2023 African Light Source Conference

Report of Contributions

Contribution ID: **87** Type: **not specified**

How can countries of the Global South get a fair deal out of membership and participation in Big Science projects?

Monday, 13 November 2023 16:00 (30 minutes)

In recent years, established Big Science organizations in the Global North, such as the particle physics facility CERN or the synchrotron facility ESRF, became increasingly internationalized, both in terms of the involved researchers and the participating countries. At the same time, more and more large Big Science projects emerge in regions where until recently no or very few Big Science projects existed. Although countries like India or South Africa are currently rendering the Global South increasingly visible in Big Science collaborations, so far, there is little research on their role in these projects.

- Which objectives do emerging powers of the Global South pursue in Big Science projects?
- Under which conditions are they likely to achieve their objectives?
- And to what extent does the institutional set-up of Big Science collaborations reinforce or diminish North-South asymmetries in science, technology and politics?

In this presentation we will shed light on these questions and provide three policy recommendations that outline strategies for countries of the Global South to maximize their benefits from participating in Big Science collaborations. The presentation is based on the findings and policy recommendations of a study that analyzed the participation of emerging powers of the Global South in four different Big Science collaborations: the European Organization for Nuclear Research, the International Thermonuclear Experimental Reactor, the Square Kilometer Array and the African Light Source Project.

References

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Primary authors: RÜLAND, Anna-Lena (Leiden University, NL); RÜFFIN , Nicolas V. (Bonn University, GER); CRAMER, Katharina C.

Presenter: RÜLAND, Anna-Lena (Leiden University, NL)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **88** Type: **not specified**

Mathematical and Physical Foundations for QED

Wednesday, 15 November 2023 10:30 (15 minutes)

In his approach to QED, Feynman reintroduced the ordering property of time as a fundamental component of his theory. This violated Minkowski's third postulate, that time be treated as a fourth geometric component, so constrained as to naturally satisfy Lorentz covariance. His work was so physically intuitive and computationally efficient, that despite some criticism, it is the method of choice for all textbooks on the subject and has since migrated to other areas of physics. This talk reviews research on the mathematical and physical foundations of quantum electrodynamics (QED).

We provide proofs of the following results.

1. Minkowski's third postulate, that time be treated as a fourth geometric component of a four vector is incompatible with the two postulates of Einstein for two or more particles.
2. Complete analysis of the Dirac equation for Hydrogen shows that the Pauli approximation is invalid for the study of s-states and that cut-offs are all ready required before field quantization.
3. Dyson's first conjecture, that the ultra-violet divergency in QED is caused by a violation of the Heisenberg uncertainly relationship.
4. Dyson's second conjecture, that the renormalized perturbation series is asymptotic.

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Presenter: GILL, Tepper (Howard University)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **89** Type: **not specified**

Dark Matter Subhalo Properties in the Cosmic Web

Tuesday, 14 November 2023 10:00 (15 minutes)

The cosmic web is a complex network of thin walls, elongated filaments, and dense clusters that map the overall distribution of dark matter density in the universe. Dark matter haloes, which are collapsed structures, form and expand due to gravitational instability caused by slight initial density variations in the cosmic field. Understanding the properties of subhaloes within these haloes is crucial for studying the impact of their location within the cosmic web on the parent haloes and the galaxies they host. While there is evidence that the characteristics of dark matter haloes and the galaxies they contain vary across different cosmic web environments, the dependence of dark matter subhalo properties on their cosmic web environment requires further investigation. In this study, using a high-resolution N-body simulation we investigate how the mass function, concentration, velocity function, and radial distribution of dark matter subhaloes depend on the cosmic web environment. We also investigated the redshift evolution of these properties and their alignment with the large-scale structure of haloes in filaments, sheets, and voids. In this presentation, I will discuss our comprehensive results on the relationship between dark matter subhalo properties and the cosmic web environment.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **90** Type: **not specified**

LATAM Synchrotron in the Greater Caribbean and AfLS

Thursday, 16 November 2023 14:30 (15 minutes)

The project of a second Larin American Synchrotron in the Caribbean and its connection with that of AfLS for what concerns implementation strategy and joint acitions of local training will be discussed

Primary author: VIOLINI, Galileo (Centro Internacional de Física, Bogotá)

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Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **91** Type: **not specified**

Higgs inflation model with non-minimal coupling in hybrid Palatini approach

Tuesday, 14 November 2023 11:15 (15 minutes)

In this paper, we construct a hybrid metric Palatini approach in which the Palatini scalar curvature is non minimally coupled to the scalar field. We derive the Einstein's field equations, the equations of motion of the scalar field. Furthermore, the background and the perturbative parameters are obtained by means of Friedmann equations in the slow roll regime. The analysis of cosmological perturbations allowed us to obtain the main inflationary parameters such as the scalar spectral index ns and the tensor to scalar ratio r. In this perspective, as an application of our analysis, we consider the Higgs field with quartic potential which plays the inflaton role, and we show that predictions of Higgs hybrid inflation are in good agreement with the recent observational data.

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Presenter: ASFOUR, Brahim (LPMR, Faculty of sciences, Mohammed First University, Oujda.)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **92** Type: **not specified**

Cobalt Sulfide-Based Biosensor anchored on Graphene for Continuous Monitoring of glucose in sweat.

Thursday, 16 November 2023 11:00 (15 minutes)

Abstract

Currently, there is an overwhelming demand for the development of biocompatible glucose sensors with improved sensing capabilities such as, low limit of detection, high sensitivity and selectivity as compared to current technologies. To meet these needs, a move towards nonenzymatic glucose sensors has become necessary. These new sensors have gained significant interest due to their capacity to achieve continuous glucose monitoring, their high stability compared to traditional glucose sensors, and the ease of their fabrication. Research has been extensively geared towards the preparation of these nonenzymatic glucose sensors from novel materials, often with unique micro- or nanostructures, which possess ideal properties for electrochemical biosensor applications. In recent years, a variety of materials including transitional metal-Sulfides (TMSs) have been explored for their electrocatalytic response to the oxidation of glucose due to their abundant nature, facile synthesis method and biocompatibility. In this regard, a flexible electrode based on Cobalt Sulfide (CoS) nanoparticles anchored on graphene as a flexible have been successfully fabricated using inkjet printing technology for the electrochemical sensing of glucose in sweat.

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Presenter: AKIIGA, Ngutor (Egypt Japan University of Science and Technology)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **93** Type: **not specified**

Black Holes in Holography Thermodynamics

Tuesday, 14 November 2023 10:15 (15 minutes)

we study thermodynamics of charged and uncharged 4-Dimension Einstein–Gauss–Bonnet (4D-EGB) black holes. The context of this study is the Visser's holographic thermodynamics with a fixed anti-de Sitter radius and a variable Newton constant known as restricted phase space thermodynamics (RPST). Our setup is constructed by using the AdS/CFT correspondence and by introducing a conjugate quantity of the Gauss–Bonnet parameter. By this ansatz, we conclude that the Gauss–Bonnet action multiplied by a temperature, behaves as a free energy. We derive the conjugate quantities corresponding to the first law in the RPST formalism. The study of the T – S processes and the effect of the Gauss–Bonnet constant, α, show that thermodynamic properties of charged black holes depend on the Gauss–Bonnet term and the charge of black holes. For an uncharged black holes, the effect of Gauss–Bonnet becomes crucial, as it behaves as a charged black hole with an effective charge. Finally, we find that the Hawking-Page phase transition occurs between a large black hole and a thermal AdS space.

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Presenter: YAHYA, Ladghami (Mohammed I University, Oujda, Morocco)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **94** Type: **not specified**

Comparative Study on X-ray Imaging with CsI(Tl) Scintillators: Monte Carlo Simulation using GEANT4

Wednesday, 15 November 2023 11:00 (15 minutes)

This oral presentation delves into the application of Monte Carlo simulation using GEANT4 software to assess the performance of X-ray detectors. The study focuses on the use of a CsI(Tl) scintillator for X-ray imaging, comparing the outcomes achieved with pixelated and non-pixelated scintillators. The primary objective is to discern the essential differences between these two configurations by calculating the Modulation Transfer Function (MTF) in each case. Furthermore, the evaluation of the Detective Quantum Efficiency (DQE) will allow for an in-depth analysis of performance. The results of this research provide significant insights into the pros and cons of pixelated and non-pixelated scintillators in the context of X-ray imaging, with important implications for enhancing radiology detection techniques. This study presents a valuable contribution to the optimization of X-ray detection systems.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **95** Type: **not specified**

Temperature and Moisture Triggered Crystallization of Triple Cation-Mixed Halide Perovskite Cells to Reduce Phase Segregations

Friday, 17 November 2023 15:30 (15 minutes)

1. Introduction

Perovskite crystallization has not been understood well to date, due to over emphasis on their efficiencies, especially the triple cation-mixed halide compositions. In addition, the difficulty in measuring the critical nucleus sizes in the range of 100 to 1000 atoms shies most experimental method researchers. Synchrotron radiation-based X-ray techniques allow structural characterization providing valuable information about the inner film morphology, e.g., Wide-Angle X-ray Scattering (WAXS) probes length scales in the atomic range and thus yields crystallographic information about the sample[1], while GISAXS is a technique that is surface-sensitive (due to the grazing incidence used) and probes longer length scales, thus providing a full mesoscale approach to the problem of crystallization and the morphology of the samples[2]. The use of fast two-dimensional (2D) detectors with synchrotron radiation allows *in situ* experiments during the growth of perovskites. Sizes, shapes, distances, and correlations of particles are determined from the GISAXS measurements. These parameters will be fundamental in understanding the process of nucleation and growth [3]. In this work, we seek to address the influence of heat stress and moisture probing on the crystallization kinetics of triple cation-mixed halide perovskite cells using in situ WAXS/GISAXS and optical microscopy through photoluminescence.

2. Methods

Cs0.05MA0.75FA0.20Pb(Ix Br1-x)3[4] will be prepared by reaction of CsI, FAI and MAI with an inorganic halide precursor salt PbI2 and PbBr2 . One mole of CsI, MAI & FAI and one mole of PbI2 & PbBr2 in stoichiometric ratios will be dissolved in 1000 µl of dimethylformamide (DMF) and 10 µl dimethyl sulfoxide (DMSO) in ratio of 4:1 for the solvent. The solution will be dissolved overnight at 60° C in a nitrogen filled glovebox. To prepare Cs0.05FA0.75MA0.20)Pb(IxBr1-x)3 films, the 100ul of the precursor solution will be spin coated onto a substrate in two steps of 2000rpm and 1500rpm for 30s. Ethyl-acetate anti-solvent will be introduced after 20s of spin coating to evaporate the solvent from the film. Annealing will be at 1500C for 15 minutes on a hot plate with 500 rpm.

In Situ GIWAXS/GISAXS Experiments:

GIWAXS measurements will be conducted at 23A small- and wide-angle X-ray scattering beamline at the Lawrence Berkeley National Laboratory. The wavelength of X-ray is 1.240 Å (10 keV) and the scattering signals will be collected by a C9728DK area detector. The sample to detector distance will be ≈166 mm, calibrated with a lanthanum hexaboride (LaB6) sample. The incident angle will be kept at 2° to enhance the signal resolution with a frame exposure time of 3 s. The spin-coating process will be conducted in an air-tight chamber under N2 flow, which will consist of a spin-coater and a motorized syringe for remote injection of CB. After the perovskite precursor is dropped on the substrate, concomitant WAXS/SAXS measurement and sample spinning could be triggered simultaneously, followed by a programmed CB injection on the spinning film at a designated timing during the whole 300 s spinning process at 1500 rpm.

In Situ Photoluminescence Microscopy Setup

A Nikon LP-EPILED microscope with a Pixelink PL-B742FF camera will be attached above a bar coating system to observe the kinetics of crystallization of the perovskite solution. Immediately after spreading the perovskite inks, the lens will be lowered in place and the focus will be adjusted to observe the perovskite ink as it dries at the center of the glass substrate. The image stacks will be processed and analyzed by Image J-FIJI to extract the number of crystals, spatial distribution (40× magnification), and area of the crystals (60× magnification)

3. References

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Presenter: Mr SHATSALA, Elly Miller (Masinde Muliro University of Science and Technology and Lawrence Berkeley National Laboratory)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **96** Type: **not specified**

Freely Available Complete Video Optics Course

Wednesday, 15 November 2023 11:45 (15 minutes)

Freely Available Complete Video Optics Course

Rick Trebino

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1. Re-inventing the Lecture

Despite the great technological advances of the past few decades, lecture preparation remains a time-consuming task, performed mostly in isolation with only the assistance of a textbook. Worse, the resulting talking head in front of a chalk-filled blackboard continues to fail to inspire students worldwide. Fortunately, technology now allows for the possibility of creating exciting video lectures with full-color images, animations, and movies. Unfortunately, creating such lectures is even more time-consuming, so it is rarely done, and PowerPoint lectures are often singularly uninspired and so have a much-deserved terrible reputation. However, once created, high-quality, appealing, exciting, even fully narrated PowerPoint lectures can easily be shared, significantly reducing teacher preparation time and vastly increasing the quality and excitement of the lecture.

