

(ALWAYS) ON THE TRACK OF MODERN PHYSICS.

A. Kamińska¹, T. Wróblewski¹, A. Karbowski², G. P. Karwasz²

¹*Institute of Physics, Pomeranian University in Słupsk, Arciszewskiego 22A, 76-200 Słupsk, Poland*

²*Institute of Physics, Nicolaus Copernicus University in Toruń, Grudziądzka 5, 87-100 Toruń, Poland*

GIREP Seminar, 2016, Kraków

Abstract

“On the Track of Modern Physics”, a series of actions – interactive exhibitions, posters, divulgation papers [1] was a part of “Physics is Fun” EU Science & Society S&S20772 programme. The programme was concluded in 2006, but the expertise acquired in the field of the most updated scientific achievements allows us to continue the didactical and divulgation activities.

In the “Track” a series of scientific questions was posed, like: the mass of neutrino [2], structure of carbon nanotubes [3], existence of resonances in Solar system [4]. Now, we really enjoy the scientific progress and Nobel awards in these fields. Nobel Prize 2015 for studies of neutrinos was assigned to the labs we cited in [2], carbon 2D nanostructures (graphene) was awarded with Nobel Prize in 2010, New Horizons probe just (July 2015) overflowed Pluton, showing a perfect resonance between the planet and its biggest satellite, Charon. The most recent announcement (February 2016), gravitational waves, are the consequence of equations of the general relativity theory [5], as we discussed it also in 2005. The continuous monitoring of recent achievements allows us to enrich and re-propose the path on the Modern Physics at school [6] and university [7] levels. Not only notions but also recent applications of modern research can be presented and simplified experiments illustrating them can be tried by students.

The technical progress, like portable violet lasers, new gadgets (like Australian “emu caller”) and some events (like the jump of Felix Baumgartner) trigger new experimental activities, understandable even for small children. Experiments on absorption and emission optical spectra, physiology of vision, Fourier transform of sounds, stratification of atmosphere - can be performed in interactive ways. As can be seen from photo reports and comments, lessons remain fascinating at each age level:

- “Jump from cosmos” 6-12 aged children (Poznań, Kids University, October 2012) [8]
- “The spectroscopy, i.e. the science on ghosts” lyceum 3rd year (Toruń, Open Days UMK, April 2016)
- “Everything plays” – 6-12 aged children (Lublin, Kids University, September 2014) [9]

The evaluation of the outcome proves a high efficiency of teaching by experiments for these traditional subjects (spectroscopy, acoustics, kinematics). Contents for the divulgations paths, technical hints for preparing simple experiments on modern physics and ways of adopting them to the end user (6-years kids vs. university students) will be discussed.

Keywords

Modern Physics, interactive lectures, optical spectroscopy, gravitational waves

References (if not specified differently, internet sites are <http://dydaktyka.fizyka.umk.pl/>)

- [1] G. Karwasz, *On the Track on Modern Physics*, Foton, Special Issue, 2006, 4.
- [2] G. Karwasz et al., *Pauli and neutrino*, http://dydaktyka.fizyka.umk.pl/Physics_is_fun/posters/neutri3.ppt
- [3] T. Wróblewski et al., *A mystery from the chimney*, /Physics_is_fun/posters/fuller3.ppt
- [4] A. Kamińska et al., *Cosmic harmony*, /Physics_is_fun/posters/harmon5.ppt
- [5] G. Karwasz, T. Wróblewski, *E pur si muove*, /Physics_is_fun/posters/gen-rel35.ppt
- [6] G. Karwasz, *A wave, from a gravitational abyss*, Fizyka w Szkole, No2/2016, p. 36
- [7] G. Karwasz, *On the Track of Modern Physics*, University lectures, UMK, 2016, nowa_strona/?q=node/531
- [8] G. Karwasz, A. Karbowski, *Jump from cosmos*, Interactive lecture, Poznań, 2012, /nowa_strona/?q=node/277
- [9] G. Karwasz, *Everything plays*, Interactive lesson, Lublin, 2014, <http://www.umcs.pl/pl/aktualnosci,3185,inauguracja-2014,17491.chtm>