EPSNA

Virtual Summer School

August 14 - 18, 2023

YouTube Link

Supported in part by

American Physical Society

Cruise School, Addis Ababa, Ethiopia

VSS Daily Schedule

Monday, August 14, 2023	
8:30 AM - 9:00 AM	**Welcome**, Dr. Daniel Erenso, EPSNA president
9:00 AM - 10:00 AM	Dr. Solomon Billign: Applying Physics for societal benefit- Role of Physics in Environmental and Air Quality Research
10:15 AM- 10:35 AM	Dr. Habtamu Anagaw: Theoretical study of upper critical magnetic field in superconductor Ute2
10:35 AM - 10:55 AM	Yibekal Hailu: Ionospheric and magnetic signatures of extreme space weather events of 17 March and 23 June 2015 over the African sector
10:55 AM - 11:15 AM	Dr. Dejene Ambissa: Spatio-Temporal Evolution of Global Ionospheric Storm Drivers and Hemispherical Asymmetry During 17–18 March 2015 Geomagnetic Storm
11:30 AM - 12:10 PM	Dr. Hagos Weldegebreal Zeweldy: The Role of Physics in Engineering and Technology
1:00 PM - 2:00 PM	Dr. Mesfine Tsige: Introduction to Polymer Physics
2:00 PM - 3:00 PM	Dr. Guebre Xabiher Tessema: The Materials Genome Initiative: How Should Future Generation of African Scientists and Engineers Prepare
3:15 PM - 4:15 PM	Dr. Sossina Haile: Solid State Electrochemistry for Sustainable Energy Technologies
4:30 PM - 5:30 PM	Dr. Hilary Hurst: The Second Quantum Revolution - Building A Robust Quantum Ecosystem in the Lab and in the Classroom
7:00 PM-08:00 PM	Dr. Carl Wieman (Nobel Laureate): Taking a scientific approach to physics education

Tuesday, August 15, 2023	
9:00 AM - 10:00 AM	Dr. Daniel Erenso: Tensor Calculus: Applications to special theory of relativity and relativistic electrodynamics
10:15 AM- 10:35 AM	Zewdie Yayeh: Effect of cerium doping and oxygen reduction on superconducting critical temperature in $\mathbf{Nd}$2-xCexCu$\mathbf{O4-\delta}$ superconductor
10:35 AM - 10:55 AM	Challachew Lingrew: NN-MLT Model Prediction for Low-Latitude Region Based on Artificial Neural Network and Long-Term SABER Observations
10:55 AM - 11:15 AM	*Break*
11:30 AM - 12:10 PM	Dr. Hagos Weldegebreal Zeweldy: The Role of Physics in Engineering and Technology
1:00 PM - 2:00 PM	Dr. Yohannes Abate: Probing Quantum Materials at the Nanoscale
2:00 PM - 3:00 PM	Dr. Mohammed Tessema: Introduction to Gröbner Basis
3:15 PM - 4:15 PM	Dr. Alemayehu Gorfe: Molecular Dynamics Simulation of Biomolecules
4:30 PM - 5:30 PM	Dr. Kevin Iga: Manifolds and the Geometry and Topology of Physics
Wednesday, August 16, 2023	
9:00 AM - 10:00 AM	Dr. Daniel Erenso: Introduction to the application of Laser trapping technique in biomedical optics research
10:15 AM- 10:35 AM	Derejaw Garedew: Investigations of Some Properties of High-Temperature Iron-Based Superconductor Using Effective Two-Band Model
10:35 AM - 10:55 AM	Habtamu Getachew: Parameter Uniformly Convergent Numerical Approach for Time-Fractional Singularly Perturbed Partial Differential Equations with Large Time Delay

10:55 AM - 11:15 AM	Dr. Tolu Biressa: Benefits of integrated STEM and Astronomy outreach program for Universities
11:30 AM - 12:10 PM	Jifar Raya: The role of Astronomy in science development
1:00 PM - 2:00 PM	Dr. Selemon Bekele: Applications of computational modelling in biology
2:00 PM - 3:00 PM	Dr. Aklilu Zeleke: Random Walks: Theory and Applications
3:15 PM - 4:15 PM	Dr. John Wallin: Transformers, Large Language Models, and Generative AI
4:30 PM - 5:30 PM	Dr. Ehsan Khatami: Quantum simulations of strongly interacting electrons
Thursday, August 17, 2023	
9:00 AM - 10:00 AM	Dr. Christopher Smallwood: Color Centers in Diamond as Teeny Tiny Quantum Light Bulbs
10:15 AM- 10:35 AM	Dr. Tesfakiros Weldu Gebreab: Why Nanoscience and Nanotechnology are so important?
10:35 AM - 10:55 AM	Dr. Tesfakiros Weldu Gebreab: Why Nanoscience and Nanotechnology are so important?
10:55 AM - 11:15 AM	Dr. Tesfakiros Weldu Gebreab: Why Nanoscience and Nanotechnology are so important?
11:30 AM - 12:10 PM	Dr. Habtu Alemayehu Atsbha: Mathematics applied for the daily life
1:00 PM - 2:00 PM	Dr. Tesfaye Kidane: Magnetic Resonance Imaging (MRI): Basic Principles and Image acquisition
2:00 PM - 3:00 PM	Dr. Dereje Seifu: Quantum Materials
3:15 PM - 4:15 PM	Dr. Tilaye Tadesse: Solar Coronal Magnetic Field Extrapolation, Why and How?
4:30 PM - 5:30 PM	Dr. Curtis Asplund: New insights into black holes
Friday, August 18, 2023	
9:00 AM - 10:00 AM	Dr. Kassahun Betre: Quantum Gravity - Why and How
10:15 AM- 10:35 AM	Zelalem Arega Worku: Panel discussion
10:35 AM - 10:55 AM	Bereket Tassew Bekele: Panel discussion
10:55 AM - 11:15 AM	Dr. Fekadu Gashaw: Novel metal oxide nanomaterials for manifold applications: From synthesis to device both experimental and computational approaches
11:30 AM - 12:10 PM	Dr. Fekadu Gashaw: Novel metal oxide nanomaterials for manifold applications: From synthesis to device both experimental and computational approaches
1:00 PM - 2:00 PM	Nani Deti: Effective communication skill via social media platforms to build network
2:00 PM - 3:00 PM	Dr. Aaron Titus: Matter Interacts and Interactions Matter
3:15 PM - 4:15 PM	Dr. Vic Montemayor: An Introduction to Medical Physics
4:30 PM - 5:30 PM	Dr. Daniel Erenso: Certificate award and Closing Remark

*** All hours are in Addis Ababa local time.**

Participating universities

- Abyiadi College
- Addis Ababa University
- Adigrat University
- Aksum University
- Adama Science and Technology University
- Arba Minch University
- Assosa University
- Bahir Dar University
- Bonga University
- Dambi Dolo University
- Debre Markos University
- Gambella university
- Mattu University
- Mekelle University
- Oda Bultum University
- University of Gondar
- Kebri Dehar University,
- Wollo University,
- Mizan-Tepi University,
- Debre Birhan University
- Dire Dawa University
- Haramaya University
- Hawassa University
- Jimma University
- Raya University
- Wolkite University
- Woldia University
- Werabe University
- Jijiga University

Ethiopian (Addis) and North America (ET) Times

VSS Day 1: Monday, Aug 14, 2023

Ethiopia: 08:30 AM - 7:20 PM Addis Time (GMT+3)

North America: 01:30 AM - 01:00 PM ET

VSS Day 2: Tuesday Aug 15, 2023

Ethiopia: 09:00 AM - 5:30 PM Addis Time (GMT+3)

North America: 02:00 AM - 10:30 AM ET

VSS Day 3: Wednesday Aug 16, 2023

Ethiopia: 09:00 AM - 5:30 PM Addis Time (GMT+3)

North America: 02:00 AM - 10:30 AM ET

VSS Day 4: Thursday Aug 17, 2023

Ethiopia: 09:00 AM - 5:30 PM Addis Time (GMT+3)

North America: 02:00 AM - 10:30 AM ET

VSS Day 5: Friday Aug 18, 2023

Ethiopia: 09:00 AM - 5:30 PM Addis Time (GMT+3)

North America: 02:00 AM - 10:30 AM ET

EPSNA and VSS Multimedia

Watch Live Stream (or recordings): Youtube Channel

How to ask a question: Ask the Speaker or Zoom Chatbox
*Students and coordinators can **ask questions verbally** (speak loudly into the computer/microphone),*

OR
*submit **written questions** using Slido or Zoom.*
(You can also scan the QR code below)

Ask a Question at

slido.com

#2924589

Join the EPS-EPSNA WhatsApp Community

Visit our website for more information, to become a member, and more:

EPSNA
THE ETHIOPIAN PHYSICS SOCIETY IN NORTH AMERICA

HOME WHAT WE DO MEMBERSHIP EVENTS NEWSROOM OPPORTUNITIES MORE...

