning we had **19231** visitors*

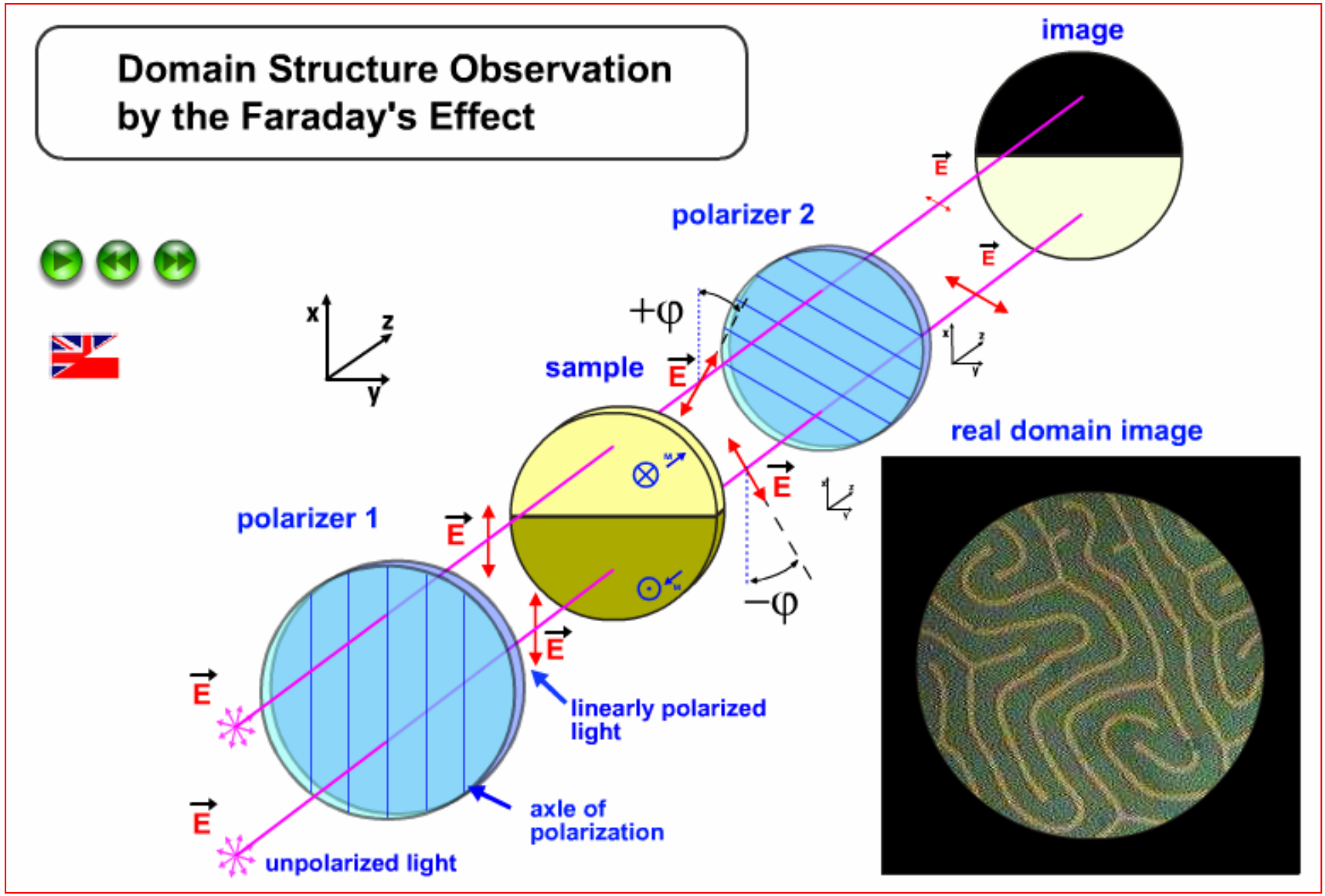

Laboratory of Magnetism, Institute of Experimental Physics, Faculty of Mathematics and Physics, University of Białystok

