The ATHENA Colloquial Talks Initiative: A Report and Future Developments

Konstantinos Petridis

Department of Electronic Engineering, Hellenic Mediterranean University,
Romanou 3, Chalepa, Chania, Crete, Greece
cpetridis@hmu.gr

Abstract. *In this manuscript, we report the motivation, the content, the challenges and the future plans of one of the outstanding ATHENA Alliance research activities: the ATHENA Colloquial Talks. Thanks to the latter, state-of-the-art scientific work, mainly in engineering and in teaching science, was presented in the last three academic periods from 2020 to 2023. The talks were delivered by world leading experts, many of them scientists with an h-index higher that 100, followed also by talented young researchers working in some of the most prestigious institutions. The event attracted more than 100 scientists as speakers and more than 1800 different individuals as attendees. Besides the expertise-showcase ATHENA Colloquial Talks is an additional incentive to alliance members in achieving the mission of ATHENA European university.*

Keywords. Invited Talks, Research, Networking, Observatory, Higher Education

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1 Introduction

Among scholars, the phrase “publish or perish” has become an ironclad rule of academic career development. Still, besides all alternative efforts for research quality assessment, without a sufficient number of publications in well-respected academic journals, tenure and promotion are just a pipe dream. But there is another, neglected and much less studied aspect of faculty work that can also shape the arc of a career in the professoriate. It is not teaching nor service. It is the invited talk. These talks can take many forms. There can be lectures, popular seminar series, colloquiums, workshops and keynotes. Some definitions of the various forms of invited talks follow:

Invited Lectures: At a speaking engagement in which an individual is specifically invited to present a lecture or talk on a particular topic or subject. It is typically organized by a host institution or an event organizer who recognizes the expertise, knowledge, or unique perspective of the speaker and wishes to provide an opportunity for them to share their insights with a specific audience.

Keynote Talks: A significant presentation or speech given at the beginning or during an event, such as at a conference, seminar, or industry gathering. The purpose of a keynote talk is to set the tone for the event, inspire and engage the audience, and provide a central theme or message that aligns with the event's objectives.

Colloquiums: A formal presentation or lecture given by an expert or a speaker on a specific topic in an academic or professional setting. It is typically a part of a larger academic program or event, such as a conference, seminar series, or departmental gathering.

Workshops: Workshop talks can cover a wide range of topics depending on the context and audience.

One of the main reasons universities organize invited talks is to provide their students and faculty members with opportunities to engage with prominent experts and professionals in their respective fields. By inviting distinguished speakers, universities aim to expose their communities to cutting-edge research, innovative ideas, and diverse perspectives. Invited talks also serve as a platform for networking and collaboration. They allow students, researchers, and faculty members to connect with experts who may share similar research interests or offer valuable insights. These interactions can lead to potential research collaborations, joint projects, or even future job opportunities.

Furthermore, invited talks contribute to the overall academic and intellectual environment of the university. They enhance the learning experience by offering students a chance to go beyond their regular curriculum and explore real-world applications of the subjects they study. Invited talks often inspire students, ignite their curiosity, and motivate them to pursue further studies or careers in the respective fields.

Additionally, universities organize invited talks to showcase their academic community and research accomplishments. By bringing in renowned speakers, universities can demonstrate their commitment to academic excellence and attract attention from the broader academic community, potential students, and funding agencies.

The invited talks can contribute to the professional development of faculty members. They provide an opportunity for the faculty to share their research findings, present their work to a wider audience, and receive feedback from experts in the field. It's a way for faculty members to establish themselves as experts, build their reputation, and expand their professional networks.

Lastly, the invited talks can be considered as a part of the at home internationalization actions the host university takes to boost the collaboration beyond the borders and encourage people to mobilize in other universities and labs.

Crucial factors such as the rising impact of academic travelling on the environment, the importance of the work-life balance, and the increasing reliability of internet connections open the avenue of new ways to organize seminars and conferences: the teleconference solution. Moreover, the technology e.g., Zoom and other platforms, provided greater accessibility to excellent speakers from all over the world without the need for mobility, which entails the use of additional funds and time. Therefore, the cost was close to zero - and no need arose to pay for airline flights, hotels and conference rooms.

The ATHENA European University Alliance shares the above-mentioned incentives to build and support its scientific ecosystem and through its Observatory of Higher Education initiative to organize the ATHENA Colloquial Talks (also used just as ATHENA Talks): a series of online colloquial talks throughout which experts within and beyond the Alliance presented their pioneer work. Moreover, the organization of online and free of any tuition fees events served the main priorities of the ATHENA: digitalization, accessibility and inclusivity.

2 Background and Motivation

The ATHENA European University Alliance invites (mainly online) since 2020 experts from universities, research centres and industry to talk about their work. The talks are completely delocalized with the speakers and attendees scattered all over the world. However, all the types of invited talks have been organized (Invited and Keynote Talks, Workshops and Colloquiums) the focus of this article will be the ATHENA Colloquial Talks. Despite this delocalization, the ATHENA talks kept some of the traditional features: the existence of a moderator, and the execution of Q&A session. The main criteria for selecting our speakers are the following:

- Expertise (KPIs: h-index, received citations).
- Availability to provide a synchronous presentation.
- Presentation Skills.
- Member (a preference is given) of the ATHENA Alliance.

The organizational committee of the ATHENA Talks invites, decides, plans and announces on a yearly base the academic program.

The paper is constructed as follows:

- Presentation of the main features of the given talks: title, thematic topic area, abstract, speaker (affiliation, h-index, received citations), attendance, link in YouTube channel.
- ATHENA Talks statistics: total views, average h-index of the presenters.
- Challenges and Future Plans.

The moderator who was handling the Q&A session and the management of participants was the organizer of the event. The ATHENA Talks used a standard registration form, from which an email list was made and a Zoom link and password were emailed to all registered participants 24 hours ahead of time. The recorded sessions were publicly available to everyone have access to the event's website.

3 Presentation of the ATHENA Talks

The topics have spanned from solar cells to problem-based learning teaching approach. More than 80 such talks have been hosted and the program is mainly addressed to researchers, academic teachers and postgraduate students.

Links to the complete seminar program and the speakers per academic year can be found at the https://athenauni.eu/athena-talks and at the following hyperlinks (DOI standard links):

- 2020 – 2021: https://iro.hmu.gr/sci-cafe-colloquial-talks/
- 2020 – 2021: https://iro.hmu.gr/the-athena-colloquial-talks-in-teaching-science-april-2021-june-2021/
- 2021 – 2022: https://iro.hmu.gr/sci-cafe-colloquial-talks-2021-2022/
- 2022 – 2023: https://sites.google.com/view/athenaunicolloquialtalks/home
- 2022 – 2023: (in mathematics teaching science): https://sites.google.com/view/athenaunimathemath/home-page

The lectures can be watched again in the ATHENA Talks YouTube Channel:

- Talks in Science: https://youtube.com/playlist?list=PL3OWQw2onmC_fjutflKRDT0OVw_1z0XFW
- Talks in Teaching Pedagogies: https://youtube.com/playlist?list=PL3OWQw2onmC_ZVHku-zWDn3GykwMUP86g
- Talks in Teaching Mathematics: https://youtube.com/playlist?list=PL3OWQw2onmC8g0JDdxGno10itZWtD5p21

A brief presentation of the selected ATHENA Talks follows in chronological order.

3.1 Academic Period 2020 – 2021

Managing projects with Theory of Constraint Principles

Topic Management

Abstract In IT, according to the survey made by The Standish Group and published in the 2015 CHAOS report, only very few projects perform well to the project management triple constraints of cost, time, and scope. Only 29% of software projects were completed on-time and on-budget, while 19% of projects were canceled before they ever got completed and 52% of projects increased their cost, scope, or have scope creep. Clearly, the failure rate of IT projects is high and as a response to that organizations tend to implement modern project management practices and attitudes, with limited or inconsistent success in terms of better project or business performance. The lecture shows examples of project portfolio using different management approaches, starting with traditional approaches and continuing with step-by-step approaches using modern project management methodologies, providing significant benefit to the organization. Achieving such improvements requires changes in how project work is managed, planned, scheduled, and queued. Particularly, it is shown how Theory of Constraints tools and applications enables at least doubling the number of projects that organization can complete in the same period, and able to deliver over 90 percent of them within defined scope, budget, and time – all within existing employees and without changes in technology and no changes to how they are performing IT-related tasks like design, implementation, and testing.

Date 23/09/2020

Speaker Tomaž Aljaž

Affiliation Academic Staff in FINI Novo Mesto university, Slovenia.

Video https://youtu.be/L7FUHTu9FjQ

The ATHENA European University

Topic	Internationalization of Higher Education.
Abstract	In this presentation, the ATHENA European University will be presented along with the tasks that have been assigned to HMU. On top of this, a review of the actions of the IRO in the last six months will be reviewed. In the end, the targets of the office the following three months will be presented.
Date	02/10/2020
Speaker	Konstantinos Petridis
Affiliation	Associated Professor, Department of Electronics, HMU, Greece.
Video	https://youtu.be/L7FUHTu9FjQ

Environmental quality-Environmental protection: A global approach

Topic	Environmental Sciences
Abstract	The presentation is referred to as the basic terms that a scientist who deals with the protection of the environment has to be familiar with. It is referred also to as the methods for monitoring the water and wastewater quality and to the water and wastewater treatment. These methods are the ones that the presenter is expert in.
Date	09/10/2023
Speaker	Melina Kotti
Affiliation	Associated Professor, Department of Electronic Engineering, HMU, Greece.
Video	https://youtu.be/eYmrZ7lEE9M

Geophysical survey at Wabar Meteo-Crater: Recent findings

Topic Geosciences

Abstract The study of impact craters on Earth has picked up high worldwide consideration, which can be done by studying the ground surface using remote sensing (satellite), geological outcrops, drilling holes and apply small-scale laboratory experiments trying to build the dynamic models of crater formation and by collecting geophysical data.
In this work, the near- crater sediments at the young Wabar crater field in Saudi Arabia has been investigated using the magnetic, EM, seismic, and GPR methods. The main targets of this research were exploring the possibility of any remnant major pieces of the meteorite, investigate the meteoroid direction, and map the deformation structure associate with the meteorite impact. During the expeditions, many small pieces of the meteoroid were found and collected for further geochemical analysis.

Date 16/10/2020

Speaker Pantelis Soupios

Affiliation Professor in King Fahd University of Petroleum & Minerals, Saudia Arabia.

Video https://youtu.be/kvgvKPY6JCE

Artificial Intelligence/An Overview

Topic Engineering

Abstract This talk will go through an introduction to the area of artificial intelligence, from the early signs of its appearance (B. C.) to its latest developments. Definitions, concepts, and philosophical concerns regarding the importance and the goals of AI will be discussed. After a brief historical overview, AI examples will be shown, together with some of AI's earlier and recent applications to everyday life. The aim of the talk is to give a general idea of AI's concept, inform about the different disciplines and research areas involved in AI's development and provide food for thought concerning the challenges and risks of AI.

Date 23/10/2020

Speaker Maria Zakynthinaki

Affiliation Assistant Professor

Video https://youtu.be/u4kkwRBaLCg

Polaritonics for improving the performance in light-emitting devices

Topic Engineering / Photonics

Abstract In our everyday life, we experience the interaction of light with the materials around us. For example, the colors we see in a flower is a result of light interacting with the flower's surfaces and molecules. Some of the very well-known light-matter interactions are light absorption, emission, reflection, and scattering. In some special cases, light interacts with matter so strongly that they merge into one and indistinguishable hybrid form. Microcavity polaritons are one of these special cases of bosonic particles that come into life under strong light-matter interactions. In the lab conditions, we create polaritons artificially in optical microcavities (2 mirrors facing each other separated by only a few hundreds of nanometres) sandwiching a thin film of a semiconductor. Because polaritons decay generates photons, we can use spectroscopy to study them.