While various web sites distribute educational applets and images, which is helpful, they only partially solve the problem; these are mere elements of something bigger and much more time-consuming. Other web sites offer video recordings of talking-head lectures, which, unfortunately, are dull and uninspiring. Others charge fees. So, for the past two decades, I have been devoting considerable time developing highly polished, full-color, complete, fully narrated courses of PowerPoint lectures for four college-level optics and physics courses, complete with pictures, movies, animations, and derivations (of which, Optics and Modern Physics are fully, essentially professionally narrated). They also borrow images and movies from numerous other (properly cited) sources. And I freely distribute these entire courses (at frog.gatech.edu). Figure 1 shows still images of several (actually highly animated) slides from these lectures. These courses are fully self-contained and can completely replace live lectures. The students watch them at their leisure (for a flipped classroom), or the videos can be played in class, pausing occasionally for discussion. Either way, the required effort by the teacher is minimal, and the result is a vast improvement over the traditional chalk-and-talk, talking-head lecture.

See pdf for figure.

Fig. 1. Sample slides from Rick Trebino's optics course. Reprinted with permission by Rick Trebino (frog.gatech.edu).

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **97** Type: **not specified**

Optimization of Properties of Bismuth doped Germanium-Antimony-Selenium-Tellurium for Threshold Switching Applications

Thursday, 16 November 2023 10:00 (15 minutes)

There is a pressing need for the development of reliable, cost-effective sources of nonvolatile electronic storage devices due to the increase in the rate at which information is exchanged during this digital era. Phase change memory (PCM) is more predictable, less expensive, scalable and has an indefinite cyclability compared with other electronic memories like silicon-based flash memory. PCM is based on stable chalcogenide alloys containing selenium or tellurium, which switches very fast between the amorphous and the crystalline states. However, the details of the crystalline to amorphous switching process utilized for memory storage remains an active research area with many incomplete details. Although studies have been done on germanium (Ge) – antimony (Sb) – tellurium (Te) thin films for use in PCM technology, selenium-bismuth (Se-Bi) doping, surface passivation and film thickness optimization on threshold switching properties has rarely been investigated. The study focuses on investigating these properties in addition to the role of materials' preparation conditions, in the understanding of the optimized properties of Ge-Sb-Se-Te thin films for application in PCM technology. The objectives of the study are: To investigate the effect of film thickness, and to determine the effect of surface passivation on the optical, electrical, and structural properties of as-deposited and annealed Ge-Sb-Se-Te thin films, and to examine the effect of film thickness and surface passivation on the threshold voltage of Ge-Sb-Se-Te thin films. Optical absorption spectroscopy, differential scanning calorimetry (thermal properties), X-Ray diffraction (structural properties), scanning electron microscopy (morphological properties), and temperature dependent electrical conductivity, are among the techniques to be applied to the study of flash evaporated thin films of Ge-Sb-Se-Te. It is expected that the analyzed thin films prepared under varied conditions will be compact, stable and have optimized properties for production of PCM devices with maximum performance and will be readily accessible. This is expected to improve on the speed and time saving which will lead to an efficient electronic storage system in both government and private institutions.

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Presenter: MULAMA, Austine Amukayia (Maseno University, Kenya)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **98** Type: **not specified**

Modified Hybrid Inflation, Reheating and Electroweak Vacuum stability

Tuesday, 14 November 2023 11:45 (15 minutes)

We propose a modification to the standard hybrid inflation model \cite{Linde:1993cn}, that connects a successful hybrid inflation scenario to the standard model Higgs sector, via the electroweak vacuum stability. The proposed model results in an effective inflation potential of a hilltop-type, with both the trans-Planckian and sub-Planckian inflation regimes consistent with the recent Planck/BICEP combined results. Reheating via the inflation sector decays to right-handed neutrinos is considered. An upper bound on the reheating temperature $T_R \leq\sim 2 \times 10^{11}$ (1×10^{13}) GeV, for large˜(small) field inflation, will suppress contributions from one-loop quantum corrections to the inflation potential. This may push the neutrino Yukawa couplings to be $calO(1)$ and affect the vacuum stability.
We show that the couplings of the SM Higgs to the inflation sector can guarantee the electroweak vacuum stability up to the Planck scale. The so-called hybrid Higgs-inflaton model leads to a positive correction for the Higgs quartic coupling at a threshold scale, which is shown to have a very significant effect in stabilizing the electroweak vacuum. We find that even with $calO(1)$ neutrino Yukawa couplings, threshold corrections leave the SM vacuum stability intact.

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Presenters: Mr ASHRY, Mustafa (Faculty of Science, Cairo University); Ms IBRAHIM, Merna (Department of Physics, Faculty of Science, Ain Shams University)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **99** Type: **not specified**

Fabrication of dye sensitized solar cell using produced platinum doped multiwall carbon nanotube as counter electrode.

Thursday, 16 November 2023 10:15 (15 minutes)

Carbon nanotubes (CNTs) were synthesized by catalytic chemical vapor deposition (CCVD) method. The synthesized CNTs was purified with acid to remove the catalyst impurities and to enhanced deposition platinum (Pt) onto the CNTs surface. Platinum multiwall (Pt-MWCNTs) nanocomposites were produced by a wet impregnation technique and a known amount (0.5 g) nanocomposites was dispersed in Texanol and Acrylic resins to form a paste. The paste was screen printed on an FTO glass substrate. Surface morphology, chemical composition, crystallographic structure electrical performance of the obtained Pt-MWCNTs nanocomposites were confirmed by HRSEM, HRTEM, EDS, XRD. The produced MWCNTs and Pt-MWCNTs were used as counter electrode to fabricate the dye sensitized solar cell. The Pt-MWCNTs solar cell was found to η=0.28%.

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Presenter: Dr IBRAHIM, Sharifat Olalonpe (Department of Physics, Federal university of Technology, Minna, Nigeria)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **100** Type: **not specified**

Study of optical and energy transfer on co-activated ZnAl2O4:0.1% Tb3+, 0.1% Sm3+ nanomaterial prepared using the citrate precursor method.

Thursday, 16 November 2023 10:45 (15 minutes)

This study reports the analysis of energy transfer on zinc aluminate (ZnAl2O4) co-activated with terbium (Tb3+) and samarium (Sm3+) prepared by citrate precursor method. The nano-powders were prepared by using the citrate sol-gel method and annealed at 900 oC for 2 hrs for all samples. The X-ray powder diffraction (XRD) results revealed a single cubic structure of ZnAl2O4 and co-doping with Tb3+ and Sm3+ did not affect the structure of synthesized ZnAl2O4. Scanning electron microscope (SEM) results showed that co-doping the host material of ZnAl2O4 slightly affected the morphology of the synthesized nano-powders. Ultraviolet-visible (UV-Vis) reflection spectroscopy suggested that the band gap of co-doped ZnAl2O4:0.1% Tb3+, 0.1% Sm3+ is 1.58 eV. The photoluminescence (PL) results showed several emission peaks located at 416, 487, 542, 564, 597, 619, 644 nm. The peak at 416 nm may be assigned to the host material and the is no any other significant peak observed for the host material besides 416 nm which may be suggesting energy transfer (ET) from the host → Tb3+ and from host→Sm3+ when single and co-doping the host material. Emission peaks at 487, 542 and 619 may be attributed to the 5D4→7FJ = 6, 5 and 3 transitions of Tb3+ ion. The observed emission peaks located at 564, 597 and 644 nm may be attributed to 4G5/2→6H5/2, 4G5/2→6H7/2 and 4G5/2→6H9/2 transitions of Sm3+ (Mabelane et al., 2022). CIE coordinates results suggested that the emission colour can be tuned from the bluish colour to the violet colour which suggest colour tunability of the material. These results may be suggesting that the co-doping ZnAl2O4 may be used for solid state lighting materials.

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Presenter: DLAMINI, Clinton (south african)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **101** Type: **not specified**

A Novel Sparse Linear Array via Maximum Interelement Spacing Concept for DOA Estimation Applications

Wednesday, 15 November 2023 11:30 (15 minutes)

Array signal processing is a field of signal processing that utilizes sensor arrays to detect incoming environmental signals and infer the signal's information, such as direction-of-arrival (DOA), signal power, amplitude, etc. Hence, it has numerous applications in automotive radar, astronomy, tomography, imaging, and wireless communication [1]-[3]. Recently, sparse linear arrays (SLAs) have gained considerable attention due to their enhanced degrees of freedom (DOF) [1]. Given the concept of difference coarray (DCA), these SLAs retain an $\mathcal{O}(N^2)$ long central uniform linear array (ULA) segment in their DCA, which boosts their DOF, making them capable of resolving $\mathcal{O}(N^2)$ uncorrelated sources using only N physical sensors. On the contrary, traditional uniform linear arrays (ULAs) can estimate only $N-1$ sources with the same N sensors. Besides, the large interelement spacings (IES) in SLAs reduce the mutual coupling (MC) effect [1], [3]. On this basis, several SLAs been proposed in [1]-[3] and references therein. In Ref. [1], an SLA with enhanced DOF and reduced MC effect, called the improved maximum IES constrained (IMISC) array, was introduced. However, according to [1, Appendix A], the IMISC array has missing virtual sensors in its DCA; therefore, the realized DOF is not as optimal as expected [2]. Inspired by IMISC, this paper proposes a new extended IMISC (xMISC) via a hole-filling strategy to recover the lost DOF. The strategy leverages IES adjustment, as demonstrated in [2, 3]. Numerical examples demonstrate the merits of the xMISC array over existing SLAs.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **102** Type: **not specified**

Constraining the phantom dynamical dark energy model and smoothing the Hubble tension.

Tuesday, 14 November 2023 10:30 (15 minutes)

The discrepancy between Planck data and direct measurements of the current expansion rate H_0 has become one of the most intriguing puzzles in cosmology nowadays. The H_0 tension has reached 5σ in the context of standard cosmology i.e ΛCDM. Therefore, explanations to this issue are mandatory to unveil its secrets. Despite its success, ΛCDM is unable to give a satisfying explanation to the tension problem. Unless some systematic errors are hidden in the observable measurements, physics beyond the standard model of cosmology must be advocated. In this perspective, we study a phantom dynamical dark energy model as an alternative to ΛCDM in order to explain the aforementioned issues. This phantom model is characterised by one extra parameter, $\Omega_{\rm pdde}$, compared to ΛCDM. We obtain a strong positive correlation between H_0 and $\Omega_{\rm pdde}$, for all data combinations. Using Planck18 measurements together with BAO and Pantheon, we find that the H_0 is 3.4σ. By introducing a prior on the absolute magnitude, $M_{\rm B}$, of the SN Ia, the H_0 tension decreases to 2.49σ with $H_0 = 69.7^{+0.83}_{-0.86}$ km s^{-1} Mpc^{-1}.

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Presenter: Ms DAHMANI, Safae (Mohammed I University)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **103** Type: **not specified**

Protocol for Dy3+ modified NaCaVO4 Nanophosphors in Solid-State Lighting Applications: Structural and Luminescence Investigations

Thursday, 16 November 2023 10:30 (15 minutes)

The combustion process was used to synthesize the dysprosium (Dy3+) doped Sodium Calcium Vanadate (NaCaVO4) phosphor. The structural, optical and morphological investigations were carried out with the dopant concentrations ranging from x = 0 to 3 mol% for which X-Ray diffraction, photoluminescence spectroscopy, SEM and UV-Vis spectroscopy were studied. We have explored that the XRD results indicate vibrant, clear, and well-defined peaks that are matched to the NaCaVO4 standard card confirming that the phosphor powder crystallized in orthorhombic phase with space group Cmcm. From the FESEM pictures, the particles had an agglomerated morphology with irregular shapes and sizes in the nm range. The PL properties of undoped and Dy3+ doped NaCaVO4 were investigated using a 310nm excitation source to determine the suitability for use in displays. The emission spectrum exhibited two sharp peaks at (450-500) nm and (550-600) nm and a weak peak at (650-700) nm which is assigned to Dy3+ emission transitions of 4F9/2 ⟶6H15/2 (blue), 4F9/2⟶6H13/2(yellow) and 4F9/2⟶6H11/2 (red). Doping of NaCaVO4 with Dy3+ for x = 0.25 to 3 mol% concentrations resulted in the band gap modifications in the range of 3.341 to 3.866 eV. The material that we have taken up might be investigated as a new phosphor that could be activated by UV light emitting diode (LED) light for solid state lighting and display applications.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **104** Type: **not specified**

Lamellipodia-like membrane protrusions regulate the integrity of epithelial cell-cell adhesions

Friday, 17 November 2023 10:00 (15 minutes)

Metastasis suppressor protein 1 (MTSS1) is a membrane-interacting scaffolding protein that functions as a tumour suppressor in various carcinomas. MTSS1 binds phosphoinositide-containing membranes through its I-BAR domain, and can sense and generate negative membrane curvatures; however, the mechanisms by which MTSS1 localizes to cell–cell adhesions in epithelial cells and regulates their integrity and maintenance remain elusive. Using fluorescence and electron microscopy, we found that cell–cell adhesions of Madin–Darby canine kidney (MDCK) cells harbour lamellipodia-like, dynamic actin-driven membrane folds, which exhibit negative membrane curvatures at their distal edges. BioID proteomics demonstrated that MTSS1 forms a complex with actin-binding proteins in lamellipodia-like membrane protrusions at cell–cell adhesions. Inhibition of actin filament assembly at adherens junctions leads to defects in epithelial integrity. Together, these results support a model in which membrane-associated MTSS1, together with actin-binding proteins, promotes the formation of dynamic lamellipodia-like membrane protrusions that regulate the integrity of cell–cell adhesions in epithelial monolayers.

