Popularization of (astro)Physics in South-Eastern Serbia

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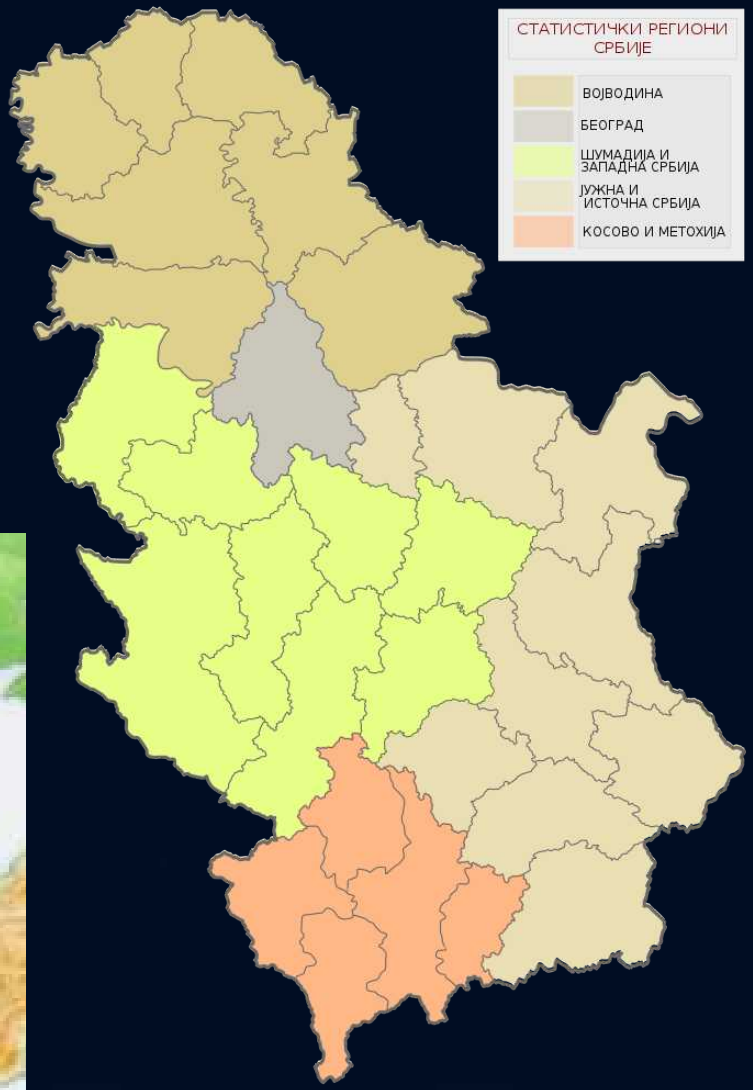
SEENET-MTP CENTRE, NIŠ

"The Community for Science Education" – STEM – partnership for quality (CNCES 2017)
November 3-4, 2017, Bucharest, Romania

Who?

- Department of Physics,
  Faculty of Sciences and Mathematics, University of Niš
  http://fizika.pmf.ni.ac.rs
- SEENET-MTP Office Niš
  http://www.seenet-mtp.info
- Partners:
  - Physical Society Niš
    http://dfn.pmf.ni.ac.rs
  - Astronomycal Society „Alfa“
    http://www.alfa.org.rs
  - Website „Svet nauke“ („World of Science“)
    http://www.svetnauke.org

Where?


СТАТИСТИЧКИ РЕГИОНИ СРБИЈЕ
ВОЈВОДИНА
БЕОГРАД
ШУМАДИЈА И ЗАПАДНА СРБИЈА
ЈУЖНА И ИСТОЧНА СРБИЈА
КОСОВО И МЕТОХИЈА

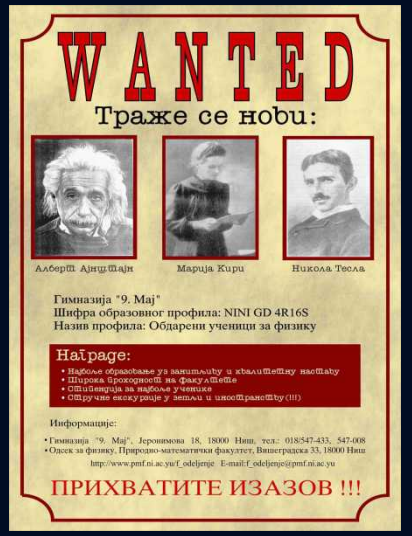
Borski
Braničevski
Jablanički
Nišavski
Pčinjski
Pirotski
Podunavski
Toplički
Zaječarski
InTER©

What?

