THE AFRICAN PHYSICS NEWSLETTER

What's New in This Issue of the Newsletter?

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APRIL 2025

Dear Readers of the African Physics Newsletter,

I'm delighted to present you with the contents of the first issue of your newsletter for the year 2025. Before getting into the swing of things, I'd like to take a look back at previous editions.

As you may have noticed, the newsletter was published three times last year. This change in the publication schedule reflects the growing professionalization of both the content and the publication of the newsletter. While it's true that in recent years the volume of the publication has grown remarkably, your editorial team—in agreement with our publisher, the American Physical Society—has understood the need to provide you with even more enticing and attractive content while keeping abreast of current events in the physical sciences across the continent and in the African diasporas. This new development, of course, has sharpened the selective and rigorous nature of information processing and delivery within your reach. You may have noticed the now constant volume of the newsletter's content, the more balanced geographical representation of contributors, and the improved clarity and succinctness of each article.

To return to the content of this new edition, it's no secret that the information in the newsletter is fresh and crisp. As usual, our editors have scoured the continent for you, from the great metropolises to the very depths, where exceptional individuals are busy inspiring the youth, bringing to life institutions and initiatives for capacity building, networking, research projects, and roadmaps for a bright future for the continent. It's great to see the African diaspora working hard to build stable and productive learned societies, as is currently the case with the nascent Mauritanian Astronomical Society. Meanwhile, their peers in southern Africa are working hard to put astronomy at the service of sustainable development. What can we say about the strategists at the head of the African Strategy for Fundamental and Applied Physics, who have mobilized hundreds of physicists from Africa and elsewhere around this salutary strategy? Since the beginning of this initiative a few years ago, we've been reporting on its progress step by step, and we're proud to see it come to fruition, auguring a brighter future for African physics, at least in the decade to come.

More and more, African women scientists are recounting their experiences. In this issue, we present two inspiring profiles from the mountainous regions of East Africa and the banks of the Bou Regreg river in North Africa. Their personal stories aim to inspire the younger generation, highlighting their difficulties, but also the triumph of their aspirations, thanks to their bravery and determination. Scientific excellence is becoming increasingly depolarized and less concentrated between the south and north of Africa. While it's true that these two parts of the continent are home to centers of excellence such as NITHeCS in South Africa, capacity-building initiatives (e.g., EGYPlasma Schools in Egypt) and international collaborative research (e.g., the photovoltaic project between Morocco and Turkey) of remarkable standards, it's also meaningful to see a great deal of international mobilization across sub-Saharan Africa. From Nigeria to Ghana, for example, the mobile capacity-building caravan in electronic structure methods and applications is underway. Dozens of young Africans from West Africa and beyond are benefiting from the expertise of world-class trainers in this field.

As you can see, no part of the continent has been—or is being—left behind, if you'll pardon the expression. The continent is on the alert, and we echo the highlights of current events.

Enjoy your reading.

Stéphane Kenmoe, Editor-in-Chief

Share and Contribute News to the Newsletter

We encourage you to forward this newsletter to colleagues you think may be interested in hearing about the latest developments in physics in Africa. Subscriptions to the newsletter are free and open to both Africans and non-Africans. To subscribe go to https://go.aps.org/africanphysics.

Do you have a meeting, conference, school, award, etc. you would like posted? Do you have any other news or articles you would like to share with your colleagues? Click here for more information on how to submit this information to the newsletter and share it with colleagues across the African continent.

THE AFRICAN PHYSICS NEWSLETTER

The Mauritanian Association of Astronomy: Advancing the Frontiers of Astronomy in Mauritania

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Figures 1 and 2: AstroCamp for Girls in Science (Photo Credit: Mohamed Elhassan Abdellah, Ahmed Bowba Sidi, Ely Cheikh Mohamed Navee, Ahmedou Mahmoud Senhoury, Ely Cheikh Mohamed Navee, Mohamed Elhassan Abdellah; AMA)

The Mauritanian Association of Astronomy (AMA) was established in July 2019 by a coalition of scholars, professionals, and passionate amateurs united by their shared dedication to meteoritics, impact craters, astrophysics, and astronomy. This multidisciplinary ensemble represents a cornerstone for the advancement of astronomical sciences in Mauritania. As a proud affiliate of the International Astronomical Union (IAU) Office for Astronomy Outreach, the African Astronomical Society (AfAS), and the Arab Union for Astronomy and Space Sciences (AUASS), AMA leverages its global and regional networks to bolster its mission. Through these partnerships, the association aims to enhance the integration of astronomy into education and scientific research in Mauritania.

Key Milestones along AMA's Development

In 2020, amid the global challenges posed by the pandemic, AMA demonstrated resilience by transitioning to virtual platforms, maintaining engagement through a series of online events and educational initiatives. The next year, AMA organized the conference titled "On The Moon Again" during July 17–18 in Nouakchott. This landmark event brought together enthusiasts and scholars to explore the significance of lunar studies and celebrate advances in moon exploration. During 2022–2023, efforts were dedicated to strengthening local outreach. The University of Nouakchott hosted a series of astronomy workshops to inspire a new generation of astronomers as well as the prestigious NASE (Network for Astronomy School Education) program from July 1–8, 2023, offering comprehensive training in astronomy education. (learn more here.)

Last year witnessed a flurry of impactful initiatives. AMA launched the transformative initiative "AstroCamp for Girls in Science," held during Oct. 9–11 in Atar. Supported by SSVI, IAU, and AMA, the initiative sought to inspire young women to pursue careers in science and technology (learn more here). The inaugural edition of the International Conference on Meteoritics and Astronomy (ICMAN) was held in Nouakchott. It welcomed participants from eight countries, fostering cross-border collaboration and establishing Mauritania as a hub for astronomical research. These included (Morocco, Saudi Arabia, France, Syria, Cameroon, Palestine, Senegal, and Mauritania). In alignment with AUASS World Space Week 2024, AMA actively participated in nationwide celebrations. During the event, Sidi Ahmed Bowba, Vice Secretary General of AMA, delivered a keynote lecture emphasizing the transformative impact of space science. Our team conducted a guided visit to the meteorite impact crater Aouelloul in the Atar region.

Vision for the Future

AMA envisions a future where astronomy thrives as a cornerstone of Mauritania's scientific and educational landscape. Key aspirations include:

- Embedding astronomy into the national education system, from primary schools to universities;
- Establishing a world-class astronomical observatory, facilitating cutting-edge research and fostering international collaborations; and
- Expanding partnerships with global organizations to further Mauritania's contributions to the global astronomical community.

