

# TEACHING PHYSICS BY EXPERIMENTS

in the Polytechnic University of Bucharest

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Science Education in School,  
Bucharest, October 2-3, 2009



# Allegation:

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- We live in a **technological society** where fewer and fewer pupils want to follow **HARD** scientific studies



## Corollaries, or sometimes causes :

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- - **Society** and **parents** are less interested in scientific or technical studies
- - Pupils follow **humanities**, **economic** or **law** faculties
- - They come from secondary schools with **less** skills in **maths** and **physics**

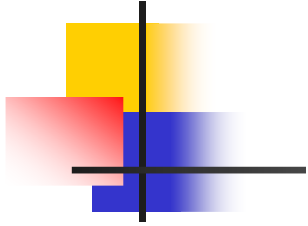


## Conditions in engineering education:

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- engineers require **less and less undergraduate physics courses**, even if they recognize **the importance of an introductory physics course** in developing **problem solving skills**.

(Engineering Criteria 2000, APS)



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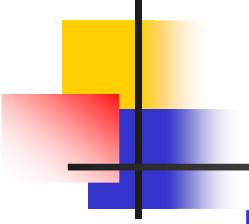


# Physics chapters

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- **Mechanics:** kinematics, dynamics, oscillations and waves, special relativity
- **Thermodynamics:** principles, methods, statistical physics
- **Electromagnetism:** Fields, Maxwell equations
- **Optics:** e.m. waves, polarization, reflection, refraction, interference, diffraction, holography
- **Modern physics:** atomic and nuclear physics, quantum theory, lasers, solid state physics

# Good points

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- Application of mathematics
  - Modern applications: light fibers, semi-conductors, nanomaterials, heavy ion therapy, liquid crystals, nonlinear dynamics
  - Experiments: 60 new experiments, 20 of them computer assisted
  - Scientific research



## What should we **not** do:

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- A. Physics before mathematics
- B. Lectures without tutorials
- C. Lectures without laboratories
- I personally did A and B





# How could we attract pupils ?

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- Less theory,
- fewer demonstrations,
- more particular situations
  
- More modern applications
  
- Experiments: - in the laboratory
  - - *during lectures*



## Situation:

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- Students in Electronics with:
  - - fair theoretical background
  - - lack of experimental skills,
  - *some never saw an experiment in physics*



# The importance of your work

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- - pupils acquire experimental abilities
- - students grasp new aspects of phenomena
- - they are more confident



# Examples of Hands on Physics Experiments

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- - Inertia
- - Buoyancy
- - Kinetic momentum
- - Total reflection



# EbulliScience

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- **La Salle de Découvertes Scientifiques de Vaulx-en-Velin**
- Mail: [vaulx@ebulliscience.com](mailto:vaulx@ebulliscience.com)



# Interactive science experiments in Bucharest ?

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- On the land of PUB
- Help from: PUB, Ministry of Education,  
Scientific World,  
City Hall, Industry