- Grammar School Class for Students With Special Abilities in Physics
- Science Popularization in Schools
- General Public

Grammar School Class for Students With Special Abilities in Physics

- Department of Phyiscs and Gimnasyum „9 May“, later Gimnasyum „Svetozar Marković“
- Founded in 2003 in Nis, Serbia
- High school class for students with special interests or abilities in physics
- The main goals of the project:
  - to offer a high-quality education
  - to give gifted pupils a perspective for continuing education in a competitive atmosphere
  - to convey initiative and enthusiasm



Grammar School Class for Students With Special Abilities in Physics

- These goals are to be reached by the following measures:
  - focus on the natural science, in particular on physics
  - provision of basic laboratory equipment and PCs (virtual experiments and Internet access)
  - close collaboration with the University
  - close collaboration with similar projects in EU and Eastern Europe
  - more intensive foreign languages teaching (especially English),

General Syllabus

- **1st grade - 4th grade**
  - Serbian (4, 3, 3, 4); English (2, 3, 3, 2)
  - Chemistry (3, 3, 2, 2); Biology (2, 2, 3, 2)
  - Physical Education (2, 2, 2, 2)
  - Mathematics (5, 5, 5, 5)
  - Computer Science (3, 3, 2+30, 2+30)
  - Practice (+60, +60, +60, +60)
  - Physics courses : (5+60, 5+60, 6+30, 5+30)

    (The + **sign** before the numbers marks the number of practical classes)
- **1st grade -2th grade**
  - History (2, 2), Geography (2, 2)
- **3th grade**

The Physics Syllabus

- **1st grade**
  - Elements of mechanics and thermodynamics, 3/w
  - Computational exercises I, 2/w
  - Laboratory exercises I, 60/y
- **2th grade**
  - Electromagnetism and Optics, 3/w
  - Computational exercises II, 2/w
  - Laboratory exercises II, 60/y
- **3th grade**
  - Mechanics with the Theory of relativity, 2/w
  - Atomic and Molecular physics, 2/w
  - Physical Electronics , 2/w
- **4th grade**
  - Modeling in physics, 2/w +30/y
  - The physics of the micro world, 3/w

May 2017

Students of the “High school class for students with special abilities in ph
Gymnasium „Svetozar Marković“, Niš

Science popularization in schools

- Visits to the faculty
  - Visits to laboratories, talks, hands-on experiments
- Visits to schools
- Projects:
  - *Astronomy everywhere* (2017-2018)
  - *Physics for everyone* (2016)
  - *Astronomy in rular areas* (2015)
  - *Astronomy for everyone* (2013)
  - *The project of capacity building, promotion and popularization of physics and natural sciences* (2006-2011)
  - etc

Partialy supported by Center for t
Promotion of Science, Belgra

Activities

- National and international seminars for physics teachers and/or students
  - *Modern topics in physics education* (2006-2010)
  - *Science and Society* – international meetings and competitions for pupils, students and teachers
    - Craiova (October 2008, November 2009)
      Drobeta Turnu-Severin (April 2011)
  - *Trends in Modern topics BSS2011*, organized as a part of Balkan Summer Institute - BSI2011 (August 2011)
  - *From the roof to the stars* (2014-2015)
  - *CERN Masterclass* (2016, 2017)
  - Numerous one-day meetings

Physical Society Nis

- Many activities were organized by **Physical Society Nis**
- Founded in 1996, one of the leading physical societies in Serbia
- Founded and organized annual *School of Physics* for pupils of primary school who are interested in physics or prepare for competitions (2005-2012)
- Founded and organized annual *Winter Physics Camp* week long school of pupils interested in physics
- More than hundred public talks on wide area of topics in popular physics and astronomy with national and international lecturers.