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Session Classification: Partner

Track Classification: AfLS

Contribution ID: **105** Type: **not specified**

Bio-fertilizers

Friday, 17 November 2023 10:45 (15 minutes)

ABSTRACTBio-fertilizers are the living microbes that inhabit the root zone or the interior plant parts. These microbes promote growth, productivity, and physiological properties of plant either directly or indirectly and hence, are also said as plant growth-promoting rhizobacteria. Biofertilizers increase the growth as well as development of plant by amassing the accessibility of mineral nutrients, biological nitrogen fixation, solubilizing phosphorus, and production of growth hormones. Moreover, these microbes and their by-products are eco-friendly organic agro-input that increased the sustainability as well as soil health and thus are considered as the best alternative to synthetic fertilizers. They are effective in very less quantity, have faster breakdown process, and are less likely to make resistance by the pathogens and other kinds of pests. The use of biofertilizers in agrarian practices overcomes the use of chemical fertilizers, which have harmful impacts on all kinds of living beings and depreciate soil health.

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Presenter: SHAAPERA, Aondoakura

Session Classification: Partner

Track Classification: AfLS

Contribution ID: **106** Type: **not specified**

Comparing phantom dark energy models using statefinder diagnostic

Tuesday, 14 November 2023 10:45 (15 minutes)

In our study, we used the statefinder diagnostic tool to analyze phantom dark energy (DE) models, specifically the big rip (BR), the little sibling of the big rip (LSBR), and the little rip (LR). We generate evolutionary trajectories of the statefinder $S_n(z)$ diagnostic using a Markov Chain Monte Carlo method and plot them based on the best fit extracted from each model. Our results demonstrate that, in the high-redshift region, the phantom DE models exhibit strong degeneracy with each other and the ΛCDM model, even with different parameter values. However, this degeneracy is broken in the low-redshift region through the use of $S_3^{(1)}$ and $S_4^{(1)}$ diagnostics. Furthermore, we observe that the statefinder diagnostic tool reveals the diverse behavior of the LSBR model, which can take on quintessence-like or phantom-like qualities depending on the Ω_{lsbr} parameter. In contrast, the LR model is only phantom-like. We also perform a direct comparison of the phantom DE models using the $\left\{S_3^{(1)}, S_4^{(1)}\right\}$ and $\left\{S_3^{(1)}, S_3^{(2)}\right\}$ planes and demonstrate that the separation between the models is visible at the current state of the models. Overall, we find that the statefinder diagnostic tool is robust in distinguishing between different DE models and even models of the same type with different equation of state (EoS), which ultimately lead to different outcomes for the fate of the Universe.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **107** Type: **not specified**

Thermodynamic Properties of Duffin Kemmer Petiau oscillator in a magnetic field with EUP

Wednesday, 15 November 2023 10:00 (15 minutes)

In this paper, we study analytically 2D bosonic oscillator under the influence of an external magnetic field in Anti de Sitter space, we expressed the energy eigenvalues and the corresponding wave function of the scalar case by Jacobi polynomials and we noticed that the energy remains discrete even for large values of the principal quantum number.For the vector case, since the problem is almost impossible to solve so we used the non relativistic limit to obtain the spectrum which shows that there is an additional term coming from the spin orbit with the interaction of the deformation.
At last, we analysed the thermodynamic properties of the system and obviously it showed that the results affected by the deformation of the space.

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Presenter: Dr SEK, Lakhdar (University of Eloued)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **108** Type: **not specified**

Watching real materials in real devices with the atomic pair distribution function (PDF)

Tuesday, 14 November 2023 15:00 (30 minutes)

Nanoparticles, nanoporous materials and nanostructured bulk materials are at the heart of next generation technological solutions in sustainable energy, effective new pharmaceuticals and environmental remediation. A key to making progress is to be able to understand the nanoparticle structure, the arrangements of atoms in the nanoparticles and nanoscale structures. Also critical is understanding the distribution of the nanoparticles and how they change in time as devices run and reactions take place. We use advanced x-ray, neutron and electron scattering methods to get at this problem. I will talk about these methods and show some recent success-stories in the fields of sustainable energy, environmental remediation and cultural heritage preservation. However, I will also discuss the fundamental limitations on our ability to extract information from the data and how we are now turning to machine learning and artificial intelligence techniques to give more insights.

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Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **110** Type: **not specified**

A new view of the Inner Core from the primary pressure scale derived from synchrotron X-ray study at high pressure

Tuesday, 14 November 2023 14:30 (30 minutes)

Establishing pressure scale has been a subject of intensive research but still involves significant extrapolation and approximations, especially under the inner core conditions. In order to solve the problem, we developed techniques to measure the sound velocity at high pressure with using Inelastic X-ray scattering (IXS). We developed a primary pressure scale extending to the multi-Megabar pressures of the Earth's core by measuring compressional velocity, shear velocity, and density of rhenium with using synchrotron IXS and XRD. Our new pressure scale agrees with previous primary scales below 100 GPa and also shock compression experiments, but it is significantly different from previous secondary pressure scales at Earth's core pressures: previous scales have overestimated, by at least 20%, laboratory pressures at 230 GPa. Our new pressure scale suggests the density deficit of the inner core is doubling the light-element contents [1].
This abstract is one of contributions from Commission of Physics of Minerals (CPM), International Mineralogical Association (IMA).

Reference:
[1] Ikuta et al. (2023) Science Advances 9, eadh8706

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Presenter: OHTANI, Eiji (Tohoku University)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **111** Type: **not specified**

Obtaining high yield recombinant Enterococcus faecium nicotinate nucleotide adenylyltransferase for X-ray crystallography

Thursday, 16 November 2023 11:45 (15 minutes)

The enzyme nicotinate nucleotide adenylyltransferase (NNAT) has proven to be a potential drug target for the design of new antibacterial agents because of its indispensability in the biosynthesis of NAD+, a metabolite crucial to the survival of pathogens. However, no information is available on the structure-function of E. faecium NNAT (EfNNAT). To provide this missing information while validating EfNNAT as a potential druggable target, the availability of a highly purified recombinant EfNNAT is a significant step and a pipeline to accessing this knowledge. This study established how to obtain high-yield recombinant EfNNAT using the Escherichia coli expression system and a single-step IMAC purification method. We further solved the three-dimensional structure of EfNNAT by X-ray crystallography. Two high-resolution crystal structures of EfNNAT in its native and adenine-bound forms were determined at 1.90 Å and 1.82 Å, respectively. The presence of phosphate and sulfate ions occupying and interacting with conserved amino acid residues within the putative substrate binding site aided better insight into the enzyme's probable substrate preference. With the accessibility to high-resolution structures of EfNNAT, further structural evaluation and drug-based screening can now be achieved to aid the discovery of structure-based inhibitors against this enzyme.

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Presenter: JEJE, Olamide

Session Classification: Partner

Track Classification: AfLS

Contribution ID: **112** Type: **not specified**

Biogeochemical Chlorination of Marine Organic Matter

Friday, 17 November 2023 10:30 (15 minutes)

Chlorine has the highest electron affinity of any element. In nature, Cl exists mainly as the chloride anion, which was long considered to be unreactive under environmental conditions. In terrestrial soils, that assumption has proved unfounded, largely due to the revelation of various chlorinating enzymes in soil fungi and other microbes. In seawater, however, there has been comparatively little evidence to change the enduring perception of the unreactivity of chloride. Halogenating enzymes in marine organisms are primarily bromoperoxidases that take advantage of abundant bromide with lower electron affinity. Known modes of natural marine chlorination produce volatile species such as methyl chloride, which is emitted by marine algae and likely forms through the action of methyl transferases.

Using synchrotron-based X-ray absorption spectroscopy at the "tender" energy of the Cl K-absorption edge (˜2,820 eV), we measured high concentrations of organochlorine in naturally degraded particulate organic matter from oceanic sediment traps. In addition, we used X-ray spectromicroscopy to reveal heterogeneously distributed aliphatic and aromatic fractions of organochlorine within the sediment trap material. The major precursor of sedimentary material is phytoplankton biomass, the detritus of which undergoes oxidative breakdown as part of the marine carbon cycle. We hypothesized that unsaturated lipid and protein moieties in phytoplankton detritus would be susceptible to chlorination through oxidative degradation. Using a series of model experiments and a novel X-ray spectroscopic technique, we have shown that algal particulates are readily chlorinated through various abiotic pathways, including photochemical and Fenton-like reactions. These processes produce organochlorine in particulate algal detritus at levels exceeding 0.1% by mass. We have also measured non-volatile natural organochlorine in several species of marine phytoplankton for the first time.

This discovery of abiotic pathways for large-scale chlorination of marine organic matter provided the first suggestion of a marine chlorine cycle involving chemical transformations of chloride. Chlorinated organic matter may represent a particularly stable component of marine organic carbon, with possible implications for preservation in sediments.

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Presenter: LERI, Alessandra (Marymount Manhattan College)

Session Classification: Partner

Track Classification: AfLS

Contribution ID: **113** Type: **not specified**

The influence of cation disorder on the mineral physics of ankerite: new HP synchrotron X-ray diffraction data

Tuesday, 14 November 2023 15:30 (15 minutes)

1.Introduction and methodology

Carbonates are the most important carbon (C) – bearing minerals being key phases in the Earth's carbon cycle.
The most abundant carbonates in nature are the rhombohedral calcite (CaCO3 - space group R-3c), magnesite (MgCO3 - space group R-3c) and dolomite [CaMg(CO3)2 - space group R-3]. Ankerite [Ca(Mg1-xFex)(CO3)2, $0 \leq x \leq 0.7$] is isostructural with dolomite and the Mg substitution by Fe has important effects on the high pressure (HP) behavior of the mineral, in terms of compressibility, structural stability and thermoelastic properties (e.g., [1]). In natural occurring R-3 carbonates, cations distribute in alternated layers (ordered crystal structures). At high temperature conditions cations start to randomly distribute among cationic sites giving rise to disordered crystal structures [2][3]. Structural parameters such as chemical composition and cation disorder strongly influence the carbonate's stability under non ambient conditions. Synchrotron single crystal X-ray Diffraction experiments were carried out at the ID-15B beamline at ESRF (Grenoble, France) up to approximately 23 GPa, in order to study the HP behavior of ordered (hereafter ank-ord) and disordered (hereafter ank-dis) ankerite, eventually locate the occurrence of phase transition, and analyze the influence of disorder on the ankerite mineral physics. Collected data were treated to study the crystal structure evolution as well as the compressibility behavior of the analyzed samples.

2.Results

The crystal structure refinements of both ank-ord and ank-dis at increasing P showed that ank-ord undergoes phase transition to ankerite-II (hereafter ank-II) in the P range 12-13.5 GPa. Upon phase transition, the coordination number of Ca increases from 6 to 8 and the space group varies from R-3 to P-1, in analogy with dolomite-II [4]. The ank-ord crystal structure regularizes with increasing P up to phase transition and, after that, distortion strongly increases, i.e., ank-II is strongly deformed with respect to ank-ord. Ank-dis regularizes too as P increases, reaching full regularization at approximately 19 GPa. However, no phase transition was observed up to the highest analyzed P. Disordering has a small but significant influence on the compressibility of ankerite, being ank-dis less compressible than ank-ord. After the phase transition, compressibility of ankerite drastically changes and ank-II is considerably less compressible than ank-ord and shows almost uncompressible MgO6 octahedra. In all the three crystal structures, the a parameter has the lowest compressibility and it even expands in ank-II (Fig 1). This behavior is strictly related to the observed increase in γ angle as P increases (Fig. 1), that is a consequence of the shear of cation layers in the (0 1 -1) plane (Fig. 2).
Fig. 1: Pressure dependence of cell parameters for ank-ord, ank-II and ank-dis.
Fig. 2: Cystal structure of ank-II at 21.97 GPa.

3.References

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13514.

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Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **114** Type: **not specified**

FinEstBeAMS: a beamline for atmospheric and materials sciences at MAX IV Laboratory

Wednesday, 15 November 2023 17:15 (30 minutes)

Beamline

FinEstBeAMS [1] – Finnish-Estonian Beamline for Atmospheric and Materials Sciences – is located at the 1.5 GeV storage ring at MAX IV Laboratory in Lund, Sweden. It has mainly been financed by Finnish and Estonian research consortiums, but any researchers can apply for beamtime at the beamline. FinEstBeAMS receives synchrotron radiation from an elliptically polarizing undulator (EPU) and monocromatizes it with a plane grating monochromator using collimated light (cPGM). The operation range of the beamline is exceptionally large: it covers photon energies 4.5-1300 eV, thus extending from ultraviolet to soft X-rays. Another defining characteristic of FinEstBeAMS is that the EPU can deliver linearly polarized radiation in different directions (horizontal, vertical, inclined) as well as left- and right-circularly polarized radiation. Horizontal and vertical linear polarizations have been used in experiments. The development of other polarizations is under progress.