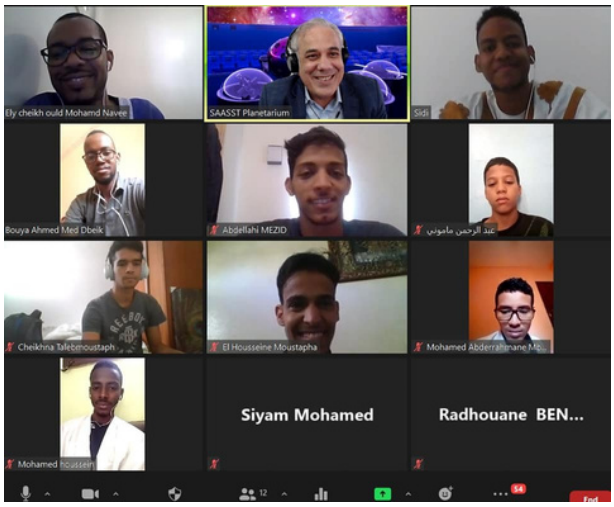

Figure 3: Navigating the COVID-19 Pandemic. (Photo Credit: Mohamed Elhassan Abdellah, Ahmed Bowba Sidi, Ely Cheikh Mohamed Navee, Ahmedou Mahmoud Senhoury, Ely Cheikh Mohamed Navee, Mohamed Elhassan Abdellah; AMA)

These efforts would not have been possible without the help of the following bodies, which the authors thank: the University of Nouakchott, Mauritanian Airlines, Nouakchott Region, National Agency for Geological Research, and Mineral Property (ANARPAM), as well as the mayor of Atar. Through unwavering commitment to scientific advancement and active collaboration with leading international organizations, the Mauritanian Association of Astronomy (AMA) continues to inspire curiosity, nurture talent, and position Mauritania as a beacon of astronomical excellence in the region.

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Astronomy for Development: The Work of the IAU OAD

Figure 1: United Nations Sustainable Development Goals with notes indicating some goals addressed through OAD initiatives. (Photo Credit: Office of Astronomy for Development)

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The Office of Astronomy for Development (OAD) is a joint project of the International Astronomical Union (IAU) and the South African National Research Foundation (NRF), supported by the Department of Science, Technology, and Innovation (DSTI). Established in 2011, the OAD aims to use astronomy and its resources—such as skills, technology, and infrastructure—as tools to promote sustainable development and address societal challenges on a global scale.

Basic sciences play a critical role in achieving sustainable development; however, this is not always straightforward to demonstrate. Astronomy uniquely contributes to sustainable development through its interdisciplinary nature, technological advancements, and cultural significance. As a field deeply intertwined with physics, chemistry, and engineering, astronomy fosters innovation in areas such as electronics, optics, and software development. It also serves as a gateway to Science, Technology, Engineering, and Mathematics (STEM) education, inspiring curiosity and critical thinking across diverse communities.

It is not always immediately obvious how the tools, methods, and content of astronomy align with the United Nations (UN) Sustainable Development Goals (SDGs) [1]. However, over the years, the OAD has ensured that its work aligns with these goals. Figure 1 shows the UN's SDGs with notes indicating some goals addressed through OAD initiatives [2]. To maximize its global impact, the

OAD has established 11 Regional Offices (ROADs) and Language Centres (LOADs) worldwide, each tailored to specific regional, cultural, or linguistic needs. With the support of these ROADs and LOADs, the OAD strategically funds and coordinates projects through its annual call for proposals, focusing on using astronomy to address sustainable development challenges.

The OAD Annual Call for Proposals

The OAD releases an annual call for proposals to support projects that use astronomy, space science, and related topics to tackle challenges in communities and regions, thereby fostering sustainable development and societal well-being. Thirteen calls have been successfully conducted to date. The call is intended for small to medium-sized projects, offering a modest grant to help them get started. To ensure sustainability, projects are encouraged to seek additional funding from local institutions and international bodies alongside the grant received from the OAD.

To date, the OAD has supported 236 projects in 112 countries across five continents, with a total of 1.4 million euros allocated to these initiatives. In 2025, the OAD will support 14 astronomy-for-development projects worldwide, targeting countries in Asia, Europe, South America, Africa, Australia, North America, the Caribbean, and the Middle East. Figure 2 shows a geographical distribution of the projects funded by the OAD through the annual call for proposals and its regional offices and language centers.

Figure 2: Geographical distribution of the projects funded by the OAD through the annual call for proposals and its regional offices and language centres. (Photo Credit: Office of Astronomy for Development)

Astronomy for Development in Africa [3]

Of the 11 regional offices of the OAD, three are based on the African continent: Ethiopia for the East African Region, Zambia for the Southern African Region, and Nigeria for the West African Region. These offices support the countries in their respective regions by overseeing funded projects or carrying out their own astronomy-for-development initiatives. A summary of an impact report [4] covering the period from 2013 to 2020 indicates that the majority of funded projects are located within Africa, with 39% in Sub-Saharan Africa. The largest investment of OAD annual grant initiatives is in Africa, constituting over 380,000 euros in more than 20 African countries. These projects address education, gender equity, economic growth, and social inclusion.

The OAD Flagship Projects

Based on past project experiences, input from regional offices, consultations with development professionals, and an analysis of international trends related to the UN SDGs, the OAD has identified key "themes" under which funded and flagship projects are categorized. Currently, the OAD focuses on three flagship projects:

Flagship Project 1: Astrotourism

The first flagship project, "Astrotourism," falls under the theme "Astronomy for Socio-Economic Development." This initiative leverages astronomical facilities such as observatories and planetariums to stimulate socio-economic benefits for local communities in dark-sky regions. The OAD has developed resources for rural communities, observatory-adjacent communities, and tourism businesses to help them incorporate nighttime activities into their offerings.

Flagship Project 2: Astronomy for Mental Health

The second flagship project, "Astronomy for Mental Health," aims to harness the inspirational potential of astronomy to improve mental well-being. Pilot projects have included writing retreats in remote dark-sky areas, online workshops for students, and art therapy incorporating astronomy concepts.

Flagship Project 3: Hack4Dev

The third flagship project, "Hack4Dev," falls under the theme "Astronomy Knowledge and Skills Development." This initiative leverages skills used in astronomy, such as programming, data handling, data analysis, and machine learning, to advance development objectives. The Hack4Dev initiative is a collaboration with the African Astronomical Society, the Inter-University Institute for Data Intensive Astronomy, Ilifu Cloud Computing, and Development in Astronomy DARA Big Data.

The next call for proposals will be released in April, with the application deadline set for May 31, 2025. This call is open to anyone from any country and any field. There are various opportunities to become involved with the OAD, either by volunteering at the OAD office or regional offices or by reaching out to discuss ideas on how astronomy can be used for development. For more information, email the OAD at info@astro4dev.org or visit www.astro4dev.org.

References:
[1] United Nations Sustainable Development Goals https://sdgs.un.org/goals
[2] What is "Astronomy for Development" https://astro4dev.org/what-is-astronomy-for-development/
[3] The potential of astronomy for socioeconomic development in Africa https://doi.org/10.1038/s41550-018-0524-y
[4] Impact of OAD projects https://astro4dev.org/projects-impact/

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A Stimulating Moroccan-Turkish Scientific Project in the Photovoltaic Area

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Figure 1: Professor H. El Ghazi from Morocco and Professor Y.E. Ramazane from Turkey with the Vice-President of the Erbakan University in Konya, Turkey. (Photo Credit: Haddou El Ghazi)

Fossil energy usage for industrial activities and transport contributes to the warming of the planet. Windmills and photovoltaic solar cells are two examples of renewable energy solutions that are ideal for windy or sunny areas. To speed up their progress, emerging countries must expand their terrestrial and spatial influence areas (space, desert, sea, mountains, and so on). These nations are continually increasing their spending in research and development activities, targeting specific areas depending on the available man-power and economic resources.