To date, most of the polaritonic samples are used for fundamental studies in physics, because polaritons hybrid light-matter nature makes them exceptionally light (8 orders of magnitude lighter than the rubidium atoms) bust still have matter properties. Besides, polaritons can propagate through defects without scattering (under special conditions), can show ultrafast nonlinear response to light inputs (all-optical transistors), and the quantomechanical states of polaritons can simultaneously emit and absorb light. In this talk, I will discuss how the special properties of polaritons can improve devices such as lasers light-emitting diodes (LEDs), waveguides, and all-optical switches.

Date 30/10/2023

Speaker Konstantinos Daskalakis

Affiliation Assistant Professor, Turku University, Finland

Video https://youtu.be/Pj_quxO_ttA

Fullerene Like Structures

Topic Engineering/Materials Science

Abstract The discovery of C60, the third variety of carbon, in addition to the more familiar diamond and graphite forms, has generated enormous interest in many areas of science. Furthermore, it turns out that C60 is only the first of an entire class of closed-cage polyhedral molecules consisting of only carbon atoms – the fullerenes (C20, C24, C26, … C60, …C70, … C1000000-carbon nanotubes). This talk presents the main mathematical principles for engineering fullerene-like structures (based on symmetry considerations and Euler relation between the numbers of faces, vertices, and edges in polyhedra). I will discuss how Nature, using fullerene-like structures, minimizes energy, and matter resources in molecules and nanoclusters, viruses, and living organisms. Examples of achievement of such goals in architecture are also presented. Discussion of scientific terms and concepts will be held in the context of the history of their discoveries. The history of discoveries of fullerenes and carbon nanomaterials made at the end of the XX century will be punctuated by excursions into the depths of time – until the Renaissance and even Antiquity.

Date 06/11/2020

Speaker Eugene Katz

Affiliation Professor, Ben Gurion University, Israel

Video https://youtu.be/4f3hEPtV5iU

Demonstration of current-induced Electro-Thermo-Mechanical instability anisotropic growth in metallic wire targets

Topic Plasma Physics

Abstract Results on the first demonstration of an Electro-Thermo-Mechanical (ETM) instability growth induced anisotropy in high current heated metallic wire targets will be presented. The anisotropy is the result of the associated difference between the longitudinal and azimuthal growth rates of the ETM instability. The nonlinear magnetic diffusion and shock wave propagation in the conductor is considered in the study. The demonstration of the anisotropy is an observation of fundamental importance since it sheds light on the unexplained elliptical instability structures observed in magnetized liner experiments.

Date 13/11/2020

Speaker Michael Tatarakis

Affiliation Professor, Department of Electronics, HMU, Greece

Video https://youtu.be/Dv8vQVlSByM

Fundamentals, challenges, and current state of the art in marine energy conversion and integration

Topic Engineering / Energy

Abstract Electricity generation is one of the major contributors to Greenhouse Gas (GHG) emissions. Meeting the Paris Agreement targets for the reduction of GHG, in order to reduce the effects of anthropogenic climate change, will require the diversification of the energy resources we use so that we can minimize our dependence on fossil fuels. There is an abundance of resources available in the marine environment, including offshore wind, wave, and tidal energy. Early research initiated during the oil crisis in the '70s has been revisited during the past decade, with new technology development and rapid expansion of offshore wind installed capacities worldwide, but also with a renewed interest in wave and tidal energy conversion systems. This has resulted in a substantial body of research in the resource, conversion, and integration of marine energy, as well as many converter designs, currently at various stages of development, ranging from conceptual design to commercial units. The University of Edinburgh is considered the birthplace of marine energy since the '70s and is still one of the world's leading research institutions in this field. In this presentation we will go through the fundamentals of marine energy conversion, we will discuss the major challenges for its development, and we will present the current state of the art as well as ongoing research at the Institute for Energy Systems of the University of Edinburgh.

Date 20/11/2020

Speaker Aristides Kiprakis

Affiliation Professor, University of Edinburgh, UK

Video https://youtu.be/d1dFo6r3tVY

Novel X-ray sources with high coherence: new horizons in biomedical imaging

Topic Physics / Optoelectronics

Abstract The index of refraction of materials in the x-ray regime is given by the equation n=1-δ+iβ, where δ is a parameter related to the ionization that slightly reduces below one the real part of the index of refraction, while parameter β counts for the absorption. Even if inherently the x-ray diffraction limit is less than 1 nm, such a spatial resolution is not even approached due to the incoherent properties of most of the available x-ray sources. The imaging using the x-ray absorption in matter, i.e. the parameter β, limiting the imaging resolution at least five orders of magnitude higher than the Abbe diffraction limit. Consequently, the need for coherent x-ray sources is of increased demand. X-ray FEL facilities currently provide such coherent sources of directional and high brilliance x-ray radiation. However, they require high budget investments for construction, maintenance and man-power operation and for this reason are a few worldwide. During the last two decades the rapid evolution of ultrafast and high-power laser technology enabled a) the generation of coherent soft X-rays with a non-linear process named High Harmonic Generation (HHG) of the fundamental laser pulse and b) the acceleration of electrons inside gas targets in table-top experiments using the Laser Wakefield Acceleration (LWFA) resulting in the generation of a directional and semi-coherent x-ray betatron-type radiation. This hard X-ray radiation fulfils the requirements for a semi- coherent x-ray source appropriate for imaging applications in the micro-scale. Laser installations that support the generation of x-ray betatron-type radiation are much less costly compared to XFELs and thus offered for development by many laboratories worldwide.

Date 04/12/2020

Speaker Nektarios Papadogiannis.

Affiliation Professor, Department of Acoustics, HMU, Greece

Video https://youtu.be/rstNe3irkLA

A non-extensive statistical physics view in Earth Physics: Geodynamic properties in terms of Complexity theory

Topic Physics / Geosciences

Abstract Boltzmann-Gibbs (BG) statistical physics is one of the cornerstones of contemporary physics. It establishes a remarkably useful bridge between the mechanical microscopic laws and macroscopic description using classical thermodynamics. If long-range interactions, non-markovian microscopic memory, multifractal boundary conditions, and multifractal structures are present then another type of statistical mechanics, then BG, seems appropriate to describe nature (Tsallis, 2001).

To overcome at least some of these anomalies that seem to violate BG statistical mechanics, non-extensive statistical physics (NESP) was proposed by Tsallis (Tsallis, 1988) that recovers the extensive BG as a particular case. The associated generalized entropic form controlled by the entropic index q which represents a measure of non-additivity of a system. Sq recovers SBG in the limit q→1. For a variable X with a probability distribution p(X), like that of seismic moment, inter-event times or distances between the successive earthquakes or the length of faults in a given region, using terms of NESP, we obtain the physical probability which expressed by a q-exponential function as defined in Tsallis, (2009). Another type of distributions that are deeply connected to statistical physics is that of the squared variable X2. In BG statistical physics, the distribution of X2 corresponds to the well-known Gaussian distribution. If we optimize Sq for X22, we obtain a generalization of the normal Gaussian that is known as q-Gaussian distribution (Tsallis, 2009). In the limit q→1, the normal Gaussian distribution recovered. For q>1, the q-Gaussian distribution has power-law tails with a slope -2/(q-1), thus enhancing the probability of the extreme values.

Date 11/12/2020

Speaker Filippos Vallianatos.

Affiliation Professor, Kapodistrian University of Athens, Greece

Video https://youtu.be/TKBgfCHl_RE

Challenges and Perspectives of Energy in the Built Environment: From Smart Buildings to Smart Cities

Topic Engineering

Abstract In an increasingly urbanized world, governments and international corporations strive to increase the productivity of cities, recognized as economic growth hubs, as well as ensuring a better quality of life and living conditions for citizens. Although a significant effort is performed by international organizations, researchers, and others to transform the challenges of cities into opportunities, the visions of our urban future are trending towards bleak. Social services and health facilities are significantly affected in negative ways owed to the increase in urban populations (70 percent by 2050) as verified by the recent Covid-19 pandemic The talk starts with the emerging challenges for urban regions and cities and focusing on the importance of data collection and smart energy management for buildings, districts, and communities. Zero energy communities and the energy technologies to achieve zero energy targets are analyzed. The role of smart grids as a key mechanism for smart communities is discussed. Finally, the integration of nature-based solutions in smart cities and the benefits for the urban context and citizens' health and wellbeing is presented.

Date 18/12/2020

Speaker Denia Kolokotsa

Affiliation Professor, Technical University of Crete, Greece

Video https://youtu.be/EYA0cNeKyL4

Biomarker Discovery, Machine Learning, and Agro-Health: building bridges between experts

Topic Biomedicine.

Abstract Biomarkers are the cornerstone of precision medicine: identified as a measurable indicator of some biological state or condition, they promise to offer solutions for accurate diagnosis, prognosis, and therapeutic monitoring. Among other biological entities, DNA methylation patterns differing dramatically between tissues and changing dynamically over time, are suggested to carry clinically valuable information. We have been studying methylation in liquid biopsy material, ie cell-free DNA liberated in the circulation, in different pathological conditions such as cancer and diabetes. Recently, following the global scientific trend, we move gradually from hypothesis-driven to (big) data-driven approaches, as modern -omics technologies lead the accumulation of large precious multi-parametric biological datasets. We employ ad-hoc auto Machine Learning tools for data extrapolation, delivering low-feature validated models/classifiers. Translational development will lead to emerging cost-effective multiplex bench assays expected to retain high diagnostic performance in a real-world setting, readily available for commercialization. Our approach can have unprecedented added value in different medical conditions, such as the Covid-19 pandemic, and/or other biological problems

Date 22/01/2021

Speaker Ekaterini Chatzaki

Affiliation Professor, Democritus University, Greece

Video https://youtu.be/oi6QWpd2CcQ

A brief introduction into the physics of ultra-cold atomic systems

Topic Physics

Abstract In the last 25-30 years, the field of cold atomic gases has shown remarkable achievements, ranging in a very wide range of sub-fields of physics. These include condensed-matter physics, atomic physics, quantum optics, nonlinear physics, nuclear physics, etc. These systems are gaseous and are very dilute, which is a great advantage, as compared with other systems, e.g., liquid Helium, superconductors, nuclei, etc. In addition, we can manipulate them, as they are easily tunable. Given the numerous activities on cold atoms, in this talk, I will give a very brief introduction and I will focus mostly on some basic principles. I will then discuss some of their remarkable properties, focusing mostly on their superfluid properties.

Date 29/01/2021

Speaker George Kavoulakis

Affiliation Professor, Department of Mechanical Engineering, HMU, Greece

Video https://youtu.be/b_rJ7O7Mu6o

Printed Nanoelectronics: there is a plenty room down there

Topic Engineering / Electronics

Abstract In silicon microelectronics, the ability to downscale critical dimensions of its building block, the field-effect transistor, has proven extremely successful over the past sixty years in increasing the computational power of modern microprocessors. These extraordinary developments have been achieved through a virtuous circle of scientific and engineering breakthroughs which have led to the proliferation of information & communication technologies with an extraordinary impact on our daily life and society. However, adopting silicon's approach of scaling to emerging technologies such as printed and large-area electronics, has proven challenging both in terms of technology and cost. In this talk, I will focus on the progress being made downscaling emerging forms of large-area electronics through new materials and fabrication paradigms and their application in the ever expanding ecosystem of The Internet of Everything.