End stations

FinEstBeAMS has three dedicated end stations that are or can be installed at two branch lines: a gas-phase end station (GPES) [2], a photoluminescence end station (PLES) [3], and a solid-state end station (SSES) [4]. The GPES was designed for coincidence measurements between energy-resolved electrons and ions, but it can also be used for stand-alone electron spectroscopy and ion time-of-flight (TOF) spectroscopy. Different sources such as a cluster source and an aerosol sample delivery system (ASDS) can be coupled to the GPES. The PLES is used in optical spectroscopy to collect emission spectra in the wavelength range 200-1350 nm and excitation spectra in the operation range of the beamline, while allowing the temperature of samples to be varied from 10 K to 300 K. The GPES and PLES nowadays share one of the branches (Branch A). The SSES is a newer end station, which, due to its complexity, is permanently installed at the other branch (Branch B). It was designed as a high-throughput apparatus for X-ray photoelectron spectroscopy (XPS), angle-resolves photoemission spectroscopy (ARPES) and X-ray absorption spectroscopy (XAS).

Aerosol sample delivery system

We have recently developed the ASDS to study aerosol and free nanoparticles using X-ray photoelectron spectroscopy. Its main components are an aerodynamic lens and a source chamber, which is pumped by turbomolecular pumps. The source chamber is connected to the GPES via a skimmer, which has a conical shape and a small aperture (1.0-1.5 mm). The ASDS enables the delivery of a continuous flow of an aerosol from atmospheric pressure to vacuum in the shape of a narrow beam of free flying particles (Figure 1). It facilitates XPS studies of aerosol particles in-flight without prior deposition. In the commissioning stage, the ASDS was used to study sea salt aerosol particles, which are composed of complex mixtures of organic and inorganic compounds, as well as engineered nanoparticles ablated from Sn, Cu, Pd and Zn electrodes. The ASDS was made available to general users in autumn 2023. The first two user experiments focused on model atmospheric organic-salt aerosol particle mixtures and on the role of alkali metals in soot formation.

References

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[2] K. Kooser et al, J. Synchrotron Rad. 27 (2020) 1080.

[3] V. Pankratov et al, Radiation Meas. 121 (2019) 91.

[4] W. Wang et al, J. Phys. Conf. Series 2380 (2022) 012048.

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Presenter: KIVIMÄKI, Antti (Lund University)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **115** Type: **not specified**

Spectroscopy capabilities in the VUV - Soft X-ray region at the Canadian Light Source, the Variable Line Spacing-Plane Grating Monochromator beamline

Wednesday, 15 November 2023 18:45 (15 minutes)

The VLS-PGM beamline at the Canadian Light Source (CLS) is one of the few beamlines in the Americas that is built to optimize the delivered flux below 250eV, and it is capable of performing X-ray absorption spectroscopy (XAS) at Lithium (Li) and Boron (B) K-edges, and Sulfur (S), Phosphorus (P), Silicon (Si) and Aluminium (Al) L-edges with two dedicated endstations and a suite of detectors.
Improvement to the X-ray absorption near edge structure (XANES) measurements over the B K-edge, and S and P L-edges, have been achieved by the use of a recently commissioned silicon drift detector (SDD) for partial fluorescence yield (PLY); a multichannel plate detector (MCP) for total fluorescence yield (FLY) and total electron yield (TEY) are routinely used over the full beamline energy range.
This combination is well suited for a number of CLS strategically important scientific disciplines, being B, S and P some of the essential elements in agriculture, agri-food, and environmental science research.
The capabilities of the beamline, with relevant examples, are highlighted in the talk.

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Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **116** Type: **not specified**

Phytonanoremediaton using mangroves and iron nanomaterials to remove heavy metals

Wednesday, 15 November 2023 18:30 (15 minutes)

1 / 2
Phytoremediation using nanoscale Zerovalent iron (nZVI) and mangroves for decontamination process

Dr. Keyla Soto Hidalgo and Dinorah Martinez Torres
University of Puerto Rico, Rio Piedras Campus

Abstract:

Phytoremediation uses plants to clean up contaminated environments. Plants can help clean up many types of contaminants, including metals, pesticides, explosives, and oil. Our recent studies have shown that phytonanoremediation process is efficient combining mangroves and nanoscale zerovalent iron (nZVI) using contaminated soil with Cadmium and Lead. We evaluated the efficiency of the phytonanoremediation process using Avicennia germinans and Rhisophora mangle with and without nZVI to remove Cd and Pb in contaminated soils by inductively coupled plasma (ICP) analysis measurements. Comprehensive chemical and physical characterization of the resulting nZVI products after their exposure to Cd2+ was done. Further studies of the resulting nanostructures were completed using a photoelectrochemical solar cell (PSC) as the photoanode material. Incident photon-to-current efficiency (IPCE) and electrochemical impedance spectroscopy (EIS) analysis of these PSCs showed active photochemical properties in the ultraviolet range for the sample exposed to 30 ppm of Cd2+. Changes in the structure and chemical oxidation states of the species were observed in transmission electron microscopy (TEM), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS), and X-ray absorption spectroscopy analysis was attributed to these photochemical properties. These results show an alternative synthetic method for producing iron oxides for photocatalytic applications, and a possible strategy for reuse of nZVI after water remediation treatments. At CLS, we will evaluate fresh and aged nZVI together with Fe oxide model compounds, using synchrotron-based X-ray absorption (XAS) and X-ray fluorescence spectroscopy (XRF) to obtain both the relative oxidation state, using the absorption structure near edge X-ray images (XANES), well-extended regions (EXAFS), and quantitative speciation information regarding the types and proportions of mineral species present, from the extent analysis. On the other hand, the use of mangroves with nZVI to remove heavy metals with different concentrations will be evaluated using BioXAS and X-ray fluorescence imaging.

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Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **117** Type: **not specified**

Exploration of the deep Earth water cycle: a collaboration of first-principles calculations and synchrotron x-ray diffraction studies

Tuesday, 14 November 2023 17:15 (15 minutes)

Water at the Earth's surface is believed to be transported into the Earth's interior by hydrous minerals. Until recently, however, hydrous minerals were not thought to persist at the extremely high-pressure conditions of the Earth's lower mantle (e.g., 23-120 GPa). In recent years, hydrous phases such as phase H (MgSiO4H2), pyrite-type FeOOH, and delta-AlOOH have been found to be thermodynamically stable at lower mantle pressures. First-principles studies have played an essential role in identifying these new phases and determining their geophysical properties (compressibility, elastic modulus, sound velocity, etc.), as well as providing the necessary parameters required to support the experimental identification of these high-pressure polymorphs using synchrotron radiation experiments. First-principles calculations suggest that the hydrous minerals stable at lower mantle pressure conditions (i.e., phase H, FeOOH, and AlOOH phases) all have symmetric hydrogen bonds. This suggests that the strength of hydrogen bonds is closely related to the stability and physical properties of hydrous minerals under pressure. This presentation summarizes recent theoretical and experimental studies of hydrous minerals that are stable at extreme pressures with a focus on the important role of hydrogen bonding [1]. This abstract is one of contributions from Commission of Physics of Minerals (CPM), International Mineralogical Association (IMA).

References

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Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **118** Type: **not specified**

Terms of Trade, Institutional Quality and Exchange Rate Volatility in the Economic Community of West African States

Wednesday, 15 November 2023 10:45 (15 minutes)

Abstract
In this study, we examine the relationship between terms of trade and exchange rate volatility in the ECOWAS bloc taking into account the existential role of institutions. We focus on 15 countries in the ECOWAS bloc for the past 21 year (i.e., 2000-2021). Using the Panel Autoregressive Distributed Lag Model (PARDL), we estimate the short, long-run parameters and the error-correction mechanism to show the relationship between the exchange rate and the other variables. We find terms of trade and institutional quality mostly exert significant negative impact on exchange rate returns in the long run whiles financial development, external debt and debts services have mixed results. The general imbalances of the term of trade in the sub-region causes the destabilization of currencies and as a result, reduces aggregate GDP and eventually sinks economic development. Therefore, strong institutions are needed to produce counterproductive policy response to stabilize exchange rates movements.
Keywords: West Africa, exchange rate, institutional quality, term of trade, financial development.

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Presenter: Ms ESHUN, Rosemary (University of Education, Winneba)

Session Classification: Partner

Contribution ID: **119** Type: **not specified**

Tapered Fiber Connector and its performance analysis

Wednesday, 15 November 2023 11:15 (15 minutes)

The diameter of single mode fiber is approximately 50 μm, due to the small diameter of fiber, effective coupling between two optical fibers is possible when fiber connectors will have high precision. In this simulation work, effectiveness of fiber connector will be analysed based on core diameter, taper length, tapered ratio, and numerical aperture. Generally, optical fiber is used in pair for transmitting and receiving the optical signal. So, new type of directional tapered fiber connector would be designed in which the structure of the fiber head will be tapered as per the direction of signal transmission and market demand. For the performance analysis of new connector based on lateral deviation and other traditional connectors, coupling efficiency will be compared, it is observed tapered connector will have high efficiency at lower error rate based on optical transmission theory, numerical aperture matching technology, refractive index discontinuities, optical loss mechanism, longitudinal and angular deviation, materials etc.

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Presenter: Dr JHA, Ved Nath (MLS College, Madhubani)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **120** Type: **not specified**

Confined Atomic Systems in Charged Environments

Wednesday, 15 November 2023 10:15 (15 minutes)

The discovery and development of quantum confinement triggered the study of the influence of the environment on quantum systems. Under such conditions, rearrangement of orbitals occurs in atoms and molecules, leading to changes in physical and chemical properties. This therefore leads us to study hydrogénoïde or artificial atomic systems (quantum dots QD) in plasmas.
We study this systems by using the Killingbeck potential as a confining potential and solve the Schrodinger equation for this potential analytically to find the exact expressions of both energies and eigenfunctions.

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **121** Type: **not specified**

Exploring grain-scale chemistry of African meteorites using Synchrotron X-ray Fluorescence Microprobes

Wednesday, 15 November 2023 17:45 (15 minutes)

A large fraction of all the meteorites recovered on Earth's surface are found in Africa. These include carbonaceous chondrites, samples of primitive material from the early Solar System that include prebiotic organic compounds and essential nutrients for the development and sustenance of life. There are also rock fragments from the Moon and from Mars, the latter being the only physical samples from our planetary neighbor that we currently have for study. These reveal important aspects of planet formation and differentiation processes.

Synchrotron X-ray fluorescence (XRF) microprobes provide an excellent – and generally non-destructive – set of element-specific tools for microscale characterization of chemistry in these rare samples, and provide a wealth of information about the formation and early evolution of the Solar System. Elemental maps of sample sections and surfaces reveal the distributions, co-locations, and host phases of most elements heavier than Na. By scanning the incident beam energy across an element's absorption edge, microscale X-ray absorption spectroscopy can reveal an element's local-scale oxidation state, chemical speciation, and local structure, in both crystalline and non-crystalline phases.

Examples will be presented that include Northwest Africa 11288, which is a Martian meteorite consisting of a highly shocked igneous rock, and Northwest Africa 12748, which is a CM2 carbonaceous chondrite. Other African meteorites including a CV3 and a lunar meteorite will be shown.

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Presenter: NORTHRUP, Paul (Stony Brook University)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **122** Type: **not specified**

Prediction of Polymorphism and Crystallographic Properties of Cinnamic Acid using CSD-Materials

Thursday, 16 November 2023 11:15 (15 minutes)

1. Introduction
   Cinnamic acid (2-phenylacrylic acid) is a naturally occurring aromatic fatty acid with known cytotoxic activity towards different cancer cell lines [1]. The activity of this important molecule can be attributed to potential substitution reactions on the phenyl ring, the reducing ability of the C=C double bond and the ability of the -COOH group to donate an H+ to scavenge free radicals [2]. A search in the Cambridge Structural Database (CSD) shows that nine polymorphs of cinnamic acid have been deposited in the database with seven of the entries crystallizing in the P21/n space group and P21/a and P21/c for the remaining two polymorphs. Other entries involving cocrystals of cinnamic acid were also found in the database. These crystals are usually grown in order to investigate the solid state stability and physicochemical properties of the resulting products [3]. Polymorphism, the occurrence of different crystal forms of the same compound under different crystallizing conditions is an important phenomenon in the pharmaceutical industry since two polymorphs of the same compound may have different therapeutic effects [4].
2. Results
   Recently, we crystallized a new polymorph of cinnamic acid which has been deposited in the webCSD with refcode; CINMAC12. It has the following cell parameters; a = 6.0098(2), b = 3.941(2), c = 31.5336(14); α = 90o, β = 90.349(4)o, γ = 90o with a P21/c space group.
   This presentation will demonstrate the prediction of polymorphism and other crystallographic structural parameters using the CSD-Materials functionality in the program Mercury. Parameters such as full interaction maps, hydrogen bond statistics and aromatics analyzer will be accessed. This work will be of interest to crystallographers, crystal engineers, pharmacists and chemists.
3. References

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Presenter: TETTEH, Samuel (University of Cape Coast, Ghana)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **123** Type: **not specified**

Layered high-pressure, high-temperature experiments with lunar Fe-Ti cumulate and Mg-rich mantle compositions to understand the origin of varied Ti-contents of lunar basalts

Thursday, 16 November 2023 12:00 (15 minutes)

1. Introduction

Lunar magma ocean (LMO) crystallization experiments and simulations performed by earlier workers have revealed that at the last stage, Fe-Ti-rich cumulates are formed [1,2,3], which have been linked to the varied TiO2 contents of the lunar basalts [4]. These last stage cumulates are postulated to be dense enough to sink down through the underlying Mg-rich mantle 5, possibly till depths of the lunar core-mantle boundary 6. To understand this interaction between the Fe-Ti cumulates and the underlying mantle, new high-pressure, high-temperature, layered experiments have been performed between an iron-titanium-rich silicate composition signifying the Fe-Ti cumulates (6.22 wt.% TiO2 and 40.54 wt.% FeO) and forsteritic olivine (Mg# ~ 92) signifying the lunar mantle composition, taken in nearly 1:4 weight ratio (Fig. 1). These experiments were performed between 1-3 GPa and 1100-1525 ℃ pressure and temperature ranges, respectively.