Białystok Branch Polish Physical Society,

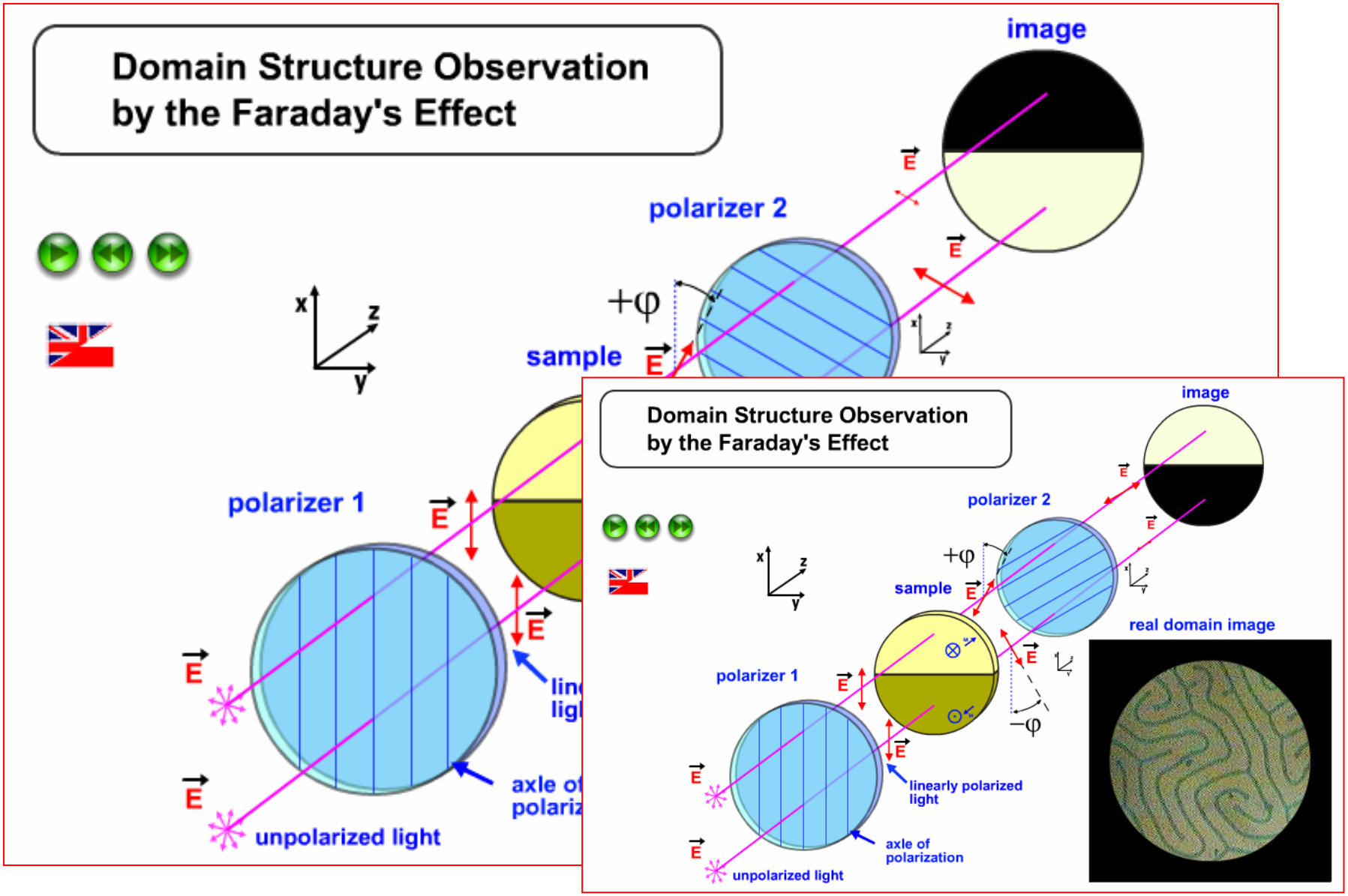
Lipowa 41,Białystok 15-424, Poland, **E-mail:** exp@physics.uwb.edu.pl **WWW:** http://labfiz.uwb.edu.pl/exp/


Last modification: May 21, 2005

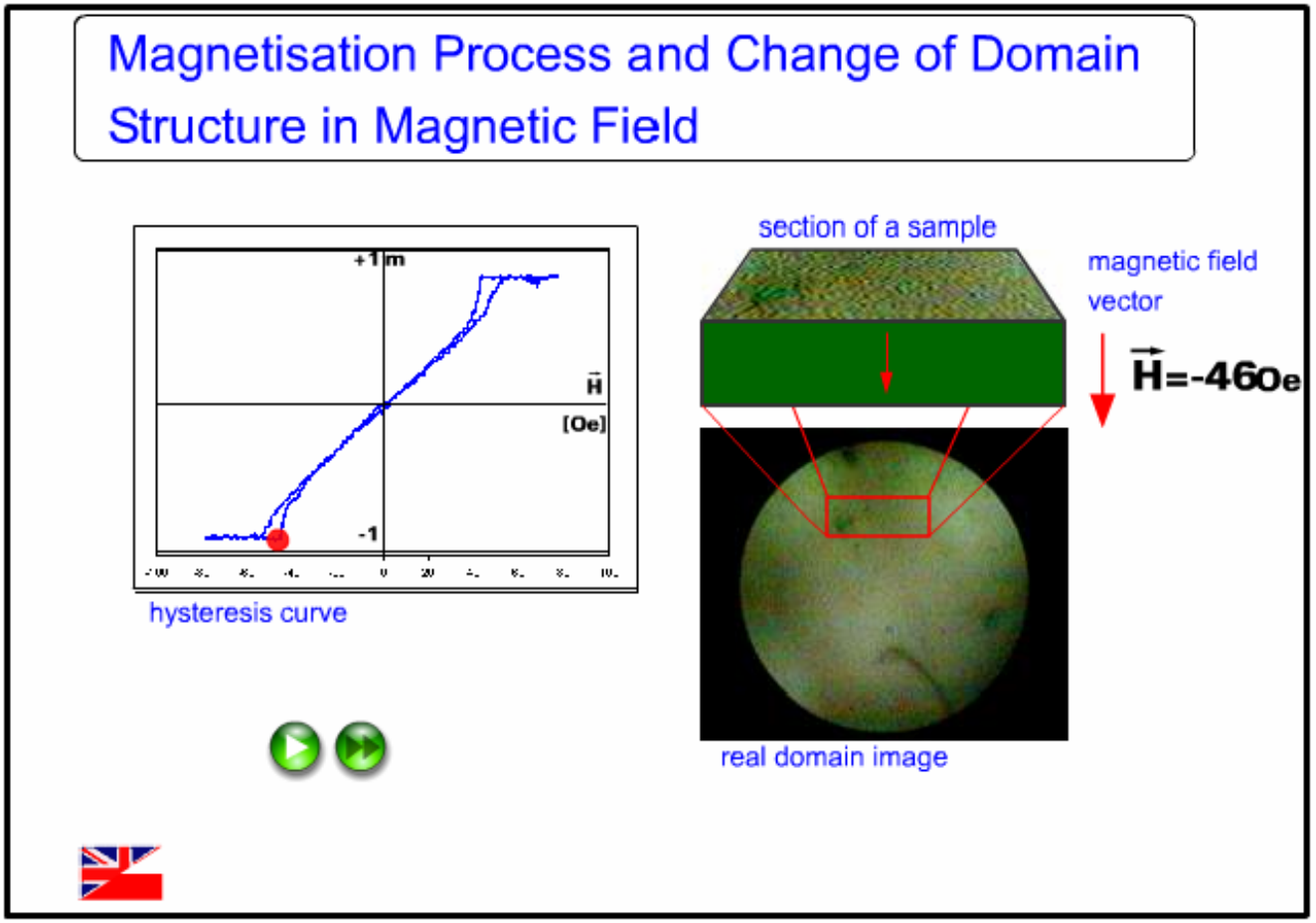
http://labfiz.uwb.edu.pl/exp/domeny/animacje/schemat805.html