Date 05/02/2021

Speaker Thomas Anthopoulos

Affiliation Professor, KAUST, Saudia Arabia

Video https://youtu.be/NXwr7IJyfms

An Introduction to Bioelectronics

Topic Engineering / Bioelectronics

Abstract Organic bioelectronics defines a generic platform with unprecedented biological recording and is maturing toward applications ranging from life sciences to the clinic. Conjugated polymers that support mixed (electronic and ionic) conduction are key to advancing a host of technological developments for next-generation bioelectronics devices. When interfacing an electrolyte, the electrical properties of the conjugated polymer film are modulated dramatically due to ions penetrating into the bulk of the film. The latter is the main principle of operation of organic electrochemical transistors (OECTs), which operate in biological media and translate low magnitude ionic fluctuations into measurable electrical signals. This talk will go through the principles of electronic and ionic conduction in conducting polymers, such as PEDOT:PSS and other, p-type and n-type semiconducting polymers. Polymer structure-property relations and their link with OECT performance will be demonstrated. The talk will also go through novel biological applications of organic bioelectronics devices such as metabolite biosensors, cell membranes-on-a chip, and 3D bioelectronic devices for tissue engineering.

Date 12/02/2021

Speaker Achilleas Savva

Affiliation Post-Doctoral, University of Cambridge, UK

Video https://youtu.be/VADaaCvZx3A

Carbon-Based Electrodes for Solution-Processed Solar Cells

Topic Engineering / Optoelectronics

Abstract Solution-processed metal halide perovskite solar cells (PSCs) are considered the most promising photovoltaic (PV) technology to replace Silicon due to their high certified power conversion efficiencies (PCEs), low manufacturing cost, and potential for high throughput device fabrication. Recently, the research efforts of the PSC's scientific community have been focused on tackling the remaining drawbacks towards commercialization, which includes: 1) the use of expensive metallic electrodes and hole transport layers (HTLs), that increase the overall device cost and hinder their high throughput fabrication and 2) the low device operational stability. Thus, the aforementioned bottlenecks should be tackled in order for the full potential of PSCs to be reached. The most promising approach to overcome these drawbacks of PSCs is with the adoption of a fully printable device fabrication route, which is enabled by the replacement of the thermally evaporated electrodes using low-cost printable carbon-based conductive films. Using this fully printable device configuration, efficient, very stable and ultra-low-cost PSCs can be prepared at very high throughput. In this talk, I will focus on the recent advancements, fundamental challenges, and prospects of this promising PV technology and finally, I will present my recent results in this research direction.

Date 19/02/2021

Speaker George Kakavelakis

Affiliation Assistant Professor, Department of Electronic Engineering, HMU

Video https://youtu.be/p7n3XuWM3t8

Light-matter interactions in atomically thin semiconductors

Topic Physics / Material Science

Abstract The Nobel Prize in Physics 2010 was awarded jointly to Andre Geim and Konstantin Novoselov "for groundbreaking experiments regarding the two-dimensional material graphene". Thenceforth two-dimensional (2D) materials have attracted tremendous research interest due to their unique optical, electronic, and mechanical properties. The way these materials interact with light depends strongly on the number of atomic layers. More than 5000 compounds are predicted to appear layered and they can be easily assembled to form heterostructures and combine the unique properties of the constituent layers. Potential applications in future photonics, optoelectronics and quantum technology are based on our understanding of the light-matter interaction on an atomic monolayer scale. I will discuss what we can learn from optical spectroscopy of these atomically thin semiconductors and their heterostructures for future applications but also for fundamental physics. A description of the physical origin of the main absorption and emission features in the optical spectra will be introduced.

Date 26/02/2021

Speaker Ioannis Paradisanos

Affiliation Postdoctoral Fellow, CNRS, France

Video https://youtu.be/_GeqL3ETbiI

Atomic Physics with Accelerators: Projectile Electron Spectroscopy

Topic Atomic Physics

Abstract The APAPES initiative (Atomic Physics with Accelerators: Projectile Electron Spectroscopy) established in Greece the discipline of Atomic Physics with Accelerators, a field with important contributions to fusion, hot plasmas, astrophysics, accelerator technology, and basic atomic physics of ion-atom collision dynamics, structure, and technology. This has been accomplished by combining the existing interdisciplinary atomic collisions expertise from Greek Universities, the strong support of distinguished foreign researchers, and the high technical ion-beam know-how of the "Demokritos" tandem Van der Graaff accelerator group into a cohesive initiative. The on-going ion-atom collisions research activities of the APAPES team in "Demokritos", the related collaborative activities at GSI heavy nuclei accelerator, and future perspectives will be presented.

Date 05/03/2021

Speaker Emmanouil Benis

Affiliation Associate Professor, University of Ioannina, Greece

Video https://youtu.be/xdS3Ya7IMBg

Multiphoton Lithography: Principles, Materials, and Applications

Topic Physics / Laser Physics

Abstract Multiphoton Lithography is a technique that allows the fabrication of three-dimensional structures with sub-100 nm resolution. It is based on multi-photon absorption; when the beam of an ultra-fast laser is tightly focused on the volume of a transparent, photosensitive material, polymerization can be initiated by non-linear absorption within the focal volume. By moving the laser focus three-dimensionally through the material, 3D structures can be fabricated. The technique has been implemented with a variety of materials and several components and devices have been fabricated such as micro-optics, biomedical devices, and scaffolds for cell growth. The unique capability of Multiphoton Lithography lies in that it allows the fabrication of computer-designed, fully functional 3D devices. Here, I summarize the principles of microfabrication and present recent research in materials processing and functionalization of 3D structures. Finally, I discuss the future applications and prospects for the technology.

Date 12/03/2021

Speaker Maria Farsari

Affiliation Director of Research, IESL-FORTH, Greece

Video https://youtu.be/YNZbFweHkRw

Nanoparticle Based Photonic Devices

Topic Engineering / Materials Science

Abstract In this talk, I will describe the fabrication and the optical characterization of multilayer photonic structures. The multilayer structures have been fabricated starting from colloidal dispersions of metal oxide nanoparticles and by employing the spin-coating technique. We have mostly used nanoparticles of silicon dioxide, titanium dioxide, and indium tin oxide. We have obtained in this way porous multilayer structures. I will then show the exploitation of such multilayer structures in different device architectures. By placing the photonic structures between two electrodes, we could observe electric field-driven tuning. By adding a thin layer of silver on top of the photonic structures we could obtain colorimetric sensors for bacterial contaminants.

Date 12/03/2021

Speaker Francesco Sotognella

Affiliation Associate Professor, POLIMI, Italy

Video https://youtu.be/7COY4iq5h80

Laser Direct Printing for Flexible Electronic Applications

Topic Laser Physics

Abstract Current technological trends require the precise deposition of highly resolved features, in a direct writing approach that preserve their structural and electronic properties upon transfer while increasing the number of components that can be integrated into a single device. Over the past decade, printed electronics technology has evolved and is now used in applications such as flexible screens, intelligent labels, and packaging. Among the printing techniques, Laser-induced forward transfer (LIFT) technique is capable of printing electrical circuits quite inexpensively and quickly. At the same time, this technique is environmentally friendly and has no restrictions in terms of viscosity. In this work, we highlight the newest trends of LIFT manufacturing for the development of a variety of components with electronic, optoelectronic, and sensing functionality such as RFID antennas, RF transmission lines, organic thin-film transistors, metallic interconnects, circuits defects repairing, and biochemical sensors.

At the same time, the increasingly demanding requirements have highlighted the need for more thorough, all-embracing research regarding the rheological characteristics of the printable fluids, their jetting dynamics, and their electrical, post-sintering properties, that will define the process' reliability, aiming towards its industrialization.

Date 19/03/2021

Speaker Ioanna Zergioti

Affiliation Professor, National Technical University, Greece.

Video https://youtu.be/swhqCI2bhkA

Organic electronics for Neural Interfaces

Topic Materials Science / Electronics

Abstract Our capacity to understand and modify neural activity will lead to tremendous advancements for humanity during the next decades. These advancements will pave the way for high-quality brain-machine interfaces, wearable electronics and therapeutic devices. However, current technology and materials impede this development with bulky, non-biocompatible electrical components that require rigid encapsulation in body, and interfaces that lack the appropriate mechanical and electrical properties to safely and efficiently contact tissue for extended periods of time. There is a critical need for reliable, safe, soft, implantable devices that can acquire and process neural and electrophysiological data, as well as deliver responsive stimulation. Organic materials and electronics hold great promise as the optimal interfaces with biological tissue owing to their biocompatibility, efficient ionic conductivity, and mechanical properties that resemble biotic materials. Let me show you a beginning of a journey where dissolved scientific boundaries among different fields and an interdisciplinary way of thinking can create biomedical devices and therapeutic systems that will benefit human health.

Date 26/03/2021

Speaker George Spyropoulos

Affiliation Assistant Professor, Ghent University, Belgium

Video https://youtu.be/9KnrszlxrHM

Studies and Research Collaboration with China

Topic Education / Internationalization of Higher Education

Abstract In this talk, tips regarding the collaboration with the Chinese Higher Institutions will be revealed. Moreover, the priorities of the Chinese Institutions will be presented and key information will be provided

Date 09/04/2021

Speaker Pelagia Karpathiotaki

Affiliation Associate Professor, University of International Business & Economics, China

Video https://youtu.be/xCzRRvDBNao

Essentials of Problem Based Learning for Teachers.

Topic	Education Science
Abstract	In this talk, the main principles of the Problem-Based Learning (PBL) pedagogical approach will be presented. Then, we will discuss how PBL can be applied with project-based learning and how other instructional design issues, such as facilitation and assessment, are affected by PBL. Part of this presentation is based on the results of the ITEM Erasmus+ project (https://item.hmu.gr/) and the Strategic Partnership project CRETE module in PBL for teachers
Date	14/04/2021
Speaker	Evangelia Trianafyllou
Affiliation	Assistant Professor, Aalborg University, Denmark
Video	https://youtu.be/9uDI0yuOBMA

Approaching effective and rational energy transition in Crete

Topic	Engineering / Renewable Energy Sources
Abstract	Since 2019, Crete has been included in the 20 pioneering islands of the European Commission regarding energy transition, within the frame of the "Clean Energy for E.U. Islands" initiative. This means that Crete has the role and the responsibility, among the other pilot and pioneering European islands, to pave the way towards effective and rational energy transition for the islands in Europe. Energy transition has to be based on specific pylons, such as capacity building for the local community, energy-saving, transition to e-mobility, electricity and thermal energy production from renewables, and integration of decentralized projects within smart grids. Given the abundant wind, solar, and biomass potential available on the island, the energy transition can lead to 100% energy independence in Crete, through technically secure and economically effective projects. With the extensive involvement of the local citizens in the overall process, the energy transition can also constitute the basis for economic and social development for the Cretan society.
Date	16/04/2021
Speaker	Dimitris Katsaprakakis
Affiliation	Professor, Department of Mechanical Engineering, HMU, Greece.
Video	Not available

Bio-Optic Interfaces

Topic	Engineering
Abstract	The overarching goal of my research is to induce light sensitivity in living cells, in order to control cell functioning. We develop specific devices that behave as light actuators. In the years we studied planar interfaces, nanoparticles, and intramembrane molecular switches that are able to transduce light absorption into a biological signal. Fundamental questions regard the coupling mechanism at the abiotic/biotic interface, while the application is in the treatment of neurodegenerative diseases. Direct neuronal stimulation is a promising tool for addressing disorders such Alzheimer's and Parkinson's, but also in prostheses for the rescue of fundamental functions such as vision. An artificial retina prosthesis is one of the most advanced applications so far demonstrated in animal models. Controlling muscular cell contraction is another development under study that may lead to artificial organs as well as cyborgs.
Date	21/04/2021
Speaker	Guglielmo Lanzani
Affiliation	Professor, POLIMI, Italy
Video	Not available

