Fall 2015 Meeting of the Western Pennsylvania Section of the AAPT, 17.October.2015

University of Pittsburgh at Johnstown, Johnstown, PA; Krebs Hall, Room 123

Agenda *(may be modified at the discretion of the Executive Committee)*

8:30-9:15 Registration. *Continental breakfast provided.*

9:15-9:30 Opening and Welcome Remarks: Allan Walstad, Physics Department Chair

9:30-9:45 Haija, A.J. and Numan, M.Z. **Facilitating the computation of the optical properties of dielectric and absorbing layer stacks through Excel**

In calculating the reflectance and transmittance of absorbing single thin films and multilayer coatings, a topic suitable for undergraduate level optics, the familiar Microsoft Excel software proves to be equally capable as other sophisticated codes like Mat Lab, C++, Java, etc. Typically, computations involving such optical properties relied on advanced softwares that, beside being costly, require a steep learning curve. The computational aspect conducted on Excel was explored to compare between the values of the optical properties of well referenced reported cases of thin films, both dielectric and absorbing, as calculated by Excel and those calculated by C++. The agreement is perfect. The comparison started with employing Excel to the formulae of the reflectance and transmittance of thin film systems derived via the elegant characteristic matrix technique. In essence, once the elements of the characteristic matrix that represents a layer are properly defined, Excel demonstrates being powerful in calculating and instantaneously displaying accurately the expected results. The analytic representation of a dielectric layer by a 2×2 element-matrix, real for a dielectric and complex for an absorbing layer, becomes an easy task for those who lack the ability to code in and use softwares other than Microsoft Excel. With the matrix elements, explicitly expressed in terms of the quantities they consist of, and the reflectance and transmittance formulas are introduced as functions, also on excel, their execution is immediate; thereby, the burden of working with or coding matrices is lifted. Also, extending the process to a multilayer stack becomes straightforward, because the stacked layers will be represented by an equivalent matrix whose elements can similarly explicitly be defined and used in the final execution of the reflectance and transmittance formulas.

9:45-10:00 Walstad, Allan (University of Pittsburgh at Johnstown): **"Relativistic" Particle Dynamics Without Relativity**

I show that the correct expressions for momentum and kinetic energy of a particle moving at high speed were already implicit in physics going back to Maxwell. The demonstration begins with a thought experiment of Einstein that established the mass equivalence of energy, independently of the relativity postulates. A simple modification of the same experiment does the rest.

10:00-11:00 *Invited Speaker:* Clark, Russell J. (University of Pittsburgh): **Adventures in Introductory Physics Lab**

Over the past dozen years or so we have tried a number of different things meant to improve the experience of the students taking our freshman level, introductory physics labs. These things include, creating demonstration videos for the experiment procedures, including bio or medical themed experiments for our pre-med students, using a peer review system for editing and grading journal style lab reports and the implementation of online, informal lab reports. This talk will give a brief overview and summary of each, as well as our plans for the future.

11:00-11:15 Break

11:15-11:30 Hall, Jonathan (Penn State Erie – the Behrend College) **The music of East and West and the physics of it**

A comparison is made between toy metallophones from America and Southeast Asia; the differences in the musical scales, and the physics of how they are similar.

11:30-11:45 Brown, L. Todd (University of Pittsburgh at Greensburg): **Eclipsed! Using Archived Newspapers to Show the Hype, the Science and the Misconceptions of Solar Eclipses**

The excitement is building towards the August, 2017 total solar eclipse; the first one in the continental USA since 1979. This talk will show how the Digital Newspaper Collection at the Library of Congress can be used to explore how society has perceived and appreciated previous eclipses. The science of eclipses as well as the misconceptions (some of which are still present today) will be discussed through the use of a historical chronology of clippings from prior headline-making eclipses.

11:45-12:00 Cho, Shinil (La Roche College): **On the OCED Assessment Report**

We brief a recent report of Organisation of Economic Co-operation and Development (OCED) which evaluated education systems worldwide by testing the digital skills and knowledge of 15-year-old students, and reflect the outcome to college education. We also present an example of technology used for acquiring knowledge.

12:00-1:30 Lunch: UPJ cafeteria, $9.90/person, cash or credit

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1:30-1:45 Li, Chunfei (Clarion University): **Microstructure Observation of Al65Cu20Fe15 Alloy**

Icosahedral quasicrystalline phase stands out from their crystalline and amorphous counterparts with its unique five fold rotational symmetry, which is prohibited in regular crystalline structure. Aluminum based alloy with nominal composition of $Al_{65}Cu_{20}Fe_{15}$ are well known for the formation of stable icosahedral quasicrystalline phase. It has also been reported that the detailed phases of this alloy depends on the preparation process. In an attempt to prepare icosahedral

quasicrystalline nanoparticles, several alloys of this composition was prepared. Grains with distinct pentagon facets, sphere-like and column-like structures were observed by using Clarion's brand new Scanning Electron Microscope (SEM). These structures were analyzed by using techniques such as Energy Dispersive X-ray Spectroscopy (EDS), Transmission Electron Microscopy (TEM), X-ray Diffraction (XRD), and Electron Back Scattering Diffraction (EBSD) and the results will be introduced in this presentation.

1:45 – 2:00 Meyer, Ed (Baldwin Wallace University): **Multiple Make-ups Lead to Students' Success**

Physics has the highest "thinking opportunity to knowledge" ratio of any subject. With only v-bar = xt, the students can be challenged with a tremendous range of problems. This makes physics the best subject for developing problem solving skills. That is, the ability to attack problems that they have never seen before. Many students are stymied by problems that they don't know how to do and must undergo a transformation if they are to succeed in physics. They have to stop memorizing rules and protocols and they have to start thinking. To aid in this transformation, the physics department at Baldwin Wallace University has developed an extensive make-up system whereby a student can take an exam a number of times. The fact that there are so many make-up opportunities actually motivates the students to understand the material. This short presentation will explain the grading system and quickly present a variety of sample problems.

2:00-2:30 Business Meeting, drawings, giveaways and other fun stuff.

Have a safe drive home!