In addition, efforts are devoted to sharpening technical skills, sharing knowledge and technologies beyond national boundaries, and promoting international cooperation. In this context, a Moroccan-Turkish scientific project aims to prepare p-i-n solar cells [1] in a complementary collaboration between researchers from both countries at the theoretical and experimental levels. Moroccan researchers at ENSAM CASA (Ecole Nationale Supérieure des Arts et Métiers Casablanca) contribute their expertise in modeling and simulating physical events within photovoltaic solar cells while Turkish scientists at BİTAM (Research and Application Center of Science and Technology) develop optoelectronic devices employing thin film technology to produce third-generation solar cells, which are yet not widely marketed.

"Nitride-based solar cells are very stable in hostile settings such as temperature, corrosion, and mechanical stress, making them suitable for producing sustainable energy under extreme conditions [2-7]."

Taking Advantage of the Predictive Power of Theory

The goal of this research is to develop a p-i-n based solar structure (p-GaN/InxGa1-xN/n-GaN) for wide-ranging application situations. A gradual increase of Indium (In) composition in the InxGa1-xN intrinsic layer causes absorption over a broad portion of the solar spectrum because the band gap energy changes along the layer. Modeling and simulation are, therefore, essential as they offer the possibility of computing and designing different cells and, hence, allow rational design. Furthermore, the standard thin film methods known in the literature are costly and difficult to implement for the commercialization of InGaN-based solar cells. To lower the cost of cell preparation, the Turkish and Moroccan teams work together to resolve this issue:

- After the Turkish team shares the first photovoltaic measurement findings, the Moroccan team will use these data as input parameters to develop models.
- The Moroccan team will perform numerical simulations, including a larger set of input parameters to identify or predict the optimal models.
- The Turkish team will utilize this knowledge to make a final photovoltaic device that will be tested in a vacuum at temperatures between 77 K and 500 K to simulate space and desert conditions.

Experimental Procedure

The collaboration initially created clean GaN, Mg-doped GaN, Si-doped GaN, and InxGa1-xN layers on glass and sapphire substrates. The properties of single-layer films are determined using Grazing Incident X-Ray Diffraction (GIXRD), Raman spectroscopy, Fourier Transform InfraRed Spectroscopy (FTIR), film thickness measurement, Hall effect measurement, Field Emission Scanning Electron Microscopy/Energy-Dispersive X-ray Spectroscopy (FE-SEM/EDS), Optical Profilometry, and UV-Vis-NIR (UV-Visible-Near Infrared) spectroscopy.

The link between preparation parameters (e.g., concentration, heating, and time) and film qualities are identified so that each layer is produced in accordance with theoretical suggestions.

Expected Impact

This initiative addresses the requirement for many strategic goals recently established by the Moroccan and Turkish governments. Nitride-based solar cells are very stable in hostile settings such as temperature, corrosion, and mechanical stress, making them suitable for producing sustainable energy under extreme conditions [2-7]. The know-how gained through this project will support the Turkish government's space and Antarctic programs, as well as the Moroccan government's development of power plants in the Sahara Desert and desalination plants on the Atlantic Ocean shoreline, thereby accelerating the energy and economic transition to a depolluted model.

A Parallel Opportunity for Capacity Building

Furthermore, each group shares its knowledge and scientific expertise through two training sessions and two workshops scheduled in each nation throughout the project's lifespan. Post-graduate students and scientists from local universities will also be welcomed to these meetings. As a result, this relationship will provide a chance to stimulate and teach young researchers while also expanding the expertise of proven scientists. By the end of this project, the current Technology Readiness Level (TRL) of such InGaN-based photovoltaic cells is predicted to have improved from TRL3 to TRL4. TRL is the scale used to assess the technological maturity of an innovation before its operational implementation. Furthermore, more comprehensive work will be planned to accomplish TRL7 in the future, specifically the construction of an integrated pilot system.

References:

[1] Thin-film solar cell, https://en.wikipedia.org/wiki/Thin-film_solar_cell (see section on Amorphous silicon)

[2] A.E. Görmez, M.A. Basyooni, S.E. Zaki, Y.R. Eker, E. Sönmez, M. Yılmaz, Effect of in-/ex-situ annealing temperature on the optical, structural and gas sensing dynamics of CdS nanostructured thin films, Superlattices Microstruct. 142 (2020) 106536. https://doi.org/10.1016/j.spmi.2020.106536

[3] H. Abboudi, H. El Ghazi, A. Jorio, I. Zorkani, Impurity-related photovoltaic efficiency of (In,Ga)N/GaN quantum well-single intermediate band solar cell considering heavy hole impact, Superlattices Microstruct. 150 (2021) https://doi.org/10.1016/j.spmi.2020.106756

[4] H. El Ghazi, Numerical investigation of one-intermediate band InN/GaN QW solar cell under electric field, impurity and size effects, Phys. B Condens. Matter. 602 (2021) https://doi.org/10.1016/j.physb.2020.412427

[5] R. En-nadir, H. El Ghazi, W. Belaid, A. Jorio, I. Zorkani, Intraconduction band-related optical absorption in coupled (In,Ga)N/GaN double parabolic quantum wells under temperature, coupling and composition effects, Results Opt. 5 (2021) 100154 https://doi.org/10.1016/j.rio.2021.100154

[6]. M.A. Basyooni, Y.R. Eker, M. Yilmaz, Structural, optical, electrical and room temperature gas sensing characterizations of spin coated multilayer cobalt-doped tin oxide thin films, Superlattices Microstruct. 140 (2020) 106465. https://doi.org/10.1016/j.spmi.2020.106465

[7] M.A. Basyooni, S.E. Zaki, M. Shaban, Y.R. Eker, M. Yilmaz, Efficient $MoWO_3/VO_2/MoS_2$/Si UV Schottky photodetectors; MoS_2 optimization and monoclinic VO_2 surface modifications, Sci. Rep. 10 (2020) 1–18. https://doi.org/10.1038/s41598-020-72990-9

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EGYPlasma Schools: Empowering the Next Generation of Plasma Physicists

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The field of plasma physics is one of the most exciting and rapidly developing areas of scientific research, with applications ranging from energy generation to space exploration. In Egypt, a key figure advancing this field is Professor Waleed Moslem, whose dedication and leadership have significantly contributed to the growth of plasma science through the Egyptian Plasma Society (EGYPlasma) initiative. EGYPlasma is a specialized program focused on nurturing the field of plasma physics in Egypt and across the African continent. Since its inception, the initiative has been pivotal in providing high-quality education, research opportunities, and collaborative platforms for students, researchers, and professionals interested in plasma physics.

Figure 1: Participants in the 5th Basics of Plasma Physics Summer Course holding their attendance certificates with lecturers. (Photo Credit: EGYPlasma)

Professor Moslem has been at the forefront of EGYPlasma's efforts. With a deep commitment to education and research, he has played a crucial role in organizing and leading numerous schools, workshops, and conferences under the EGYPlasma banner. His vision is to build a vibrant and self-sustaining plasma physics community in Africa that can contribute to global scientific advancements.