Demystifying micro-credentials: between opportunities, threats, and everyday life

Topic	Education Science
Abstract	Micro-credentials are high on the policy agenda of the European Commission. Today we see competing definitions of what micro-credentials are and are not. Is it the latest Covid-19 induced fashion or something that has been around for decades? How to assure their quality? What challenges are associated with their recognition? Asking questions is important, even if we may not know all the answers yet.
Date	21/04/2021
Speaker	Aurelija Valelkiene
Affiliation	Administration Staff, Vilnius Tech, Lithuania
Video	https://youtu.be/e254D882IrE

Lab-in-a-fiber photonic devices: technologies and prospects

Topic	Physics / Optoelectronics
Abstract	The field of Optical Fibre Devices is conceptually re-directed towards the investigation of smart materials and versatile guiding platforms for attaining novel functionalities while targeting numerous applications in a "disruptive" approach. Different optical designs, processing, and material science technologies fuse together for constituting the "Lab-in-a-Fiber" concept, where benchtop operations are now scaled down and implemented into the robust optical fiber geometry. The photonic devices which will be presented, refer to configurations realized in standard, tapered and microstructured optical fibers, whereas their development blends diverse photonic, processing, and material technologies, demonstrating operational characteristics beyond the current state-of-the-art.
Date	23/04/2021
Speaker	Stavros Pissadakis
Affiliation	Research Coordinator, IESL, Greece
Video	https://youtu.be/z4BYduMFVPI

Digital Tools for Active Online Learning and Engagement

Topic	Education Science
Abstract	In this talk, I will present some digital tools and tasks that focus on student collaboration and production. I will demonstrate how to make online lessons truly interactive and share some good practices for engaging students online in a meaningful way. In addition, I will discuss how virtual collaboration can be integrated into our teaching program and demonstrate how to encourage student active participation.
Date	28/04/2021
Speaker	Elena Mizrahi
Affiliation	Teaching staff, Western Galilee College, Israel
Video	https://youtu.be/HrYGuDsmPmE

Micro-credentials in Higher Education

Topic Education Science

Abstract The Irish National Framework of Qualifications (NFQ), established in 2003, facilitates the offering of small awards/micro-credentials. Irish Higher Education Institutions (HEI) – public and private – have offered programs leading to small awards for a long time and continue to do so. The NFQ sets out award-type descriptors for a range of different kinds of small qualifications – minor, special purpose, and supplemental – in addition to the traditional major awards e.g. degrees. Quality Assurance is a key feature underpinning the NFQ and central to the development of all programs and awards. HEIs have primary responsibility for QA. HEIs are autonomous and have their own awarding powers. They develop their own QA policies and procedures, in line with QQI's Core Statutory Guidelines and the European Standards and Guidelines (ESG). QQI has a legislative responsibility to externally review HEIs every seven years.

Date 05/05/2021

Speaker Barbara Kelly

Affiliation Director of Qualifications with Quality and Qualifications Ireland (QQI)

Video https://youtu.be/13OeSCfp7GA

The Flipped Classroom Approach

Topic Education Science

Abstract In this talk, I will introduce the flipped classroom instructional approach and its pedagogical underpinnings. Then, I will present the principles of Game-Based Learning (GBL) and how GBL and the flipped classroom can be combined for engaging students both in online and offline learning environments. Part of this presentation is based on the results of the FLIP2G Erasmus+ Knowledge Alliance (https://flip2g-project.eu/).

Date 12/05/2021

Speaker Evangelia Triantafillou

Affiliation Assistant Professor, Aalborg University, Denmark

Video https://youtu.be/HRVGYHnjC3Y

Ultrafast laser engineering of biomimetic surfaces: from lab to fab From Lab to Fab

Topic Engineering / Materials Science

Abstract Nature has provided a plethora of functional surfaces exhibiting unique, complex hierarchical morphologies with dimensions of features ranging from the macroscale to the nanoscale. Such morphologies are behind the superior properties exhibited by the natural surfaces, including extreme wetting, antireflection, floatation, adhesion, friction, and mechanical strength [Mat. Sci Eng. R, Reports, 141, 100562, (2020)]. Femtosecond (fs) laser surface structuring has been employed to produce numerous biomimetic structures for a range of applications, including microfluidics, tribology, tissue engineering, and advanced optics. In this paper, we provide an overview of our recent research activities towards fs laser fabrication of biomimetic self-organized surface structures of variable shape and periodicity on different types of materials, including metals, semiconductors, and dielectrics. Such structures were produced upon line and large-area processing with femtosecond laser beams of tailored shape and polarization. The primary research objective is to perform a systematic investigation of the laser conditions that lead to structures with specific application-based properties such as, drag reduction, omnidirectional diffraction, and anti-reflection. The capability of fabrication of a plethora of complex structures, realized upon variation of the laser beam polarization, brings about a new concept in biomimetic structuring and it can be considered as an emerging laser-based fabrication approach. The structure formation mechanism is explained through a detailed investigation of the fundamental processes that characterize laser-matter interaction.

Date 14/05/2021

Speaker Emmanuel Stratakis

Affiliation Research Director, IESL, Greece

Video https://youtu.be/0Ld9Mq5rCh0

Writing More and Better: the Tel Aviv University Academic Writing Initiatives

Topic Education Science

Abstract As Sir Mark Walport stated: "Science isn't finished until it's communicated". Thus, apprenticing our students to become effective writers as well as excellent scientists is of the essence. Tel Aviv University deploys several strategies toward this aim. In 2010, our division (The Division of Languages) started a multifaceted program offering academic/scientific writing courses for Ph.D. students in selected faculties which has expanded to almost all faculties to date, as well as discipline-based writing courses for masters and undergraduate students. To reach an even larger audience, we recently designed and developed a new online academic writing reference course for all graduate and post-graduate populations, in conjunction with our Center for Language Excellence (CLE) which provides individualized support to help students with all their writing and communication needs. Taking advantage of the university's move toward internationalization which, among other changes, requires undergraduate students to take 1-2 content courses in English, our division provides support for students as well as the faculty who need to give their content courses in English for the first time. By implementing this integrative holistic approach, we hope that the strategies and tools we provide will help students and faculty gain international recognition in professional journals and conferences, and become more effective science communicators.

Date 19/05/2021

Speaker Monica Broido

Affiliation Head of the Writing Programs in the Division of Languages at Tel Aviv University, Israel

Video https://youtu.be/hiHdkrWdWBY

The European Student Card Initiative

Topic	Education Science
Abstract	The European Student Card establishes a common European identity for higher education students. Students can get their student status verified easily across Europe with their European Student Card.
Date	26/05/2021
Speaker	Joao Bacelar
Affiliation	Director of the European University Foundation
Video	https://youtu.be/8U9beH9_kGc

Metamaterials: metallic nanogaps for single-molecule sensing

Topic	Materials Science
Abstract	Not available
Date	04/06/2021
Speaker	Angelos Xomalis
Affiliation	Postdoctoral Fellow in Swiss Federal Labs for Materials Science, Switzerland
Video	https://youtu.be/HyWHsIOe6Lk

The Assessment Dilemma

Topic	Education Science
Abstract	In this session, Dr. Bengu will share some tips about how to design our courses holistically and make the assessment for learning as part of our course design. She will also talk about alternative assessment techniques and present a list of tools that can be used for assessment.
Date	09/06/2021
Speaker	Elif Bengu
Affiliation	Assistant Professor, Abdullah Gul University, Turkey
Video	https://youtu.be/6cNsYHpOOC8

Laser Annealing as a platform for optimising materials properties

Topic Laser Physics

Abstract Advanced materials are becoming increasingly important as substitutes for traditional materials and as active elements in new and unique applications. They have had a considerable impact on the development of a wide range of strategic technologies. Structural ceramics, biomaterials, composites, optical materials and advanced semiconductors fall under this particular category. Even though these materials can be fabricated by conventional schemes, material processing with lasers is an expanding field which is drawing considerable attention. In particular laser processing has been employed in many applications to modify materials' properties. As lasers offer several advantages such as spatial and material selectivity, flexibility and automation, the scope for materials' laser processing is further increased.

Date 11/06/2021

Speaker Nikolaos Kalfagiannis

Affiliation Associate Professor, University of Ioannina, Greece

Video https://youtu.be/Y8TzjjaZLUU

The OPEN Science Initiative

Topic Education Science

Abstract Not available

Date 16/06/2021

Speaker Ivo Grigorov (DTU, Denmark) & Iris Buunk (LIBER, Netherlands)

Affiliation Research Coordinator, DTU, Denmark

Video https://youtu.be/R-6QnNaAgFE

Optoelectronics using Quantum Dots

Topic	Physics / Optoelectronics
Abstract	The discovery of quantum confinement effects in nanometer-sized crystals embedded in glasses marked the birth of the field of colloidal quantum dots (CQDs). Four decades after the discovery, breakthroughs in synthetic approaches allow the fabrication of highly robust, air-stable CQDs with a narrow size distribution, multinary composition, and elaborate shapes and multi-shell structures. The synthetic progress has been combined with an extensive body of theoretical and experimental breakthroughs on the chemistry and physics of CQDs that pave the way towards a CQD optoelectronics technology. The talk will discuss important milestones on the roadmap towards CQD consumer products, focusing on photophysics and the optoelectronic properties of various classes of semiconductor CQDs.
Date	18/06/2021
Speaker	Grigorios Itskos
Affiliation	Professor, University of Cyprus, Cyprus
Video	https://youtu.be/5sOj2JWhYiQ

How to Teach Mathematics on the 21st Century

Topic	Education Science
Abstract	Not available
Date	23/06/2021
Speaker	Nissim Harrel
Affiliation	Senior Lecturer in HIT, Israel
Video	https://youtu.be/7U1_iEnKTKc

Green Electronics

Topic Electronics

Abstract The growing demand of new and sustainable consumer printed electronics led to the increased interest in devices integrating natural materials. Here we present the wok resulting from recent research concerning the application of cellulosic materials and suberin (a cork component) in flexible electronic devices. First topic to be addressed are printable inks based on carbon fibers and zinc oxide nanoparticles mixed with cellulose derivatives that were optimized to create printed active layers at temperatures lower than 150 °C. This allowed the development of fully screen-printed sensors and electrolyte gated transistors on paper substrates. Second topic is related to the development of electrolytic membranes to be used as dielectric in transistors exploring the high capacitance that can be obtained by the formations of electric-double layers. The optimization of the cellulose dissolution method in alkaline hydroxides allowed for selfhealable ion-conducting membranes. Addition of suberin introduce anti-microbial characteristics to these membranes. Finally, we will show how cellulose nanocrystals can self-assemble in chiral nematic structures that mimic structures existing in nature. These can be then used as dielectric in field-effect transistors making possible the detection of circular polarized light in such devices

Date 25/06/2021

Speaker Luis Pereira

Affiliation Professor, NOVA, Portugal

Video https://youtu.be/ViiaEnrP78o

Project-Based Learning

Topic Education Science

Abstract Project-Based Learning (PBL) is a unique learning method in which students develop skills and knowledge by working on authentic, challenging, and engaging projects. The definition of PBL varies to some degree among educators. Buck Institute of Education developed Gold Standards to help educators implement effective PBL practices. Gold Standard PBL consists of the following elements; forming a challenging open-ended problem or question, having sustained inquiry and authenticity, students having an input/ownership, attainment of thoughtful reflection, analyzing and revising, and having a public product. Gold Standard PBL has been proven to link the gap between theory and real-world problems.