Fig. 1: Run product showing the two layers of starting material and the reaction zone

2. Results

The results show that it is not necessary that the cumulates would sink through the underlying mantle. Even if they do, the Fe-Ti cumulates may undergo melting at the pressures and temperatures that were prevalent in the early lunar mantle. These would produce partial melts of various TiO2 contents, depending on the dissolution of different phases, degree of melting and extent of interaction with the lunar mantle. These different melts have different densities, which may or may not be negatively buoyant with respect to the ambient lunar mantle. Thus, these melts may be stranded inhomogeneously at various depths in the lunar interior. The assimilation of these melts with lunar basaltic melts may perhaps explain the TiO2 variation in lunar basalts.

3. References

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Co-authors: Dr GHOSH, SUJOY (INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR); Mr MUKHERJEE, TAMALKANTI (INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR); Prof. GUPTA, SAIBAL (INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR)

Presenter: MOITRA, HIMELA (INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **124** Type: **not specified**

Coral reef formation from nanometers to kilometers

Monday, 13 November 2023 15:00 (30 minutes)

Coral reefs cover only 1% of ocean floors, yet they host 25% of all known marine species. This incredible biodiversity is sheltered by the 3D structure of coral skeletons. My group and I revealed that corals form their skeletons by attachment of amorphous calcium carbonate (ACC) nanoparticles[1], then fill interstitial spaces by ion attachment[2]. Polarization-dependent Imaging Contrast mapping (PIC mapping) revealed that subsequent crystallization starts as randomly oriented aragonite (CaCO3) nanocrystals, termed sprinkles, which coarsen and become radially oriented acicular crystals termed spherulites[3-5]. This is Nature's 3D printing4! The resulting space-filling, solid, isotropic structure grows slowly (0.5-5.0 cm/year) to form m-km coral reefs visible from outer space.
Unexpected nanostructures were revealed by PIC mapping in other completely different biominerals, mollusk shell nacre6 and human tooth enamel[7]. In both cases the slight misorientation of adjacent nanocrystals plays an important role in toughening the biomineral5, providing it with better function, and thus providing an evolutionary advantage to the forming animal.

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Presenter: Prof. GILBERT, Pupa (University of Wisconsin-Madison and Lawrence Berkeley National Laboratory)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **125** Type: **not specified**

Synchrotron X-ray studies of superconducting vacancy-ordered monoclinic Titanium monoxide films during synthesis

Wednesday, 15 November 2023 18:15 (15 minutes)

Introduction

Light sources provide an indispensable resource for probing with atomic-scale precision, the structural properties of nanoscale materials. In these materials where a strong correlation exists between their crystal structures and their electronic, optical, and magnetic properties, structural and chemical probes using synchrotron X-ray diffraction and spectroscopy are critical for understanding and engineering the functional properties of materials for applications in quantum computing, energy, and catalysis. The ability to directly probe these materials as they are being synthesized and in-operando allows for developing precise quantitative models to predict how materials grow and behave.
In this talk, results will be presented on the evolution of the crystal structure of superconducting monoclinic titanium monoxide thin films during thin film synthesis using the molecular beam epitaxy atomic layer-by-layer growth technique. By monitoring the lattice structure during growth using synchrotron high-energy X-ray diffraction at the 33ID beamline at the Advanced Photon Source, we observe the evolution of strain and the ordering of Oxygen and Titanium vacancies leading to the formation of the monoclinic TiO phase.

Results

Vacancy ordering is correlated to a superconducting-to-metal transition at ˜ 2.8 K. The transition contrasts with the superconducting-to-insulator transition observed in other superconducting TixOy phases where disorder may play a role in the insulation normal phase.
These results are essential for understanding the role disorder plays in modulating transport in superconducting materials and pave the way for designing high-temperature superconductors.

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Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **126** Type: **not specified**

Using X-PEEM and XANES to explore barnacle exoskeleton mineralization

Monday, 13 November 2023 15:30 (15 minutes)

Rebecca A Metzler1, Sarah Traenkle1, Edlin Davis1, Beatriz Orihuela de Diaz2, Daniel Rittschof2, and Gary Dickinson3

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Introduction

Barnacles, such as *Amphibalanus amphitrite* studied here, are found throughout marine intertidal communities. As adults, *Amphibalanus amphitrite* have a calcified exoskeleton consisting of multiple plates: parietal or lateral plates surrounding the body, a base plate securing the barnacle to its substrate, and an operculum that opens and closes for feeding. However, barnacles begin life as unmineralized free-floating larvae that then undergo two metamorphoses, before settling onto a substrate, adhering for life, ad forming a mineralized exoskeleton. Despite their importance in intertidal communities and the role they play in biofouling, little is known about the formation process of barnacles' exoskeletons. Through the combination of synchrotron based techniques x-ray photoemission electron microscopy (X-PEEM) and x-ray absorption near-edge structure spectroscopy (XANES) with scanning electron microscopy (SEM) we were able to provide an unprecedented view of the early stages of mineralization within the exoskeletal plates.

Results

X-PEEM [1, 2] and SEM show that 1-day after metamorphosis, the parietal and opercular plates have already begun the mineralization process, with both parietal and opercular plates consisting of small calcite crystallites of varied orientation. In comparison, the parietal and opercular plates of a 6-day post-metamorphosis barnacle appears to have larger co-oriented crystalline domains and a thicker mineralized region within the parietal plates. These results begin to provide hints to how mineralization progresses within the barnacle exoskeleton and provides a baseline for ongoing experiments into how predicted changes in ocean temperature will impact the barnacle exoskeleton mineralization process.

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Presenter: METZLER, Rebecca (Colgate University)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **127** Type: **not specified**

Deblurring for Nuclear Physics

Tuesday, 14 November 2023 11:30 (15 minutes)

Deblurring is commonly applied in optics to correct images for distortions caused by apparatus. Here, we analyze the deblurring from the perspective of applications to nuclear and high energy data. To understand the deblurring we employ Singular Value Decomposition (SVD). We look for cases where the deblurring is successful and where it fails. The essential role is played by null space. Important role in suppressing an uncontrolled growth of null-space contributions in the restored images is played by regularizations. Surprisingly, the deblurring can achieve a partial success in restoring null space contributions in the case of high-contrast intensity distributions.

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Presenter: MAMBA, Sinethemba Neliswa (African Institute for Mathematical Sciences (AIMS))

Session Classification: Partner

Track Classification: Partner

Contribution ID: **128** Type: **not specified**

Effect of an ambient environment on light-induced degradation of organic solar cells based on a benzodithiophene–quinoxaline copolymer in air

Friday, 17 November 2023 10:15 (15 minutes)

Introduction
Experimental Procedure
Result and Discussion
Conclusion

Primary author: Mrs GEBREMARIAM, Kidan (University lecturer)

Presenter: Mrs GEBREMARIAM, Kidan (University lecturer)

Session Classification: Partner

Track Classification: AfLS

Contribution ID: **129** Type: **not specified**

Quantifying trace metal stoichiometry of marine microalgae by synchrotron x-ray fluorescence spectroscopy (SXRF)

Tuesday, 14 November 2023 17:30 (15 minutes)

Iron and other trace metals are essential micronutrients for marine phytoplankton. The availability of these minerals varies seasonally and spatially, and one or more metals is the primary limiting nutrient in about one third of the global ocean. Synchrotron x-ray fluorescence spectroscopy (SXRF) enables simultaneous quantification of multiple elements in individual microalgal (phytoplankton) cells. Chemically preserved microalgae are mapped at submicron resolution to measure biomass proxies (S, P), structural elements (Si), and trace metals (Mn, Fe, Co, Ni, Cu, Zn). These measurements have been used to quantify the biogenic component of particulate iron pools and to compare physiological trace metal requirements of different taxa. This talk will cover practical aspects of sample collection and SXRF analysis as well as brief vignettes of trace metal biogeochemistry informed by these measurements.

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Presenter: SOFEN, Laura (Bigelow Laboratory for Ocean Sciences)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **130** Type: **not specified**

Deconvoluting source function from two-particle correlations in Heavy-ion Collision

Tuesday, 14 November 2023 11:00 (15 minutes)

In the context of heavy-ion collisions, low relative-velocity two-particle correlations play a pivotal role in understanding the space-time characteristics of particle emission. These characteristics are typically represented by a relative emission source, which is determined through the Koonin-Pratt (KP) convolution formula, utilizing the relative wave-function of the particles. Previous studies have commonly approximated this source with a Gaussian parametrization and fit it to the correlation function, although broader inferences have also been made through fitting methods. Here, we propose the application of the Richardson-Lucy (RL) optical deblurring algorithm to extract the source from a correlation function. The RL algorithm, grounded in probabilistic Bayesian principles, relies on the positive definiteness of intensity distributions for the optical object, its image, and the convolution kernel, which align with the relevant quantities in the KP formula. Additionally, we employ a transport model to analyze two-proton (p-p) correlations in heavy-ion collisions at low incident energies per nucleon (E/A). Specifically, we utilize the Boltzmann-Uehling-Uhlenbeck (BUU) transport model to simulate the p-p source. Subsequently, we integrate this source and the p-p kernel within the KP formula to calculate the correlations. By comparing the correlations obtained from the BUU simulation with those from the RL algorithm, we aim to gain a deeper understanding of the impact of fast and slow emissions on the measured correlations. Drawing insights from this comparison, we correct the BUU source function by incorporating a tail to account for the contribution of secondary decay emissions, which cannot be accurately captured by BUU simulations. To illustrate our approach, we examine p-p correlations measured in Ar + Sc reactions at E/A = 80 MeV, considering both momentum-independent and momentum-dependent nuclear equations of state (EOS).

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Session Classification: Partner

Track Classification: Partner

Contribution ID: **131** Type: **not specified**

First-principles investigation of MXenes M4C3 (M = Sc, Cr, and Mn) for clean energy

Thursday, 16 November 2023 12:15 (15 minutes)

The goal of this research is to investigate the structural, optoelectronic, and thermoelectric properties of the MXene, M 4 C 3 (M = Sc, Cr, and M n), using Wien2k code, that is based on density functional theory (DFT). Structural properties and optimization were calculated using PBE-GGA, PBEsol, LDA, and WC approximation. Based on an analysis of the phase stabilities of the carbides, it was found that they are energetically stable, with the following phase stability sequence: Sc 4 C 3 > Cr 4 C 3 > M n 4 C 3 . The band gap 0.784 eV for Sc 4 C 3 is a good gap, compared to the other MXenes. Using the BoltzTraP2 code, the transport properties were thoroughly investigated in terms of electrical conductivity, thermal conductivity, and Seebeck coefficient. The figure of merit (ZT), which is significant for M 4 C 3 , was used to determine its role in clean energy applications.

Primary author: Mr DARKAOUI, El Mokhtar

Presenter: Mr DARKAOUI, El Mokhtar

Session Classification: Partner

Track Classification: Partner

Contribution ID: **132** Type: **not specified**

New opportunities on the studies of matter at extreme conditions in the ESRF-EBS

Wednesday, 15 November 2023 15:30 (15 minutes)

In the last decades, we have witnessed an unprecedented surge in high-pressure research that has greatly improved our fundamental understanding of materials under high compression. The X-ray investigations of matter under extreme conditions has become one of the major activities at the ESRF and other 3rd generation synchrotron sources. The array of techniques includes X ray diffraction, Inelastic X-ray Scattering, Nuclear Inelastic Scattering, X ray absorption and emission spectroscopy, X ray magnetic circular dichroism, X-ray Compton scattering, X-ray magnetic scattering, among many others. As a direct consequence, many scientific breakthroughs have been achieved across fields ranging from fundamental physics to Earth and planetary sciences, chemistry and materials research, and extending into biophysics/biochemistry including questions concerning life and biological function under extreme conditions. Since August 2020, the new ESRF-EBS (extremely brilliant source) opened to the user community a new generation of synchrotron light source with unprecedented characteristics. In particular, the crystallography beamlines dedicated to the studies of materials under extreme conditions (ID15B and ID27) benefit enormously of the beam focusing capabilities and the coherent fraction.
In this presentation, the new capabilities available on ID15B and ID27, very recently reconstructed, will be presented. Also, the strengthen of the user support capabilities on the High-pressure laboratory allow to prepare the most challenging crystallographic studies under extreme pressure (P<2Mbar) and temperature (3K<T<6000K) conditions.
We will discuss particular scientific problems regarding the studies of compounds with charge density in function of high pressure and at low temperature. Finally, the possibilities of collaborations and discussions on possible future beamtime access will be introduced.