One of EGYPlasma's flagship activities is the annual Spring Plasma School at Port Said (SPSP), which brings together students, early-career researchers, and seasoned experts from around the world. The EGYPlasma schools, held each year in Port Said, Egypt, target BSc and MSc students interested in plasma physics and its applications. These schools offer a week of intensive lectures, hands-on computational tutorials, and problem-solving sessions. Participants also have the chance to explore the beautiful city of Port Said, which overlooks the Suez Canal and the Mediterranean Sea [1].

"A key aspect of EGYPlasma's mission is to build a strong and inclusive community of plasma physicists in Africa."

Figure 2: Participants in the 4th Basics of Plasma Physics Summer Course with lecturers. (Photo Credit: EGYPlasma)

Participants benefit from lectures, hands-on experiments, and interactive sessions designed to deepen their understanding of plasma phenomena and their applications. The EGYPlasma School is not just a learning experience but also a networking platform, enabling participants to build connections with peers and experts, fostering future collaborations. The curriculum of the EGYPlasma Schools covers a wide range of topics, including the basics of plasma physics, space plasma, experimental plasma, plasma etching, and plasma approximation. The schools also include a one-day conference where MSc students, Ph.D. candidates, and postdocs can present their research and receive valuable feedback from peers and experts.

Over the past five years (2020-2024), SPSP has accepted 311 applicants out of 714. Participants have come from around 17 Egyptian universities. Additionally, SPSP hosts a select number of international students annually from neighboring countries such as Sudan, Algeria, Syria, Yemen, and Iraq.

Alongside the Spring School, EGYPlasma offers an intensive summer course on the fundamentals of plasma physics for senior undergraduate and junior graduate students. This course, first offered in 2019, has seen around 120 students participate in its last three editions.

In 2025, EGYPlasma will celebrate the 10th SPSP by launching an advanced summer course in plasma physics, designed for graduate students and early-career researchers. This course will cover a broad range of research techniques in theoretical plasma physics as well as the numerical methods commonly used in the field.

A key aspect of EGYPlasma's mission is to build a strong and inclusive community of plasma physicists in Africa. Professor Moslem has been instrumental in fostering partnerships with international institutions and research centers, ensuring that African scientists have access to the latest resources and opportunities in the field. Looking ahead, EGYPlasma aims to expand its reach by introducing new programs and initiatives that cater to the evolving needs of the scientific community. This includes online courses, regional workshops, and collaborative research projects that address pressing scientific challenges.

The EGYPlasma initiative represents a significant step forward in the development of plasma physics in Africa. Through its schools, workshops, and conferences, EGYPlasma is not only enhancing participants' knowledge and skills but is also contributing to the global advancement of plasma science. As EGYPlasma continues to grow, it will undoubtedly play a crucial role in shaping the future of plasma research and education across the continent.

Reference:

[1] International Centre for Theoretical Physics – East African Institute for Fundamental Research https://www.egyplasma.com/school/

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The African School of Electronic Structure Methods 2025: An expanded school

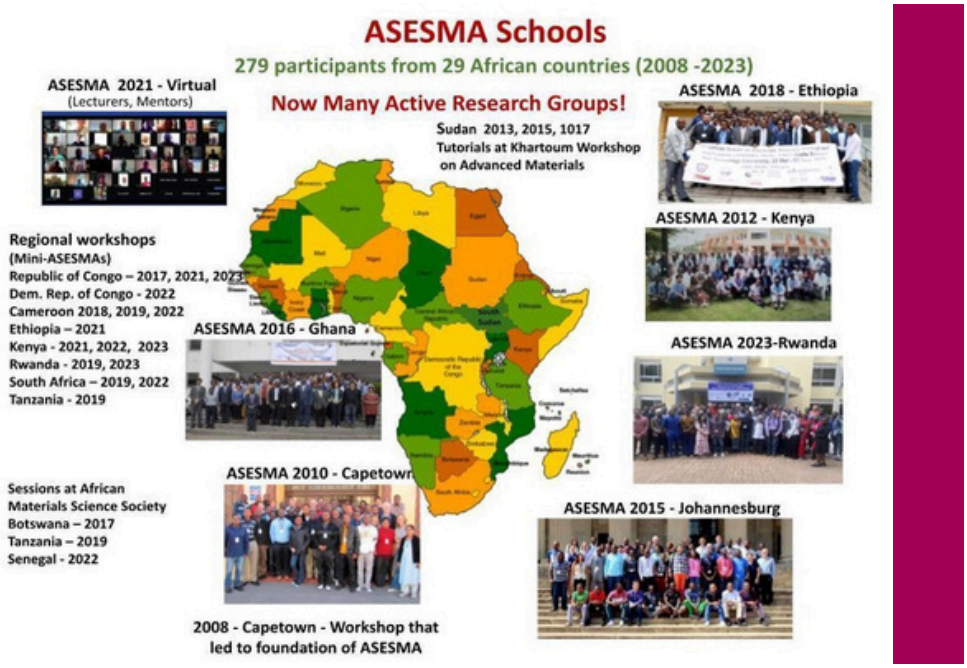

Figure 1: ASESMA in images and numbers. (Photo Credit: The Authors)

The 2025 edition of the African School for Electronic Structure Methods and Applications (ASESMA) will be different from the previous schools in the series, with an on-line "preschool" similar to one which was held online at the end of last February, preceding the main school taking place in Accra, Ghana on June 9-20, 2025. The online lectures and question-and-answer sessions were designed to open more opportunities for students and young researchers to learn about the field, and to help prepare the new participants for the main school (see recordings at https://www.asesma.org). The school in June will be in-person, and will follow the format of previous schools with lectures, hands-on tutorials, and projects, with the difference that there can be a greater range of topics and more in-depth projects. The new approach is possible because of a growing number of active researchers, and is meant to strengthen the research networks with an expanded long-term vision for research in Africa.

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"Materials science is an important discipline for development in Africa because of the region's rich reserves of mineral resources, energy potential, and unparalleled biodiversity."

Background

ASESMA is an on-going series of schools started in 2008 and held in different African countries every two years. The result of this long-term effort is an active research community in the field of atomistic simulations and computational materials science. It has built a collaborative network of scientists inside Africa and with the other scientists across the globe. The schools are focused on the fundamental understanding of materials at the atomic scale. It therefore brings together scientists in physics, chemistry, materials science, and other fields. The topics of the schools are methods that are widely used throughout the global science community, and they evolve to keep up with new advances. This provides a foundation for collaboration across different disciplines at a college or university, building networks among scientists across Africa, and collaboration with the global science community.

Materials science is an important discipline for development in Africa because of the region's rich reserves of mineral resources, energy potential, and unparalleled biodiversity. The advancement of materials science in Africa offers promising opportunities for economic growth and the cultivation of skilled individuals. The field is a key area for technological advancement and is an essential part of education for the future of the continent. There are numerous successful materials science initiatives underway on the continent that deserve broader international recognition and the encouragement of global collaborations. ASESMA is playing an important role in these efforts by developing knowledge and experience in computational materials science and electronic structure simulation methods, which are fundamental for understanding and for practical applications from the conversion and storage of energy, through environmental remediation (e.g., water treatment), to catalysis and biochemistry. This research is therefore linked to pressing issues for the whole African continent, like those of securing sustainable sources of energy, clean water, food, efficient exploitation of natural resources, and development of drugs against diseases, many of which are specific to the continent.