At York College of Pennsylvania, I have implemented project-based learning in freshman-level engineering design and senior-level thermal system design classes. Collaboration with the local community and industry partners helped to provide a variety of interesting real-world applications. Examples of these projects include a little free library project with a local high school, the design of an interactive Ram pump museum display for the York Agricultural and Industrial Museum, and the cooling system design for injection molding machines. In PBL, students ideally work ineffective team environments, where every member of the team is valued equally. In this talk, we will discuss various tools and strategies that can help to improve team effectiveness and promote inclusion when implementing PBL.

Date 30/06/2021

Speaker Emine Celik Foust

Affiliation Associate Professor, YCP, USA

Video https://youtu.be/vRn8p6P7jnI

3.2 Academic Period 2021 – 2022

Introduction to tribology and green tribology

Topic	Mechanical Engineering
Abstract	Not available
Date	07/10/2021
Speaker	Raimundas Rukuiza
Affiliation	Professor, Vytautas Magnus University, Lithuania
Video	https://youtu.be/T1K3FWUckdM

Tunable Laser Sources for Ultrashort Laser Pulses Generation

Topic	Laser Physics
Abstract	Not available
Date	22/10/2021
Speaker	Masood Ghotbi
Affiliation	Assistant Professor, University of Kurdistan, Iran
Video	https://youtu.be/agYLfv6spyE

Atomic-scale computational modeling of materials: synergy of theory and experiment towards novel technological applications

Topic Atomic Physics

Abstract Materials modeling at the atomic scale is well established as an indispensable tool to explain available experimental data, but also opens new directions in research by proposing novel materials and phenomena. Perhaps the most popular method for the quantum-mechanical atomistic study of materials is the so-called Density Functional Theory (DFT) approach, which is an effective and robust way to deal with the challenging many-body problem of interacting electrons. This talk will first give a brief introduction to the basic concepts and technicalities of DFT and then highlight representative cases of joint experimental and DFT-based computational work on the design and optimization of state-of-the-art devices in diverse fields of technology. Examples include work on solar cells with outstanding photo-conversion efficiencies and on transistors with high carrier mobilities and operational stability. We will conclude with the recently achieved laser-induced transfer of two-dimensional materials, such as graphene, a new paradigm for printing even atomically-thin systems with high quality and well-defined patterns.

Date 19/11/2021

Speaker Leonidas Tsetseris

Affiliation Professor, National Technical University of Athens, Greece

Video https://youtu.be/UvLarmncnn8

Technology for Bioelectronic Medicine

Topic Bio-electronics

Abstract Bioelectronic medicine provides a new means of addressing disease via the electrical stimulation of tissues: Deep brain stimulation, for example, has shown exceptional promise in the treatment of neurological and neuropsychiatric disorders, while stimulation of peripheral nerves is being explored to treat autoimmune disorders. To bring these technologies to patients at scale, however, significant challenges remain to be addressed. Key among these is our ability to establish stable and efficient interfaces between electronics and the human body. I will show examples of how this can be achieved using new electronic materials and devices engineered to communicate with the body and evolve with it.

Date 26/11/2021

Speaker George Malliaras

Affiliation Professor, University of Cambridge, UK

Video https://youtu.be/SjntOQhOMrk

The Floriculture Research Group of the University of Chile

Topic Agriculture

Abstract Chile presents rich biodiversity of vascular plants with almost 5,000 native species, being about 50% of them endemic. Many of these species show an attractive ornamental value, therefore the Floriculture Research Group (GIFLOR) of the University of Chile has been focused on the propagation, characterization, and breeding of some of these species, particularly in genera such as *Alstroemeria* and *Pasithea* (geophytes); and *Junellia*, *Malesherbia*, *Salpiglossis* and *Schizanthus* (herbaceous perennials). In vitro and ex Vitro studies, using different explants and media, have been conducted to achieve an efficient method of propagation. Flower color and scent have been analyzed using different methodologies, including phenotyping (color chart, color meter, morphology), sensorial (trained and non-trained panel), chemical (HP-LC, GC-MS), and molecular (gene expression, molecular markers). Promissory species and genetic lines of *Alstroemeria* have been bred using interspecific hybridization by embryo rescue. At the moment, some of these hybrids are being evaluated to validate their performance as new varieties for the ornamental plant market.

Date 03/12/2021

Speaker Danilo Aros

Affiliation Associate Professor, University of Chile, Chile

Video https://youtu.be/lJpzwTGfPvU

Developments in Laser Inertial Fusion Energy

Topic Plasma Physics

Abstract Inertial Fusion Energy is a topic of scientific curiosity for understanding the involved science as well as for exploring the possibility for future energy production. An update of the current status of IFE will be presented. In addition, the research which takes place at the Institute of Plasma Physics and Lasers (IPPL) will also be presented.

Date 10/12/2021

Speaker Michael Tatarakis

Affiliation Professor, HMU, Greece

Video https://youtu.be/6BwiU1a61vg

Device Synthesis

Topic	Electronics
Abstract	In a nutshell, device synthesis is a method designed to complement material synthesis. It could be considered as "adapting the device structure to the material properties" or as "using the device structure to compensate for nonideal material properties". While placing all the elements together to define "Device Synthesis" is probably new, large parts of it have been practiced at least since the 1960s. For example, we tend to forget that the device structures used today are those that were found to best fit the properties of Si (and SiO2). In this talk, I will introduce the new methodology and demonstrate it primarily in the context of solar cells. If you have already watched the OMD YouTube channel, I am going to present a different perspective and the chem-Phys examples are different (i.e., you won't be bored).
Date	17/12/2021
Speaker	Nir Tessler
Affiliation	Professor, TECHNION, Israel
Video	https://youtu.be/Np63phyhZMg

Transparent Electronics

Topic	Electronics
Abstract	Not available
Date	21/01/2022
Speaker	Elvira Fortunato
Affiliation	Professor, NOVA & Minister of Education & Research, Portugal
Video	https://youtu.be/WagmfoObxbM

The Softer Side of Robots and their Wearable Applications

Topic Robotics

Abstract The inherent compliance in soft material robotic systems can enable capabilities and task versatility not found in traditional rigid-bodied robotic systems. The robots of the future will use soft design approaches to provide a more conformal, unobtrusive, and compliant means to interface and interact, externally and internally, with the human body, and will be able to monitor, assist, or augment the capabilities of individuals. For example, elastomeric and textile actuators powered by pressurized fluids can offer several desirable features including robust, lightweight structures, inexpensive development, proven fabrication methods, and simple as well as complex motion paths with simple inputs. Furthermore, these actuators can provide compliance, fast actuation speeds, and most importantly safe human interaction, making them ideal for wearable and medical applications.
This talk will focus on soft components (actuators and sensors) as well as integrated systems that are tested in realistic settings. The first part will cover the principle of operation of soft composite elastomeric and fabric-based actuators, as well as their design and fabrication. The second part of the talk will present a number of research projects on wearables that demonstrate the design, fabrication, and sensing principles required to realize such soft systems as well as their challenges.

Date 11/02/2022

Speaker Panagiotis Polygerinos

Affiliation Associate Professor, HMU, Greece

Video https://youtu.be/XD48ffuftNQ

Neural networks for direct and inverse problems in mechanics

Topic Mechanical Engineering

Abstract Machine learning methods, neural networks, and big data have attracted the interest of researchers in mechanics. The exploitation of experimentally or numerically generated data is one example where artificial neural networks can be trained in order to provide a reduced-order metamodel. A multi-layer feed-forward network, trained by the back-propagation method can be used in structural analysis problems for several inputs in order to predict the expected outputs. Depending on the input-output data, this approach can be used in order to study direct or inverse problems. A review of various applications will be given at the first part of the talk, including the early work for the study of crack and damage identification and recent results on spring-back prediction in metal stamp processing and on data-driven multiscale analysis of composite structures.

The talk will demonstrate that combined usage of computational mechanics and artificial intelligence tools is able to give solutions to hard classical tasks and provide novel approaches for the design of smart systems and reliable digital twins.

Date 18/02/2022

Speaker George E. Stavroulakis

Affiliation Professor, Technical University of Crete, Greece

Video https://youtu.be/C7hOIhFmNi4

Additive Manufacturing 2D and 3D printing technologies.

Topic	Mechanical Engineering
Abstract	Additive manufacturing (AM) is currently considered as one of the most promising manufacturing technologies. 2D printing has been widely used for low-cost printed electronic devices e.g. Thermoelectric Generators (TEGs,) Photovoltaic (OPVs, PePVs: third-gen PVs) harvesting devices, actuators, heaters, sensors, etc. Among 3D printing technologies, fused filament fabrication (FFF) has been the most prominent technology, while the utilisation of multi-functional polymer nanocomposite filaments has received a continuous scientific interest. Within this talk, a focus will be given to 2D and 3D printing technologies with a special emphasis on: *i)* the printing process principles, proper materials & formulations with tailored optoelectronic properties, and *ii)* to the resulting multi-functional devices/ objects with thermoelectric harvesting capabilities (TEG devices), heater functions, electrically conductive 3D objects, mechanical reinforcement and structural character. A hybrid approach combining 2D and 3D printing will be presented towards printed structures with response to multiple external fields against 4D printing applications.
Date	25/02/2022
Speaker	Lazaros Tzounis
Affiliation	Associate Professor, HMU, Greece
Video	https://youtu.be/7Jfdq40slHM

Nano-Biosensors for Health

Topic	Electronics
Abstract	Not available
Date	11/03/2022
Speaker	Arben Merkoci
Affiliation	ICREA Research Professor, ICN2, Spain
Video	https://youtu.be/6hTK4_q-0EA

The Versatility of Perovskite Materials for Optoelectronics

Topic Optoelectronics

Abstract Perovskite solar cells (PSCs) have created much excitement in the past years and attract spotlight attention. This talk will provide an overview of the reasons for this development highlighting the historic development as well as the specific material properties that make perovskites so attractive for the research community. The current challenges are exemplified using a high-performance model system for PSCs (multication Rb, Cs, methylammonium (MA), formamidinium (FA) perovskites). The triple cation (Cs, MA, FA) achieves high performance due to suppressed phase impurities. This results in more robust materials enabling breakthrough reproducibility.

Through multi-cation engineering, usually not-considered alkali metals, such as Rb, can be studied resulting in one of the highest voltages compared to the bandgap. Polymer-coated cells maintained 95% of their initial performance at elevated temperature for 500 hours under working conditions, a crucial step towards the industrialization of PSCs.

To explore the theme of multicomponent perovskites further, molecular cations were re-evaluated using a globularity factor. With this, we calculated that ethylammonium (EA) has been misclassified as too large. Using the multi-cation strategy, we studied an EA-containing compound that yielded a high open-circuit voltage of 1.59 V. Moreover, using EA, we demonstrate a continuous fine-tuning for perovskites in the "green gap" which is relevant for lasers and display technology. [6]

The last part elaborates on a roadmap on how to extend the multiplication to multicomponent engineering providing a series of new compounds that are highly relevant candidates for the coming years, also in areas beyond photovoltaics, for example for medical scintillation detectors.

Date 18/03/2022

Speaker Michael Saliba

Affiliation Professor, University of Stuttgart, Germany

Video https://youtu.be/kF9m4pE4aQ8

Replacing mechanical metrology tools, one photon at a time

Topic Mechanical Engineering

Abstract Metrology is a founding pillar and a driving force of scientific discovery and understanding. Albeit its key importance in all aspects of science and engineering, the field is still dominated by the use of mechanical, intrusive probes. To tackle the matter, our group is developing coherent Rayleigh-Brillouin scattering (CRBS) as an alternative, non-intrusive probe for neutral and plasma thermodynamic characterization. CRBS is a four-wave mixing diagnostic technique that relies on the creation of an optical lattice in a medium due to the interaction between polarizable particles and intense laser fields. Single shot CRBS[1] has been demonstrated to be the coherent analog of spontaneous Rayleigh-Brillouin scattering in measuring the temperature, pressure, bulk and shear viscosity, speed of sound and polarizability of a gas or gas mixture[2], as well as nanoparticles produced in an arc discharge[3]. In this talk, an overview on the theory and experimental aspects of single shot CRBS will be presented along with our recent work in measuring simultaneously the temperature, density and flow velocity[4] of neutral species radially across a glow discharge and a neutral flow. Finally, the feasibility and working progress towards the use of CRBS as a thermodynamic characterization technique for partially/fully ionized gases such as those encountered in fusion or low-temperature plasmas will be discussed.

