2016

Physics Abstracts

Forth Annual International Symposium on Physics 18-21 July 2016, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Physics Abstracts

4th Annual International Symposium on Physics

18-21 July 2016

Athens, Greece

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First Published in Athens, Greece by the Athens Institute for Education and Research.
ISBN: 978-960-598-076-4

8 Valaoritou Street
Kolonaki, 10671 Athens, Greece
www.atiner.gr

TABLE OF CONTENTS

(In Alphabetical Order by Author's Family name)

Preface

This abstract book includes all the abstracts of the papers presented at the 4th Annual International Conference on Physics, 18-21 July 2016, Athens, Greece, organized by the Athens Institute for Education and Research. In total, there were 14 papers and 17 presenters, coming from 6 different countries (Czech Republic, France, India, Romania, Turkey, and USA). The conference was organized into ten sessions that included areas such as Environmental Issues, Astrophysics and Geophysics, Nuclear Physics and Elementary Particles and other related fields. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into six research divisions and twenty-seven research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
4th Annual International Conference on Physics
18-21 July 2016, Athens, Greece

Conference Venue: Titania Hotel, 52 Panepistimiou Street, 10678 Athens, Greece

Co-Organizer and Sponsor

http://erc.ncat.edu/

Monday 18 July 2016

(all sessions include 10 minutes break)

08:00-08:30 Registration and Refreshments

08:30-09:00 Welcome & Opening Address (ROOM A-10th Floor)

- Gregory T. Papanikos, President, ATINER.
- George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

09:00-10:30 Session I (ROOM B-10th Floor): Environmental Issues

Chair: Ethel Petrou, Academic Member, ATINER & Professor and Chair, Department of Physics, Erie Community College-South, State University of New York, USA.

1. Jagannathan Sankar, Distinguished Professor, North Carolina A&T State University, USA. Revolutionizing Metallic Biomaterials for Biodegradable Implants – A Global Status.
2. Marwa Elkady, Associate Professor, Egypt-Japan University of Science and Technology, Egypt & Hassan Shokry Ahmed, Assistant Professor, City of Scientific Researches and Technological Applications, Egypt. Nano-Tube Zirconium Tungesto-Vanadate as Cation Exchanger for Lead Decontamination from Polluted Wastewater.
3. *Burhan Davarcioglu, Associate Professor, Aksaray University, Turkey. Adaptation to Climate Change and Eco-Efficiency (Cleaner Production) for More Effective Environmental Management in Industry.

10:30-12:00 Session II (ROOM B-10th Floor): Astrophysics and Geophysics

Chair: Jagannathan Sankar, Distinguished Professor, North Carolina A&T State University, USA.

1. M. Howard Lee, Regents Professor of Physics, University of Georgia, USA. Hamilton-Jacobi Trajectories of Comets Kohoutek and ISON.
2. *Jaroslav Klokocnik, Professor, Astronomical Institute, Czech Academy of Sciences, Czech Republic, Jan Kostelecky, Research Institute of Geodesy, Topography and Cartography, Czech Republic & Ales Bezdek, Astronomical Institute, Czech Academy of Sciences, Czech Republic. On Feasibility to Detect Volcanoes Hidden under Ice of Antarctica via their "Gravitational Signal".
3. *Avinash Sharma, Professor and Director, GGS Indraprastha University, India. Relic Neutrinos: Challenges & Possible Ways for their Detections.

12:00-13:30 Session III (ROOM B-10th Floor): Nuclear Physics and Elementary Particles

Chair: *Jaroslav Klokocnik, Professor, Astronomical Institute, Czech Academy of Sciences, Czech Republic.

1. Spyridon Margetis, Professor, Kent State University, USA. High Energy Nuclear Collisions - One Trillion Degrees in the Shade.
2. Gerassimos Petratos, Professor, Kent State University, USA & Mina Katramatou, Associate Professor, Kent State University, USA. A Novel Experiment on the Quark-Gluon Structure of the Proton and Neutron.