The ASESMA schools combine lectures with hands-on computational experience and projects with scientists at the schools. Participants are selected from across the continent through a competitive process, and the lecturers and mentors are outstanding scientists from across the world, with more and more African scientists assuming responsibilities as the expertise increases within Africa. In order to grow the field and develop networks, about half of the participants in each school are new to the field while the other half are experienced participants, who serve as tutors, expanding their knowledge and building connections. ASESMA was endorsed by the International Union of Pure and Applied Physics (IUPAP) as a series initially for ten years (2010-2020) and has since then been renewed for a second decade (2020-2030). Success in building up a network is possible only because of long-term support by the Abdus Salam International Centre for Theoretical Physics (ICTP), IUPAP, the U.S. National Academy of Sciences, the U.S. National Science Foundation, the European Centre Européen de Calcul Atomique et Moléculaire (CECAM), the Swiss National Centres of Competence in Research (NCCR-MARVEL), the Thomas Young Centre, and others. For more information, see https://www.asesma.org/.

The success of ASESMA has led to new activities, including many smaller regional schools focused on particular topics. The network of scientists is enhanced by ASESMANET, which aims to promote scientific exchange and collaboration through scientific exchanges within Africa and between Africa and Europe, including also support for attending international conferences. Since 2019, this network has supported 24 intra-Africa research visits, nine Africa-Europe research visits, and the participation of nine scientists in meetings in Europe. These contributions highlight the network's crucial role in advancing its goals by fostering collaboration among scientists across African countries and building strong connections with research groups around the world. There will be a call for participation in Psi-k and CECAM activities and research visits in 2025. See links to ASESMANET at https://www.asesma.org/.

The 2025 edition will build on the previous schools while adding a broader range of topics and new aspects designed to make it easier for new people to participate and for active people in the field to become more effectively involved in advanced activities. The main school will be organized to first go over the basic topics. Because many topics were covered in the preschool, it will be possible to move more quickly into the theory and computational methods for electronic structure. Small groups working on carefully planned projects will provide experience in areas of current research. The goal is for all participants to have sufficient experience to be able to do calculations with the understanding of what is being done, so they can join the community and begin to contribute effectively. At the same time, experienced participants will be able to start more quickly in advanced topics that will lead up to advanced projects. The goal is for there to be time during the two-week school to make solid progress on a project that may continue after the school concludes.

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Advancing Physics in Nigeria, Africa: Abeokuta Hosts International Training to Empower Young Physicists

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Figure 1: Participants at the school. (Photo Credit: The Author)

Physicists in Nigeria have seized enriching training opportunities following the postponement of the 2014 African School for Electronic Structure Methods and Applications (ASESMA) workshop scheduled to take place in Abuja, Nigeria. The Federal University of Agriculture, Abeokuta (FUNAAB), has since hosted two international training programs for theoretical physicists. The first workshop, "Advanced School on Applications of First-Principles and Molecular Simulations in Physical Sciences," took place in February 2018, led by professor Gboyega Augustine Adebayo and professor Peter Kratzer. The second training, "Joint ICTP-IAEA-FUNAAB Sub-Saharan Africa School on Applications of Monte Carlo and Molecular Dynamics Simulations in Radiation and Health Physics," held June 5-9, 2024, focused on theoretical studies for medical and biophysicists. ICTP is the Abdus Salam International Centre for Theoretical Physics, and IAEA is the International Atomic Energy Agency. While professor G. A. Adebayo played a pivotal role in both events, with his leadership and vision instrumental to their success, key organizers Dr. Paul O. Adebambo, professor Itunu C. Okeyode and professor Amidu O. Mustapha also made significant contributions. Through their combined efforts, they ensured the success of the ICTP-IAEA-FUNAAB program.

Joy Adeyiga and Femi Dansu (from FUNAAB) report that during the ICTP-IAEA-FUNAAB school's opening ceremony on June 24, the Vice-Chancellor Professor Babatunde Kehinde emphasized the need to sustain knowledge and skills through post-school mentorship, research collaboration, and student and staff exchanges among participating institutions. Professor Kehinde commended the organizers for bringing the scientific program to FUNAAB and highlighted the university's contributions to research and development. He expressed gratitude to ICTP for its financial support, noting that young theoretical physicists from developing countries can now pursue careers without leaving their home countries. He also acknowledged the symbolic coincidence of hosting the school alongside the 60th anniversary of ICTP, affirming the Centre's dedication to extending research skills to scientists in developing countries. He wished participants successful engagements and encouraged them to enjoy FUNAAB's environment.

After the ICTP-IAEA-FUNAAB event, professor Adebayo, who was instrumental in organizing both workshops in Nigeria, shared his thoughts below on the significance of these training initiatives and the prospects for theoretical physics in Africa in light of these accomplishments.

How do you foresee the impact of these training programs on the development of theoretical physicists in Nigeria and Africa?
Adebayo: "In the activity, we were able to bring together over 65 participants—virtual and in-person—from across Africa, including 26 from Nigeria. This is an impressively large number of foreign participants for a scientific activity in Nigeria. Although the limited funds we had would only have catered for the participation of four foreign participants, the wise decision of the organizers to accept many foreign participants' virtual participation through Zoom meeting provided expanded access.

The impact of the training school will be felt not only by young theoretical physicists, but also by those in radiation and health physics, as the programs' topics were points of convergence between computational condensed matter physics and radiation and health physics. At the end of the activity, research groups were formed by the participants to carry out small projects, with the potential to culminate into long-term research problem-solving partnerships.

In terms of the growing need for local training, I believe the way to go is a hybrid mode of participation as this will allow participants and speakers to engage fully from any part of the world. However, the immediate problems for virtual mode are the very things our counterparts in Europe and other developed countries are taking for granted, namely, electricity and internet access. In Nigeria, for example, the organizers invested huge amounts to provide uninterrupted power supply throughout the event. Additionally, the prevailing slow internet connectivity is an immediate problem for organizing workshops, meetings and training schools virtually, which has to be mitigated at very high cost."

Given the emphasis on sustaining knowledge and skills through mentorship, research collaboration, and exchanges, as highlighted by Vice-Chancellor Professor Kehinde, what strategies do you recommend to ensure the long-term success and continuation of these training initiatives?
Adebayo: "African Scientists have to form research clusters across nations to remove border lines, leading to greater collaborations amongst Africans to develop the continent. Also, the training of young ones must be transnational, not just concentrated in a country. In this regard, it is anticipated that the strategy of forming long-term research problems solving groups should help."

In conclusion, the Joint ICTP-IAEA-FUNAAB School has been pivotal in advancing physics in Africa. With the support of ICTP and IAEA, the initiative emphasizes sustainability through mentorship, collaboration, and exchanges. FUNAAB continues to play a vital role in fostering scientific growth, providing young physicists opportunities to pursue world-class careers locally.