Preface

Financial support for research in Ethiopian universities is very low. In 2011/12, for instance, research allocation of all universities accounted for 1% of their total budget. The Ethiopian government has focused on increasing access to higher education – opening on average two new universities per year over the past decade. Perhaps, the government's effort is justifiable given the fact that the higher education system in Ethiopia is still an "elite" system with 8.1% gross enrollment rate. While increasing access to education remains crucial, enhancing the quality and the research capabilities of the universities is of at most importance for sustainable economic and social development. To expedite the process, a coordinated effort is needed among students, faculties, and the diaspora community.

In 2015, only 15% of university instructors in Ethiopia had doctoral degrees. Not surprisingly, the 2015 action plan of the Ethiopian Ministry of Education identified the scarcity of personnel to conduct high-quality research in higher education institutions as one of the major bottlenecks limiting the contribution of research to the development of the nation. In contrast, there have been reports indicating that a larger number of Ethiopian origin individuals with doctoral level of education reside outside of Ethiopia, which suggests that there is a huge potential in the Ethiopian diaspora community to contribute to the enhancement of education in Ethiopia.

The Ethiopian Physics Society in North America (EPSNA) strives to bridge this gap by creating opportunities for researchers in the diaspora community to directly interact with students and faculties in different Ethiopian universities. In 2019, EPSNA piloted its first week-long summer school at Addis Ababa Science and Technology University (AASTU). The summer school was attended by more than forty students from AASTU, Jimma University, and University of Gondar, and thirteen instructors from the US and Canada presented their research.

The virtual summer school this year will give students in Ethiopian higher education institutions a glimpse of the state-of-the-art research in their fields of studies. We hope this will motivate more students to pursue graduate schools and contribute to the advancement of research in Ethiopia. Furthermore, we hope that the VSS will create a conducive environment for collaboration among faculties, e.g., through co-advising graduate students in Ethiopia.

A short history of EPSNA

EPSNA was established officially as a section 501 (c) organization in the US as the North American Chapter of the Ethiopian Physics Society in 2008. However, Ethiopian physicists working in the US had formed an unofficial society and have been active on several projects in the preceding decade. The primary reasons that brought the community together were the desire to play a role in empowering the Ethiopian physics community in both Ethiopia and North America and also to help make physics research and education relevant to the needs of Ethiopia. Ethiopian physicists have met on the sidelines of the American Physical Society annual meeting since the 1980s, a tradition that has continued to this day. The first discussion of forming an official organization was held during the 1999 APS centennial conference in Atlanta with the leadership of Dr. Abebe Kebede and the participation of about fifteen physicists from across the USA. In the following decade, the community built a vibrant and well-known website. In addition, it held several workshops, such as the 2003 session on physics in Africa at the APS March Meeting and the 2007 space physics workshop in Addis Ababa, Ethiopia.

In 2007, the leadership board of the Ethiopian Physical Society in Ethiopia asked Dr. Solomon Bililign to reorganize and revitalize the Ethiopian Physicists Society in North America. As a result, an organizing committee led by Dr. Solomon Bililign was formed to draft bylaws and organize a meeting to formally establish the EPS-NA, leading to the organizational conference and workshop on August 2, 2008. About eighteen Ethiopian Physicists met for one day at the American Physics Society (APS) head office in Maryland, USA, to officially approve the bylaws and conduct elections. Dr. Tessema, Guebre X (Professor of Physics, and currently a program officer at the National Science Foundation), was elected president unanimously. In the15 years following its official founding, EPSNA has been actively promoting physics excellence through its annual EPSNA Scholarship awards for Ethiopian students, organizing meetings among EPSNA members during the annual APS conference, and advocating for recognition of prominent Ethiopian physicists. Recently, it has embarked on expanding its activities by organizing summer schools, graduate school application mentorship programs, and research experience for students at Ethiopian Universities.

Mission of EPSNA

EPSNA is an organization that aims at promoting physics education and research among Ethiopians in Ethiopia and North America. Its missions are:

- To promote and support the education and training of Ethiopian Physics professionals by donating educational materials, field equipment, computing and other necessary resources.
- To promote and support the training of Ethiopian physics professionals by providing scholarship, financial and mentoring assistance to Ethiopian students and educators.
- To inform Ethiopian students of career and scholarship opportunities that may exist in the physical sciences.
- To organize conferences and workshops on all aspects of physics in Ethiopia.
- To sponsor educational programs and to undertake coordinated research in Ethiopia.
- To provide a networking platform for Ethiopian physics professionals.
- To act as a liaison between members of this organization and other physical science organizations.
- To create or facilitate collaboration among universities in Ethiopia and North America.
- To organize and teach short courses in Ethiopia.

Message from the president of EPSNA

It is with immense joy and pride that I welcome you all to the EPSNA Virtual Summer School 2023. This is the third summer school delivered by EPSNA. EPSNA which is an organization with the mission to advance STEM in Ethiopia. As the President of EPSNA and a firm believer in the power of education and scientific exploration, I am honored to stand before you. Though we may be physically distant, our collective spirit remains united in the pursuit of knowledge and advancement in science and engineering. This virtual summer school offers us unparalleled opportunities to connect and engage with experts, researchers, and students from diverse backgrounds, cultures, and experiences. It breaks down barriers and transcends borders, allowing us to collaborate in ways that were previously unimaginable. Let us seize this opportunity to exchange ideas freely, learn from one another, and forge lasting connections that will endure beyond the confines of this virtual space.

As we embark on this virtual journey of knowledge, I encourage each one of you to be bold, inquisitive, and open-minded. Embrace the unknown and dare to ask the difficult questions, for it is through questioning that we uncover the answers that propel us forward. Let us approach every session, every discussion, and every interaction with the spirit of curiosity and the determination to make a difference. To the young minds in Ethiopia participating in this virtual summer school, I want you to know that you are the architects of the future. Your thirst for knowledge and your dedication to physics and related disciplines will shape the world in profound ways. Embrace the opportunities that lie before you and know that the knowledge you gain here will empower you to create a better and more sustainable world for generations to come.

I extend my heartfelt gratitude to the distinguished scientists who volunteered to take time out of their busy schedule for this summer school; our sponsors EPSNA dedicated members, APS, and Cruise School; the directors leading the summer school at the six center universities; the EPSNA executive committee members who have worked tirelessly to make this virtual summer school a reality. Your commitment to supporting the goals of EPSNA is commendable.

As we officially inaugurate EPSNA Virtual Summer School 2023, let us remember that despite the distance that separates us physically, our passion for science unites us as one strong and vibrant community. Let us embrace the power of this virtual platform to empower minds, enrich futures, and foster a legacy of scientific excellence. Thank you all for being a part of this remarkable journey. Now, let us embark on this virtual summer school with enthusiasm, determination, and a shared commitment to unlocking the mysteries of the universe. May this virtual gathering be a resounding success.

Daniel Erenso

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Abstracts

Taking a scientific approach to physics education

Dr. Carl Wieman
Professor of Physics, **Physics Nobel Laureate**
Department of Physics and Graduate School of Education, Stanford University, USA

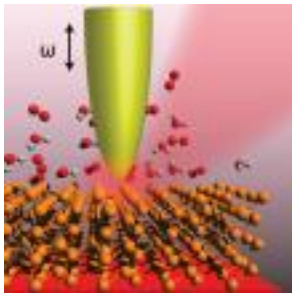
Wieman, Cornell, and Ketterle were awarded the Nobel Prize for Physics in 2001 for their research that demonstrated Bose- Einstein condensation, the cooling of atoms to near zero K

(Nobel Prize Outreach, 2023)

Guided by experimental tests of theory and practice, science has advanced rapidly in the past 500 years. Guided primarily by tradition and dogma, science education has remained largely medieval. Recent research on how people learn, combined with careful experiments in university physics classrooms, is now revealing much more effective ways to teach and evaluate learning than is currently used in most science classes. I will discuss these results and what they tell us about principles of learning and their effective implementation in physics courses and research advising. This research is setting the stage for a new approach to teaching that can provide the relevant and effective science education for all students that is needed for the 21st century. It also reveals that traditional attitudes about learning and the introductory physics curriculum can be inadvertently sustaining systemic discrimination.