Date 08/04/2022

Speaker Alexandros Gerakis

Affiliation Senior researcher, Luxembourg Institute of Science & Technology, Luxembourg

Video https://youtu.be/_X8zMFLjFC0

Hydrothermal carbonization of biomass for the production of added – value materials

Topic	Materials Science
Abstract	Not available
Date	06/05/2022
Speaker	Dimitrios Kalderis
Affiliation	Professor, HMU, Greece
Video	https://youtu.be/WcweS4eaKP4

Cell Opto stimulation by intra membrane molecular switches

Topic	Physics
Abstract	Not available
Date	13/05/2022
Speaker	Guiglielmo Lanzani
Affiliation	Professor, POLIMI, Italy
Video	https://youtu.be/qvQntcVraaU

Integrative lighting: Understanding the visual and non-visual effects of lighting on humans

Topic	Engineering
Abstract	Not available
Date	20/05/2022
Speaker	Giorgos Traintafyllidis
Affiliation	Associate Professor, Aalborg University, Denmark
Video	https://youtu.be/Atc7fsY6Jek

A frank assessment of ceramic conductors as alternative plasmonic materials

Topic Physics

Abstract Ceramic conductors, such as the nitrides of the group IVb, Vb and VIb metals (TiN, ZrN, HfN, VN, NbN, TaN, and MoN) and transparent conductive oxides (TCOs) like ITO, AZO and IGZO, have emerged as important alternative plasmonic materials due to the unique combination of substantial electric conductivity and plasmonic features in the midIR-NIR-Vis-UV ranges with their refractory character (mostly for nitrides) and chemical inertness, which provide the durability of nanostructures upon exposure to high-power laser beams, and due to their compatibility with CMOS (for nitrides) and solution (for TCOs) fabrication of various devices. However, this comes in the expense of inherent electronic losses that lead to reduced near-field enhancement compared to metals. Furthermore, their refractory character can turn from a blessing to a curse due to the excessive density of structural defects when grown at relatively low temperatures. The extended defects, i.e. the grain boundaries, scatter the conduction electrons resulting to further enhanced electronic losses. Unlike the conventional plasmonic metals, the conductive conductors may also incorporate point defects, which affect the plasmonic performance. In this seminar, the defect formation mechanisms in nitrides and TCOs will be reviewed, and their association with the bottom-up growth processes will be discussed in view of their plasmonic performance. In addition, we will consider and discuss the optical properties of conductive nitrides and TCOs in the form of films, colloidal nanoparticles, and self-assembled nanowires and nanoislands produced by various high-throughput physical processes such as glancing angle deposition, nanosphere lithography, and laser ablation in liquids.

Date 27/05/2022

Speaker Panos Patsalas

Affiliation Professor, AUTH, Greece

Video https://youtu.be/pA1JUnCL7Vw

3.3 Academic Period 2022 – 2023

The genesis of molecular photovoltaics and perovskite solar cells.

Topic	Optoelectronics
Abstract	Not available
Date	14/10/2022
Speaker	Michael Graetzel
Affiliation	Professor, EPFL, Switzerland
Video	https://youtu.be/az54MbUckrM

Agreements and disagreements between mathematics teacher educators. A collaborative work around a calculus lesson

Topic	Mathematics Education
Abstract	Mathematics teacher education in Uruguay is a concurrent preparation, which means the joint occurrence of general education and professional education in the same program. Mathematics teachers and mathematics teacher educators use to work solely, and they do not discuss their teaching practices among them. This talk will report a study about collaborative work of mathematics teacher educators around a lesson planning process. Mathematics teacher educators' team had to collectively plan, implement, and analyse a calculus lesson in the context of mathematics teacher education. I used classic Grounded Theory as the methodological approach, to inquiry into the process and obtain an explanation. I identified a process developed by the team, called looking for agreements. This process was resolved by the activation and eventual mobilization of the personal theories built-in practice of each mathematics teacher educator, the core category that emerged during the research. I will present the different degrees of agreement and disagreement caused by these divergent personal theories. I will also discuss the implications of this study for mathematics teacher education.
Date	20/10/2022
Speaker	Daniela Pages
Affiliation	Professor, Instituto Politechico Mexixo, Mexixo
Video	Not available

Ultrafast quantum nano-optics

Topic	Laser Physics
Abstract	Not available
Date	21/10/2022
Speaker	Mario Agio
Affiliation	Professor, University of Siegen, Germany
Video	https://youtu.be/ac-ggSwdXNE

Layered Materials Characterization and Applications

Topic	Materials Science
Abstract	'Graphene and layered materials (LMs) have great potential in photonics and optoelectronics, where the combination of their optical and electronic properties can be fully exploited, and the absence of a bandgap in graphene can be beneficial. The linear dispersion of the Dirac electrons in graphene enables ultra-wide-band tunability as well as gate-controllable third-harmonic enhancement over an ultra-broad bandwidth, paving the way for electrically tuneable broadband frequency converters for optical communications and signal processing. Saturable absorption is observed as a consequence of Pauli blocking and can be exploited for mode-locking of a variety of ultrafast and broadband lasers. Graphene integrated photonics is a platform for wafer scale manufacturing of modulators, detectors and switches for next generation datacom and telecom. Heterostructures based on LMs have properties different from those of their individual constituents and of their three dimensional counterparts. These can be exploited in novel light emitting devices, such as single photon emitters, and tuneable light emitting diodes. LMs have potential for quantum technologies, as scalable sources of single photon emitters (SPEs). Quantum emitters in LMs hold potential in terms of scalability, miniaturization, integration. Generation of quantum emission from the recombination of indirect excitons in heterostructures made of different LMs is a path with enormous potential.''
Date	04/11/2022
Speaker	Andrea Ferrari
Affiliation	Professor, University of Cambridge, UK
Video	https://youtu.be/OQxxGRNNlUo

Gamification: An Instructional Approach for Teaching Mathematics

Topic	Mathematics Education
Abstract	Gamification, integrating game elements into the learning process, seems to be one of the most popular teaching methods nowadays. It has a wide application area, from elementary school to higher education, including online classes. Its potential could be valued for improving learning outcomes, assessment, and solving educational administrative issues. This talk aims to take a closer look at existing research to understand the effect of gamification in education and to be aware of the game elements which can take place in gamification design. Supported with implication examples, the talk will include the design of gamified learning environments following player types. The talk will end by mentioning the tools and tips to gamify classrooms.
Date	03/11/2022
Speaker	Selay Arkün Kocadere
Affiliation	Associate Professor, Hacettepe University, Turkey
Video	https://youtu.be/4qUEPUNXqAI

The 2022 Nobel Prize in Physics: A very brief introduction to quantum mechanics and Bell's inequalities

Topic	Physics / Quantum Mechanics
Abstract	Not available
Date	09/11/2022
Speaker	George Kavoulakis
Affiliation	Professor, HMU, Greece
Video	https://youtu.be/1fYbGzuX8ro

Towards a framework to reconcile and support students' remote and face-to-face mathematical problem-solving activities

Topic Mathematics Education

Abstract The teachers and students' intense use of digital technologies and online developments not only marked the implementation of educational tasks during the pandemic confinement; but also opened novel paths for students to deal with mathematical problems. What ways of reasoning do students develop to reason and solve mathematical tasks? To what extent does the students' activation of digital tool affordances shape their ways to represent, explore, discuss, and solve mathematical problems? During the talk, I will address this type of questions and sketch elements of a framework to integrate and reconcile both students' remote and face-to-face problem-solving activities.

Date 10/11/2022

Speaker Luis Manuel Santos Trigo

Affiliation Professor, Cinvesrav-IPN, Mexico

Video https://youtu.be/FE6t7RL1dgY

Supramolecular Strategies in Hybrid Perovskite Photovoltaics

Topic Optoelectronics

Abstract Hybrid organic-inorganic perovskite materials have become one of the leading semiconductors for renewable solar-to-electric energy conversion in photovoltaics. However, they are unstable under operating conditions, which stimulates global research efforts to overcome this challenge towards practical applications. Supramolecular strategies have provided an invaluable tool for controlling hybrid perovskite materials by purposefully tailoring non-covalent interactions with organic components, such as through halogen bonding, π- interactions, and host-guest complexation, which has been assessed at the atomic level by solid-state NMR spectroscopy. These strategies were also applied to the development of low-dimensional perovskite architectures that further enhance stabilities as well as photovoltaic performances. As a result, perovskite solar cells have reached superior operational stabilities without compromising their performances, providing a versatile strategy for advancing hybrid photovoltaics.

Date 18/11/2022

Speaker Jovana V. Milić

Affiliation Assistant Professor, University of Freiburg, Germany

Video https://youtu.be/gCez_g1a4pY

A Paradigm Shift to Education 4.0: The STEAME School of the Future – Building the puzzle

Topic Mathematics Education

Abstract The project "STEAME Guidelines for Developing and Implementing STEAME Schools" was completed recently and now several projects are producing the building blocks completing the puzzle around it. This project became the kick-off of a paradigm shift to Education 4.0 as it provides what steps Education Systems around the world could follow in order to escape from Education 2.0 and change to Education 4.0 with learning based on inquiry and project based learning. Literature and research is showing for years now that this should be the way forward in order to help school students and HE students develop the needed competences and skills that appear to lack when they enter HE studies or enter the world of work. With today's development of digital learning, most of the learning needed by students can be easily accessible or retrieved at any time and place through digital and video learning. STEAME (Science - Technology – Engineering - Arts - Mathematics - Entrepreneurship) has been developed to support European teachers' knowledge and understanding of creating successful STEAME learning and creativity plans and programs. The results are based on a European survey and a validation though focus group of experts. It offers approaches to teaching, teaching materials, entrepreneurship aspects, organizational suggestions for STEAME-oriented teaching, propositions and analysis of STEAME-oriented curriculum. All the OERs of the project are available through the STEAME Observatory. As an observatory, it is designed to be adaptive and dynamic, able to support a dynamic and adaptive STEAME Curriculum in any school that needs to implement STEAME activities in the learning process. The presentation will also show proposed architectural designs of the STEAME School of the future and results from several projects contributing to the completion of the needed puzzle of future learning.

Date 01/12/2022

Speaker Gregory Makrides.