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Defining the Next Decade of Fundamental and Applied Physics in Africa

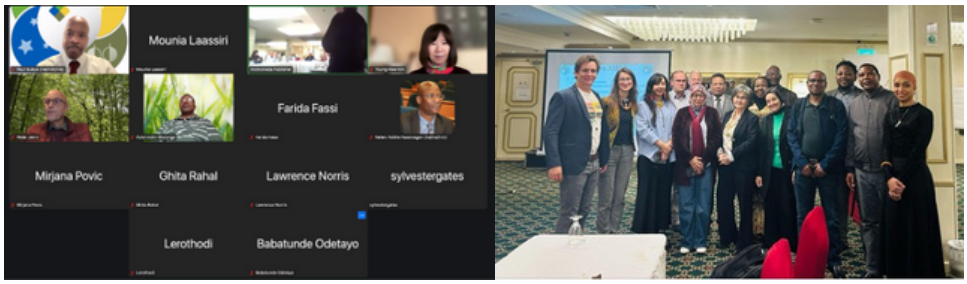

Figure 1: Participants of the ASFAP—towards the final report meeting, joining both in person and online. (Photo Credit: Mounia Laassiri)

In 2019, African physicists began preparing a new community study for the African Strategy for Fundamental and Applied Physics (ASFAP) [1] for 2025–2035 and beyond. The Steering Committee of the African Strategy launched ASFAP on November 18, 2020, during an online workshop organized jointly by the African Physical Society, AfPS, and the African Light Source, AfLS [2]. This was followed by a Community Town Hall in July 2021 [3]. For the first time, the ASFAP community met in person at the "ASFAP—towards the final report" meeting [4], which took place from December 15-17, 2024. More than 20 physicists gathered in person in Cairo, Egypt, while another 10 to 15 from Africa, Europe, and the United States joined online.

The ASFAP process is a scientific study that brings together the entire African fundamental and applied physics community to identify and document a scientific vision for the future of physics in Africa, in collaboration with its international partners. The initiative is organized into four thematic areas central to ASFAP's mission: societal engagements, cross-cutting fields, particles and related applications, and light sources and applications. The three-day engagement was instrumental in fostering deeper connections and facilitating more dynamic and meaningful discussions. During the course of three intensive days, participants collaboratively reviewed the ASFAP draft report, providing constructive feedback aimed at elevating the quality of these contributions to the highest scientific standards. This shared endeavor underscored the importance of collective ownership and dedication to achieving outcomes that resonate globally while addressing Africa's unique needs in education, science, and technological development through physics.

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"The ASFAP process is a scientific study that brings together the entire African fundamental and applied physics community to identify and document a scientific vision for the future of physics in Africa, in collaboration with its international partners."

As ASFAP progresses, the insights and outcomes from the "ASFAP—towards the final report" meeting will serve as a cornerstone for future initiatives. The commitment to integrating feedback and upholding high publication standards reflects a determination to position ASFAP as a leading voice in the global scientific community. The emphasis on themes such as societal engagement and interdisciplinary collaboration ensures that ASFAP's work remains relevant and impactful. The meeting also reinforced the importance of building capacity and infrastructure to support physics research in Africa. By fostering talent, enhancing collaboration, and advocating for strategic investments, ASFAP aims to create a vibrant and sustainable research ecosystem that drives innovation and addresses societal needs.

The work done during the meeting serves as a basis for progressing toward the ASFAP final strategy report, expected to be ready for a symposium planned at the University of Lomé, Togo, for September 22-25, 2025. At the symposium, the report will be presented to the international community for input. The United Nations Educational, Scientific and Cultural Organization (UNESCO), the main sponsor of ASFAP, aims to distribute the report to its member states to serve as a basis for engaging African policymakers in physics research and education. Strategies for implementing key recommendations of the ASFAP report may then be explored.

Thank you to UNESCO, the American Physical Society (APS), the Istituto Nazionale di Fisica Nucleare (INFN), Centre national de la recherche scientifique (CNRS), University of Pennsylvania - Penn Medicine, Brookhaven National Laboratory (BNL), and professor Young-Kee Kim. Their support ensured that this event was both productive and memorable.

References:

[1] The African Strategy of Fundamental and Applied Physics, https://africanphysicsstrategy.org/
[2] AfLS2020 Virtual Workshop, http://events.saip.org.za/event/afls2020
[3] ASFAP Community Town Hall, https://indico.cern.ch/event/1039315/
[4] ASFAP—towards the final report, https://indico.cern.ch/event/1464802

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NITHeCS: An extraordinary Centre of Excellence

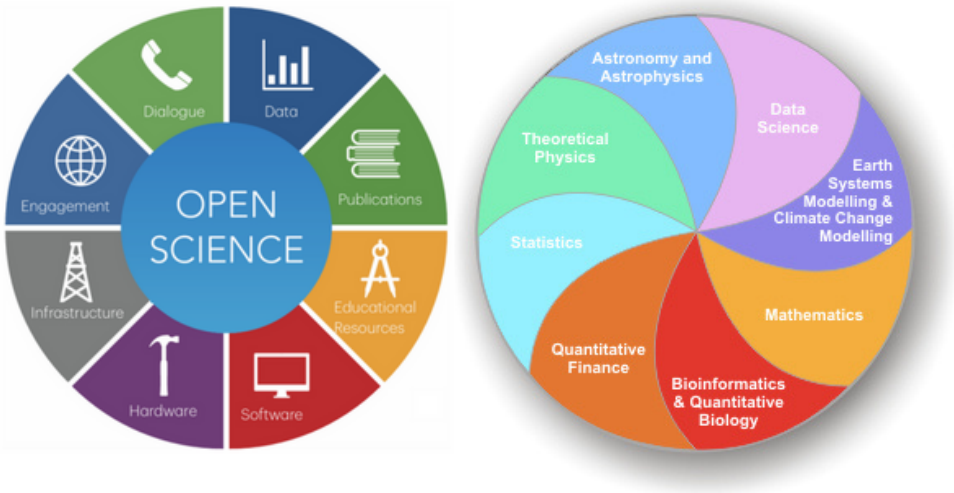

Figure 1 Photo Credit: NITheCS

First, the basics: The National Institute for Theoretical and Computational Sciences (NITheCS) in South Africa was formally launched on April 1, 2024, and was built on the foundation of its predecessor, the National Institute for Theoretical Physics (NITheP). It serves as a Centre of Excellence under the National Research Foundation (NRF), an entity of the Department of Science, Technology and Innovation of South Africa. The NITheCS Consortium comprises 26 South African universities and the African Institute for Mathematical Sciences (AIMS). While the headquarters of NITheCS resides at Stellenbosch University, the institute also has five coordinating nodes at Nelson Mandela University, North-West University, the University of Cape Town, the University of KwaZulu-Natal, and the University of the Witwatersrand. NITheCS is funded by the Department of Science, Technology and Innovation (DSTI) through the National Research Foundation (NRF). The NITheCS executive management committee is supported by a scientific advisory board.

Now, let me expand on our aims and approaches. The fast pace of development in virtually all areas of human activity demands collaboration and mutual support as backbones of scientific progress. The tentacles of science stretch around the globe – therefore, the overarching aim of the NITheCS is to be a leading African institute for theoretical and computational sciences. Its mission is to position South Africa at the forefront of global technological advancements while

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"We are committed to enhancing transparency, fostering innovation, and ensuring that research benefits both science and society."