Probing Quantum Materials at the Nanoscale

Dr. Yohannes Abate
Professor of Physics
University of Georgia, USA



Interactions at the nanometer length scale in hard and soft condensed matter give rise to intriguing phases in correlated electron materials, lead to the design of exotic metamaterials, and offer enormous opportunities for the development of novel optoelectronic devices. In this talk, I will give representative examples of high-resolution probing of fundamental nanoscale physical phenomena and interactions in quantum materials at infrared (IR), terahertz (THz), and optical frequencies. At mid IR frequencies, we probe the local interaction of a heterostructure of isotopically enriched hexagonal boron nitride (hBN) in direct contact with the phase-change material (PCM) single-crystal vanadium dioxide (VO_2) and demonstrate a reconfigurable hyperbolic metasurface. Local metallic and dielectric domains in VO_2 provide spatially localized changes in the local dielectric environment, enabling launching, reflection, and transmission of hyperbolic phonon polaritons (HPhPs) at the PCM domain boundaries, and tuning the wavelength of HPhPs propagating in hBN. At THz frequencies, in the truly THz frequency range 13 cm^{-1} - 60 cm^{-1} we probe and quantify local charge carriers in correlated and complex oxides and heterogeneously doped semiconductors. We demonstrate a novel nanoscale THz hyperspectral imaging technique combined with a Drude model for measuring—noninvasively and without the need for Ohmic contacts—the local mobile carrier concentration of complex and correlated electron matter. In

the visible spectral region we investigated 2D in-plane MoS2-WS2 heterostructures that exhibit nanoscale alloyed interfaces and map exotic interface effects during photo-degradation using a novel combination of hyperspectral tip-enhanced photoluminescence, Raman and near-field nanoscopy. Coupled with surface and interface strain, 2D alloy regions create localized potential wells that concentrate excitonic species via a charge carrier funneling effect.

Applying Physics for societal benefit- Role of Physics in Environmental and Air Quality Research

Dr. Solomon Bililign
Department of Physics and Applied Sciences and Technology

North Carolina A&T State University, USA

This introductory lecture will cover many of the optical spectroscopic techniques, which have found applications far beyond the discipline of Physics. The lecture will mainly focus on classical and quantum-mechanical descriptions of the interaction of light with matter, major spectroscopic instrumentation for atmospheric applications, the fundamental principles of laser action, and some specific techniques of laser spectroscopy. In all applications, light must interact with matter of whatever origin. Thus, the major objectives will be understanding of light–matter interactions; the basic principles for different spectroscopic techniques; the kind of system information one can obtain from such methods. It is the objective of this class to provide the student with an in-depth knowledge of these topics so that spectroscopic methods can be successfully applied to the student's research projects.

Solid State Electrochemistry for Sustainable Energy Technologies

Dr. Sossina Haile
Walter P. Murphy Professor of Materials Science and Engineering, Professor of Applied Physics, Professor of Chemistry (by courtesy),

Northwestern University, USA

Over the past decade, global CO_2 emissions have continued to rise, while the costs of solar and wind electricity have fallen by about 90%. The challenge society thus faces is not in generating carbon-free electricity, but in storing the electricity for use on demand. Electrolysis of water, or using electricity to split the H_2O molecule into hydrogen and oxygen, has garnered renewed interest due to the suitability of hydrogen for long term energy storage. Subsequent use of the hydrogen in fuel cells generates electricity without carbon emissions. Here we describe recent advances in electrochemical cells, based on proton conducting ceramic electrolytes, that can operate reversibly to both generate hydrogen from electricity and generate electricity from hydrogen, effectively functioning like rechargeable batteries. Beyond local interconversion between hydrogen and electricity, the use of hydrogen has been hindered by the lack of an appropriate delivery infrastructure. One solution that is gaining momentum is the use of ammonia as a carbon-free, easily liquified carrier of hydrogen. Success in this approach relies on local conversion of the ammonia into nitrogen and ultra-high purity hydrogen that can be supplied to fuel cells. We describe recent progress in the development of ammonia electrochemical conversion devices based on solid-state proton conducting electrolytes. The overview of these technologies will focus on the fundamental materials limitations and the steps undertaken to overcome them and achieve devices with compelling performance metrics.

Molecular Dynamics Simulation of Biomolecules

Dr. Alemayehu Gorfe,
Professor
University of Texas Medical School – Houston, USA

The goal of this lecture is to introduce students to the basic concepts of molecular dynamics simulation and its applications in the study of biomolecular fluctuations. Emphasis will be placed on protein conformational fluctuations, protein-membrane interactions, and protein-ligand interactions including a brief discussion of the application of molecular dynamics in drug discovery.

Random Walks: Theory and Applications

Dr. Aklilu Zeleke
Professor
Michigan State University, USA

In this talk, we investigate random walks in d-dimensional Euclidean space. We discuss their construction, their fundamental properties such as mean square distance, return to the origin, recurrence and transience. Some applications of random walks will also be presented.

The Second Quantum Revolution - Building A Robust Quantum Ecosystem in the Lab and in the Classroom

Dr. Hilary Hurst
Department of Physics & Astronomy

San José State University, USA

Despite many advances in our understanding of how to create and manipulate quantum systems, challenges in both research and education remain for commercialization of quantum technologies. On the research side, the fragility of quantum states continues to present difficulties. Superposition and entanglement are essential quantum properties which can be easily destroyed, rendering quantum devices useless. Isolating quantum systems from external disturbances has therefore been the primary mode of preserving quantum coherence, but it is difficult to scale to large quantum systems. New modes of harnessing system-environment coupling can enable robust, entangled quantum phases in open systems, providing a route toward scalable quantum technologies for quantum sensing, computing, and networking. Likewise, education in quantum science has been isolated to upper-level undergraduate physics majors and those seeking advanced MS or PhD degrees in physics. This educational model is also difficult to scale up and does not address the increasingly interdisciplinary nature of quantum technologies or workforce needs. In this talk I will provide an overview of the emerging field of quantum technology. I will then discuss ongoing work in my group toward building robust quantum systems and a robust quantum educational landscape. In particular, I will review our recent theoretical results in using weak measurement and feedback to engineer new phases in ultracold atomic systems. Finally, I will provide a brief look at the interdisciplinary coursework being developed at San José State University to re-imagine how we teach quantum mechanics and expand access to training in quantum information science and engineering.

Quantum Gravity - Why and How

Dr. Kassahun Betre
Department of Physics & Astronomy

San José State University, USA

In this presentation we will discuss the motivations for a quantum theory of gravity and some of the avenues that have been and are being explored to produce theories of quantum gravity. We will also discuss the successes and limitations of the approaches.

Introduction to Gröbner Basis

Dr. Mohammed Tesemma
Department of Mathematics

Spealman College, USA

In this talk, I will present the very basic introduction to the theory of Gröbner basis. The only background assumed is the typical undergraduate abstract algebra course that covers topics such as groups, rings and fields. Once the concept is introduced we will discuss examples and some applications that will open the door for further investigation.

Color Centers in Diamond as Teeny Tiny Quantum Light Bulbs

Christopher L. Smallwood
Assistant Professor, Department of Physics & Astronomy
San José State University, USA

In everyday life, diamonds are prized for their purity. Recently, however, the scientific community has taken an interest in samples that are intentionally contaminated with foreign atoms like nitrogen or silicon, and in many cases, these atoms combine with the host material in special ways to form light-absorbing “color centers” in diamond that bring the oddities of quantum mechanics into sharp relief. In this talk, I will discuss some of the recent progress that has been made investigating a specific form of color center—negatively charged silicon-vacancy centers in diamond—using the laser-based observation technique of multidimensional coherent spectroscopy (MDCS). Notable results include the discovery in high-density samples of a new class of hidden silicon-vacancy centers, which are not visible in standard photoluminescence experiments, and which have surprisingly long electronic coherence times in comparison to their more commonly observed counterparts. In turn, the results could prove useful in devices involving squeezed, stretched, and/or twisted circuit elements built from diamond laced with color-center defects. The end goal—a quantum internet—would have broad abilities to simulate the natural world, solve mathematical problems, and enable unbreakable cryptography in a way that currently available computer technology lacks.