Video conference with CERN organized during BSS2011;
Photos from some of the public talks

CERN Masterclass
2016, 2017

ЕРЗИТЕТ У НИШУ
МАТЕМАТИЧКИ ФАКУЛТЕТ
НИШ

General public

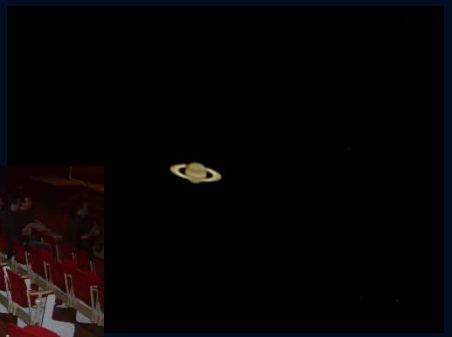
- Popular science talks
- Astronomical observations
- Science fair projects
- Where:
  - at the faculty, in schools, at public places
  - Online (website, live streaming, recording, etc)

“Astronomy from an armchair”

- Student’s project, in cooperation with Faculty of Science and Mathematics and Astronomical Society “Alfa”
- Supported by program „Pokeni se za buducnost“ (PZB) and Philip Morris operations a.d.
- The first astronomycal observatory was built for non-professional astronomerers in south Serbia
- The observatory is remotely controled and equipped for night-sky and Solar observations.

“Astronomy from an armchair”

- The crucial part of the project – popularization of astronomy
  - Observations on regular basis for general publics
  - Public talks on interesting topics in astrophysics and physics
  - Most of talks and some observations were recorded and/or live streamed over the Internet
- The most important:
  - Most of the project was realised in Do-it-yourself way



Photos: Prof. D. Gajic and youngest astronomers; Saturn recorded during the first online observation; Telescope in the observatory; The solar telescope infront of the observatory

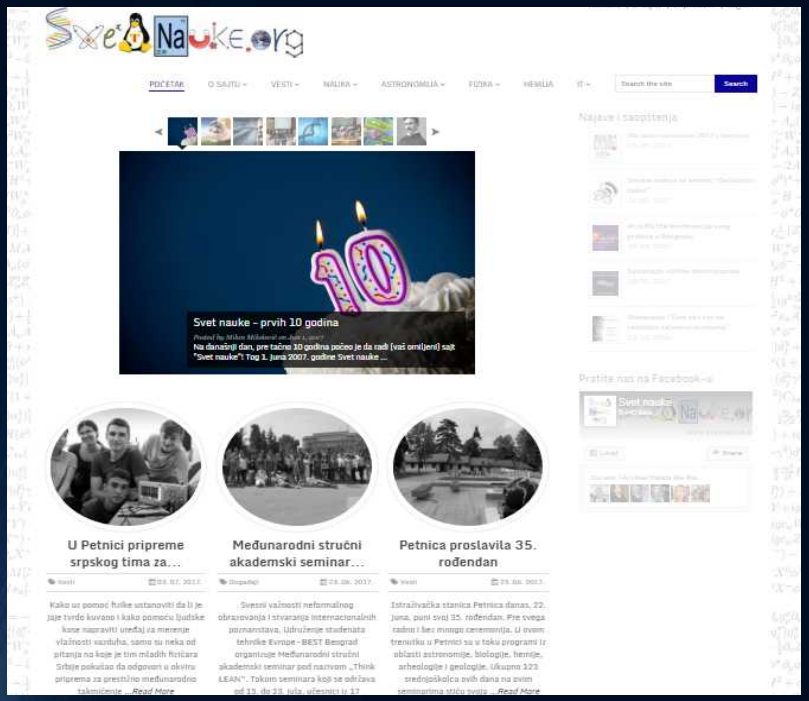
Science fair projects

Department of Physics, Nis

Solar Eclippse, March 2015

Live straming...