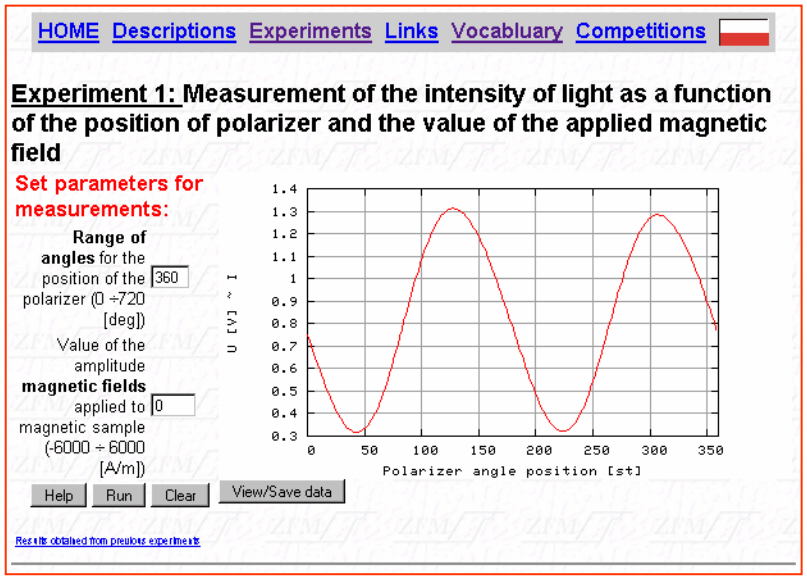
http://labfiz.uwb.edu.pl/exp/domeny/animacje/schemat805.html

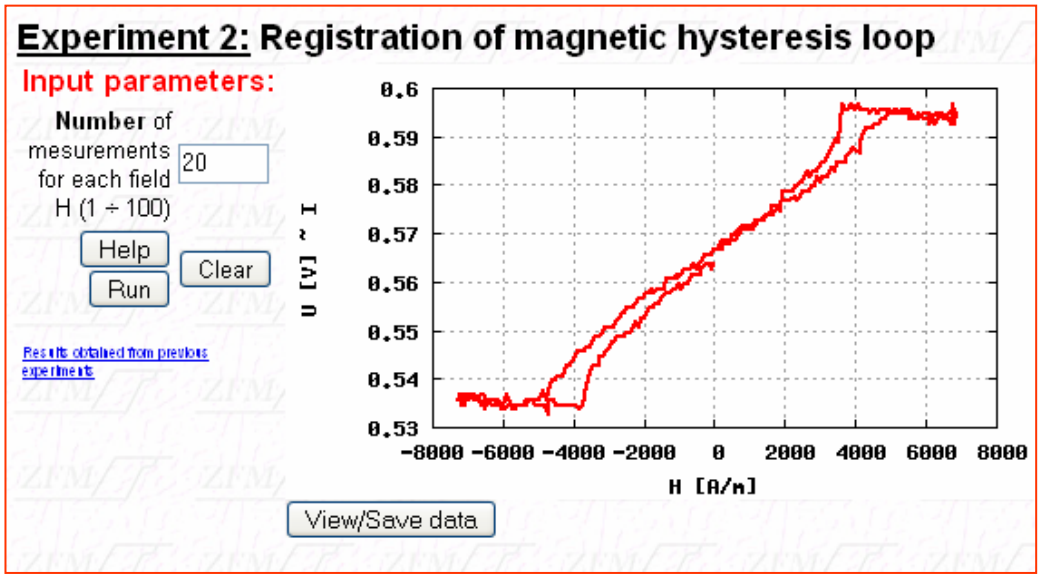


http://labfiz.uwb.edu.pl/exp/domeny/animacje/histereza805.html

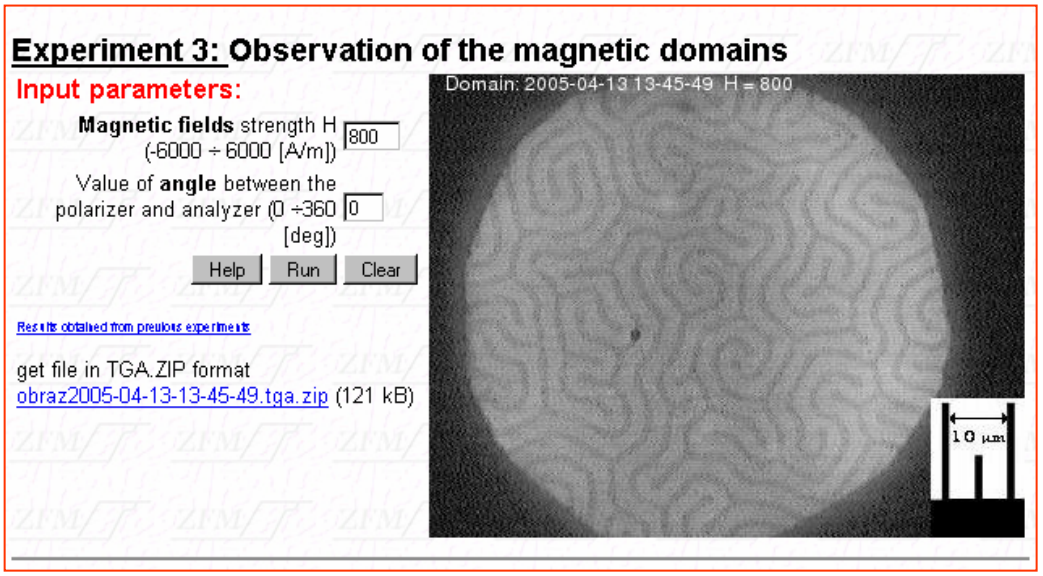


# Exemplary browser screen shots




*Data analysis could be performed either on school or university level – description available via Internet.*