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Presenter: GARBARINO, Gaston (ESRF)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **133** Type: **not specified**

Experiences in several synchrotrons as a user and as staff using infrared spectroscopy and X-ray microscopy

Tuesday, 14 November 2023 17:45 (15 minutes)

For most of my studies and research, I have been doing experiments in different synchrotrons. Synchrotrons are facilities where the main interest is to generate light at different frequencies, from X-ray to IR, and use the light to investigate matter. The main techniques I have worked on, is Fourier Transform InfraRed Spectroscopy and X-ray microscopy and fluorescence. These two techniques measure chemical and elemental composition of matter. In order to obtain high resolution or brightness, synchrotron light is required. Nevertheless, the access to these infrastructures is difficult because of limited time and resources. I have mainly worked at Elettra Sincrotrone Trieste in Italy, although I have had experiences in other synchrotrons. In this presentation, I will show different modalities of access to Elettra and other facilities, that can be used by international applicants for a particular measurement, or for training purposes.

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Presenter: Dr BEDOLLA, Diana E. (International Center for Genetic Engineering and Biotechnology)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **134** Type: **not specified**

ASESMA: the second decade and its role in new initiatives for scientific research

Tuesday, 14 November 2023 16:00 (30 minutes)

The African School of Electronic Structure Methods and Applications (ASESMA) has built up a network of researchers across Africa with expertise in an area that is now an essential part of research. The focus on computational methods and applications of electronic structure was chosen because it is an important field that is narrow enough to build up a network for joint work and collaboration, yet broad enough to span the range from fundamental physics to applications in materials science, chemistry, biology and many other fields. It is supported by ICTP and other sources and endorsed by IUPAP as a 10-year series of workshops 2010-2020 and renewed for a second decade until 2030. The schools have been held in 5 countries with participants from 29 countries across Africa, and it has led to a number of active research groups, mini-ASESMA meetings on special topics and the US Africa Initiative on Electronic Structure (USAfrI) funded by the American Physical Society.
What is the role of ASESMA for initiatives like The African Light Source? Almost every aspect: a network of scientists with expertise ready for combined theory/experiment collaborations that are essential in all modern research; bringing together scientists in physics, chemistry, materials science and other disciplines; connections to the global community; and more. What is the justification for such bold claims? This talk is about ASESMA, the science, and examples of projects that led to work at light sources in the US and Europe.

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Presenter: MARTIN, Richard (University of Illinois)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **135** Type: **not specified**

Laser-induced nonthermal diffusion of impurities and vacancies in Silicon

Thursday, 16 November 2023 12:30 (15 minutes)

Laser-induced disordering processes have been studied intensively during the last decades. In this work, we present investigations of a laser induced ordering process which consists in the controlled mobility of crystal defects. In order to study the possibility to guide vacancies by femtosecond-laser pulses we performed ab initio molecular dynamics simulations of laser-excited Silicon with different defect densities using our code CHIVES (Code for Highly Excited Valence Electron Systems). The objective of this study is to determine the impact of laser excitation on defects (vacancies and impurity atoms) migration in Silicon (Si). Starting from initially randomly distributed defects, we simulated the ultrashort time dynamics of the system after laser heating. As a preliminary results we observed the changed mobility of the vacancies.

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Presenter: Mrs K. MEBOU, C. I. (University of Kassel)

Session Classification: Partner

Track Classification: Partner

Contribution ID: **136** Type: **not specified**

Instrumentation Neutron Activation Analysis & Proton Induced X-RAY Emission techniques supported with Machine learning analysis for rare earth/macro/micro elements correlation from O. Sativa Rice varieties in Senegal River valley

Wednesday, 15 November 2023 18:00 (15 minutes)

The accumulation of metal and their correlation with the rare earth elements (REE) namely Na, Cl, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Cu, Zn, As, Se, Br, Rb, Sb, Cs, Ba, and REE(La, Ce, Nd, Sm, Eu, Tb, Tm, Yb, Lu), Hf, Ta and Th in roots, leaves and grains in O. Sativa Rice are investigated by destructive Instrumental neutron activation analysis and Proton induced x-ray emission. Exploration of resulting experimental data using Machine Learning techniques shows that the iron is highly correlated with the amount of REE (Cs, Rb, Sr, Sb, Ba, La, Ce, Sm, Yb, Nd, Eu, Tb, Tm, and Lu) and Hf, Ta and Th accumulation. More importantly, we observe a decreasing iron concentration between root and stem in comparison with the increasing chlorine contents. We also remark that there are no accumulation effects for all root tissues of REE.

Primary authors: TRAORE, Alassane (Universite Cheikh Anta Diop Dakar); Mrs NDIAYE, Anna; Dr FERNANDEZ, Sandrina (Institute of Nuclear Physics Czech republic); Dr FAYE, Jean paul Latyr; Prof. KUCERA, Jan; Dr KAMENÌK, Jean (Institute of Nuclear Physics); Prof. NDAO, ABABACAR SADIKHE (Institut de Technologie Nucléaire Appliquée)

Presenter: TRAORE, Alassane (Universite Cheikh Anta Diop Dakar)

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **137** Type: **not specified**

Importance of X-ray diffraction for the economic and industrial development of Latin American countries

Friday, 17 November 2023 16:30 (15 minutes)

Countries of the Latin American and Caribbean region demonstrate a clear lag in progress towards the 2030 Agenda for Sustainable Development adopted by all United Nations Member States in 2015. This lag seems to become more evident after the pandemic caused by the coronavirus SARS-CoV- 2, and one of the most overdue SDGs is 9: Industry, innovation and infrastructure. Large regional research centers appear to be a good strategy to advance this objective and contribute to the inclusion of women scientists with multidisciplinary training. Particle accelerator rings work around laboratories dedicated to contributing to the scientific priorities of the regions. This means, laboratories of Crystallization of Macromolecules, Mass Spectrometry, Nuclear Magnetic Resonance, Spectroscopy and Calorimetry, Biophysics of Macromolecules, High-Performance Sequencing, Metabolomics, Bioprocess Development and Scale-up, Microscopy, Spectroscopy and light scattering, Device manufacturing, Materials synthesis, Nanotoxicology and nanosafety, which have historically had a high participation of women scientists. All these laboratories generate jobs, build technical capacities for men and women, and train generations of doctors for our countries. This presentation shows statistics that demonstrate a high participation of women scientists using large research centers where transdisciplinarity and gender equality are considered fundamental.

Primary author: Dr SANTACRUZ-PEREZ, Carolina (International Science Council)

Presenter: Dr SANTACRUZ-PEREZ, Carolina (International Science Council)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **138** Type: **not specified**

New beamlines for Siam Photon Source-II in Thailand

Tuesday, 14 November 2023 18:30 (30 minutes)

Siam Photon Source-II is a new low-emittance synchrotron storage ring that is planned to be built in Thailand. There will be seven Phase-I beamlines for the construction project. In this talk, I will present the selection of the beamlines, their technical details and how the new capabilities from them will benefit the current and future academic and industrial users in Thailand and from around the world.

Primary author: EUARUKSAKUL, Chanan

Presenter: EUARUKSAKUL, Chanan

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **139** Type: **not specified**

The African Strategy for Physics and Applied Physics

Monday, 13 November 2023 16:30 (20 minutes)

This is the first community driven African Strategy for Physics and Applied Physics. It started in July 2019, and it is now in the final preparation of the Strategy Document. Scientific and technological achievements have become commonplace. As remarkable as these achievements are for other regions of the world, enormous challenges and opportunities remain to be addressed in Africa. Although vital for development, Africa's science, innovation, education and research infrastructure, particularly in fields such as Fundamental and Applied Physics, has been over the years undervalued and under-resourced. The vision is that Africa should take its equal place as a co-leader in the global scientific process, along with all the social-economic benefits thereto. The necessity of initiating ASFAP has become essential for Africa, hence our ambition and motivation to jump-start this process.

Primary authors: ASSAMAGAN, Ketevi Adikle (Brookhaven National Laboratory); FASSI, Farida (Mohammed V University in Rabat); CONNELL, Simon (University of Johannesburg); MALEK, Fairouz (CNRS France); Prof. KHALIL, Shaaban (Zewail Institute); LAASSIRI, Mounia (Mohammed V University)

Presenter: LAASSIRI, Mounia (Mohammed V University)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **140** Type: **not specified**

African Ministers of Science Forum and STF Discussion

Monday, 13 November 2023 18:30 (30 minutes)

Ministerial representatives of several African Countries discuss science on the continent and the role of the Advanced Light Source.
Combined with
Strategic Task Force discussion
All of these issues have a Pan-African or regional African character.

Primary author: NORRIS, Lawrence (National Society of Black Physicists)

Presenter: NORRIS, Lawrence (National Society of Black Physicists)

Session Classification: Discussion

Track Classification: AfLS

Contribution ID: **141** Type: **not specified**

The role of synchrotrons in African Bio-science?

Tuesday, 14 November 2023 14:00 (30 minutes)

Structural information obtained at synchrotrons and cry-EMs at up to the atomic level of resolution for even large macro-molecular biomolecules helps to elucidate the function of the bio system. One can identify drug targets or similar medical interventions. This inspires the design of new drugs. Africa should lead research of this nature finding cures for diseases, especially if these are of particular relevance to Africa. Synchrotrons are extremely important facilities for the imaging of bio-molecules and therefore for initiating the pathway to the development of vaccines.

Primary author: MOYO, Thandeka (National Institute for Communicable Diseases)

Presenter: MOYO, Thandeka (National Institute for Communicable Diseases)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **142** Type: **not specified**

Africa Bioimaging Consortium - Strengthening the microscopy community in Africa

Wednesday, 15 November 2023 15:00 (30 minutes)

The African BioImaging Consortium (ABIC) was founded as a catalyst to empower and grow life science research in Africa by addressing needs for training, education, and accessibility of microscopy technologies. As a community-driven and community-guided initiative, ABIC seeks to expand the role microscopy plays in biomedical research on the continent — helping embrace imaging approaches in solving research questions of importance to the African continent. As a centralized hub, the ABIC network provides an opportunity for African biologists, microscopists, and data scientists to foster new partnerships and form a unified voice of the community.

Primary author: Dr JACOBS, Caron (UCT - Disease and Molecular Medicine and Wellcome--CIDRI)

Presenter: Dr JACOBS, Caron (UCT - Disease and Molecular Medicine and Wellcome-CIDRI)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **143** Type: **not specified**

Scientific and Societal Impact of Synchrotron Light Sources

Tuesday, 14 November 2023 16:30 (30 minutes)

Ever since the first dedicated light source facilities in the 1980's, synchrotron light sources have been developing rapidly around the world. These light sources essentially extend our human vision and allow us to see and investigate tiny things from microstructures to molecules and atoms, in many cases in-situ and under operating conditions. Such research activities have made substantial scientific and technological impacts in such critical areas as clean energy, microelectronics, quantum information, advanced manufacturing, bio-preparedness, and the environment. In addition to the direct impacts, the light sources also provide significant indirect broader impacts to our society. These impacts are reflected in business and economic impact to the local community, promoting high-quality education and workforce training and development, and encouraging people working together in a naturally diverse and inclusive light source environment. National Synchrotron Light Source II (NSLS-II) is a bright synchrotron facility at Brookhaven National Laboratory on Long Island, NY. It provides stable and intense photon beams, from infrared to hard X-rays, experimental capabilities, and data infrastructure to enable multiscale, multimodal, high-resolution studies on diverse systems of materials. In this presentation, I will go through a few research and activity examples from NSLS-II to illustrate their scientific, technological, and societal impacts. National Synchrotron Light Source II is a U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Brookhaven National Laboratory under Contract No. DE-SC0012704.

Primary author: SHEN, Qun (Brookhaven National Laboratory)

Presenter: SHEN, Qun (Brookhaven National Laboratory)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **145** Type: **not specified**

4th Generation High Energy Synchrotron X-rays at the ESRF: A Pivotal Large-Scale Tool with Socio-Economic Benefits

Thursday, 16 November 2023 14:00 (30 minutes)

The European Synchrotron (ESRF) has recently completed its upgrade to become the world's first fourth-generation high-energy synchrotron X-ray source, serving nearly 10,000 researchers annually. The ESRF holds a prominent position on the European Strategy Forum for Research Infrastructures Roadmap and is recognised as a central pillar of the European Research Area. The exceptional brilliance and unique properties of the ESRF's X-rays open new avenues for scientific research, leading to emerging applications for a growing user base.