Quantum simulations of strongly interacting electrons

Dr. Ehsan Khatami
Department of Physics & Astronomy

San José State University, USA

Most of what we see and deal with around us are classical objects and events. However, some truly amazing phenomena, such as magnetism or superconductivity, have their origins in laws of quantum mechanics and are now intertwined with our daily lives. In this talk, I will give an introduction to how we derive toy models that can shed light on electronic properties of solids at low temperatures, which are at the heart of such phenomena. I will then turn my focus to traditional and modern approaches for solving those models, including their emulation in cold atom experiments, limitations of different approaches, and some of the new physics we have learned from them.

An Introduction to Medical Physics

Dr. Victor Montemayor
Germantown Academy (GA), Fort Washington, PA

Medical Physics is the physics behind the treatment of cancer with radiation---predominantly high-energy photons, nuclei, protons and electrons. At a fundamental level, Medical Physics concerns itself with how the radiation deposits energy into tissue in order to kill cancer cells. This talk will start off with a coverage of the fundamental physics behind how radiation deposits energy in tissue. It will then move on to discuss how an understanding of that energy deposition is exploited in order to detect the presence of cancer (medical imaging) and to treat cancer with radiation (radiation therapy).

Quantum Materials

Dr. Dereje Seifu
Professor
Morgan State University, USA

In this presentation, quantum materials, including transition metal dichalcogenide (TMD) and topological insulator (TI) with their applications, citing recent research at the laboratory of Seifu Research Group (SRG), will be presented. Applications include electromagnetic interference (EMI) shielding, TMD-based field effect transistor, and TI-based tunneling magneto-resistance (TMR) materials in the form of thin films, nanowires synthesized by filling vertical standing and substrate supported nanotubes, and nano-columns through glancing angle deposition. TMR materials with a high enough magneto-resistance (MR) ratio at room temperature can be useful for several applications, including sensors, logic gates, and MRAM for quantum computers. TMR in nanowires / nano-columns for potential applications as components in nano-electromechanical systems (NEMS). In addition, lower dimensional systems with enhanced magnetic properties via ferromagnetic proximity-induced ferromagnetism in a carbonaceous matter to develop nano-sensors will be presented.

Tensor Calculus: Applications to special theory of relativity and relativistic electrodynamics

Dr. Daniel Erenso
Professor of Physics
Middle Tennessee State University, USA

This course introduces the mathematical methods to Einstein's theory of general relativity with a limited application. We begin with a discussion of the mathematical background that would include the necessary tensor calculus and differential geometry tools. These tools are the background to develop the topic of special relativity and general relativity. In this one-hour class, we can cover the outline that one should cover as an instructor to introductory tensor calculus course essential for a better understanding of general relativity. It is entirely impossible to teach tensor calculus in an hour effectively that one teaches for one semester.

Introduction to the application of Laser trapping technique in biomedical optics research

Dr. Daniel Erenso
Professor of Physics
Middle Tennessee State University, USA

Optical trapping, a versatile technique that utilizes focused laser beams to manipulate micron-scale particles and cells, has emerged as a powerful tool in biomedical optics research. This technique leverages the momentum of photons to create attractive or repulsive forces, enabling the precise manipulation and study of biological entities without physical contact. One of the primary applications of optical trapping in cell biology involves the investigation of cellular mechanics. This talk introduces the historical progression of laser trapping research within the context of biomedical optics at MTSU (Middle Tennessee State University). We outline the key milestones in the application of laser trapping to various biological entities, including living cells, magnetic beads, and plasma. The interaction between laser beams and cellular structures has led to intriguing phenomena, notably the ionization of cells and the formation of dark spaces, which hold significance in understanding cellular responses to external forces. The ionization process, driven by intense laser fields, showcases the interplay between light and matter, ultimately influencing cellular behaviors and offering insights into their electrical properties. Exploring further into the realm of laser trapping, the talk introduces the captivating formation of plasma and star-like phenomena.

New insights into black holes

Dr. Curtis T. Asplund
Department of Physics & Astronomy

San José State University, USA

I will discuss how both astrophysical and theoretical research into black holes has provided exciting new information and understanding about these mysterious objects. Radio astronomy and gravitational wave astronomy have produced new direct observations of black holes and their collisions. New theoretical research has clarified that black holes do appear to obey the laws of quantum mechanics, although in an unusual way that we are still working hard on figuring out in detail.

Introduction to Polymer Physics

Dr. Mesfin Tsige
Professor of Physics
University of Akron, USA

Polymers are a group of materials made up of long covalently-bonded molecules, that includes rubbers and plastics. Polymers, mostly synthetic, are all around us, from everyday plastics to functional components of electronic devices. Polymer Physics, mainly incorporating statistical mechanics and spectroscopy, is a branch of physics that seeks to understand the unique properties of polymer molecules and polymeric matter. I'll approach this topic from a Materials Science viewpoint, being principally concerned with the relationship between structure and property. While no prior knowledge of polymers is required to effectively participate in this lecture, a basic knowledge of mathematics, chemistry and physics is assumed for participants of this course.

Manifolds and the Geometry and Topology of Physics

Dr. Kevin Iga

Pepperdine University, USA

What shape is the space we live in? This question is not only an idle science-fiction speculation. The physics that comes out of this question can address real questions in ordinary mechanics situations, and can shed light on questions involving electromagnetism, general relativity, quantum field theory, and more. The mathematics involves topology, a kind of geometry where we characterize shapes not by their lengths and angles but by how they are connected. The topological classification of manifolds is a big research area in math that started in the early 20th century and continues to this day, and I will mention a few key findings in the subject.

Transformers, Large Language Models, and Generative AI

Dr. John Wallin

Director, Computational and Data Science PhD Program

Middle Tennessee State University, USA

Over the last year, we have seen extraordinary progress in generative artificial intelligence. These technologies are transforming human work across disciplines. These new systems can generate large drafts of documents, code, and images hundreds of times faster than human authors. Despite their advanced capabilities, the key technologies are simple algorithms, massive data sets, and using graphics cards in computing. This talk will explore how these new systems work, their capabilities, limitations, and how to use them effectively. We will also discuss the challenges generative presents to scholarly work, including ethical issues associated with their usage.

Magnetic Resonance Imaging (MRI): Basic Principles and Image Acquisition

Dr. Tesfaye Kebede Kidane

Engineering Manager at GE HealthCare MRI Science and Technology, USA

This course introduces physical principles of MRI, instrumentation, image formation and basic imaging parameters. Fundamental principles covered include magnetism, signal production, contrast characteristics, imaging planes and image formation. The first half of the course will focus on MRI physics and basic design of MRI hardware component such as Magnet design, Gradient coil design and RF coil design. The second half of the course covers details of MR parameters, pulse sequences, methods of data acquisition, imaging options and fast imaging techniques including parallel imaging.

Matter Interacts and Interactions Matter

Dr. Aaron Titus

North Carolina State University, USA

For more than twenty years, the textbook Matter and Interactions by Ruth Chabay and Bruce Sherwood has represented the promise and potential of a contemporary introductory physics course. Designed to emphasize fundamental principles, unification of thermal physics and mechanics, physical atomic models to explain macroscopic phenomena, and the utility of computational modeling, Matter and Interactions helps prepare early-career students to think like a physicist. I will describe Matter and Interactions and the foundation it provides for students throughout their academic careers.

Solar Coronal Magnetic Field Extrapolation, Why and How?

Dr. Tilaye Tadesse

NASA Johnson Space Center, USA

Magnetic fields play a key role in the physics of the solar surface and atmosphere and in solar activity in particular. To understand the physical mechanism of any of the activity phenomena observable in the solar atmosphere one needs to know the underlying magnetic field. The magnetic field also provides the link between different manifestations of solar activity like, for instance, sunspots, flares, or coronal mass ejections. Therefore, there is a strong need for information about the magnetic vector throughout the solar atmosphere. Routine measurements of the solar magnetic field are still mainly carried out in the photosphere. Therefore, one has to infer the field strength in the higher layers of the solar atmosphere from the measured photospheric field based on the assumption that the corona is force-free. This approach assumes that the Lorentz force vanishes, i.e. that the magnetic field and the electric currents are co-aligned with each other. This is justified in regions where the ratio of the plasma pressure to the magnetic pressure and flow speeds to Alfven speed are significantly lower than unity. This is true in large parts of the chromosphere and corona while the photosphere is a region where this assumption is not warrantable. The procedure used to infer the 3D coronal magnetic field is known as magnetic field extrapolation. Extrapolation codes in Cartesian geometry for modelling the magnetic field in the corona do not take the curvature of the Sun's surface into account and can only be applied to relatively small areas, e.g., a single active region. Within this presentation, I will show numerical methods to carry out magnetic field extrapolation into the solar corona from the photospheric boundary using spherical geometry. The computational box can then be chosen as large that can accommodate much of the connectivity between neighboring solar active regions.