13:30-14:30 Lunch

14:30-16:00 Session IV (ROOM B-10th Floor): New Ideas and Methods in Education

Chair: *Avinash Sharma, Professor and Director, GGS Indraprastha University, India.

1. *Bala Maheswaran, Professor, Northeastern University, USA. Assessment and Analysis of a New Teaching and Learning Approach via Mastering Technique.
2. Mina Katramatou, Associate Professor, Kent State University, USA. Winds of Change in Undergraduate Physics Programs in the USA.
3. Nassim Haramein, Director of Research, Hawaii Institute for Unified Physics, USA & Amira Val Baker, Research Scientist, Hawaii Institute for Unified Physics, USA and University of Malaya, Malaysia. The Electron and the Holographic Mass.

16:00-18:00 Session V (ROOM B-10th Floor): A Round-Table Discussion on *Teaching and Researching Sciences (Physics and Chemistry) in a Global World*

Chair: Ethel Petrou, Academic Member, ATINER & Professor and Chair, Department of Physics, Erie Community College-South, State University of New York, USA.

1. Dr **Jagannathan Sankar**, Distinguished Professor, North Carolina A&T State University, USA.
2. Dr **Edward Lee-Ruff**, Professor, York University, Canada.
3. Dr **Nassim Haramein**, Director, Hawaii Institute for Unified Physics, USA
4. Dr **Avinash Sharma**, Professor & Director, GGS Indraprastha University, India.
5. Dr **Batric Pesic**, Professor, University of Idaho, USA.
6. Dr **Anouar Alami**, Professor & Head of Department of Chemistry, Sidi Mohamed Ben Abdellah University, Morocco.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 19 July 2016

08:00-11:00 Educational and Cultural Urban Walk Around Modern and Ancient Athens (Details during registration)

11:00-13:00 Session VI (ROOM B-10th Floor): Applied Chemistry & Applied Physics

Chair: *Bala Maheswaran, Professor, Northeastern University, USA.

1. *Haiduke Sarafian, Professor, The Pennsylvania State University, USA. Vibrating Inductor and an RL(t) Network.
2. *Edward Lee-Ruff, Professor, York University/Chemistry, Canada. Photochemical Generation of 9-Fluorenyl Radicals.
3. Batric Pesic, Professor, University of Idaho, USA. Transport of Chloride Ions Evaluation through Modulated Concrete Microstructures.
4. Gregory Boutis, Associate Professor, The City University of New York, USA. 13C, 2H NMR Studies of Structural and Dynamical Modifications of Cholesterol Exposed Porcine Aortic Elastin.
5. Jorge Rosenblatt, Professor Emeritus, Institut National de Sciences Appliquées, France. Inequality and Indistinguishability in Statistical Econophysics.

13:00-14:00 Lunch

14:00-15:30 Session VII (ROOM B-10th Floor): Nanophysics, Nanotechnology and other Issues

Chair: *Burhan Davarcioglu, Associate Professor, Aksaray University, Turkey.

1. Sergiu Cojocaru, Researcher, Horia Hulubei National Institute for Physics and Nuclear Engineering, Romania. Electron-Phonon Coupling and Heat Transfer in Layered Nanostructures at Low Temperatures.
2. Seda Hekim, PhD Student, Firat University, Turkey & Sinan Akpinar, Supervisior, Firat University, Turkey. Renner Teller Quantum Dynamics of ND($\alpha^1\Delta$)+D$'$(^{2}S) Reaction.