Figure 2 Photo Credit: NITheCS

building competencies for the future through research, training, and engagement across eight scientific disciplines: astronomy and astrophysics, bioinformatics and quantitative biology, data science, earth systems and climate change modeling, mathematics, quantitative finance, statistics, and theoretical physics.

Our programs and events reflect our approach as a multidisciplinary and multi-themed institute that thrives on collaboration. We organize an abundant number of scientific activities throughout the year and offer a bursary scheme for postgraduate studies. We are particularly proud of our network of 20 Institutional Associates and more than 300 Individual Associates, all who hold PhDs and are instrumental in many of our activities. Among others, they conduct research under specific research focus areas, while sharing knowledge and insights through colloquiums, mini-schools, micro-schools, and other events. Associates make vital contributions in terms of collaborative work, mentoring students, and conducting outreach activities. Most of our events are presented both online and in person, which are also recorded and published on the NITheCS YouTube channel. This creates an accessible repository of knowledge for both local and global communities.

Still in line with our overall approach, many of our events are co-hosted by organizations whose activities align with ours, such as collaborating with the Centre for High-Performance Computing (CHPC) for the annual CHPC & NITheCS Coding Summer School.

Figure 3: Francesco Petruccione is the Director of NITHeCS. (Photo Credit: NITheCS)

Importantly, I am a proponent of the concept of 'pan-disciplinarity.' While the interdisciplinary and transdisciplinary approaches promote collaboration between different fields, they still operate within the framework of distinct disciplines. Pan-disciplinarity, on the other hand, dissolves these boundaries entirely because it views science not as a collection of separate disciplines, but as a unified whole, with the most pressing scientific and societal issues at its core.

NITheCS, therefore, champions open science as a core principle. We promote the inclusive sharing and accessibility of scientific knowledge that enables global collaboration and broad societal engagement in scientific processes. We are committed to enhancing transparency, fostering innovation, and ensuring that research benefits both science and society.

The importance of this approach of inclusiveness, pan-disciplinarity, collaboration, and open science becomes particularly evident during the International

Year of Quantum Science and Technology (IYQ) that is celebrated in 2025, as multiple disciplines share an interest in the current and future importance of this scientific topic. Our approach also addresses, for instance, the Sustainable Development Goals of the United Nations – something that requires the extraordinary efforts and cooperation of scientists, in conjunction with other influential groups from all over the world. Just recently, the year 2024 marked the 60th anniversary of the International Centre for Theoretical Physics (ICTP), with whom NITheCS has a formal memorandum of agreement supporting joint research, education, and visiting opportunities between the two bodies.

We communicate regularly with the NITheCS community through our website, newsletters, social media, and e-mail notices, while increasing these activities where needed and possible.

Currently, NITheCS remains in a period of strategic growth and consolidation, but our focus remains on strengthening our institute through operational excellence, robust governance, and expanded collaboration. We believe this will ensure that we maintain a thriving and sustainable network that allows all voices in our community to be heard, and pan-directional collaboration in science and research to flourish. By supporting local scientists and researchers, we are not only laying foundations for the science and technologies of tomorrow, but providing practical backing for the work already being done today.

Learn more about the NITheCS at https://nithecs.ac.za/.

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From the Hills of Southwestern Kenya to the Frontiers of Physics

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Figure 1: During DARA basic training at Ghana Radio Astronomy Observatory, Ghana, and a visit to Longonot, Kenya 2017/2018. (Photo Credit: The Author)

I am Annah Moraa Ondieki, born and raised in a lush and hilly region in southwestern Kenya. My journey in the field of physics has been a remarkable one, filled with incredible opportunities, beginning with a humble background and evolving into a pursuit of advanced research and mentorship. I am deeply honored to share my story with the hope of inspiring others and highlighting the importance of education and mentorship.

I grew up with a keen interest in the sciences and mathematics, which led me to Maseno University, where I pursued an undergraduate degree in science majoring in physics with mathematics as a minor. My dedication and passion for the subject were reflected in my academic performance, and in 2016 I graduated with a First Class Honours. However, my journey was far from over. With a burning desire to advance my studies in physics, I sought opportunities for sponsorship and further training.

Fortune smiled upon me when I was selected in 2017 for a sponsored basic training program in astronomy through the Development in Africa with Radio Astronomy (DARA) initiative, in collaboration with the Technical University of Kenya. This experience not only deepened my knowledge of space exploration, but also opened new avenues for my academic and professional growth. This encouraged me to apply for a Master of Science degree in physics at the University of Nairobi (UoN), but I could not enroll due to financial constraints. Fortunately, my desire to pursue a master's degree at the UoN was fulfilled when I secured a scholarship opportunity sponsored by the Swedish International Development Cooperation Agency (SIDA) through the International Science Program (ISP) of Uppsala University in Sweden.

"Fortune smiled upon me when I was selected in 2017 for a sponsored basic training program in astronomy through the Development in Africa with Radio Astronomy (DARA) initiative, in collaboration with the Technical University of Kenya. This experience not only deepened my knowledge of space exploration, but also opened new avenues for my academic and professional growth."

During my master's program, I specialized in laser physics and spectroscopy. My dedication and excellent performance in this field earned me another chance to pursue an ISP-sponsored PhD degree in the same area of specialization. I am now on track to graduate in September 2024 from UoN. In May 2024, I was privileged to showcase my work in the East Africa Summer School for Optics and Lasers at the Multimedia University of Kenya, in which I was honored to receive a best poster award in second place. As I near the completion of my Ph.D. program, my research interests have evolved toward vibrational spectroscopy, combined with optical imaging and machine learning for live cell disease diagnosis. This cutting-edge research holds promise for significant advancements in medical diagnostics and has become my primary focus.

Beyond my academic ambitions, I am driven by a deep desire to give back to the community that nurtured my early love for science. I am particularly passionate about mentoring the next generation of scientists, particularly young girls in physics, encouraging them to pursue careers in science, technology, engineering, and mathematics. For instance, I have had the privilege of working with high school students through the Elimisha Msichana Elimisha Jamii na Astronomia (EMEJA) initiative which was profoundly rewarding. Witnessing the enthusiasm and growth of these young girls reaffirms my belief in the transformative power of education and mentorship. By providing quality education and inspiring mentorship, we are not only empowering individual students, but also uplifting entire communities. I believe that with the right support and guidance, the next generation of female scientists can achieve incredible things, breaking down barriers and pushing the frontiers of knowledge. As I continue my research and mentorship endeavors, I am driven by a vision of a world where more girls and young women are inspired to pursue careers in science and technology.

In sharing my journey, I hope it serves as an inspiration to young women from similar backgrounds to pursue their dreams in the sciences. The road may be challenging, but with determination, passion, and the right opportunities, anything is possible.

Figure 2: Mentoring High School girls under the EMEJA program, June 2024 (left); Receiving the best poster award during East Africa Summer School for Optics and Lasers in May 2024 (right). (Photo Credit: The Author)

THE AFRICAN PHYSICS NEWSLETTER

The Academic Journey of Dr. Mounia Laassiri and the Impact on the African School of Physics

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As highlighted in the previous issue of APN (Citizens and Travelers: A Collection of African Scientists' Stories) this article seeks to share the journeys of African scientists who have overcome significant challenges to excel in their fields. Dr. Mounia Laassiri is one such scientist whose passion for nuclear physics was sparked during her high school years in Morocco. Despite societal pressures and limited resources, Dr. Lassiri's determination has led her to achieve remarkable success in the world of nuclear physics and computer science.