NN-MLT Model Prediction for Low-Latitude Region Based on Artificial Neural Network and Long-Term SABER Observations

Dr. Chalachew Lingerew

Department of Physics, Washera Geospace and Radar Science Laboratory, Bahir Dar University, Bahir Dar, Ethiopia

The low-latitude mesosphere and lower thermosphere (MLT) regions are distinct and, highly turbulent transition zones in Earth's atmosphere. The scarcity of reliable measurements makes continuous monitoring of these areas challenging. Therefore, the necessity for studies focused on the MLT region cannot be overstated, as they are essential for developing effective models that meet the accuracy requirements of satellite-based observations. The neural networks NN-MLT model, developed using 15 years of Thermosphere, Ionosphere, and Mesosphere Energetics and Dynamics/satellite, equipped with Broadband Emission Radiometry (SABER) observed temperature data spanning from January 2006 to December 2020, employs neural network techniques. The data set was split, with 90% used for training and the remaining 10% allocated for prediction. The model's validation was tested with two other partitions (80(20) and 70(30)). The 90(10) partition, exhibiting a high correlation coefficient (R), low standard deviation (σ), and low root mean square error (RMSE), demonstrated the model's good performance. As clearly shown from statistical metrics (R, RMSE, mean, and σ) at three specific altitude levels (60, 75, and 90 km), the NNMLT model's performance aligns closely with the empirical model (NRLMSISE2-0) and SABER observations. The NN-MLT model displays a high R (0.74) and low RMSE (4.35 K) at 60 km, indicating its effective performance compared to the other two heights of 75 and 90 km. The NN-MLT model's spatiotemporal variability in MLT temperature prediction agrees well with the SABER data at all altitudes, particularly at 60 km. While the NN-MLT model accurately captures the seasonal variations of MLT temperature, the analysis leads to the conclusion that it consistently outperforms the empirical model and aligns closely with observations.

Investigations of Some Properties of High-Temperature Iron-Based Superconductor Using Effective Two-Band Model

Dr. Derejaw Gardew

Department of Physics,

Bahir Dar University, Bahir Dar, Ethiopia

This paper studies about theoretical investigations of some properties of high temperature ironbased superconductor using effective two-band model. The mathematical expressions of different superconducting parameter are held by the retard double time temperature dependent Green’s function formalism. The superconducting order parameter of the material for electron and hole as well as the inter band are plotted with the temperature as well. This parameter is decreased with increasing the temperature and vanishes at the transitional temperature of the superconductor. The values of superconducting order parameter coupling strength in electron intra band, hole intra band, intra-inter band and the combined band mathematically determined. The pairing potential of this material is increased as a function of the critical temperature. The phase diagram of temperature-dependent electron and hole-intra-band density of state versus excitation energy for iron-based superconductor are clearly plotted and both are decreased

with increasing of the excitation energy. The influences of temperature, pairing potential and critical temperature on condensation energy are expressed graphically in a scientific manner and the condensation energy decreased with increasing of both temperature and pairing potential and vanished at the critical temperature of the superconductor. Furthermore, the densities of state for electron and hole-intra band of different temperatures versus excitation energy are plotted using experimental values. These densities of states are decreased slowly with increasing of the excitation energy and diminished at low temperature values.

Theoretical study of upper critical magnetic field in superconductor Ute_2

Dr. Habtamu Anagaw Muluneh

Department of Physics, College of Science, Bahir Dar University, Bahir Dar, Ethiopia

This study focuses on the theoretical investigation of temperature dependence of upper critical magnetic field of superconductor. We demonstrated a clear correlation between the upper critical magnetic fields, and , the GL coherence length and penetration depth with temperature using the Ginzburg-Landau (GL) phenomenological equation and also we have derived the expression for Ginzburg Landau characteristic parameter as a function of temperature. We have plotted the phase diagrams and it is observed that the upper critical magnetic field decreases as temperature increases and finally vanishes at the superconducting critical temperature of UTe2. At the same time the GL-coherence length and GL penetration depth increase as temperature increases and goes to infinity at the superconducting critical temperature of, and results in the breakdown of Cooper pairs and the cessation of superconductivity. Our findings are in agreement with previous results.

Mathematics applied for the daily life

Dr. Habtu Alemayehu Atsbaha

Department of Mathematics, Mekelle University, Ethiopia

For the EPSNA summer school the topics covered will be straight line, circle and the parabola. These topics will be designed to include the general audience as well as in a way these topics shall be applied for the daily life of the audience. Mathematically we will focus on gradient and equation of a line, slopes of parallel and perpendicular lines and application of the straight line in demand curve related to economics problems. In addition, we look into a circle as a locus of a point in a plane and equation of a circle in several forms. Then, we discuss about a parabola as a locus of a point in a plane, its equation in several forms, and application in parabolic reflector, beam supported by wires at the end of the support, girder of a railway bridge, etc.

The Role of Physics in Engineering and Technology

Dr. Hagos W/Ghebriel

Department of Physics, Mekelle University, Mekelle, Ethiopia

From communication and transport to healthcare and connectivity, technology has enhanced our lives for the better. Better communication, easier access to information, more productivity, and higher quality healthcare are just a few of how technology has benefited civilization. Engineers and technicians are among the most in- demand jobs in the world. However, it is obvious that technological advancement is not possible without understanding the basic principles of Physics. In this summer school I will be presenting the topic on “The Role of Physics in Engineering and Technology” targeting undergraduate physics students. The presentation will include the following topics:

- Revisit the fundamentals of physics (Fundamental Forces, Fundamental Laws and Conservation Laws),
- Relation of Physics with Engineering and Technology,
- Applications/Importance of Physics in:

  o Meeting Future Energy Requirements,

  o Medical Technologies, and

  o The Communication Industry

- Finally I will introduce some physics equations that changed the world.

The role of Astronomy in science development

Jifar Raya

Jimma University, Ethiopia

Astronomy plays several key roles in the development of science. This presentation explores the pivotal role of astronomy in the development of science. By examining the historical and contemporary contributions of astronomers, it becomes evident that the study of celestial bodies has significantly advanced our understanding of the universe and laid the foundation for scientific inquiry. Through observations and analysis of stars, galaxies, and other cosmic phenomena, astronomers have made groundbreaking discoveries that have influenced various fields, including physics, chemistry, and biology. Furthermore, the exploration of space has led to technological advancements that have revolutionized scientific research, such as satellite technology and advanced imaging techniques. By showcasing the remarkable impact of astronomy on scientific progress, this presentation highlights the ongoing importance of this field in pushing the boundaries of human knowledge.

Why Nanoscience and Nanotechnology are so important?

Dr. Tesfakiros Weldu Gebreab

Mekelle University, Ethiopia

In this presentation the basic principles of Nanoscience and Nanotechnology and why it become so important explained in a simpler way. Advancement of the study of matter at small scale leads to the control and structure manipulation of materials engineering at nanoscale what we call it Nanoscience. This new science drastically changed the manufacturing industry's capability to design new small, custom-made smart materials by systematically organize and manipulate properties and behavior at molecular and atomic scale. Consequently causes for the establishment of new broad field of study at the interface between Physical Sciences (Physics and Chemistry), Life Sciences (Biology and Medicine) and Material Science (Engineering). Important physical properties of materials such as electrical, optical, thermal and mechanical properties can be manipulated. Major achievements of Nanotechnology field areas are Nanoelectronics, Aircraft manufacturing, imaging, tissue engineering, water purification, energy efficiency, sensors, environmental pollution, environmental-friendly construction materials and control drug delivery.