21:00-22:30 Dinner (Details during registration)

Wednesday 20 July 2016
Cruise: (Details during registration)

Thursday 21 July 2016
Delphi Visit: (Details during registration)

Sergiu Cojocaru
Researcher, Horia Hulubei National Institute for Physics and Nuclear Engineering, Romania

Electron-Phonon Coupling and Heat Transfer in Layered Nanostructures at Low Temperatures

Heat transfer between electrons and phonons mediated by their coupling is studied for the case of a layered nanostructure consisting of a metal film deposited on an insulating membrane. Electrons are heated by an external source to a temperature higher than the temperature of the crystal lattice (Te > Tp). The system is representative of the central element in the electronic microrefrigerators designed for the on-chip cooling of ultrasensitive detectors far down to the sub-Kelvin region [1]. For the total thickness below 100-200 nm the phonon subsytem is dominated by long wavelength vibrations and can be treated in terms of an effectively quasi-two-dimensional elastic medium with a dramatic enhancement of the heat transfer over the bulk material [2]. By assuming the deformation potential mechanism of coupling, an explicit expression for the electron-phonon heat flux is derived analytically by taking into account the acoustic non-uniformity of the device. The obtained expression explains the behavior observed in some experiments including the case of Cu film supported by a SiN insulating membrane. It is demonstrated that the main contribution to the heat flux is due to the electron coupling with Lamb's dilatational and flexural acoustic modes.

Burhan Davarcioglu
Associate Professor, Aksaray University, Turkey

Adaptation to Climate Change and Eco-Efficiency (Cleaner Production) for More Effective Environmental Management in Industry

Climate change emerges as a multifaceted global problem those results in serious environmental and socio-economic consequences. National and international regulations on climate change initiated immense revolution process in industry. Manufacturing sector causes majority of the global emissions. Lately, new concepts emerged in manufacturing business including eco productivity, environmentally friendly technologies, and industrial ecology and thus essentiality of more efficient use of available potentials became imperious both for environmental quality and sustainability of production.

Consumption of natural resources including raw materials, water, energy, and commodities is fast increasing due to mining, industrial and agricultural activities. Consequently; solid, liquid and gas wastes generated by these activities have adverse effect on the environment. Metal coating sector-the objective of this work is one of the leading sectors for state economy due to exportation extent and potentials, creating market for by-products, and generating recruitments. Most important environmental effects of the metal coating sector include use of chemicals, consumption of high energy and water, emissions to both surface and ground waters and toxic wastes. Practice of eco-efficiency (cleaner production) includes a wide range of opportunities from zero-cost simpler and better operations to high-cost and laborious equipment changes. For the companies in the metal coating sector, by defining the areas of intense resource use and waste production and the parts that could be improved, simple, low-cost and clean production implementation models both for saving resources and reducing waste production were developed.

It is imperative to take precautions against elements and factors that will have direct adverse effect on production and competitiveness due to the imposed adaptation to the climate change. It appears that the use of environmentally friendly technologies which is considered to be the most vital method in management of effects resulted by the climate change could deliver substantial advantage for the corporation.

Nassim Haramein
Director of Research, Hawaii Institute for Unified Physics, USA
&
Amira Val Baker
Research Scientist, Hawaii Institute for Unified Physics, USA and
University of Malaya, Malaysia

The Electron and the Holographic Mass

A computation of the electron mass is found utilizing a generalized holographic mass solution in terms of quantum electromagnetic vacuum fluctuations. The solution gives a clear insight into the structure of the hydrogen Bohr atom, in terms of the electron cloud and its relationship to the proton and the Planck scale vacuum fluctuations. Our electron mass derivation is accurate to within 0.000000002 x 10-28 g (99.99999998%) of the CODATA value. As a result an elucidation of the source of the fine structure constant , the Rydberg constant , and the proton-to-electron mass ratio is determined to be in terms of vacuum energy interacting at the Planck scale.