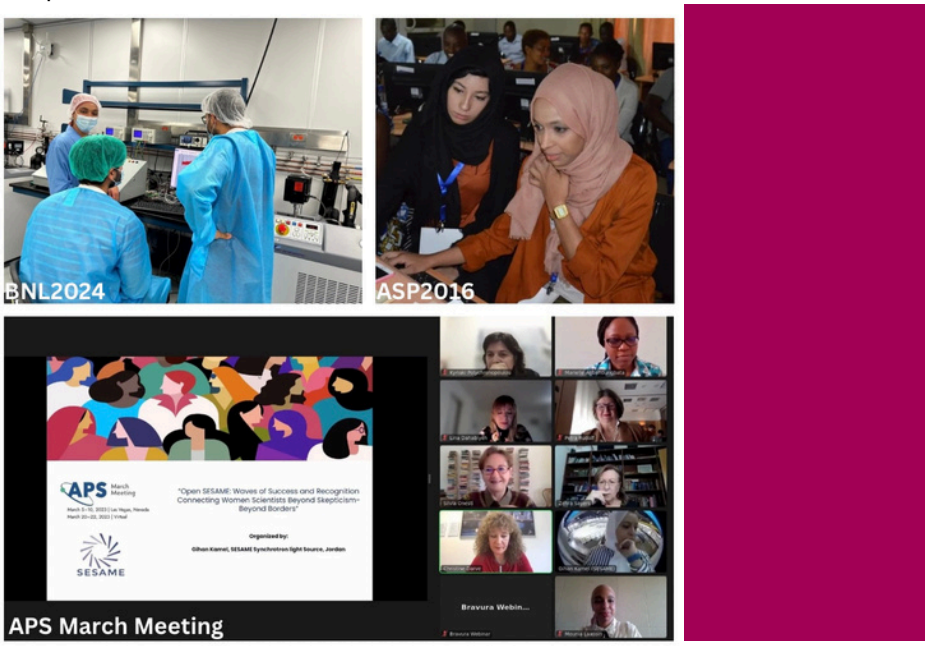

Figure 1: The Journey of Dr. Lassiri - A participant of the African School of Fundamental and Applied Physics (ASP2016), to becoming a postdoctoral scientist at the Brookhaven National Laboratory in 2024. (Photo Credit: Mounia Laassiri)

Paving Her Own Path to Discovery in Physics

Mounia was born in Morocco, where she grew up in a commuter town across the bridge from Rabat, the country's capital. As a child, she experienced a rich communal environment where the local kids didn't have ready-made toys. Instead, they used whatever they could find to create games and adventures. This was how she learned the value of community, a value deeply embedded in African philosophy through the concept of "Ubuntu," which means "I am because you are, and you are because I am." Being the first female child in a Moroccan family, Mounia was constantly faced with societal pressures, but wanted a life where she could contribute to her society in several ways – having a good personal life and making impacts in society both as a mentor and an academic.

"Mounia's academic journey wasn't always smooth, but her curiosity for science propelled her forward."

Figure 2: Dr. Laassiri's impact in the advancement of science in Africa through the African School of Fundamental and Applied Physics (ASP) Students' and High School Learners' Programs. (Photo Credit: ASP Photo Album)

Fueling Curiosity: From Classroom Challenges to a Career in Physics

Mounia's academic journey wasn't always smooth, but her curiosity for science propelled her forward. In primary school, her interest was initially in mathematics. However, it wasn't until secondary school that she developed a serious interest in physics. Her understanding of physics was limited at first; she thought it might be related to cars or mechanics, but as she dug deeper, she realized it was much more. Education in Morocco also presented some challenges. The teaching of physics was heavily theoretical, with little access to hands-on experiments due to lack of equipment. Despite this situation, Mounia's passion grew. She was one of the few students who chose to pursue the physical sciences track in high school, even convincing more than 80 classmates to follow suit just so the school would create a dedicated class for them. When the administration mistakenly placed her in the natural sciences class, she fought to be moved to physical sciences. By the time she finished high school, her path was clear; physics had captured her imagination, and she knew that was the field she wanted to dedicate her life to. She completed her undergraduate and Ph.D. studies at Mohammed V University in Rabat, specializing in nuclear physics, and continued her research with international collaborations.

From Student to Leader: Mounia's Impact on African School of Physics and Beyond

Mounia's journey with the African School of Physics (ASP) started when she was selected to participate in the fourth school (ASP2016) in Kigali, Rwanda (Figure 1). This journey has indeed been beneficial to her and the advancement of the ASP's mission. Engagements with and subsequent mentorship by ASP2016 lecturers have sustained and extended Mounia's interests and expertise in detector simulation and performance studies, and research in nuclear physics and instrumentation. She has remained engaged with ASP through mentorship and support for her Ph.D. thesis. Upon the conclusion of her thesis defense, she was among nine ASP alumni selected for the inaugural short-term research visit program to Brookhaven National Laboratory (BNL), and was also the first alumna invited to report on ASP at the American Physical Society (APS) Division of Particle and Fields meeting in 2019 in Boston. In addition, she worked with the BNL Electronics Detector Group by constructing a dedicated system to calibrate the field response functions for the wire-readout-based single-phase Liquid Argon Time Projection Chamber. She also collaborated with the University of Johannesburg on the modeling of nuclear reactors with Geant4.

In 2022, she acquired a post-doctoral position at the Helsinki Institute of Physics, where she worked on performance studies of passive gamma emission tomography devices. From 2023 to early 2024, she collaborated closely with BNL on different projects, including researching the usage of cadmium-zinc-telluride and germanium detectors for position-sensitive gamma-ray detection for 3D imaging.

During the COVID-19 pandemic, Mounia contributed to ASP online events and, during ASP2022, she was invited to lecture on Monte Carlo event generation and detector simulation. Afterward, she was appointed to the ASP International Organizing Committee (IOC), led the organization of the third African Conference on Fundamental and Applied Physics (ACP2023) and the eighth African School of Physics (ASP2024) (Figure 2), and was also appointed an Editor of the African Physics

"By the time she finished high school, her path was clear; physics had captured her imagination, and she knew that was the field she wanted to dedicate her life to."

Newsletter. Mounia's work has received global recognition, and she has been invited to speak at APS March Meeting sessions.

Mounia is also extending physics outreach to marginalized groups and minority serving institutes in the U.S. and to open house community outreach at BNL. She is presently a postdoctoral fellow at BNL, where she has worked on the construction and performance studies of the ATLAS Inner Tracker upgrade (ITk) (Figure 1), bringing the experience she has accumulated in nuclear physics on detector design, simulation, testing, building and performance studies to the BNL team. Mounia has also been involved in physics research impacting detector upgrades for High Luminosity LHC (the future of the Large Hadron Collider). Additionally, she is an elected member of the executive committee of the APS Forum on International Physics (FIP).

Despite the challenges faced, such as limited resources and post-doctoral positions, Mounia remains optimistic about Africa's future and hopes to continue mentoring the next generation of African physicists.