Affiliation Visiting Professor in the university of Cracow, Poland

Video https://youtu.be/4F4GMTAoRww

Semiconductor photoelectrodes and photocatalysis for solar-driven water splitting

Topic	Optoelectronics
Abstract	Not available
Date	02/12/2022
Speaker	Kevin Sivula
Affiliation	Professor, EPFL, Switzerland
Video	https://youtu.be/jnwf9q8owBQ

International Sign Everywhere: Towards Internationalization of Education and International Mobility of Deaf Students

Topic	Assistive Technologies.
Abstract	The inclusion of deaf students in education has been always a topic of debate and research for a long time. Deaf students experience numerous communication challenges, which is especially true for communication with those from other nationalities due to the lack of a common sign language. Further deaf students face serious difficulties to understand new technical concepts along their academic path. Fields such as engineering or geography, lack signs representing specific lexicons like nanotechnology or tropical rain belt. The University of Siegen along with EU partners and stakeholders aims to overcome these challenges through the outcomes of InSign and TechWhiz Erasmus+ projects. **InSign** promotes the internationalization of education and the international mobility of deaf students through the use of International Sign as an effective channel of communication between deaf and non-deaf and its implementation in higher education. **TechWhiz** aims to promote equity in education by providing access to explanations of technical and scientific concepts for deaf students in sign language. Deaf students are a specific cluster in European Higher Education where they have little support that might be largely extended by InSign and Techwhiz projects.
Date	08/12/2022
Speaker	Omar Gamal
Affiliation	PhD candidate, University of Siegen, Germany
Video	Not available

Perovskite Photovoltaics enabled by 2D materials take to the field

Topic Optoelectronics

Abstract During the past decade, there was intensive research on the development of perovskite solar cells (PSCs), which have emerged as an alternative efficient energy harvester for both IoT devices and solar farms. The power conversion efficiency (PCE) of PSCs has rapidly increased and is now approaching the state- of-the-art PCE of 26.1%1 obtained by crystalline-silicon PVs. However, this impressive PCE obtained on small-area cells and in laboratory conditions should be also valid to large-area PV panels in real outdoor conditions. Interface engineering, using solution processable 2D materials (e.g., graphene and transition metal dichalcogenides) is an effective approach to increase the readiness of this technology for manufacturing. The incorporation of the 2D materials improves the charge dynamics of the interfaces and most importantly protects the perovskite layer against diffusion of external agents, such as oxygen and moisture and the metal ion migration2. In this context, the Graphene Flagship partners University Rome Tor Vergata, BeDimensional S.p.A, Greatcell and Hellenic Mediterranean University demonstrated the validity of this technology through the entire value chain, from materials development, perovskite modules and panels fabrication and their integration in an autonomous solar farm, to outdoor field tests, and assessment of the real energy production output. The main validation of the proposed approach is the realization of an autonomous solar farm, consisting of 5m2 perovskite PV panels in the HMU campus at Crete3. A continuous monitoring of the solar farm was performed through in-house developed maximum power point trackers, coupled with a correlation of the environmental conditions, recorded by a weather station, with the outdoor performance of farm. The assembled solar farm delivered peak power exceeding 260W, proving the scalability of the proposed technology. The energy production of the solar farm was monitored for 12 months, demonstrating a remarkable 20% reduction (T80) of the PV performance over 8 months of operation. Moreover, the solar farm's electrical characteristics were monitored as a function of temperature and light intensity. The data analysis demonstrated that the perovskite panels enabled by 2D materials are promising for outdoor operation at elevated temperatures, such as in high-irradiance global locations.

Date 09/12/2022

Speaker Emmanuel Kymakis

Affiliation Professor, HMU, Greece

Video https://youtu.be/6m7P5kFeiBo

Design and implementation of advanced water treatment and desalination system and advanced studies on photocatalytic activity of hybrid nanomaterials for different environmental applications.

Topic Environmental Sciences

Abstract The quality of groundwater in Egypt is deteriorating rapidly due to salinization and industrial pollution. To help reverse this trend, novel batch reverse osmosis (RO) desalination for high recovery of freshwater from ground-water, and new photocatalysts to eliminate emerging contaminants from wastewater – thus allowing effective and safe recharge of aquifers, have been developed. Prof El Nazer research team members have also developed an innovative solution for the management of harmful brine from desalination plants, using it to cool agricultural greenhouses. With the overall aim of developing new technology for better protection and management of groundwater in Egypt, the specific objectives are to (a) develop novel photocatalytic materials and composites, with sensitivity to both UV and visible light, for the removal of emerging pollutants from wastewater and groundwater, (b) develop high efficiency, high-recovery desalination technology for groundwater, based on batch reverse osmosis (RO), giving resistance to fouling by organic and inorganic species, (c) Develop a solution for management of brine rejected from groundwater desalination plants by evaporative cooling of agricultural greenhouses, (d) demonstrate the above solutions in the study areas, and disseminate the knowledge generated, through the Egyptian ministries and industrial partners involved in the project. In addition, Prof. El Nazer guest, Prof. Yasser Mahmoud (Photochemistry Department, National Research Center, Egypt), will discuss the implementation of heterogeneous nano-photocatalysts in environmental applications that have been significantly investigated in the last decade as a result of the increasing demand for the use of green approaches and through the availability of visible light source. Herein, the presented results highlight the basic concepts of nano-photocatalysis and the applications of these catalysts in various photocatalytic processes.

Date 14/12/2022

Speaker Hossam El Nazer

Affiliation Professor, National research Center, Egypt

Video https://youtu.be/EXokH9E3DT0

Advanced electromagnetic wave control with chiral and parity-time symmetric metamaterials

Topic	Materials Science
Abstract	Not available
Date	16/12/2022
Speaker	Maria Kafesaki
Affiliation	Professor, University of Crete, Greece
Video	Not available

Creativity, Innovation and Sustainability in STEAM education

Topic	Mathematics Education
Abstract	The presentation is focusing on the role of creativity, innovation and sustainability in the STEAM learning process, based on projects and publications by our Research Group of Innovative Learning Environments (https://www.jyu.fi/it/ile). We will explore pedagogical potentials based on the integration of STEAM, i.e., Science, Technology, Engineering, Arts, and Mathematics. Discussing issues related to creativity, innovation, sustainability, and STEAM learning, we will address the role of informal methods in formal education, especially in the area of skills and competence development. The presentation includes several practical examples based on the Experience Workshop STEAM Network (www.experienceworkshop.org), such as using 3D-printers, robotics, Augmented Reality in the mathematics classroom. We will explore the potential of mathematics and art combinations, including projects focusing on children and youth engagement and motivation.
Date	12/01/2023
Speaker	Kristóf Fenyvesi
Affiliation	Researcher in Finish Institute for Educational Research, University of Jyväskylä, Finland
Video	https://youtu.be/gOUAs1ROCWM

Semiconductor Nanocrystal Optoelectronics for Lighting and Displays: Pushing the Limits, Breaking Records

Topic Optoelectronics

Abstract Lighting and displays are integral parts of human activities and economic development. Semiconductor nanocrystals, now offering a market volume exceeding 1 Billion Euros annually, have attracted great interest in quality lighting and displays in the last decade. Such colloidal semiconductors enable enriched color conversion essential to superior lighting and displays. These colloids span different types and heterostructures of semiconductors, starting in the form of colloidal quantum dots about three decades ago and extending to the latest subfamily of nanocrystals, the colloidal quantum wells, in the last decade. In this talk, we will present most recent examples of photonic structures and device architectures using the colloidal quantum wells for lighting and displays. Also, we will present a powerful, large-area self assembly technique for orienting these colloidal quantum wells either all face down or all edge up. We will demonstrate three dimensional constructs of their oriented self assemblies with monolayer precision. Among their extraordinary features important to applications in lighting and displays, we will show record high efficiency from their colloidal LEDs and record gain coefficients from their colloidal laser media using heterostructures and/or oriented assemblies of colloidal quantum wells. Given their current accelerating progress, these solution processed quantum wells hold great promise to challenge their epitaxial thin film counterparts in semiconductor optoelectronics in the near future.

Date 13/01/2023

Speaker Hilmi Volkan Demir

Affiliation Professor, Bilkent University, Turkey

Video https://youtu.be/CW5466sCpzk

The university mathematics lecture: To record, or not to record, that is the question

Topic	Mathematics Education
Abstract	While recordings of lectures proved invaluable for students' learning during the pandemic, as our university transitioned back to in-person teaching there was a call from some lecturers to remove the requirement to provide lecture recordings due to the perceived negative impact on attendance. Colleagues in other universities describe similar debates. In this talk, I will present findings from studies conducted with colleagues on the role of recordings in the teaching of undergraduate mathematics, from both before and after the lockdown due to the pandemic. As an education researcher and mathematics lecturer, I will discuss the implications for lecturers' practice.
Date	19/01/2023
Speaker	Maria Meehan
Affiliation	Lecturer, University College Dublin, Ireland
Video	https://youtu.be/TI9zHqOyULY

Beyond the ritualised vs exploratory mathematics dichotomy: teaching and learning in symbolically structured environments.

Topic	Mathematics Education
Abstract	In this session Alf will consider some recent debates around ritualised versus exploratory activity in mathematics – two approaches which are often set in opposition. The session will exemplify the idea (developed with colleague Nathalie Sinclair) of teaching and learning mathematics in a symbolically structured environment (SSE), which includes processes they label "ritualisation". In a SSE, students are actively engaged from the start, initially in a tightly controlled context, which then broadens out to allow space for conjecturing and proving.
Date	26/01/2023
Speaker	Alf Coles
Affiliation	Assistant Professor, University of Bristol, UK
Video	https://youtu.be/u-mREDC-eDU

Taking advantage of the magnetic functionality of nanostructures with induced movement

Topic Engineering / Materials Science

Abstract The incorporation of magnetic nanostructures into a nano/micromotor design is a very convenient strategy for magnetic actuation. Accordingly, herein, some advantages with which nanostructures become endorsed when including magnetic nanoparticles in the final assembly, will be detailed. One hand, we can consider the basic physical mechanism by which a magnetic field can be used to generate motion in fluidic environments, namely by inducing the so-called magnetophoretic motion by applying forces due to the magnetic field gradients, which require a spatially inhomogeneous field. Furthermore, this effect can be exploited jointly with self-propulsion of swimmers, such that, the movement becomes directed. On the other hand, we can also take into account the ability of magnetic nanoparticles to deliver heat, via the external stimulation using an alternating magnetic field. This heat delivered can have a tremendous impact in the induced movement, as it can be employed to catalyse the reactions involved in the concentration gradient generating the movement or to change the surrounding environment.

Date 27/01/2023

Speaker Verónica Salgueiriño

Affiliation Associate Professor, University of Vigo, Spain

Video https://youtu.be/a4jK1ZExNXQ

Ignition a dream that came true, a brief history of the ICF program at LLNL

Topic	Laser Fusion
Abstract	A historical discovery for science and technology was announced on Tuesday 13-12-2022 in the US. The announcement concerned the demonstration of the production of net laser fusion energy in the National Ignition Facility (NIF). As it was said by the US Minister of Energy, the achievement of the fusion "will remain in the books of History". Indeed, for about 70 years, scientists have been trying to unlock the secret of controlled thermal fusion. To produce pure energy in the way nature produces it in our sun and in all stars. Two methods are followed, one uses magnetic fields to limit the plasma and the other powerful laser. The achievement announced in the US concerns fusion using strong lasers. The talk will go over the science evolution until the historical event of ignition at NIF.
Date	10/02/2023
Speaker	Sebastien Le Pape
Affiliation	Professor, Ecole Polytechnique Paris, France
Video	https://youtu.be/cCVUItFJnhM

Teachers' Inquiry in Mathematics Education

Topic	Mathematics Education
Abstract	The talk will present the main ideas and results of the Erasmus+ project TIME (named as in the title). Some of the ideas are likely to be relevant to teachers of science and other disciplines, and indeed some of the cases considered in the project also concerned the boundaries between mathematics and other school subjects.
Date	23/02/2023
Speaker	Carl Winsløw
Affiliation	Professor, Copenhagen University, Denmark
Video	Not available

Using EduScrum in mathematics teaching

Topic	Mathematics Education
Abstract	Not available
Date	02/03/2023
Speaker	Carla Pinto
Affiliation	Coordinating professor, IPP, Portugal
Video	https://youtu.be/GW_fX3m20vo

Accelerating emerging PV technologies.