Ionospheric and magnetic signatures of extreme space weather events of 17 March and 23 June 2015 over the African sector

Dr. Yibekal Kassa

College of Science, Department of Physics, Washera Geospace and Radar Science Research Laboratory (WaGRL), Bahir Dar University, P.O. Box 79, Ethiopia

We have investigated responses of the African sector of the ionosphere to 17 March and 23 June 2015 severe geomagnetic storms. The vertical total electron content (TEC) measurements from Global Navigation Satellite System (GNSS) stations, which are located across the African continent, have been used to estimate the deviation of TEC (ΔTEC). The observed ionospheric response to these events was different at different locations. In the main phase of the 17 march 2015 storm, a significant positive ionospheric storm (ΔTEC maximum) occurred at Meli (245.8% enhancement) and Adis (105% enhancement) stations in the post-sunset period. On the other hand, during midnight negative ionospheric storms (ΔTEC minimum: ~ 46%–68% depletion) were observed at Dakr, Nklg, Wind, and Haro stations. The effects of 23 June 2015 storm are more pronounced during the initial phase. In the recovery phase of 23 June storm, negative storm effects observed at the eastern dip latitude and western equatorial stations. In contrast, at the northern and southern mid-latitude stations, we observed positive storm effect during the night periods. Night time TEC enhancement at mid-latitude stations probably caused by the vertical drift of the ionospheric plasma. We have also studied the magnetic signatures of the severe storms of 17 March and 23 June 2015 by analyzing their impacts on the horizontal (Hcomponent) of the Earth's magnetic field. By using a moving average filter, we have separated the effect of the magnetic disturbance (DP2) and the disturbance dynamo (Ddyn). The Hcomponent analysis shows that there was maximum oscillation of DP2 and Ddyn currents occurrence when the IMF-Bz directed southward. In the main and recovery phases of the storm, this strong current oscillation is the driver for the development of positive ionospheric effect.

Effect of cerium doping and oxygen reduction on superconducting critical temperature in $Nd_{2-x}Ce_xCuO_{4-\delta}$ superconductor

Dr. Zewdie Yayeh

Department of Physics, College of Science, Assosa University, Ethiopia

The superconducting critical temperature (Tc) depends strongly on parameters such as doping (or charge carrier concentration in the CuO2 planes), number of CuO2 layers n, density of states and annealing. When the material is doped, charge carriers enter the CuO2 plane and destroy the long-range antiferromagnetic (AFM) order. In this study, we investigated the effect of cerium doping and oxygen reduction variability on Tc in Nd2-xCexCuO4−δ (LCCO) superconductor and their interconnection by using the Green's function technique and Tikhonov regularization method (TRM). In the above methods, both TC parameter and antiferromagnetic transition temperature (TN) are calculated quantitatively by considering cerium (or electron) doping followed by annealing and magnetic ordering (ηe)) for the NCCO system. It was demonstrated that when magnetic ordering was present, TC is suppressed whereas TN is enhanced. On the other hand for cerium doping, the values of these parameters become vice-versa. It is shown that, with further electron doping, the AFM state leads to higher frustration. However, it subtly persists up to about, $x \approx 0.12 - 0.13$. The Tc of NCCO occurs in the range of x between 0.05 and 0.27 with $T_{C,max} \approx 25.63$ K at $x \approx 0.157$ where Fermi surface is reconstructed. The finding demonstrated that, the AFM phase and superconducting (SC) phase diagrams are established and coexist. The finding is compatible with previous results.

Novel metal oxide nanomaterials for manifold applications: From synthesis to device both experimental and computational approaches

Dr. Fekadu Gashaw

Department of Physics, College of Science, Addis Ababa University, Ethiopia

Over the past few years, nanomaterials have been the subject of extensive investigation. Nanoscale matter differs from matter in the solid, liquid, gaseous, and plasma states due to its unique physical and chemical properties. The shapes and dimensions of nanomaterials mainly determine their properties and their intended use. The fundamentals of nanomaterials from a physics perspective, as well as several low-cost synthesis approaches and characterization techniques, will cover in this lecture. Additionally, our research group's utilization of nanomaterials for numerous applications will present. Specially the applications of metal oxides semiconductor nanomaterials for solar cell and photocatalytic degradation of organic pollutants will receive special attention.

Benefits of integrated STEM and Astronomy outreach program for Universities

Dr. Tolu Biressa

Department of Physics, College of Science, Jimma University, Ethiopia

Education is central to life and development agenda of any country and community where science education plays major role in exploration and technology development. However, the way we handle and coordinate efforts and the integration of the sciences is not an easy task to do. Aware of this fact, we (I and my team) have exploited the multidisciplinary nature of Astronomy to participate stakeholders and the community to give attention towards science education (STEM) and astronomy in Ethiopia particularly around Jimma, West Ethiopia. For this task we used OAD vision 2024 under project entitled "Jimma Outreach Program for Astronomy". To this end, we were able to reach many schools including higher institutions in Astronomy and STEM outreach program creating clubs and working MoUs. Furthermore, we have benefited from the TUIMP project (www.TUIMP.org) in translating basic astronomy in local languages to teach and promote both Astronomy and STEM education. Therefore, in this paper we present our experiences, their benefits and address the way forwards in for the future perspectives. Also, we discuss on the effective use of projects and the way to collaborate and bring the trend to other sciences to reach school children and attract attention towards STEM education.

Biographies

Dr. Carl Wieman

Carl Wieman is a Professor of Physics and Education at Stanford University. Wieman has done extensive experimental research in both atomic physics (Nobel Prize in physics 2001) and university science and engineering education (Carnegie Foundation Professor of the Year 2004). He founded PhET, which provides online interactive simulations that are used 100 million times/year to learn science and recently published a book “Improving how universities teach science”. He is currently studying expertise and problem solving in science and engineering disciplines, and how this can be better measured and taught. Most recently, he is the recipient of the 2020 Yidan International Prize for Education Research.

Dr. Sossina Haile

Sossina M. Haile is the Walter P. Murphy Professor of Materials Science and Engineering at Northwestern University, a position she assumed in 2015 after serving 18 years on the faculty at Caltech. Prior to that she served for three years on the faculty of the University of Washington. She earned her Ph.D. in Materials Science and Engineering from the Massachusetts Institute of Technology in 1992 and spent two years, 1991-1993, at the Max Planck Institute for Solid State Research in Stuttgart, as a Fulbright and then a Humboldt Fellow. Prof. Sossina’s research broadly encompasses materials for sustainable energy technologies. Amongst her many awards, she received in 2008 an American Competitiveness and Innovation Fellowship from the U.S. National Science Foundation in recognition of “her timely and transformative research in the energy field and her dedication to inclusive mentoring, education and outreach across many levels.” In 2010 she was awarded the Chemical Pioneer Award (American Institute of Chemists), in 2012 the International Ceramics Prize (World Academy of Ceramics), and in 2020 the Turnbull Lectureship of the Materials Research Society. She is a fellow of the Materials Research Society, the American Ceramics Society, the African Academy of Sciences, and the Ethiopian Academy of Sciences, and serves on the editorial boards of *Joule* and *Annual Review of Materials Research*.

Dr. Solomon Bililign

Dr. Solomon Bililign joined NCA&T in 1993. He did his undergraduate and MS work in Physics at Addis Ababa University, Ethiopia, PhD at the University of Iowa and postdoctoral research fellowship at the University of Utah Department of Chemistry. His area of specialization includes Experimental and Theoretical Atomic, Molecular and Optical Physics /and Chemical Physics. He built research capacity in chemical physics and atmospheric sciences at NCA&T with a combined federal grant of over 23 million. He served as the Department Chair. In 2010 he was the recipient of the Presidential Award for Excellence in Science, mathematics and Engineering. He has received the senior researcher award for NCAT in 2002 and 2017, Interdisciplinary research team award in 2012, teaching excellence award in 2006, 2015 and 2018. 2010 Alumni Fellows of College of Liberal Arts and Sciences, The University of Iowa. 2022 Nominee for AGU Fellow.