# Domain structure in the Internet experiment is similar to that observed in magnetic nanostructures

**Experiment 3: Observation of the magnetic domains**

**Input parameters:**

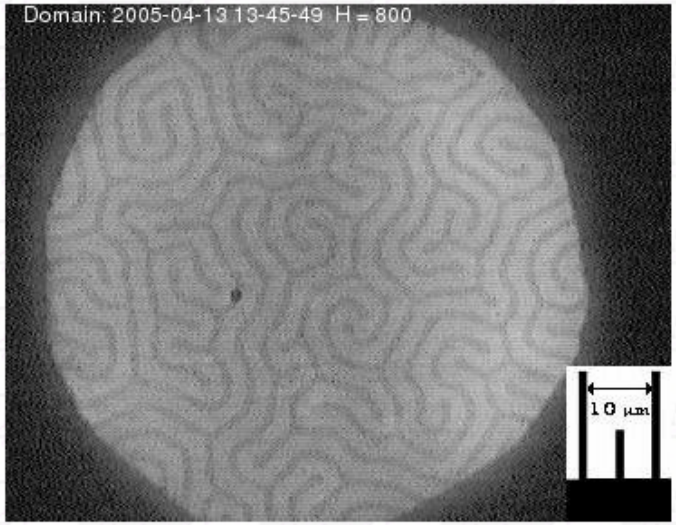
**Magnetic fields** strength H (-6000 ÷ 6000 [A/m]) 800

Value of **angle** between the polarizer and analyzer (0 ÷360 [deg]) 0

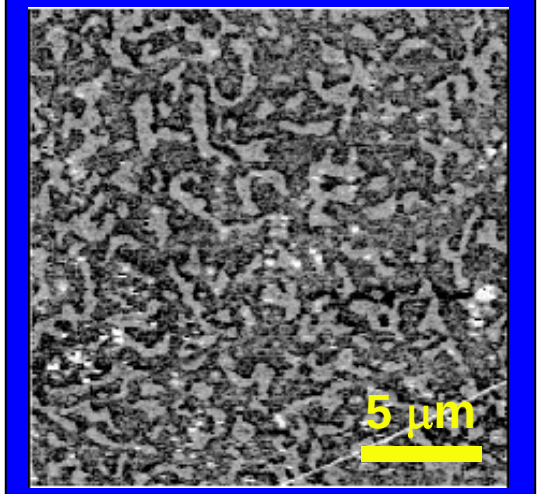
Help Run Clear

Results obtained from previous experiments

get file in TGA.ZIP format
obraz2005-04-13-13-45-49.tga.zip (121 kB)




*Au/Co(d=1nm)/Au*




MFM

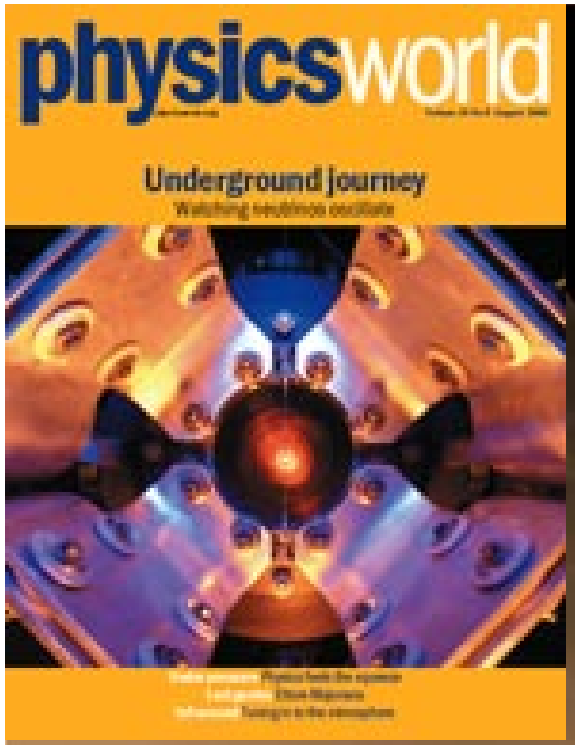
# Is it really work for education?

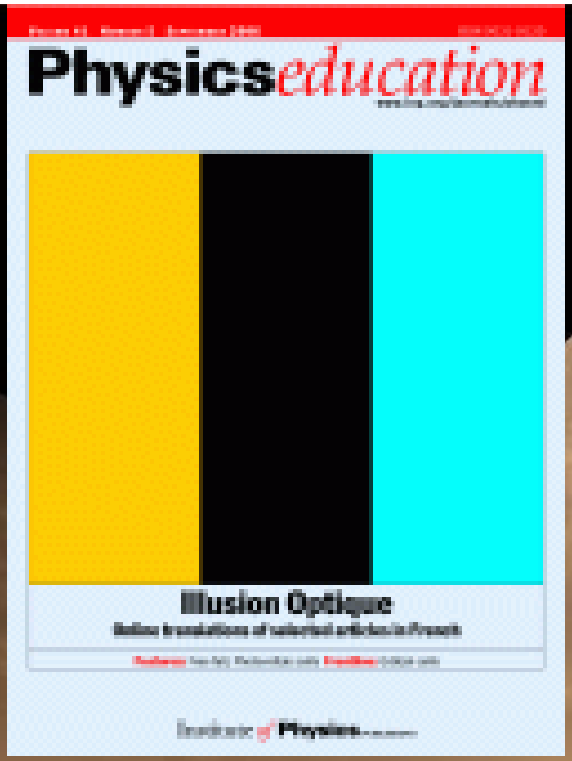
- During the **last 9 months** (since September, 2005) (i) the experiments were performed 1626 times from 296 computers, (ii) our web pages were opened from **4486 IPs located in 67** countries, and 102 387 documents and data files were taken. So, in our remote Laboratory we had almost **300** students (fulfilled our on-line experiment) and about **16 'virtual'** students per a day.
- This implies a success in the creation of our remote controlled Lab. These experiments are also included in the teaching plans of our faculty.