Recent ground-breaking research conducted at the ESRF has had wide and novel socio-economic impacts. For example, multiscale imaging of human organs has revealed unprecedented insights into disease mechanisms. These results are accessible through "The Human Organ Atlas" (human-organ-atlas.esrf.eu), an open science and FAIR data resource available to all. This resource is being utilised for medical education, providing valuable insights and improving clinical diagnostics for medical scanners. The ultimate goal is to create a comprehensive micron-scale human model.

Other examples include research on battery safety and design, utilising ultra-high-speed X-ray radiography and specific containment for real-time destructive battery testing, as well as high-throughput structural analysis in collaboration with an industrial partner to provide data for materialomics.

Worldwide, there are approximately 30 medium and high-energy synchrotrons. Building on the pioneering work of the ESRF, more high-brilliance synchrotron sources are planned globally, promising further advancements in the remarkable science produced by these facilities. Moreover, many countries and regions without direct access to a synchrotron are actively pursuing scientific, technical, and socio-economic justifications for establishing such facilities, recognising their broad utility and impact.

Primary author: Dr KRISCH, Michael (ESRF)

Presenter: Dr KRISCH, Michael (ESRF)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **146** Type: **not specified**

Sirius Light Source - machine and Science highlights and a message for Africa

Thursday, 16 November 2023 16:00 (30 minutes)

The Machine and Science highlights of the Sirius Light Source and a message for Africa

Primary author: Prof. WESTFAHL, Harry (LNLS)

Presenter: Prof. WESTFAHL, Harry (LNLS)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **147** Type: **not specified**

SESAME BM02-IR Microspectroscopy beamline: a plethora of opportunities

Monday, 13 November 2023 14:30 (30 minutes)

Accelerators-based sources are super microscopes implementing various sets of experimental techniques those are powerful enough to reveal the most vital details about matter. They can shed light on invisible particulars in physics, chemistry, biology, pharmaceuticals and biomedicine, environment and materials science.

The high brightness delivered by these sources allows to compensate for some of the restrictions imposed by conventional sources. Among these, Synchrotron Radiation Fourier Transform Infrared Microspectroscopy, SR-FTIRμ, which is extensively used in cultural heritage and archaeological samples' investigations. This is because of the distinguished benefits of the lateral resolution offered by SR-FTIR which is reflected as improved data quality regardless of the roughness and the heterogeneity of the samples, better signal-to-noise ratio, and short data acquisition time.

In this regard, the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME) stands as a major scientific hub for archaeological and heritage domains being the only synchrotron light facility in the Middle East and its neighboring regions. It is an intergovernmental organization aims at promoting advanced research capabilities and technology and considered as the region's bridge to peace and mutual understanding. It is the first facility of its kind in the region, and its current Members are: Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestine and Türkiye. The SESAME BM02-IR Microspectroscopy beamline was implemented in the framework of a partnership agreement between SESAME and the SOLEIL Synchrotron facility in France. It came into operation in November 2018 to serve users of the infrared scientific community. The beamline utilises both edge and constant field radiation presenting a powerful tool for a variety of research fields based on the identification and imaging of IR-active vibrational modes of molecular components at microscopic scale.

Herein, examples in the domains of life sciences, archaeology, cultural heritage, water pollution, and pharma, will be highlighted.

In addition, with the challenges that the Middle East and Africa are similarly facing, a special highlight will be presented on the role that SESAME plays as a model for the African community.

Primary author: KAMEL, Gihan (SESAME Light Source)

Presenter: KAMEL, Gihan (SESAME Light Source)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **148** Type: **not specified**

The Photon Factory: Some XAFS studies and a message for Africa

Friday, 17 November 2023 14:00 (30 minutes)

The Institute of Materials Structure Science is one of the institutes in KEK, and runs a synchrotron facility, Photon Factory (PF), where two synchrotron rings, PF and PF-AR (Advanced Ring) are operated. PF is operated with the beam energy of 2.5 GeV. PF-AR with 6.5 GeV or 5. 0GeV provides higher energy regions. There are about 50 end stations including 6 x-ray absorption fine structure (XAFS) beamlines: 9A, 9C, 12C, 15A1, NW2A and NW10A.
XAFS is one of the most demanded methods at synchrotrons and is applied to study a wide variety of materials such as catalysts, batteries, functional oxides, semiconductors, minerals and environmental samples. XAFS is usually divided into characteristic two regions, x-ray absorption near edge structure (XANES) and extended x-ray absorption fine structure (EXAFS). XANES is the region of the spectrum from just below the absorption edge to ˜50-70 eV above the edge. EXAFS is the other higher energy region above XANES and analysed to investigate local structures of elements of interest. We will share a couple of XAFS studies performed at our facility. In addition, I would suggest potential topics to be studied at the AfLS in the context of natural resources in Africa and some issues.
Finaly, I would like to share my story on the AfLS project. I have been involved in the AfLS project since 2015, when I met Prof. Herman Winick at an international conference held in New York. In the same year of 2015, the first AfLS conference was held at ESRF, Grenoble, France. Dr. Francesco Sette, Director General of ESRF, gave impressive words in his speech, “Science is Peace”. A faculty and student team from the Botswana International University of Science & Technology (BIUST) visited us in 2017. They stayed for a month, performed XRD experiments, and published a paper very soon. We are happy to accept another team to learn and to perform synchrotron experiments.

Primary author: ABE, Hitoshi (Photon Factory (PF), Institute of Materials Structure Science (IMSS), High Energy Accelerator Research Organization (KEK))

Presenter: ABE, Hitoshi (Photon Factory (PF), Institute of Materials Structure Science (IMSS), High Energy Accelerator Research Organization (KEK))

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **149** Type: **not specified**

Status and Capabilities of INDUS-2 at Raja Ramanna Centre for Advanced Technology

Wednesday, 15 November 2023 16:00 (30 minutes)

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Primary author: Dr GANGULI , Tapas (Raja Ramanna Centre for Advanced Technology)

Presenter: Dr GANGULI , Tapas (Raja Ramanna Centre for Advanced Technology)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **150** Type: **not specified**

X-TechLab in Benin as a model for human capacity building in X-Ray science

Friday, 17 November 2023 14:30 (30 minutes)

X-TechLab is the first experimental platform in West Africa dedicated to training in X-ray techniques and their application to problem solving in key economic sectors. It is established within Sèmè City hub, one of the Benin government's flagship project which aims to create a world-class knowledge and innovation center in Africa. Started in 2019, X-TechLab has trained over 100 learners (PhD students, Engineers & Postdocs) from 13 African countries, more than 1000 undergraduate students and has involved around 30 lecturers from Africa, Europe, USA, and Western Asia. Several applied research projects are underway, some of which have already led to scientific publications in peer-review journals.
This presentation will focus on how X-TechLab becomes a role model for human capacity building in Africa. It will highlight the current and upcoming challenges.

Primary author: D'ALMEIDA, Thierry (CEA)

Presenter: D'ALMEIDA, Thierry (CEA)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **152** Type: **not specified**

LAAAMP : Lightsources for Africa, Asia, Americas, Middle East and Pacific

Tuesday, 14 November 2023 18:00 (30 minutes)

The project LAAAMP was started in 2016 by the International Science Council (ISC) through a grant awarded to the joint IUPAP-IUCr project entitled Utilisation of Light Source and Crystallographic Sciences to Facilitate the Enhancement of Knowledge and Improve the Economic and Social Conditions in Targeted Regions of the World. Aim of the project is to enhance Advanced Light Sources (AdLS) and crystallographic sciences in Africa, Mexico, the Caribbean, South America, Central and Southeast Asia, Middle East and the Pacific Islands.

Primary author: MTINGWA, Sekazi (Massachusetts Institute of Technology & Brookhaven National Laboratory& African Laser Centre)

Presenter: MTINGWA, Sekazi (Massachusetts Institute of Technology & Brookhaven National Laboratory& African Laser Centre)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **153** Type: **not specified**

AfCA : Introduction update and working towards the AfLS

Friday, 17 November 2023 16:00 (30 minutes)

AfCA : Introduction update and working towards the AfLS

Primary author: MEHLANA, Gift (Zimbabwe Chemical Society)

Presenter: MEHLANA, Gift (Zimbabwe Chemical Society)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **154** Type: **not specified**

Synchrotron X-Ray micro-computed tomography on beamlines BM18 and BM05 at the ESRF and current applications in biomedicine, material sciences and natural and cultural heritage

Wednesday, 15 November 2023 14:00 (30 minutes)

Synchrotron X-ray micro-computed tomography has shown its importance through time for biomedical, structure of materials, and natural and cultural heritage research. The new installation of BM18 and upgrade of BM05 (Extremely Brilliant Lightsource, EBS), which are both propagation phase contrast micro-computed tomography (PPC-SRμCT) beamlines, at the European Synchrotron and Radiation Facility (ESRF) presents a novel opportunity for advances in these three fields of imaging. Here, it is presented some of the fruitful results from experiments on both these beamlines which highlight the advances made in imaging techniques. Ground-breaking research is made possible for biomedical imaging with whole organ imaging and hierarchical tomography. The possible represented applications of PPC-SRμCT to investigate fossils includes non-destructive histological studies, dental sequencing and studying the gross anatomy in specimens. Higher available X-ray energy ranges combined with a large field of view has proven to be important for imaging larger and denser manufactured components, which is crucial for industrial development and material sciences research. As imaging technologies advance, X-ray imaging will continue to be pivotal tool for these impactful fields of research.s

Primary authors: Dr DOLLMAN, Kathleen (ESRF); FERNANDEZ, Vincent (European Synchrotron Radiation Facility); TAFFOREAU, Paul (ESRF)

Presenter: Dr DOLLMAN, Kathleen (ESRF)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **155** Type: **not specified**

Angle Resolved Photoemission Spectroscopy at Synchrotron Light Source

Wednesday, 15 November 2023 16:30 (30 minutes)

Angle-resolved photoemission spectroscopy (ARPES) is a widely recognized experimental probe to study the electronic band structure of a material. It has shown its practical applications in several scientific disciplines such as solid-state and condensed matter physics, material science and engineering, as well as in surface science. ARPES is based on the photoelectric effect, in which an incoming photon of sufficient energy ejects an electron from the surface of a material. ARPES is the most direct method that measures simultaneously the kinetic energy and the angular distribution (or momentum) of the photoemitted electrons from a sample illuminated by light.

ARPES experimental setup is a complex structure consisting of mainly a monochromatic light source to deliver a narrow beam of photons, a sample holder connected to a manipulator used to position the sample of a material, and an electron spectrometer. Synchrotron radiation or laboratory light sources (gas-discharge lamp or laser light source) are used as the incident light for ARPES experiments. A synchrotron offers the advantages of covering a wider spectral range with an intense and highly polarized continuous spectrum. A laboratory source provides only discrete emission lines of specific elements. Thus, synchrotron radiation sources, together with their built-in beamlines, are superior to laboratory sources because the wide energy range of their photons allows, for example, a detailed investigation of the valence photoemission spectra. Recent advances in synchrotron science, instrumentation and data analysis drove a paradigm shift in using ARPES to study novel materials such as quantum materials, which had a huge impact on physics and other scientific fields.

In this presentation, I will discuss some of our recent ARPES studies on quantum materials and correlated electron systems that were done at synchrotron light source. Lastly, I will discuss how an ARPES beamlines at AfLS could potentially be leading tools pushing the frontier of solid-state and condensed matter physics, material science and engineering researches; thus helping to set the intellectual agenda by testing new ideas and making discoveries that will be done on the African continent.

Primary author: NGABONZIZA, Prosper (Louisiana State University)

Presenter: NGABONZIZA, Prosper (Louisiana State University)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **156** Type: **not specified**

STF - African Regional Infrastructure

Monday, 13 November 2023 17:45 (15 minutes)

This is research infrastructure that is highly competitive in its own right but which is also seen as an important training and feeder infrastructure to an AdLS. Current examples are the OpenLabs started in in several African countries together with the IUCr, XTechLab in Benin and the Sir Aaron Klugg Bioscience Facility in Capetown.

Primary author: KOBOR, Diouma (University Assane Seck of Ziguinchor)

Presenter: KOBOR, Diouma (University Assane Seck of Ziguinchor)

Session Classification: Discussion

Track Classification: AfLS

Contribution ID: **157** Type: **not specified**

STF - African Beamline at an International AdLS

Monday, 13 November 2023 18:15 (15 minutes)

This is an African designed and operated beamline that can address selected African Research Imperatives. It is both an opportunity for increased Science and then something new, Engineering and Technical training and Technology Transfer.

Primary author: MITCHELL, Edward (ESRF)

Presenter: MITCHELL, Edward (ESRF)

Session Classification: Discussion

Track Classification: AfLS

Contribution ID: **158** Type: **not specified**

STF - Collective African Membership of an International AdLS

Monday, 13 November 2023 18:00 (15 minutes)

Here several African countries jointly acquire formal membership of an international AdLS. They leverage a threshold of participation that allows African Government involvement in the Council of the Facility, so that there is increased African Access of Researchers, Technologists, Industries and also Governments.