Education, Science Communication and **SCIENCE**



World of Science (svetnauke.org)

Southeastern European Network in Mathematical and Theoretical Physics
www.seenet-mtp.info

CERN – SEENET-MTP PhD Training program

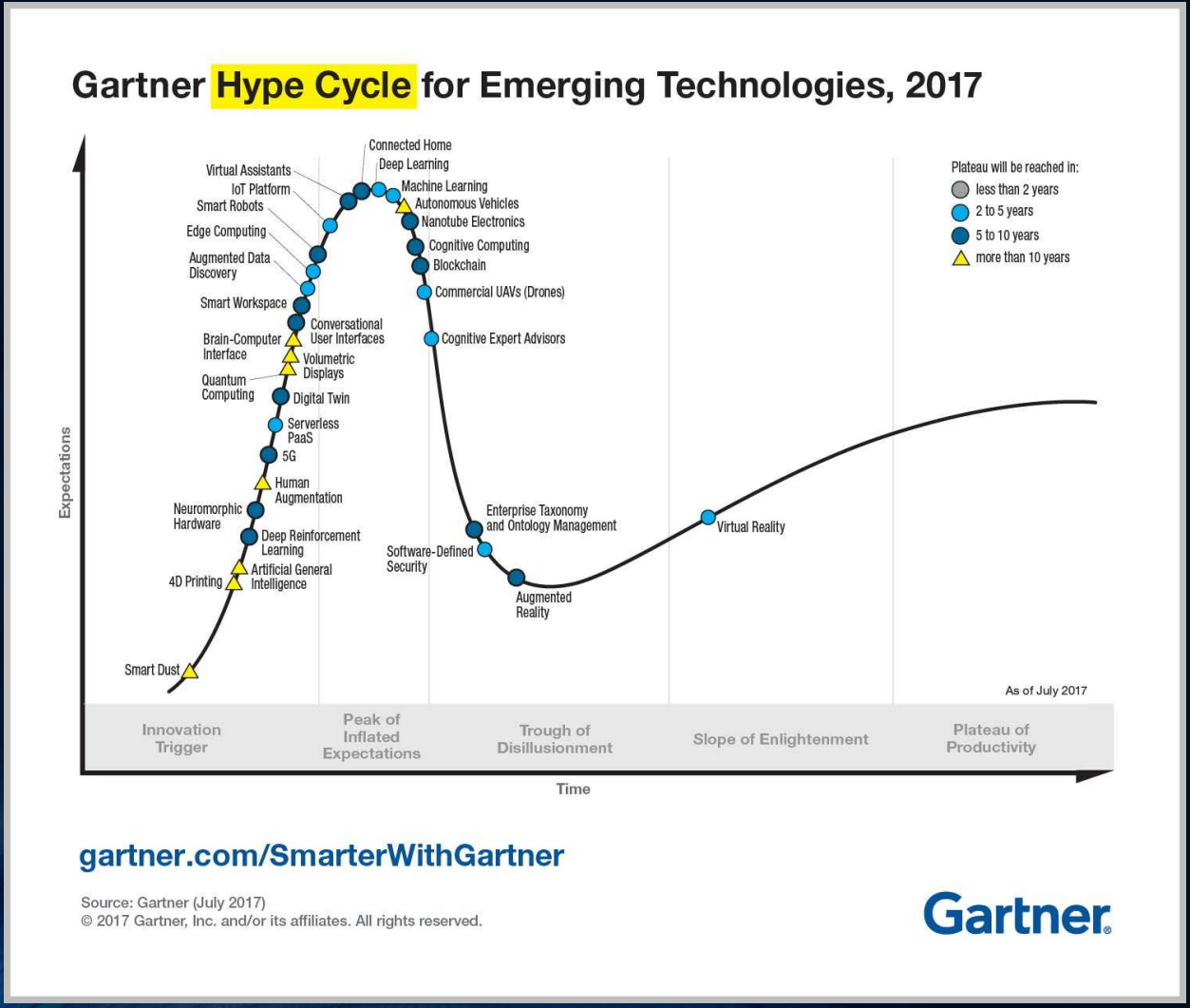
- Series of intense, self-connected, one-week seminars for PhD students
- Lectures followed by appropriate exercises, given by 2-3 professors-specialist and 1-2 assistants.
- 4 seminars:
  - *Supergravity* (Belgrade, Serbia, 2015)
  - *Modern Aspects of Quantum Field Theory* (Bucharest, Romania, 2015)
  - *Computational methods in Cosmology and General Relativity* (Timisoara, Romania, 2016)
  - *New Trends in High Energy Theory* (Sofia, Bulgaria, 2017)