**YES, our Web-Lab works !**

# Remote experiment for pupils


**Our vision of the future Lab - *GloLab***





# GloLab publications

***Clouds and Sand on the Horizon of Mars: http://antwrp.gsfc.nasa.gov/apod/ap061017.html***

M. Howard, T. Öner, D, Bouic & M. Di Lorenzo for unmannedspaceflight.com.

# GloLab: creating a global Internet-accessible laboratory

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In summary, there are excellent reasons—and it is within reason—to create a Global Web Laboratory sharing the effort among different institutions, each contributing unique building blocks: access to particular experimental set-ups corresponding to their accumulated scientific and teaching potential, their equipment and their samples. Both view-type and fully remote experiments performed according to the highest standards can have importance for wider society, while giving quick access to every interested physicist world-wide. Besides developing the common scientific base, the *GloLab* will disseminate knowledge and research results to a non-expert audience, inspiring and attracting young talent to physics [6, 7].

**Andrzej Maziewski** is a professor at the University of Bialystok, Poland. His present activity is focused on studies of magnetism of nanostructures. His educational interest is in computer-supported teaching experiments. He is involved in science popularization.

**Wojtek Dobrogowski** works in the University of Bialystok. He is involved in teaching computer science and physics, and in software development for computer-supported experiments for educational and scientific purposes.

**Vitalii Zablotskii** is a professor in physics at the universities of Bialystok and Donetsk, working in solid state physics and biomagnetism. He is also with the Institute of Physics in Prague. His educational activities focus on the use of qualitative problems in physics to increase students' interest in the subject and develop their imaginative thinking.

INSTITUTE OF PHYSICS PUBLISHING EUROPEAN JOURNAL OF PHYSICS

Eur. J. Phys. **28** (2007) 71–83 doi:10.1088/0143-0807/28/1/008

# Remote teaching experiments on magnetic domains in thin films

**W Dobrogowski[1], A Maziewski[1] and V Zablotskii[1,2]**

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**Abstract**

We describe our experience in building a remote laboratory for teaching magnetic domains. Fulfilling the proposed on-line experiments, students can observe and study magnetization processes that are often difficult to explain with written material. It is proposed that networks of remotely accessible laboratories could be integrated in the Global Laboratory which could make research and education closer as well as disseminate knowledge and research results to a non-expert audience.

is infinite." I tried to explain that she was confusing energy and power. As I pointed out, a prize of £1 million might sound exciting, but not if it is paid at the rate of just £1 a month.

**James Morrow**
Belfast, Northern Ireland
jc.morrow@btopenworld.com

## Working towards a global laboratory

Created by physicists, the Internet continues to revolutionize many aspects of daily life and has become our most powerful tool for transmitting knowledge. In fact, the idea of a global Web library is fast becoming a reality.

It is in this context that we propose a new global Web laboratory called GloLab. This would consist of various websites overseen by a suitable body. It would consist of "view-only" experiments that would give users access to scientific data, as well as "remote" experiments to let pupils drive real experiments and obtain data files.

We are working with various institutions towards this idea and have already produced an example of a remote experiment that allows users to study the magnetic-domain structure of a thin garnet film (physics.uwb.edu.pl/exp/domeny). Apart from providing a short tutorial on the domains and magnetization processes in thin films, the site also includes access to remote experiments at our university.

GloLab would involve different institutions working together to provide access to experiments, equipment and samples. If it became a reality, Internet-based experiments could easily be included in the teaching programmes of all high schools and universities. The initiative would help to disseminate knowledge and research results to non-experts and encourage would-be physicists around the world into the subject.

**Andrzej Maziewski, Wojtek Dobrogowski and Vitalii Zablotskii**
Institute of Experimental Physics, University of

because he knew that the country's military power owed much to their work. Indeed, Stalin once protected future peace campaigner Andrei Sakharov from disciplinary measures taken against him by his own chief of police, Lavrenty Beria. In another instance, the Communist Party prepared a plan to "purge" Soviet physics, just as biology had been, but suddenly dropped it – probably because Stalin feared that it might be harmful to the development of nuclear arms.

However, another reason why Soviet physics was so strong was that science education in schools and universities was heavily promoted. Indeed, it reached a level of excellence that surpassed science education in the West. Moreover, governments in both the East and the West poured an unprecedented amount of money into physics after the Second World War because, to a large extent, they felt that it was science that had won the war. It would be naïve not to admit that physics has greatly benefited from this.

**Georges Ripka**
Centre d'Etudes de Saclay, France
ripka@cea.fr

## A Bethe unit

Following the death of Hans Bethe last year, I have proposed a new unit called the bethe, where 1 B is $10^{51}$ ergs or $10^{44}$ J. This would replace the unit of $10^{51}$ ergs, which is commonly used by those studying supernovae – a field in which Bethe worked. Ian Mills, president of the consultative committee on units of the International Committee for Weights and Measures, has concurred and agreed that the bethe can be used.

**Stephen Weinberg**
Rochester, New York, US
docweinberg@cal.berkeley.edu

### Quiz results

The winner of the Quiz of the year 2005 (December 2005 p64) is **Richard de Grijs** of the University of Sheffield, UK.