Seda Hekim
Ph.D. Student, Firat University, Turkey
&
Sinan Akpinar
Supervisior, Firat University, Turkey

Renner Teller Quantum Dynamics of ND(α¹Δ)+D'(²S) Reaction

In recent years, there has been growing interest in quantum mechanical study of nonadiabatic transitions, i.e., transitions between adiabatic states. Although most quantum mechanical theories are built upon the Born-Oppenheimer (BO) approximation to separate the nuclear and electronic degrees of freedom, this approximation will break down in the region which nonadiabatic transitions occur. Among them, the Renner Teller (RT) effect is a typical example. The effect has been developed for the calculation of the rovibronic energies of a triatomic molecule in an electronic state that become degenerate at the linear nuclear configurations. In such an electronic state the coupling caused by the electronic orbital angular momentum is very significant and it is called Renner-Teller (RT) effect.

In this presentation, four reaction $ND(a^1\Delta)+D'(^2S)$ are investigated by the quantum mechanical real wave packet method, taking into account nonadiabatic Renner Teller (RT) and Coriolis Coupling (CC) between the involved states. We consider depletion $N(^2D)+D_2(a^1\Delta)$ and $N(^4S)+D_2(a^1\Delta)$, exchange $ND'(a^1\Delta)+D$ and quenching-exchange $ND'(X^3\Sigma^-)+D$. Reaction probabilities, cross section and rate constants are presented, and RT result are compare with Born Oppenheimer (BO) results.

Mina Katramatou
Associate Professor, Kent State University, USA

Winds of Change in Undergraduate Physics Programs in the USA

Efforts by the United States Physics Departments to improve their Undergraduate Physics Programs as initiated by the American Physical Society, the American Institute of Physics and the American Association of Physics teachers will be described. Results in learning effectiveness from improvements and significant innovative changes in the instruction of introductory Physics courses, and in the increase in the number of Bachelor's degrees awarded will be presented. Ongoing efforts to overhaul and improve the undergraduate program and increase the enrollment and retention of undergraduate majors at the Physics Department of Kent State University in Ohio will be also presented. The revised program is based on a new curriculum, new introductory physics Labs based on active learning modules, new student advising structure and creation of an environment of community and belonging for physics majors. The new curriculum aims to prepare students not only for entry into the graduate school but also into the industrial/high-technology private sector. It is based on consolidation of traditional Mathematics and Physics courses in order to allow for introduction of Modern Physics courses and their applications, and of elective courses suitable for the preparation of students for diverse careers in physics. Plans to overhaul the introductory Physics courses using active learning by integrating their lecture, recitation and laboratory components will also be presented.

*Work supported by Kent State University.

Jaroslav Klokocnik
Professor, Astronomical Institute, Czech Academy of Sciences, Czech Republic
Jan Kostelecky
Research Institute of Geodesy, Topography and Cartography, Czech Republic
&
Ales Bezdek
Astronomical Institute, Czech Academy of Sciences, Czech Republic

On Feasibility to Detect Volcanoes Hidden under Ice of Antarctica via their "Gravitational Signal"

Many not yet discovered volcanoes may be hidden under thick layers of ice of Antarctica. Discovery of two volcanoes active under the ice (from seismic network), new gravitational field models with high resolution (like EIGEN 6C4) based also on gradiometry data from satellite GOCE and progress in mapping topography of bedrock (BEDMAP 2), mostly from remote sensing by satellites, has been inspiring to seek for hypothetic volcanoes hidden under ice of Antarctica by using these data sources. Our method is novel, never used before. We make use of analogy with the „gravitational signal" known for volcanoes and other structures in other parts of the Earth. We utilize various functionals and functions (not only ordinary gravity anomalies) of the disturbing geopotential (being represented by harmonic coefficients in expansion of the potential to spherical harmonic series, namely by EIGEN 6C4 to degree and order 2160). We work with Marussi tensor of the second derivatives, with the invariants and their ratios, the strike angle and with the virtual deformations. Are the best present-day available gravitational and topographic data of sufficient precision and resolution? How fast is an attenuation of the „gravitational signal" of a volcano with increasing depth under the ice? We are able to answer these questions. We claim that our method is promising for future successful search (with new forthcoming data with higher resolution) for subglacial volcanoes, having of course in hands also other than satellite data. Our present-day attempts to discover such volcanoes hardly can be of big success, because of low resolution (mainly) of the existing gravity data and (partly) due to low resolution of the best bedrock topography of Antarctica now available, but we try and present our results.