http://phd.seenet-mtp.info

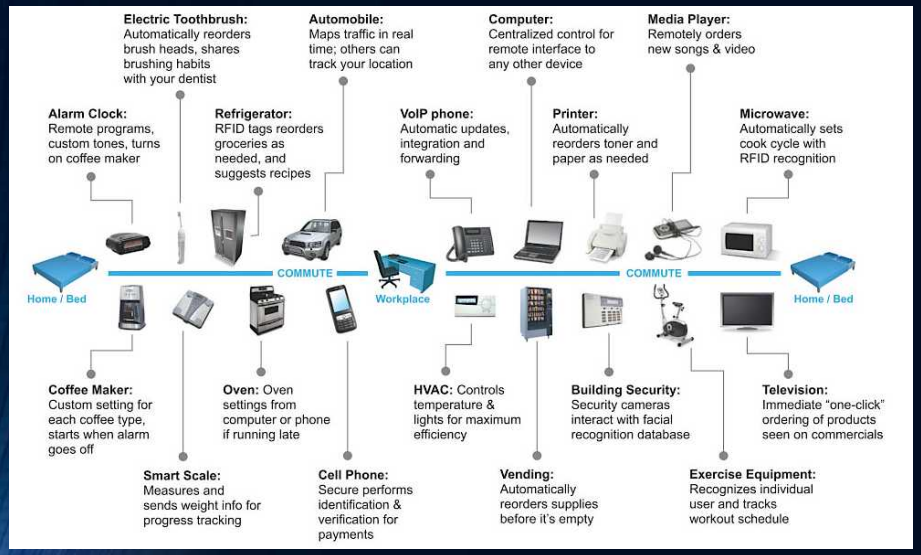
Future…

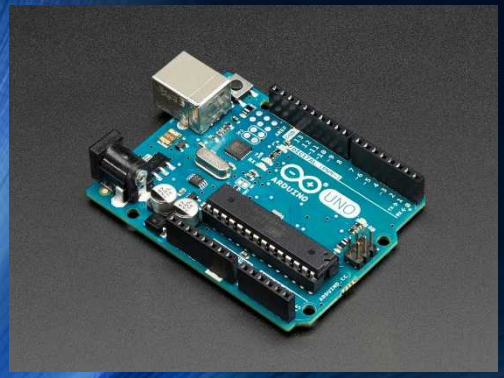
- Is change always good?
- Good things don’t have to be changed
- However, science popularization and communication have to be improved
- New trends - Gartner Hype Cycle charts
  - Internet of Things (IoT)

Gartner Hype Cycle charts



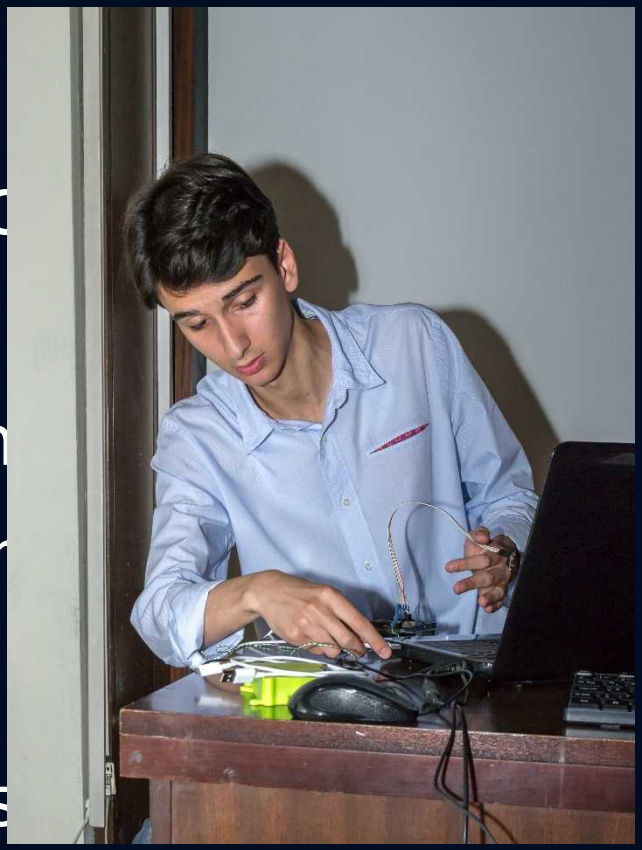
Internet of Things (IoT)