**Answers**

# Remote Biology Labs

Austin J. Che

Massachusetts Institute of Technology

February 19–21, 2005

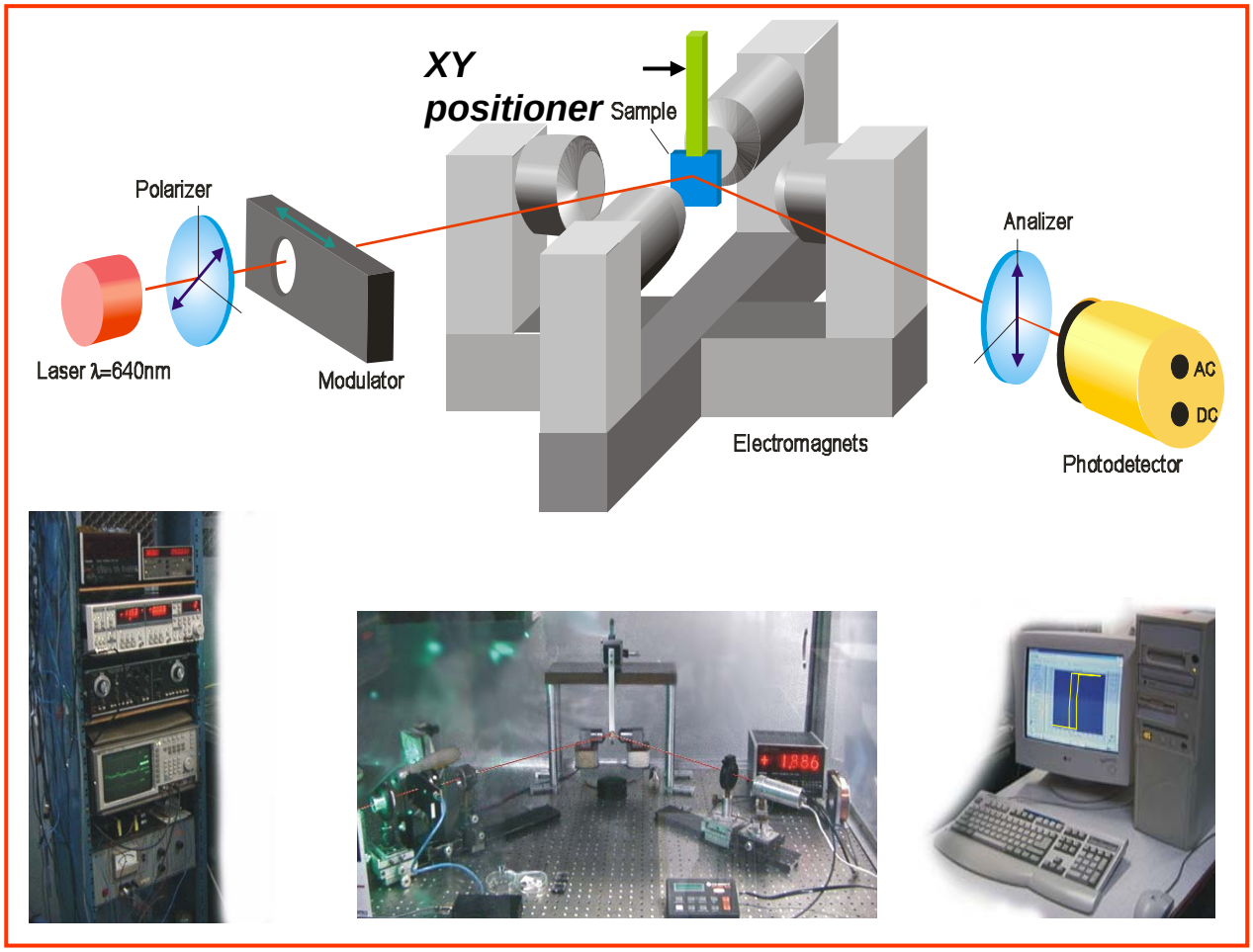
**Abstract**

**Purpose:** The impact of biology in this century will be enormous. As engineers bring the traditional science of biology to consumers, everyone will be capable of tinkering with biological systems. Just as the personal computer allowed ordinary people to apply the physics of electricity and magnetism, molecular biology is entering an era with easily available technology for manipulating living systems. I present a *proposal* for the development of biology engineering education along with a discussion on the *responsible development of e-learning.*