M. Howard Lee
Regents Professor of Physics, University of Georgia, USA

Hamilton-Jacobi Trajectories of Comets Kohoutek and ISON

There are a class of comets which visit the solar system just once and never return. These events occur once or twice a century. They are thus of special interest as evidenced by world-wide attentions they have received when the comets become visible from the earth. Comet Kohoutek (K) which appeared in 1973 and comet ISON (I) in 2012 are the two most recent such comets.

The trajectories of these comets have not yet received the theoretical treatments from the basic principles of mechanics. By trajectory we mean t=t(q), where t is time and q is a generalized coordinate, e.g. radial distance, angle. It refers to the coordinate evolution of time. The trajectories are not easily obtained from the canonical approach by the equation of motion if there are two or more degrees of freedom. This approach can in principle yield q=q(t), the time evolution of a coordinate. But it is not easy to invert it to obtain t=t(q) unless there is only one degree of freedom. A very natural approach to obtain trajectories is by the Hamilton-Jacobi (HJ) theory.

Comets K and I are observed to have their eccentricity e very nearly at the parabolic limit e=1. To obtain their trajectories, we use the HJ theory first to obtain the trajectories for e<1 (ellipse) and e>1 (hyperbola). From these solutions we approach the parabolic limit carefully to obtain the trajectories of comets K and I.

Our general solutions for the trajectories when e<1 contain the famous 3 laws of Kepler's. The Kepler's equation by which the astronomers chart the movements of stellar objects in an elliptic orbit also follow directly from our general solutions. When e>1, our general solutions contain the analogs of Kepler's law 1 and 2. (No analog for law 3 for an open orbit.) To our knowledge "the equal time-equal area rule" for a hyperbolic orbit has never been known.

For the trajectories on a hyperbolic orbit one can introduce a new concept the "horizon" singularity with an exponent gamma>0. When the angle approaches a critical value defined by the angle of the asymptote, time approaches infinity. The trajectories are completely regular everywhere else e.g. near the perihelion. The trajectories of comets K and I are characterized by the exponent of the horizon singularity gamma=3 for both comets. By this critical exponent an early observation is possible to identify whether the approaching comet is of the class that visits the solar system once and never returns, different from more commonly observed comets on elliptic orbits like comet

Hally. By our solution it is also possible to determine the eccentricity of a comet as it nears the perihelion.

Bala Maheswaran
Professor, Northeastern University, USA

Assessment and Analysis of a New Teaching and Learning Approach via Mastering Technique

Teaching electrical engineering circuits to undergraduate non-electrical engineering majors such as Mechanical Engineering students is a challenging and motivating adventure. The basic circuit concepts are long-standing; Ohm's laws are centuries old but still students struggle to solve problems involving the application of Ohm's laws when incorporating it with other ideas. For example, in the node voltage analysis, estimating the currents entering and leaving a node using Ohm's law is sometime problematic to students. Exploring new techniques for teaching electrical circuits is a continual journey. For our part, we have introduced Mastering Engineering online problem solving and answering approach for electrical circuits with the intent to improve students' learning skills and mastering circuit concepts.

This online assignments have video based coaching problems, tutorials with hints to guide students to learn the electrical circuit concepts and regular text book end of chapter homework problems. As part of the course requirement, students are assigned to do the conceptual problems to self-learn and to do more advanced problems to master the concepts. This mandatory requisite makes them learn the chapter-materials in more in-depth. The aim of this study was to determine whether this tool will indeed help students to learn the course materials to their own as well as to their instructors' satisfaction.