Primary author: Prof. SEMEDO, Sonia (UFPLP and Universidade de Cabo Verde)

Presenter: Prof. SEMEDO, Sonia (UFPLP and Universidade de Cabo Verde)

Session Classification: Discussion

Track Classification: AfLS

Contribution ID: **160** Type: **not specified**

SESAME, a perspective view

Thursday, 16 November 2023 16:30 (30 minutes)

SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is a "third-generation" synchrotron light source that was officially opened in Allan (Jordan) on 16 May, 2017. It is the first synchrotron light source in the Middle East and neighbouring countries, and also the region's first major international centre of excellence.
It is a cooperative venture by scientists and governments of the region set up on the model of CERN (European Organization for Nuclear Research) although it has very different scientific aims. It was developed under the auspices of UNESCO (United Nations Educational, Scientific and Cultural Organization) following the formal approval given for this by the Organization's Executive Board (164th session, May 2002).

SESAME is designed with an eye towards sustainability. Since 26 February 2019, when SESAME's solar power plant was inaugurated, SESAME is the world's first large accelerator complex to be fully powered by renewable energy. Energy efficiency is only one aspect of the concept of sustainability, that extends beyond environmental concerns to include long-term viability, equitable access, and capacity for positive societal impact.

SESAME provides scientists from the region and wordwide—many of which have limited access to high-quality research facilities—the opportunity to conduct cutting-edge research. This democratization of access contributes to social sustainability by leveling the playing field and facilitating equitable scientific advancements. By bringing together scientists from various countries, SESAME promotes efficient utilization of intellectual and material resources. Researchers share not just the equipment but also expertise, thereby fostering an ecosystem where resources are maximized.

SESAME's various educational and training programs aim to build local and global capacity in scientific research. This human capital development is a cornerstone of sustainability, ensuring that the facility has a lasting impact beyond immediate research outcomes.

SESAME advocates for open-access publishing and data sharing, ensuring that the benefits of research extend beyond the immediate scientific community. This enhances the sustainability of the scientific enterprise by broadening its impact and reducing duplication of effort.

The infrastructure is designed to accommodate future technological advancements, making it adaptable and resilient. In summary, SESAME serves as a model of sustainable scientific infrastructure, embodying principles of environmental stewardship, social equity, and long-term viability. Its multi-faceted approach to sustainability ensures that it will continue to serve as a valuable asset for the global scientific community for years to come.

Primary author: LAUSI, Andrea (SESAME)

Presenter: LAUSI, Andrea (SESAME)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **161** Type: **not specified**

An overview of the Munich CLS

Thursday, 16 November 2023 17:15 (30 minutes)

The Munich Compact Light Source (MuCLS) is an inverse-Compton scattering source and consists of an electron storage ring and a passive bow-tie laser resonator. The X-ray energy varies between 15 keV and 35 keV with a flux up to 1.5·10ˆ10 ph/s. Examples of the experiments that can be performed include dynamic in vivo respiratory imaging, propagation-based phase-contrast imaging, grating-based phase-contrast imaging, X-ray microtomography, K-edge subtraction imaging and X-ray spectroscopy.

Primary author: Prof. PFEIFFER, Franz (Technical University of Munich)

Presenter: Prof. PFEIFFER, Franz (Technical University of Munich)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **162** Type: **not specified**

Elettra - Machine and Science Highlights, a message for Africa

Thursday, 16 November 2023 17:45 (30 minutes)

Elettra - Machine and Science Highlights, a message for Africa

Primary author: Dr PAOLUCCI , Giorgio

Presenter: Dr PAOLUCCI , Giorgio

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **164** Type: **not specified**

A structural biology approach to win the fight against infectious diseases

Wednesday, 15 November 2023 14:30 (30 minutes)

Structural biology clarifies the molecular basis of disease processes, guides the rational design of new drugs and vaccines, and improves existing therapeutics. Few Africa-based scientists are trained in structural biology. BioStruct-Africa develops Africa-based structural biologists by organizing workshops onsite at our partner institutions and universities in Africa, followed by online mentoring of the participants to ensure sustainable capacity building (J. Synchrotron Rad. 26, 1843-1850 and Biology Open 11, bio059487).
I will present the significance of structural biology for Africa and, in addition, the recent advances and future perspectives of BioStruct-Africa.

Primary author: NJI, Emmanuel (BioStruct-Africa)

Presenter: NJI, Emmanuel (BioStruct-Africa)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **165** Type: **not specified**

ASFAP Discussion

Monday, 13 November 2023 16:50 (10 minutes)

Discussion session after presentation on ASFAP

Primary author: ASSAMAGAN, Ketevi Adikle (Brookhaven National Laboratory)

Presenter: ASSAMAGAN, Ketevi Adikle (Brookhaven National Laboratory)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **166** Type: **not specified**

Official Opening

Monday, 13 November 2023 14:00 (10 minutes)

The Conference organiser officially opens the Conference

Primary author: OLADIJO, Philip Oluseyi (Botswana International University of Science and Technology)

Presenter: OLADIJO, Philip Oluseyi (Botswana International University of Science and Technology)

Session Classification: Opening

Track Classification: AfLS

Contribution ID: **167** Type: **not specified**

AfLS : Opening Address

Monday, 13 November 2023 14:10 (10 minutes)

AfLS : Opening Address

Primary author: CONNELL, Simon (University of Johannesburg)

Presenter: CONNELL, Simon (University of Johannesburg)

Session Classification: Opening

Track Classification: AfLS

Contribution ID: **168** Type: **not specified**

AfPS : Opening Address

Monday, 13 November 2023 14:20 (10 minutes)

AfPS : Opening Address

Primary author: WAGUE, Ahmadou (African Physical; Society)

Presenter: WAGUE, Ahmadou (African Physical; Society)

Session Classification: Opening

Track Classification: AfLS

Contribution ID: **170** Type: **not specified**

How to build skills for the African Synchrotron

Thursday, 16 November 2023 15:15 (15 minutes)

With a PhD in Biomedical Sciences from the National University of Mexico and postdoctoral experience at the Imperial College in London, Brenda Valderrama is biotechnologist specialized in molecular biology and biochemistry. She has been a researcher at the Biotechnology Institute of the National University of Mexico since 1997 and member of the National Researchers System with level II. With more than 44 scientific articles, book chapters and a book, her publications have been cited more than 1,500 times.

Between 2012 an 2018 she directed the Innovation, Science and Technology Secretariat at the Morelos Government in Mexico, the first high level office in the country specialized in promoting innovation based economic development. Dr Valderrama is the current president of the Science Academy of Morelos.

Primary author: Prof. VALDERRAMA, Brenda (Instituto de Biotecnología UNAM)

Presenter: Prof. VALDERRAMA, Brenda (Instituto de Biotecnología UNAM)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **171** Type: **not specified**

Crystallogenesis and structural research on human transferrins as potential drug transporter using Synchrotron techniques

Thursday, 16 November 2023 15:30 (15 minutes)

Dr. Abel Moreno was awarded with a B.Sc. in Chemistry from the Autonomous University of Puebla (Mexico) in 1990. Dr. Moreno was also awarded with a Ph.D. in Chemistry from the University of Granada (Spain) in 1995. Currently, Dr. Moreno is a full Professor of Biological and Physical Chemistry at the Institute of Chemistry of the National Autonomous University of Mexico (UNAM) in Mexico City. He has been distinguished as a member of the Mexican Academy of Sciences, Mexican Society of Crystallography, Mexican Society of Synchrotron Light, the New York Academy of Sciences, and member of the Mexican and American Chemical Societies as well as the Spanish Royal Society of Chemistry. Prof. Moreno has been a visiting professor at the University of Granada (Spain, from November 2020 to October 2021); University of Cambridge (United Kingdom, January-December 2009) and at the University of Strasbourg (France, 2003–2004). Dr. Moreno has been a visiting scientist at the University of Luebeck and at the Institute of Crystal Growth (IKZ) Berlin (Germany, February 2004), at the University of Tohoku (Japan, Autumn 2003), at Imperial College London (United Kingdom in 1999 and 2000), and at the University of California Riverside (USA, 1997).

Dr. Abel Moreno has published more than 123 papers in prestigious international journals cited 2500 times having a H-index of 25. He is the author of 15 book chapters and 8 books on his specialties in Biological Crystallogenesis, Crystallochemistry, and Biomineralization processes. Into the Academia he has graduated more than 33 students at all levels from BSc up to the PhDs and postdoctoral fellows. Prof. Moreno is member of the Editorial Board of the journal Progress in Crystal Growth and Characterization of Materials (ELSEVIER). Editor for the Latin America section of the Newsletter of the International Union of Crystallography, and Editor-in-Chief of the section Biomolecular Crystals of the journal Crystals (MDPI, Switzerland). Recently was assigned associate editor of the journal CrystEngComm from the RSC (UK) as well as the Mexican Journal of Physics (Mexico).

Primary author: Prof. MORENO, Abel (Institute of Chemistry, UNAM)

Presenter: Prof. MORENO, Abel (Institute of Chemistry, UNAM)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **172** Type: **not specified**

Pan African and Ministerial perspectives

Monday, 13 November 2023 17:15 (30 minutes)

Pan African and Ministerial perspectives

Primary author: Prof. KHUMBAH, Nkem (AAS)

Presenter: Prof. KHUMBAH, Nkem (AAS)

Session Classification: Discussion

Track Classification: AfLS

Contribution ID: **174** Type: **not specified**

Finnish Synchrotron Radiation User Organisation (FSRUO)

Thursday, 16 November 2023 18:45 (15 minutes)

The Finnish Synchrotron Light Source Community presents an overview of their community, its science and their roadmap towards a light source

Primary author: Prof. HUOTARI, Simo J (Finnish Synchrotron Radiation User Organisation (FSRUO))

Presenter: Prof. HUOTARI, Simo J (Finnish Synchrotron Radiation User Organisation (FSRUO))

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **175** Type: **not specified**

Status of Hefei light source II, a recently constructed IR-FEL, and the new 4th generation diffraction limited storage ring

Thursday, 16 November 2023 18:30 (15 minutes)

Status of Hefei light source II, a recently constructed IR-FEL, and the new 4th generation diffraction limited storage ring

Primary author: Prof. LI, Heten (National Synchrotron Radiation Laboratory (China))

Presenter: Prof. LI, Heten (National Synchrotron Radiation Laboratory (China))

Session Classification: AfLS Contribution

Track Classification: AfLS

Contribution ID: **176** Type: **not specified**

Frontier Synchrotron Technologies Contribution to Society : The role of light source governance structures to explain it

Thursday, 16 November 2023 14:45 (30 minutes)

Both science in general and frontier technologies researchers in particular, have struggled to communicate to Society their contribution to improve the wellbeing of people around the globe. I have estimated that almost 50 billion dollars have been invested by more that 20 countries in the design, construction, operation, maintenance and upgrade of more than 50 operating Synchrotrons facilities in the last 30 years. However, despite this level of investment, little information has been collected, analysed and communicated to the global audiences about their benefits to society. This innovative technology is changing the game about how we approach and solve human challenges in relatively short time periods, as the commercialization of COVID 19 vaccines have demonstrated, but few in the decision-making spheres, know about it. The world demands more information about Synchrotron technologies but to achieve it Synchrotron leaders and researchers have to do much more to produce meaningful information that can be understood by all… in plain language. This is the only way that regions around the worlds without access to this technology could aspire to one day get the level of investment require to access it.

Primary author: Dr DEL RIO, Victor (SOCIEDAD MEXICANA DE LUZ SINCROTRÓN A.C.)

Presenter: Dr DEL RIO, Victor (SOCIEDAD MEXICANA DE LUZ SINCROTRÓN A.C.)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **177** Type: **not specified**

Recent highlights from Diamond Light Source

Friday, 17 November 2023 15:00 (30 minutes)

Diamond Light Source is the UK's national synchrotron providing national science infrastructure that is free at the point of use. Based on the on the Harwell Campus, Diamond facilities are available to researchers through a competitive application process, provided that published results are in the public domain. Over 14,000 researchers from across life and physical sciences both from academia and industry use Diamond to conduct experiments, assisted by approximately 700 staff. Here I will give an overview of recent research highlights from across the life sciences division, a brief update on Diamond II as well as an update on progress towards a potential Start II.

Primary author: QUIGLEY, Andrew (Diamond Light Source)

Presenter: QUIGLEY, Andrew (Diamond Light Source)

Session Classification: Plenary

Track Classification: AfLS

Contribution ID: **178** Type: **not specified**

Commwealth Chemistry - The Federation of Commonwealth Chemical Sciences Societies

Thursday, 16 November 2023 18:15 (15 minutes)

The Federation of Commonwealth Chemical Sciences Societies – or simply, Commonwealth Chemistry is a federation of organizations bound together in the spirit of the Commonwealth. We champion equal opportunity for all, drive innovation, and promote excellence in the chemical sciences for the benefit of the Commonwealth nations and their people. Our mission is to inspire, celebrate and elevate the role and practice of the chemical sciences for the benefit of Commonwealth nations and their people. Our Vision involves being one community, one voice, catalysing equality for all, ensure equal and inclusive representation from all Commonwealth nations with the recognition that those with greater resources will contribute more in order to support those with fewer resources.

Primary author: Prof. MALLON, Peter

Presenter: Prof. MALLON, Peter

Session Classification: AfLS Contribution

Track Classification: AfLS