# Remote experiments available in cooperation between universities

*Example of set-up used for research remote experiment:*

*Magnetooptical magnetometer for magnetic nanostructures studies*

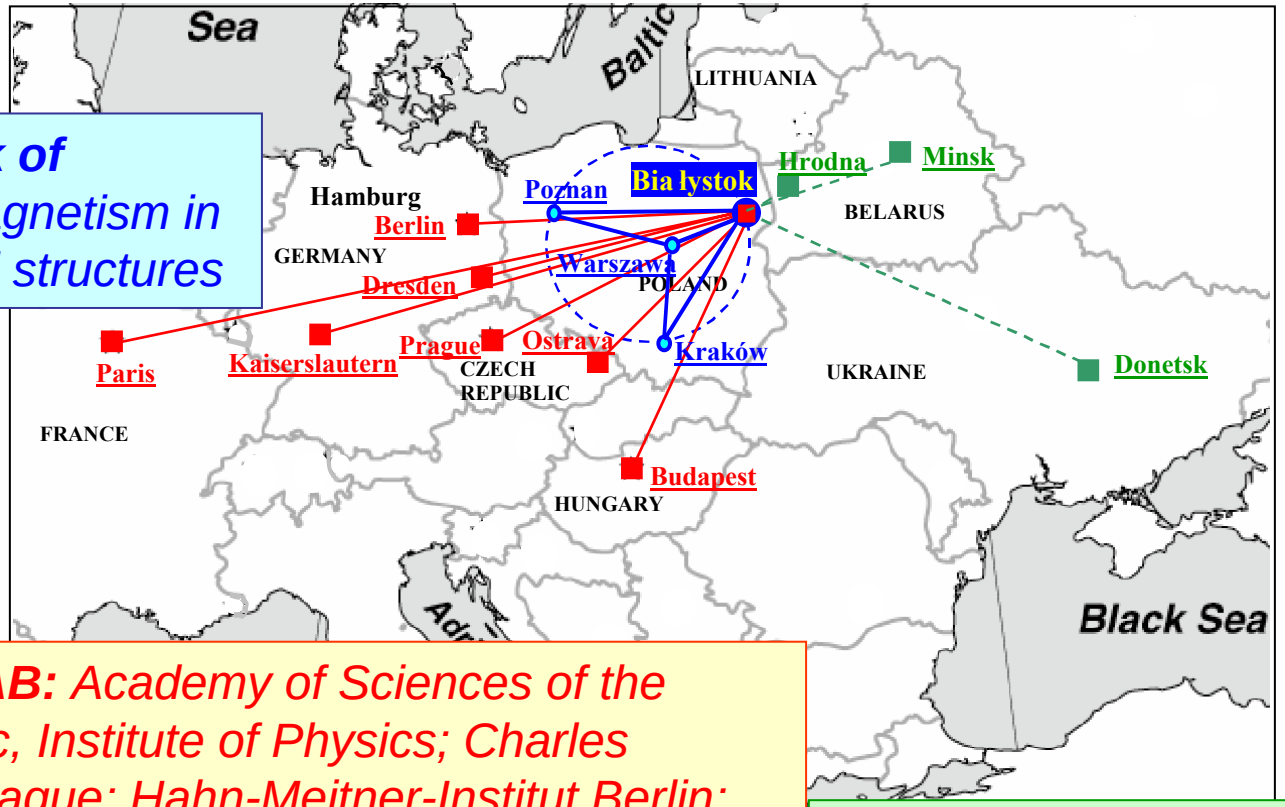


# Marie Curie Host Fellowships for Transfer of Knowledge NANOMAG-LAB" 1 IX 2004 - 31VIII 2008

http://labfiz.uwb.edu.pl/zfmag/tok/

ToK NANOMAG-LAB

**Polish Network of Excellence:** *Magnetism in low dimensional structures*




***NANOMAG-LAB:*** *Academy of Sciences of the Czech Republic, Institute of Physics; Charles University in Prague; Hahn-Meitner-Institut Berlin; Hungarian Academy of Sciences, Research Institute for Technical Physics & Materials Science (Budapest); Leibniz-Institut für Festkörper- und Werkstoffforschung Dresden; Universität Kaiserslautern; University Paris-Sud; VSB Technical University of Ostrava*

***Supporting partners:*** *Donetsk National University; National Academy of Sciences of Belarus, Institute of Engineering Cybernetics (Minsk).*