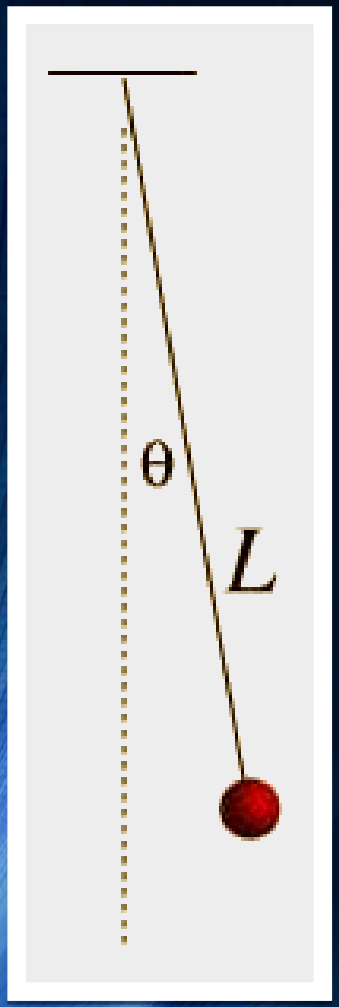
IoT in Education?

- Subject: Modeling in physic
  - Mostly theoretical
  - Numerical models, simulation
  - Programming (in Pascal/Lazar
- Now
  - A little bit of IoT in Electronics
- Future
  - IoT in Physics?!?!



Damjan Cupic
Supervisor: Prof. Dr. Dejan Aleksic

Simple Pendulum



- Lagrangian function:

$$L = T - V$$

- Euler–Lagrange equation

$$\frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q}_i}\right) - \frac{\partial L}{\partial q_i} = 0$$

- Pendulum

$$T = \frac{1}{2}mv^2 = \frac{1}{2}m\left(l\dot{\theta}\right)^2$$

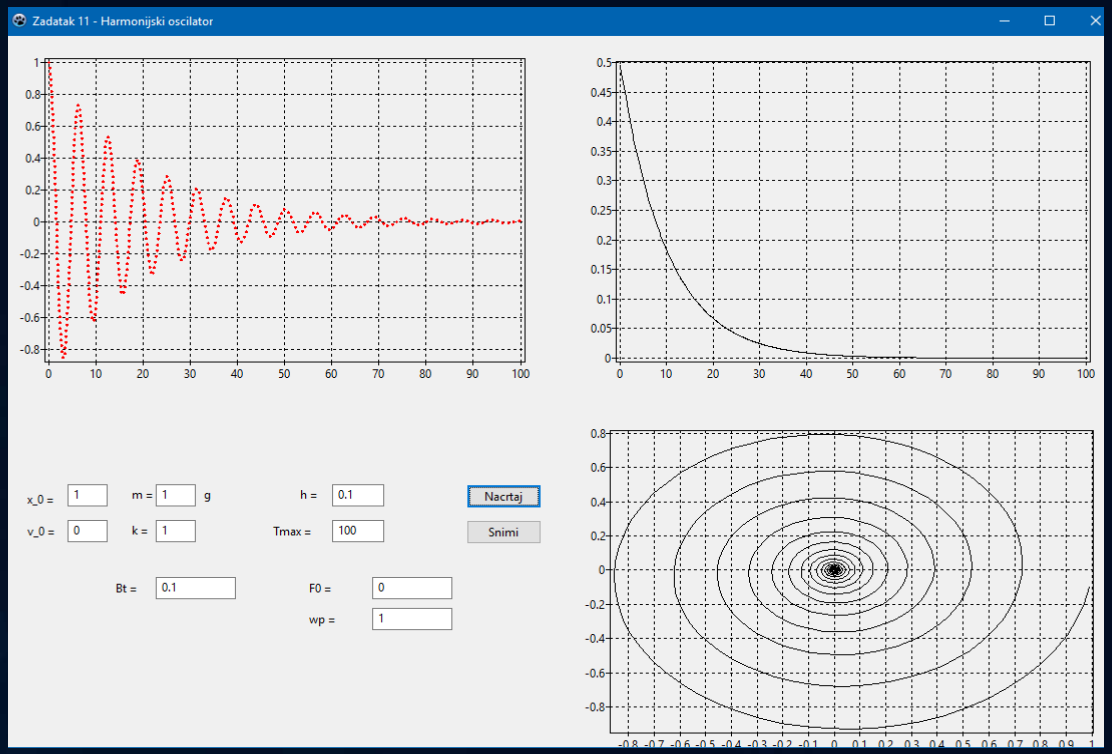
$$U = mgy = mgl\left(1 - \cos\theta\right)$$