Dr. Dereje Seifu

Dereje Seifu is a professor of physics at Morgan State University in Baltimore, Maryland, USA. He received his B.Sc. in 1982 and M.Sc. in 1985 from Addis Ababa University in Ethiopia. He completed his M.Sc. in 1989 and Ph.D. in 1994 in physics at the University of Cincinnati, Ohio, USA. The title of his doctoral dissertation was "Total Energy of Cu_cAu_{1-c} alloys". He is working at Morgan State University since 1994 as a lecturer, then in 1998 as a tenure track assistant professor. He was promoted to associate professor and tenured in 2003 and was promoted to a full professor in 2013. In addition, he served as acting department chair, from 2007 to 2009 and from 2013 to 2015. He has worked at NASA AMES Laboratory in California with the nanotechnology research group during the summer of 2004 and with the nanotechnology research group at the Army Research laboratory in Aberdeen, Maryland as a guest researcher since 1995. In addition, he has worked as a summer faculty researcher at the Brookhaven National Laboratory during the summers of 2009, 2010, and 2012. He has authored 40 peer-reviewed full-length publications, 60 abstracts, one book, two book chapters, presented at 40 national and international conference presentations, and has applied for two patents. His research interest is in nanoscience and nanotechnology, in particular, in nanomagnetic. Recently his research is evolving into quantum materials. He has received research grants from the US National Science Foundation and the US Army Research Laboratory. Since 2003 he has served as a contributor of questions to the physics GRE, and since 2018 he is a committee member as one of the six physics faculty members from US universities. He served the Ethiopian Physics Society in North America (EPSNA) from 2018 to 2021 as vice president and president.

Dr. Yohannes Abate

Yohannes Abate is the Susan Dasher and Charles Dasher MD Professor of Physics at the University of Georgia. Abate's condensed matter physics research interests include fundamental nanoscale physical phenomena and interactions in nano- and quantum- materials. His group implements various quantum-optics and nano-optics spectroscopy and imaging techniques with diffraction unlimited spatial resolution. His awards include NSF Career Award (2016), Scialog Collaborative Innovative Award, Research Corporation for Science Advancement (2015), Most Valuable Professor, California State University, Long Beach (2014), Luis Alvarez Award for Best Experimental Research (American Physical Society CA Section) (2008) and The 2000 International Publication Award (University of the Philippines, Diliman) (2000).
Professor Abate joined the University of Georgia (UGA) as an associate professor of physics in August 2017. He received BSc (physics) degree at Addis Ababa University, MS (physics) at the University of the Philippines, Diliman and PhD in Physics at the University of Iowa. From 2006-2009 he was a postdoctoral research fellow at the University of California, Berkeley and Lawrence Berkeley National Laboratory. In 2009 he was a visiting scientist at the Max-Planck-Institute für Biochemie, Martinsried, Germany. Before joining the UGA faculty, he was a member of the faculty (2014-2017) at Georgia State University and (2009-2014) at California State University.

Dr. Kevin Iga

Prof. Kevin Iga was born and raised in Honolulu, Hawai'i. He went to MIT and double majored in mathematics and physics, and in 1998 received his Ph.D. in mathematics from Stanford University, where he worked on the differential topology of four dimensional manifolds. He is currently Professor of Mathematics at Pepperdine University near Los Angeles, California, where he does research in the mathematics involved in supersymmetry and other areas of particle physics.

Dr. Hilary Hurst

Dr. Hilary Hurst is an Assistant Professor in the Department of Physics & Astronomy at San Jose State University. She is a quantum educator and theoretical physics researcher, with broad interests in condensed matter theory, many-body atomic physics, and open quantum systems. Her research primarily focuses on the theory of quantum noise and quantum measurement and feedback control for many-body quantum systems. Dr. Hurst is passionate about making quantum physics education more accessible and preparing students to work in the growing quantum technology industry. Dr. Hurst is originally from Greeley, Colorado and received her BS in Engineering Physics from the Colorado School of Mines in 2012. She went on to earn a Masters in Applied Mathematics & Theoretical Physics at the University of Cambridge (UK), and received her PhD in theoretical condensed matter physics from the Joint Quantum Institute at the University of Maryland. Following her doctoral work, she was a National Research Council (NRC) Postdoctoral Fellow at NIST in the Quantum Measurement Division. Dr. Hurst joined the faculty of San Jose State University in Fall 2020.

Dr. Christopher L. Smallwood

Christopher Smallwood is an assistant professor in the Department of Physics and Astronomy at San José State University (SJSU). He received an AB in Physics from Harvard College in 2005 where he conducted precision measurements of atomic rubidium vapor, and he received a PhD in Physics from UC Berkeley in 2014 where he developed techniques in time- and angle-resolved photoemission spectroscopy to study high-temperature superconductors. He spent two years as a postdoctoral research associate at JILA (University of Colorado and the National Institute of Standards and Technology) from 2014–2016 and two years as a postdoctoral research fellow in the Department of Physics at the University of Michigan from 2016–2018, where he specialized in using ultrafast spectroscopy techniques to study light-matter interactions in solid-state media. Between college and graduate school, he also taught fifth grade from 2005–2007 with Teach For America at Leo James Leo Elementary School in Mission, TX. He is the recipient of a National Research Council postdoctoral Research Associateship award at NIST, and the 2013 Lars Commins Memorial Award in Experimental Physics at UC Berkeley.

Dr. Ehsan Khatami

Dr. Khatami did his undergraduate and Masters studies in physics in Iran. He joined the PhD program at the University of Cincinnati in 2004 where he worked on dynamical mean-field solutions for strongly-correlated fermionic systems to study superconductivity. He graduated in 2009 and after several research positions at Louisiana State University, Georgetown University, UC Santa Cruz and UC Davis, joined San Jose State University in 2014 where he is now a Professor in physics. His numerical simulations of quantum many-body systems have been a part of several collaborations with atomic, molecular, and optical experimentalists. His group has also been exploring the use of machine learning tools for science discovery. Dr. Khatami is a KITP Scholar, and in 2018 he was awarded San Jose State University's Early Career Investigator Award.

Dr. Victor Montemayor

Dr. Victor Montemayor teaches Physics and Advanced Mathematics at Germantown Academy (GA) in Fort Washington, PA. He retired from Middle Tennessee State University (MTSU) in 2015 after serving for 25 years as Professor of Physics. Dr. Montemayor has received numerous awards for Teaching, Learning, and Innovative Educational Technology from both MTSU and GA. He was also the recipient of the 2013 Ernest L. Boyer International Award for Excellence in Teaching, Learning, and Technology. Dr. Montemayor received BS degrees in Physics and Mathematics from Bucknell University and the PhD degree in Theoretical Physics from the University of Toledo. He was a visiting scientist at the Hahn-Meitner Institute for Nuclear Research in Berlin, Germany and at the Institute for Atomic Research of the Hungarian Academy of Sciences in Debrecen, Hungary prior to accepting the position at MTSU. Dr. Montemayor has enjoyed teaching many different courses in physics, from introductory to advanced undergraduate-level courses. He was chair of the Committee on Medical Physicists as Educators and a member of the Education Council of the American Association of Physicists in Medicine for 11 years. Dr. Montemayor is currently completing another book introducing undergraduate science majors to the field of Medical Physics.

Dr. Mohammed Tesemma

Secondary education at W/O Sehin High School, Dessie, Wollo, Ethiopia; BSc &MSc in mathematics at Addis Ababa University, Ethiopia; Graduate diploma (=MS) at the International Center for Theoretical Physics, Trieste Italy; PhD in mathematics at Temple University, Philadelphia USA; Lecturer at Haramaya University (1993-97 GC before moving to USA); Assistant and Associate Professor in the department of Mathematics at Spelman College, Atlanta GA, USA (From 2004 - present. Also taught several summer graduate courses at Addis Ababa University in the effort to assist the PhD program at the University (2011 – 2018). Dr. Tesemma's research interest is in computational commutative algebra. More specifically SAGBI and Gröbner basis theories, as well as its connection to topological and ordered algebraic structures.

Dr. Curtis Asplund

Curtis T. Asplund is an assistant professor in the Department of Physics & Astronomy at San José State University, California. He completed postdocs at Columbia University and KU Leuven, and earned his Ph.D. from UC Santa Barbara, where he studied theoretical aspects of black holes and entanglement in quantum field theory. During 2022, he studied nuclear weapons policy as a Next-Generation Fellow with the Physicists Coalition for Nuclear Threat Reduction.

Habtamu Anagaw

Habtamu Anagaw is a PhD candidate at Bahir Dar University. His research focuses on theoretical investigation of superconductivity and thermodynamic properties of heavy fermon superconductors. Before joining Bahir Dar University in 2020, he completed his M.Sc. degree in condensed matter physics at Addis Ababa University. He also holds a bachelor's degree in Physics from Haramaya University.