# Dutch project "e-Xperimenteren+"

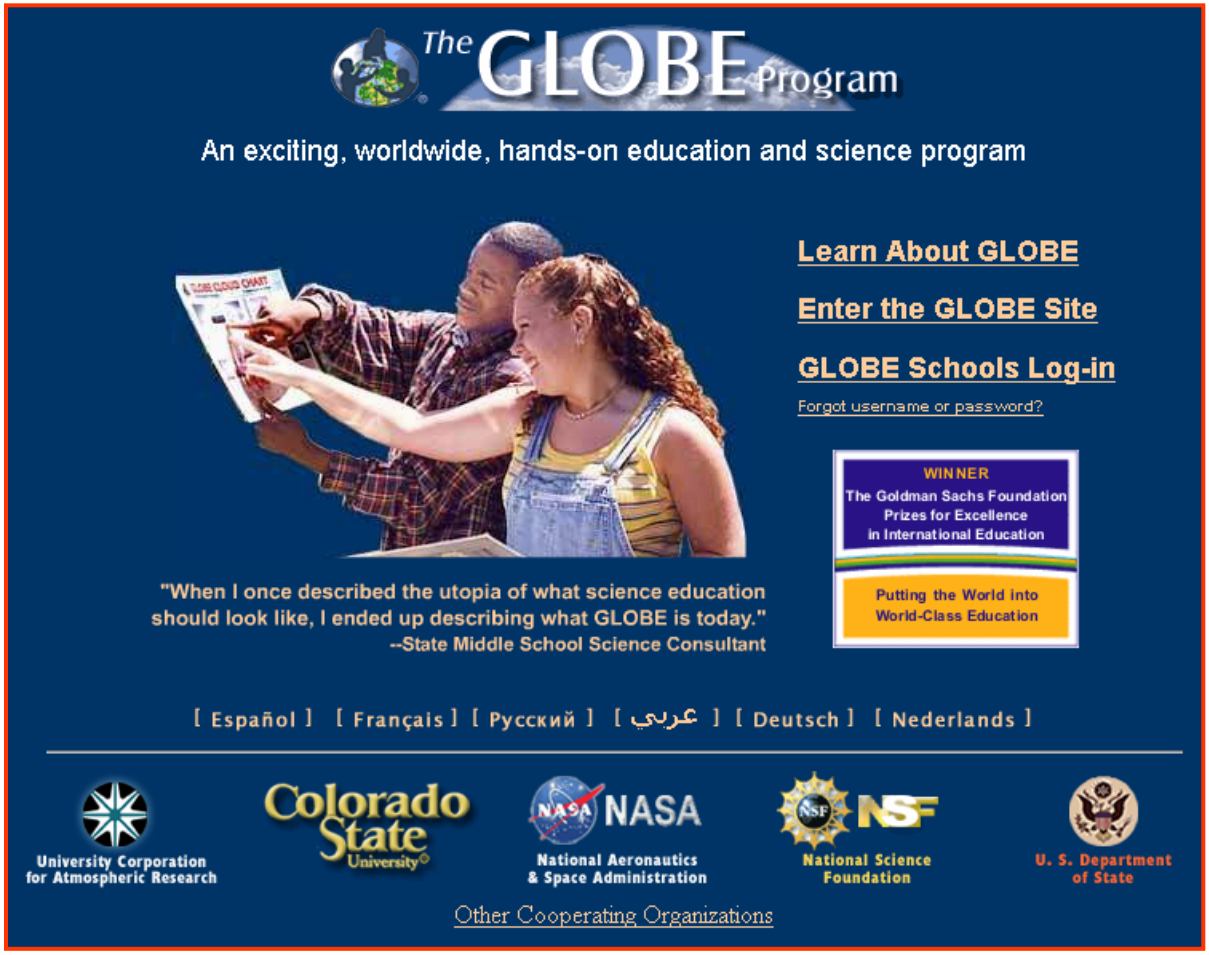
http://www.science.uva.nl/remotelabs/

**Remote experiments:**

1. Fresnel Diffraction VU, Amsterdam
2. X-ray Fluorescence VU, Amsterdam
3. Laser Doppler Anemometry VU, Amsterdam
4. Michelson Interferometer UT, Twente
5. De Bol UT, Twente
6. Level Control Fontys, Eindhoven
7. Constant Temperature Hot-Wire Anemometer Fontys, Eindhoven
   Speed of Light and the Doppler Effect UvA, Amsterdam
8. Measuring e/m UvA, Amsterdam
9. Weather Station UvA, UvA, Amsterdam
   Weather Station Fontys, Fontys, Eindhoven
   Weather Station VU VU, Amsterdam

# Example of large scale, Internet supported school-based education and science program

**GLOBE** (**G**lobal **L**earning and **O**bservations to **B**enefit the **E**nvironment)

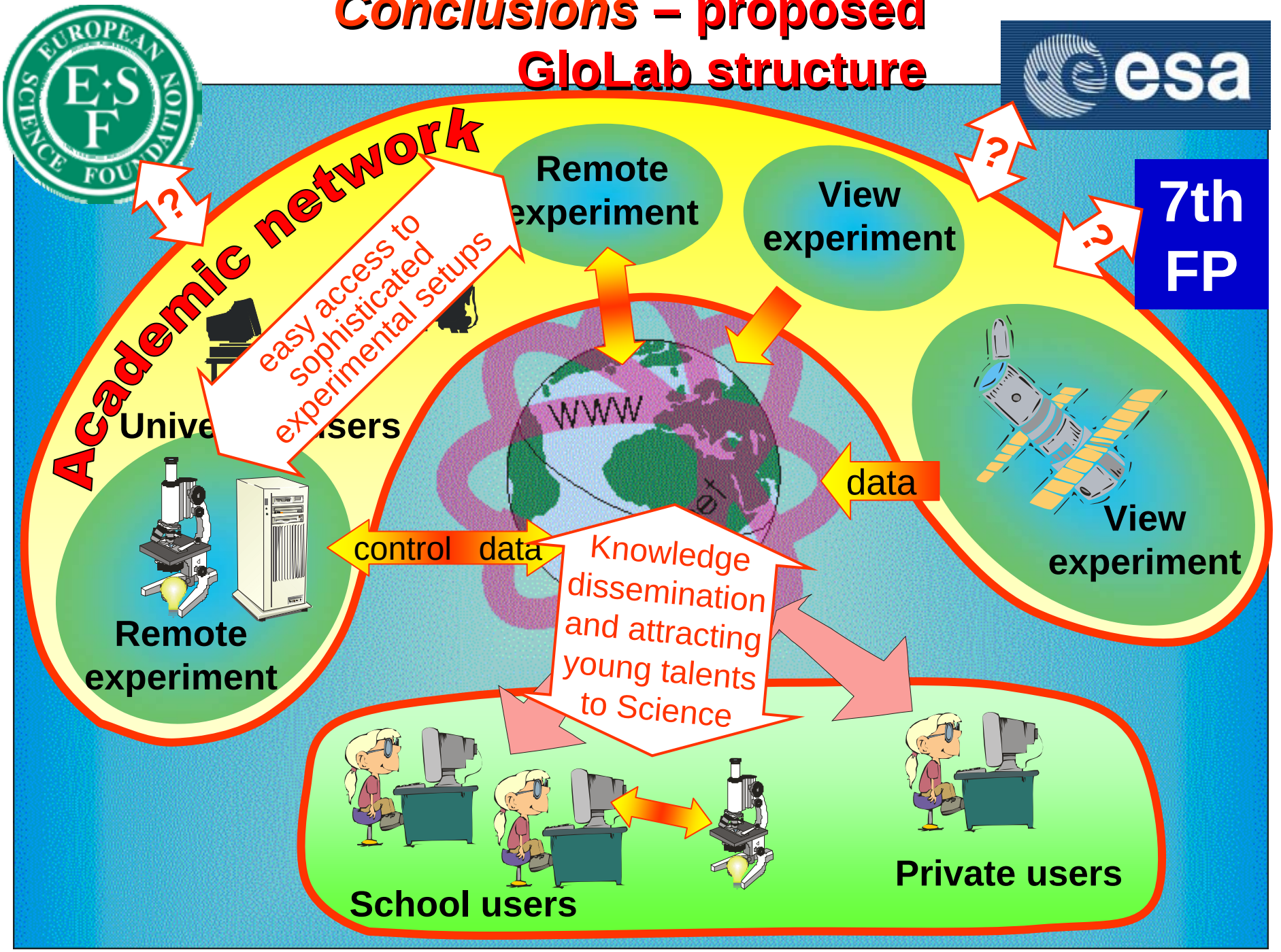





http://www.globe.gov/globe_flash.html

**31000** GLOBE-trained teachers from **17000** schools have contributed **14 million** measurements to GLOBE

# *Conclusions* – proposed GloLab structure



# Reports on *GloLab*

1. Marie Curie Conference, FP6, EU "Making Europe more attractive for researchers" Italy, Pisa, 28-30, September , 2005.
2. Marie Curie Conference, FP6 , EU "Putting the Knowledge Based Society into Practice" UK, Manchester, 10-12, April , 2006.
3. Workshop on properties of ultrathin magnetic films, Bialowieza, Poland, 7-9 September 2006.
4. Barcelona Autonoma university, Spain, 2, July, 2006
5. Navarra University, Pamplona, Spain, 1, October, 2006.
6. Congress of biophysicists of Ukraine. Donetsk, 21 January, 2006.
7. Institute of Physics ASCR, Prague, 23, January, 2007