Topic	Optoelectronics
Abstract	The development of complex functional solar materials poses a multi-objective optimization problem in a large multi-dimensional parameter space. Solving it requires reproducible, user-independent laboratory work and intelligent preselection of experiments. However, experimental materials science is a field where manual routines are still predominant, although other domains like pharmacy or chemistry have introduced robotics and automation long before. Human interaction in the process of data acquisition is seen critical due to incomplete assessment of meta-data or hidden processing correlations which complex reproducibility. Materials Acceleration Platforms (MAPs) are regarded as an enabling technology for Data-Driven Material Science, leading to an increased number of concepts and a dynamic evolution of MAP lines. In this talk, I will present our approach to laboratory automation in materials science with a strong focus on fully functional solar devices. AMANDA (Autonomous Materials and Device Application Platform - www.amandaplatform.com) was developed as a generic platform for distributed materials research comprising a self-developed software backbone and several MAPs. However, one realizes that accelerating a whole technology requires more than accelerated materials research. It also takes devices and process development to truly accelerate a PV technology. These are concepts are summarized under Technology Acceleration Platforms (TAP). This talk will stepwise introduce the current concepts and technologies to accelerate solar technologies: from the material to the device and to the process. The outlook will discuss how these platforms can be made communicative to each other to transform them into autonomously acting TAP with the power to accelerate the learning curve for a whole solar cell technology.
Date	03/03/2023

Speaker Christoph Brabec
Affiliation Professor, FAU, Germany
Video https://youtu.be/iPZVHk7klFw

Mathematics learning as the art of transitioning across discourses

Topic Mathematics Education
Abstract Every conversation about learning and teaching makes epistemological assumptions regarding how these processes come about. Being preoccupied with often heated debates about "what works", the interlocutors rarely invest in reflecting and explicating what they mean with such impalpable objects as "learning", "understanding", "knowledge", and even "mathematics". In this talk, I will argue that considering mathematics and its learning through the lens of communication and discourse has the potential to cast a new explanatory light on classical conundrums that we encounter in mathematics classrooms. Specifically, I will argue that many students' difficulties occur at specific points where "the rules of a mathematical game" change significantly. These points may be not evident to mathematics teachers who effortlessly transition across mathematical discourses.
Date 09/03/2023
Speaker Igor Kontorovich
Affiliation Senior Lecturer, University of Auckland, New Zealand
Video https://youtu.be/FUWIv4BUHLU

Remote inspection of civil infrastructures based on Unmanned Aerial Systems and Artificial Intelligence.

Topic Robotics

Abstract Condition assessment of civil infrastructure is a key instrument for infrastructure managers to evaluate structural integrity and operability, as well as defining possible maintenance or rehabilitation strategies. In recent years, remote inspection techniques based on computer vision and Unmanned Aerial Systems (UAS), also known as drones, have been recognized as key components for improving inspection and monitoring strategies to achieve an automated condition assessment of civil infrastructures. These technologies proved to be competitive in identifying damage in inaccessible and extensive areas, allowing a considerable reduction of costs and execution times. This presentation is focused on the latest developments on the remote inspection of civil infrastructures using advanced image processing techniques based on Artificial Intelligence. Within this topic, Deep Learning algorithms, such as the Convolutional Neural Networks (CNNs), and its latest enhancements, like the Mask R-CNN algorithm, will be detailed. The application of these AI algorithms to the automatic damage identification on large scale infrastructures will be presented. The first case-study is focused on the detection of exposed steel rebars in a storage silo, while the second case-study is related to the detection of corrosion on roofing systems of industrial buildings.

Date 17/03/2023

Speakers Ricardo Santos & Dr. Diogo Ribeiro

Affiliation Professors in ISEP, IPP, Portugal

Video https://youtu.be/J-tHmppJdmA

Approaches to formative assessment

Topic Mathematics Education

Abstract Not available

Date 27/04/2023

Speaker Jason Cooper

Affiliation Scientist, WIS, Israel

Video https://youtu.be/slI3mxD5n78

HPC RIVR project to establish a National supercomputer center in Maribor, Slovenia

Topic Computer Science

Abstract This talk aims to share our experience in establishing a large national research infrastructure for supercomputing. This was made possible through the HPC RIVR investment project, jointly funded by the Republic of Slovenia, the European Union (from the European Regional Development Fund), and The European High-Performance Computing Joint Undertaking (EuroHPC JU). To meet the needs of the Slovenian and European scientific community, we built three hybrid HPC systems, with the flagship production supercomputer HPC VEGA rated at 6.9 PETAFLOPS (Rmax = 10.1 PETAFLOPS). This was the first EuroHPC JU supercomputer to be put into operation in Europe. The built HPC systems are accessible under the Open Access to Public Research Infrastructure rules and regulations. During the talk, we will focus on explaining our journey from the idea of building a National supercomputer center to ensuring the necessary political and national support, executing the investment project, and finally achieving full-scale operation of the HPC systems.

Date 07/04/2023

Speaker Zoran Ren

Affiliation Professor, University of Maribor, Slovenia

Video https://youtu.be/gPBbCvr8SB4

Quantum optics in cold atomic gases

Topic Physics / Quantum Mechanics

Abstract The groundbreaking demonstration of slow and even stopped light in cold atomic ensembles led to a plethora of quantum technology applications, spanning from ultrasensitive sensors and precise interferometers to single-photon switches and quantum memories. After a brief introduction to the field of quantum optics with cold atomic gases and its applications, I will present two recent experimental studies conducted by our group. More specifically, I will demonstrate how a non-Hermitian quantum interface between single atoms and light can surprisingly switch bosonic correlations to fermion-like ones, and how such a process can contribute to quantum storage and, potentially, quantum computation. I will also present a new way to simultaneously arbitrarily manipulate the temporal and spatial wavefunctions of entangled non-spreading photons generated from an atomic gas.

Date 28/04/2023

Speaker George Siviloglou

Affiliation Professor, SUSTech, China

Video https://youtu.be/AP_nzxpuoZ0

2D materials in tandem perovskite/Si technology

Topic Materials Science

Abstract Hybrid perovskite solar cells (PSCs) are one of the most promising technologies for new-generation photovoltaics due to outstanding semiconductor properties and low-cost solution processing methods for fabrication. Indeed, PSCs dominated the PV scientific research in the last decade, by developing efficient and stable devices, produced by employing scalable and low-cost printing techniques, easily embedded in roll2roll or sheet2sheet production lines. However, PSC technology still requires to demonstrate the transfer from lab to fab, pushing the scientific community to find brilliant solutions for drawing a feasible and reliable route toward its commercialization. Moreover, the impressive potentiality of perovskite technology has already been demonstrated to compete on equal footing with traditional inorganic PV or to work in synergy with established silicon technology in tandem cell configuration. As a matter of fact, the astonishing power conversion efficiency recently achieved by small area perovskite/silicon tandem solar cells (PCE>32%) demonstrated the technology potentialities to be appealing for the PV market. However, such technology should keep the promise to be easily manufactured by employing the existing silicon cell production line and by minimizing the Levelized Cost of Electricity (LCOE). Thus, the synergetic development of large-area perovskite devices fitting the standard silicon wafer dimensions and the optimization of perovskite/silicon tandem architectures can definitively open up new horizons for winning the commercialization challenges. In this work, we develop a mechanically stacked 2T perovskite/silicon tandem solar cell, with subcells independently fabricated, optimized, and subsequently coupled by contacting the back electrode of the mesoscopic perovskite top cell with the texturized and metalized front contact of the silicon bottom cell. The possibility to separately optimize the two sub-cells allows to carefully choose the most promising device structure for both top and bottom cells. Indeed, semitransparent perovskite top cell performance is boosted through the use of selected two-dimensional materials to tune the device interfaces. A textured amorphous/crystalline silicon heterojunction cell fabricated with a fully industrial in-line production process is here used as state of art bottom cell. The perovskite/c-Si tandem device demonstrates remarkable PCE of 28.7%. Moreover, we demonstrate the use of a bifacial silicon bottom cell, as a viable way for overcoming the current matching constrain imposed by the 2T configuration. Here, the current generation difference between perovskite and c-Si cells is compensated by exploiting the albedo radiation thanks to the bifaciality of the commercial c-Si cell

used in this article. Considering standard rear irradiation, final power generation density above 32 mW/cm2 can be achieved, paving the way for a tandem technology customable according to the final installation site.

Date 12/05/2023

Speaker Antonio Agresti

Affiliation Associated Professor, Tor Vegata, Italy

Video https://youtu.be/I9EOTDKDazw

4 Conclusions and Future Plans

The ATHENA Talks during this pilot phase of the Alliance went satisfyingly well and are considered one of its success stories. However, there is still room for improvement particularly towards the expansion of its topics in other scientific fields. All the 90 colloquial talks conducted via the Zoom platform with more than 1800 individuals participating (as have been registered in the google forms used for registration) as speakers or participants. The recorded sessions have been viewed more than 9000 times. The main tips learned on how to organize such events are: (a) the early planning with the speakers but also on the announcement of the talks into its stakeholders; (b) the grouping of the talks per topic; (c) the inclusion of speakers from all the ATHENA partners; and (d) the engagement of students. ATHENA Talks operated as key opportunities for developing new collaborations, especially for early career researchers to gain valuable feedback and interact with leading figures in their topic. Moreover:

- ATHENA Talks introduce key disruptive technologies, pedagogies and research innovators within the Alliance
- ATHENA Talks are a vehicle of the research take place within the Alliance
- ATHENA Talks operated as a dissemination activity of the Alliance within and beyond its consortium
- ATHENA Talks was one of the research activities of the Alliance

Despite the success of this pilot phase, we have experienced some challenges that are reported below.

- The need for more effective dissemination of the ATHENA Talks within the Alliance community and especially among the PhD students
- The frequency of the Talks: it seems two talks per week is too much
- The engagement of other disciplines beyond engineering and teaching pedagogies
- The rotation of the coordination of the ATHENA Talks within the consortium
- The presentation time (@10.00 CET) did not permit us to include speakers and participants in different time zones e.g., participants in the USA or in Australia
- The interactivity, the emotional engagement of the audience, and the lack of applause after each talk
- Safety issues e.g., strange intruders during the online meetings
- Audio and Video quality problems

A list of proposals follows on how to tackle the challenges, increase the ownership of the ATHENA Talks among the partners.

- The run of post – surveys after the talks to capture the challenges but also new ideas from the audience in various timeslots of a talk: before, during and after a talk
- The assignment of the branding of the talks to the branding ATHENA team
- The search of the most successful dissemination channels to announce the talks

- The call of abstracts within the ATHENA Alliance partners very early e.g. July in order to plan the talks that usually start on October of each academic year
- The organization of colloquial talks for PhD candidates in order to provide them the opportunity (a) to present their work; (b) to facilitate their professional development e.g., find a postdoc position as a next step of their career
- The expansion of the topics beyond the engineering and teaching pedagogy topics.
- The grouping per topic of the ATHENA Talks
- The assignment to all the partners of a topic of their excellence and organize per two months a series of at least three colloquial talks
- The organization of working hubs based on the colloquial talks selected topics e.g., the Photonics Hub as a result of a series of talks in this field
- The organization of BIPs in some of the presented topics in the proposed rounds of colloquial talks
- The better dissemination & branding of the talks through the creation of cluster of people interesting in the addressed topics
- The better dissemination after a talk happened, the pose of the ATHENA Talks in the ATHENA YouTube Channel
- The organization of conferences using the network build in these only talks. The integration of the Erasmus funding opportunities (e.g., short mobilities and invitation of experts) to invite experts in these face – face events
- The incorporation of virtual reality tool will be explored e.g., MaxWhere software
- The use of pre-prepared subtitles may make online talks even more accessible
- The organization of the ATHENA podcasts and the ATHENA virtual poster sessions as a by-product of the ATHENA Talks