- Equation of motion

$$\ddot{\theta} + \frac{g}{l}\sin\theta = 0$$

Simple pendulum and IoT

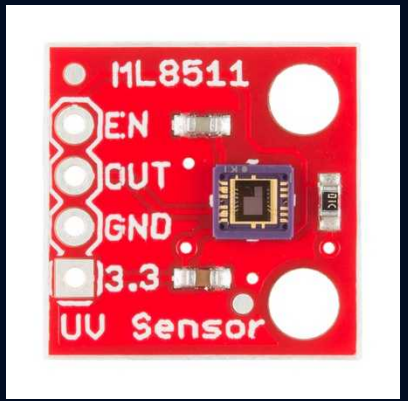
- Simulation



Next - simplest project: Make a pendulu
with a sensor (or a smart phone)

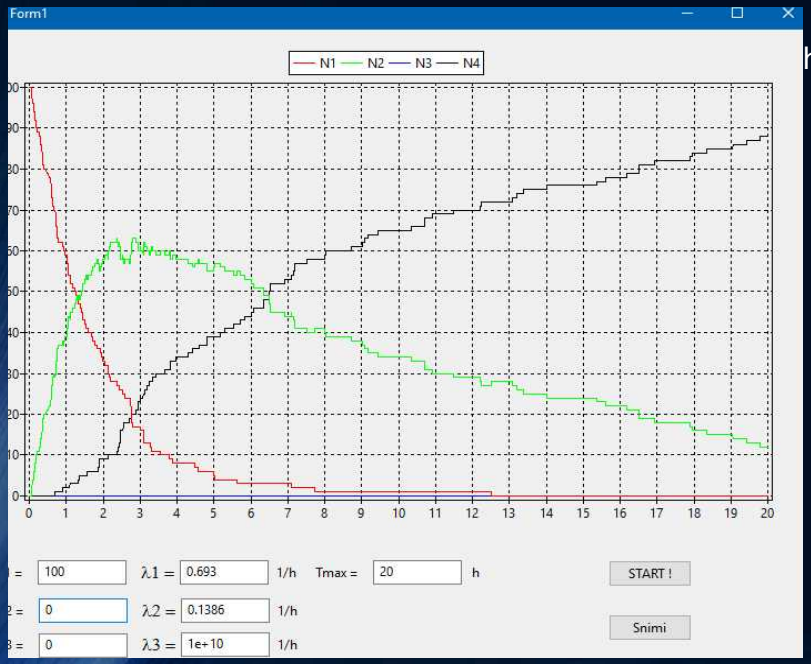
Far Future...