This report will present information about the Mastering Engineering approach used in our sections and the weekly workload assigned to students. The study will present the average time spent by students for each assignment, individual problems, and the total time spent by students to do the assignments. In addition to this work, at the end of the semester, a survey was done to see how much mastering Engineering helped our students to master the course materials. About hundred students, from two different sections participated in the survey. The data was analyzed using a spreadsheet and the outcome will be reported in this paper. This particular study was done for electrical circuit course taught to non-electrical engineering students. The electrical circuit course for non-electrical engineering students is a challenging task. The course covers mainly circuit analysis using various laws and theorems, and applications of electrical engineering, such as AC circuits and electric power, magnetic circuits, transformers, and rotating machines.

Spyridon Margetis
Professor, Kent State University, USA

High Energy Nuclear Collisions - One Trillion Degrees in the Shade

We will present an overview of current results of high-energy nuclear collisions. Emphasis is going to be given to pedagogical aspects of the research like its relation to Big Bang Cosmology, exotic Astronomical objects, Condence Matter physics and String theories. Exotic properties of hot and dense nuclear matter, like super-fluidity and opaqueness in strong interaction probes as well as recent progress in the field are presented.

Gerassimos Petratos
Professor, Kent State University, USA
&
Mina Katramatou
Associate Professor, Kent State University, USA

A Novel Experiment on the Quark-Gluon Structure of the Proton and Neutron

We will present a forthcoming large-scale, nuclear-particle physics experiment* at the Thomas Jefferson National Laboratory in Virginia, USA, investigating the structure of the proton and neutron (nucleons) in terms of their quark and gluon elementary constituents. The experiment will use the Continuous Electron Beam Accelerator and the experimental Hall-A Spectrometer Facility of the Laboratory. Cryogenic Targets of Helium and Tritium atomic nuclei will be bombarded with beams of high energy electrons. Scattered electrons which induce breakup of these atomic nuclei will be detected with two state-of-the-art, high resolution mass spectrometers equipped with large-volume superconducting magnets and particle identification detectors. The expected data will provide new critical input on unmeasured aspects of the so-called "nucleon structure functions", which provide fundamental information for the distribution of the down and up quarks and of the gluons (Richard Feynman's "partons") that make up the two nucleons. The new data will be highly complementary to data from previous measurements, which were based on another method using targets of hydrogen and deuterium nuclei. These measurements were performed at the Stanford Linear Accelerator Center in California and were awarded the 1990 Nobel Prize in Physics. The new data will test predictions of Quantum Chromodynamics, the theory of the Strong Force in nature which governs the interactions of quark and gluons which make up all visible matter in the Universe. They will also provide critical input needed for the interpretation of data from the Large Hadron Collider Accelerator at the European Centre for Nuclear Research (CERN).

*Work supported by the United States National Science Foundation Grant PHY-1405814, the United States Department of Energy, and the Kent State University Research Council.

Jorge Rosenblatt
Professor Emeritus, Institut National de Sciences Appliquées, France

Inequality and Indistinguishability in Statistical Econophysics

Very good fits are obtained to distributions of income, life expectancy, survival after cancer and electricity consumption, generically defined as resources. The model assumes individual and resource indistinguishability. Indeed, the zero-or-one occupation number of jobs, considered as states, pleads for Fermi-Dirac statistics of employment, while a quantile of income can be occupied by an unlimited number of individuals, imposing Bose-Einstein (BE) statistics. We borrow from economics the concept of inequality, measured by the out-of-equilibrium entropy $H\_BE\ (\omega)$, where ω=(individual resource)/(per capita resource). Social processes are irreversible: individuals produce entropy $S\_BE\ (\nu)$, with $\nu(\omega)$ average occupation number of ω-states. The most probable path maximizes the number of ways of finally reaching $\nu(\omega)$, and thereby $S\_BE\ (\nu)$. Total population and available benefit are obvious constraints, resulting in two adjustable Lagrange multipliers: $\beta>0$, inversely proportional to the mean individual benefit, and $\mu<0$, similar to the chemical potential. A third constraint, $H\_BE\ (\omega)$ itself, measures socially self-inflicted inequality through another parameter, $\lambda<0$. It is nonadjustable, because it depends only on the position of a poverty peak in the asymmetric probability density. We assume individual-to-individual interactions to be reflexive, symmetrical and transitive, thus defining classes of equivalence. They coincide with common definitions of social classes (poor, middle class and rich) or periods in human life (children, adults, old and very old). We introduce many-body correlations via a nonextensive entropy model, depending on another nonadjustable parameter, θ, whereby final fits to $\nu(\omega)$ are found.