- IoT in (real) physics
  - Measure UV radiation
  - Measure radioactivity



UVB and UV

https://learn.sparkfun.com/tutorials/ml8511-uv-sensor-hookup-gu

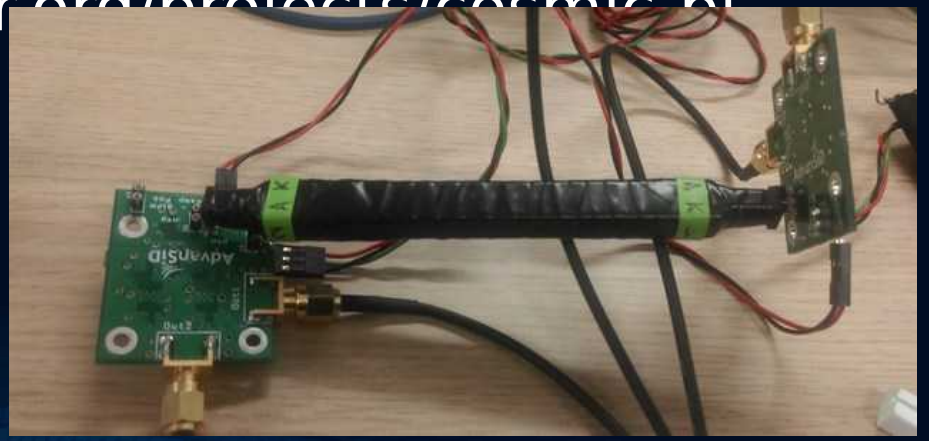


Radiation Sensor Boardwith J305β Geiger Tub

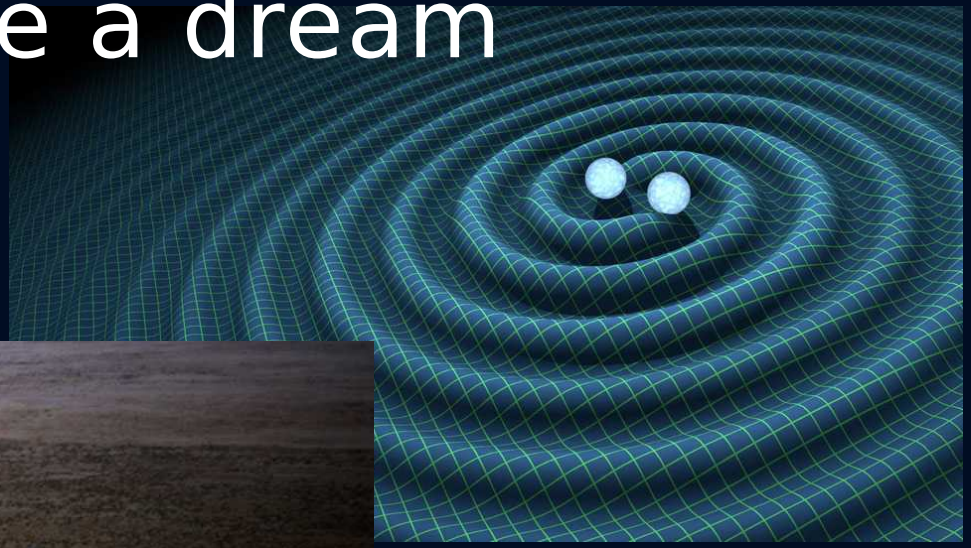
//www.cooking-hacks.com/documentation/tutorials/geiger-counter-radiation-sensor-board-arduino-raspberry-pi-tutorial/

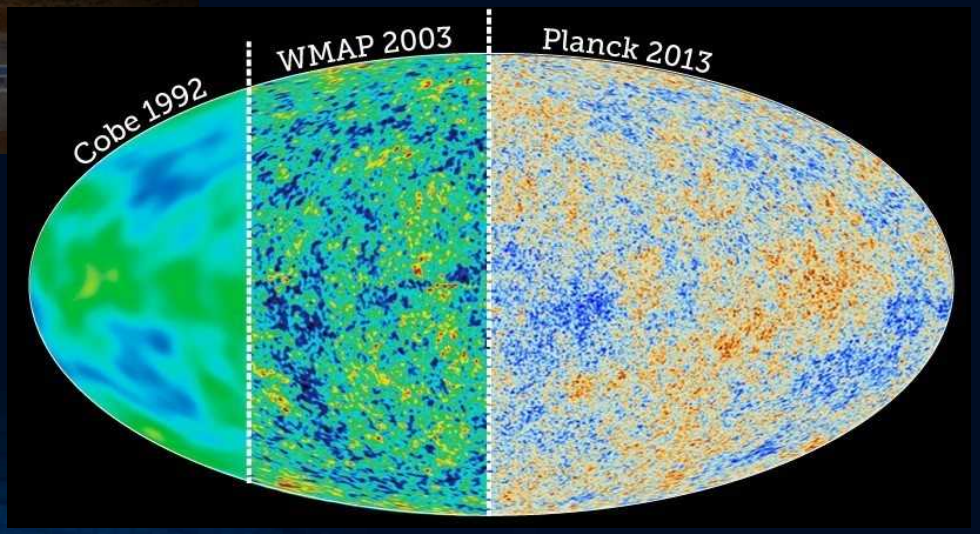
Cosmic Pi

- http://cosmicpi.org/
- A group of people from CERN is using their spare time to build Cosmic Pi, a cosmic ray detector based on a Raspberry Pi.
- Prototype http://www.ohwr.org/projects/cosmic-pi



Let’s have a dream





Serbian
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Thank you / Hvala / Хвала / Multumesc

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