Jagannathan Sankar
Distinguished Professor, North Carolina A&T State University, USA

Revolutionizing Metallic Biomaterials for Biodegradable Implants – A Global Status

The purpose of the National Science Foundation (NSF) - Engineering Research Center (ERC) is to transform current medical and surgical treatments by creating "smart" implants for craniofacial, dental, orthopedic, cardiovascular, thoracic and neural interventions. The ERC is developing biodegradable metals with the premise that new kinds of implants can adapt to the human body and eventually dissolve when no longer needed, eliminating multiple surgeries and reduce health care costs. Biodegradable systems offer significant therapeutic advantages over implants used today. These innovations would particularly benefit pediatric patients suffering from cleft palate, angular deformities of long bones, limb length discrepancies, or trauma including fractures that require pins and screws for repair. Biodegradable metal implants would reduce the expense and spare children the pain of multiple procedures used to implant, then later remove, refit and re-implant the current generation of devices. Biodegradable stents could reduce or eliminate the need for additional invasive procedures. Sensors and other neural applications developed by the ERC will provide new information on the biological response of the body to implanted devices. Breakthrough activities include new alloying techniques to produce tunable degradable metallic implants, new improved versions of existing clinical-use plates and screws, innovative nanocoating technologies to yield special surface functionalities and methods to develop new sensors for monitoring/controlling implant corrosion and studying bone growth. The talk will specifically highlight the Innovations, Translation and trailblazing pathways through holistic University- Industry partnerships for economic ecosystem and commercialization.

Haiduke Sarafian
Professor, The Pennsylvania State University, USA

Vibrating Inductor and an RL(t) Network

A mechanical rigid coiled spring possesses a constant electric inductance, L. An oscillating mechanical soft coiled spring possesses a variable, time-dependent inductance, L(t). We envision an electric network composed of an ohmic resistor in series with a mechanical oscillating soft spring, R L(t), driven with either a DC or an AC voltage power supply. The impact of the vibrating inductor on the characteristics of the circuit is analyzed. A fresh innovative resonance phenomenon is also introduced. Current characteristics of these circuits are compared to the classic RL scenarios. Circuit simulations entirely are carried out applying a Computer Algebra System, *Mathematica* [1]. This investigation intertwines two distinct areas of physics; mechanics and electricity.

Avinash Sharma
Professor and Director, GGS Indraprastha University, India

Relic Neutrinos: Challenges & Possible Ways for their Detections

The study of *Cosmic Neutrinos Background* (commonly referred as relic neutrinos) isextremely interesting and has potential of providingvital information about the very –near to the Big Bang scenario and the basic physics of it. It also provides an excellent opportunity for the fine tuning of the several critical parameters of the υ–sector particularly the estimation of masses limits, oscillation parameters, etc.

Although the very existence of the relic neutrinos is one of the powerful predictions of the Standard Big-Bang Model, they have eluded direct or indirect detections so far - mainly because of the very low energies and momentum, leading to extremely low cross-sections.

In the present work the existing proposals for direct and /or indirect detections have been briefly reviewed and a new possible new framework for the direct detection of relic υsbased upon the coherent scatteringhas been proposed. The simulation work for designing of an appropriate detector for this purpose is underway.