Dr. Aaron Titus

Aaron Titus is a Teaching Professor in the Department of Physics at North Carolina State University and has a B.S. in physics from Penn State University and a Ph.D. in physics from North Carolina State University. Aaron's contributions are at the intersection of undergraduate research, educational technology, and computational physics. In 1997, Aaron and Larry Martin co-created WebAssign—a web-based homework application. Aaron co-wrote solutions for the 3rd and 4th editions of the textbook Matter and Interactions by Ruth Chabay and Bruce Sherwood and will be coauthor on the 5th edition of the textbook with Chabay and Sherwood. Aaron also contributes to VPython, a Python package for 3D graphics and vector algebra designed for integrating computational modeling into introductory physics. In 2011, Aaron received High Point University's highest award for distinguished teaching and service. In 2020, Aaron was one of 18 collaborators on the Open Source Physics Team led by Wolfgang Christian to receive the American Physical Society's 2020 Excellence in Physics Education award.

Dr. Daniel Erenso

Dr. Daniel Bekele Erenso was born in Addis Ababa, Ethiopia. He is a professor of physics at Middle Tennessee State University (MTSU), Murfreesboro, Tennessee, USA. He joined MTSU in 2003 after he received his Ph.D. in theoretical physics from the University of Arkansas. Before he came to the USA, He received a BSc (1990) and MSc (1997) in physics from Addis Ababa University (AAU), Ethiopia. He has attended the Advanced Diploma program in Condensed Matter Physics at ICTP, Trieste, Italy, in 1999. He has served in teaching, research, and mentoring at different universities. Since he began his service at MTSU, he has taught several introductory and upper-level physics courses. He had received the MTSU College of Basic & Applied Sciences Excellence in Teaching Award in 2011. Inspired by the COVID19 pandemic, he has published a book, "Virtual and Real Labs for Introductory Physics II Optics, modern physics, and electromagnetism." Dr. Erenso has also published the first volume of the six sequences of "Studies in Theoretical Physics", (Studies in Theoretical Physics, Volume 1: Fundamental Mathematical Methods at Institute of Physics (IOP) in Bristol, UK. At MTSU, he has also maintained an active research program. involving undergraduate and graduate students. His research interests include theoretical and experimental physics. Dr. Erenso has published over 40 and presented over 80 research works at national and international venues. For his research accomplishment, Dr. Erenso received Sigma Xi the Scientific Research Society Aubrey E Harvey Outstanding Graduate Research Award from the University of Arkansas in 2003, the MTSU Foundations Special Project Award in 2005, MTSU, College of Basic & Applied Sciences Distinguished Research Award in 2016, teaching and research earned him the Fulbright Scholar Award in 2016, and a nomination for American Physical Society (APS) Prize for a Faculty Member for Research in an Undergraduate Institution in 2020. He is a member of several professional societies, such as The Ethiopian Physical Society in North America (EPSNA) where he is currently serving as president.

Dr. Mesfin Tsige

Mesfin Tsige is a Professor in the Department of Polymer Science at the University of Akron, Ohio. He received the Ph.D. degree in condensed matter physics from Case Western Reserve University in Cleveland, Ohio and then went to Sandia National Laboratories at Albuquerque, New Mexico as a postdoctoral fellow. After four years of postdoctoral research, he joined the faculty in the department of Physics at Southern Illinois University at Carbondale, Illinois achieving the rank of Associate Professor before moving to the University of Akron in 2010. Tsige's group research interest is focused in the area of interfacial science. His group uses different types of simulation techniques and theory to study fundamental problems in diffusion, adhesion, wetting, self-assembly, and rheology. For details, check out his group's website: www.blogs.uakron.edu/mtsige/.

Dr. John Wallin

Dr. Wallin is the Director of the Interdisciplinary Ph.D. Program in Computational Science and a Professor at Middle Tennessee State University in the Department of Physics and Astronomy. His research has recently focused on three topics. Understanding the gravitational interactions in the universe using a variety of computational and observational techniques to link numerical models with data. The goal of this project is to connect dynamical parameters associated with galaxy interactions (time since the collision, mass ratios, etc.) to star formation rates and morphology. Using crowd-sourced data to train neural networks in complex image identification tasks. The current project is focused on identifying characters in Ancient Greek manuscripts. In a broader sense, this research focus on how well machines can learn from imperfect data. Exploring how mixed reality systems can be used in post-secondary STEM classrooms. Currently, this involves developing a scriptable interface for MR, developing laboratory modules, and then testing it in the classroom. Wallin received his B.S. Degrees in Physics, Astronomy, and Mathematics at Mankato State University in 1984. In 1989, Wallin obtained his Ph.D. in Astrophysics at Iowa State University. He was a National Research Council Cooperative Research Associate working in the Space Sciences Division at the Naval Research Laboratory from 1989 to 1992. From 1992 to 2010, Dr. Wallin was a faculty member in the Computational Science Program at George Mason University. During the 1999-2000 school year, he was on sabbatical leave as a visiting scientist at Los Alamos National Laboratory's Applied Physics Division (X-3). In 2010, he took the job as the first director of the Computational Sciences Program at MTSU. During the spring of 2010, he will be a Visiting Fellow at Mansfield College Oxford and the University of Minnesota. Dr. Wallin was awarded a Teaching Excellence Award in 1998 from George Mason University and was nominated for the Virginia Outstanding Faculty Award by the office of the Provost in 1999 and 2006. Dr. Wallin lives with his wife Katharine and their four cats in Murfreesboro Tennessee.

Dr. **Tesfaye Kebede Kidane**

Tesfaye Kebede Kidane is Engineering Manager at GE HealthCare MRI Science and Technology and the current vice president of EPSNA. He received his Ph.D. degree in Physics from Case Western Reserve University (CWRU) in 2005, focusing on Nuclear Magnetic Resonance Imaging. Since then he has assumed several positions in the company and worked across the world. Tesfaye holds more than ten MRI-related patents and is a recipient of the GE patent award. He is the founding member of Ethiopian Physical Society in North America (EPSNA) in 2008 and Ethiopian Physics society (EPS).

Dr. Aklilu Zeleke

Aklilu Zeleke is a professor of mathematics and statistics at Michigan State University (MSU). He holds a joint appointment in the Department of Statistics and Probability and the Lyman Briggs College, a residential college committed to connecting the natural sciences and mathematics with the humanities and social sciences. He received a Ph. D in probability from Temple University in 1997 and an M. Sc in mathematics from the University of Leipzig (Germany) in 1987. His research areas are in probability theory, combinatorics and statistics education.

Eden Aklile

Eden was born and raised in Ethiopia and came to the US in 2002. She lived and went to school in San Diego before moving to Chicago/Evanston to pursue a Ph.D. at Northwestern in materials science and engineering. She is finishing up her doctoral research on atomically thin 2D material synthesis, characterization, and transfer using scanning probe and related methods within ultra-high vacuum environments. Outside of the lab, Eden is active in communities and forums about global supply-chain systems in tech, Africa and tech, and African history. Eden enjoys contributing to the ESPNA executive team's initiatives and programming. Her hope is to be a resource and serve in a mentorship role for upcoming graduate, undergraduate and high school students interested in STEM.

Dr. Kassahun Betre

Dr. Kassahun Betre is Assistant Professor of Physics at San Jose State University. Prior to that he was faculty at Pepperdine University for three years. He completed his PhD in Theoretical High Energy Physics from Stanford University focusing on numerical and theoretical methods for detecting signatures of physics beyond the Standard Model. His current area of research interest is background independent quantum gravity. He studies ways in which General Relativity might emerge as an average property of graph-theoretic quantum systems.

Bitania Admasu

I am a recent graduate from Ohio State University and studied materials science and engineering. Currently, I work at the Goodyear Tire & Rubber Company as an engineering compounder. My work consists of advanced compound development for off-the-road tire performance through the use of innovative materials and technology. I serve as the secretary for the Ethiopian Physics Society - North America where I am responsible for recording meeting minutes and providing the newsletter to membership. I also serve as the communications chair for the Goodyear Black Network (GBN) where I am responsible for the marketing and communication as well as organizing events to inspire culture.

Dr. Selemon Bekele

My name is Selemon Bekele. I received a PhD in high energy experimental nuclear physics from The Ohio State University and another PhD in computational polymer science from The University of Akron. I have been a member of EPSNA since 2008. I had served as an auditor with the executive committee from 2008 to 2013. Presently, I am serving as a treasurer.

Dr. Alemayehu A. Gorfe

Alemayehu A. Gorfe, PhD, is Professor of Integrative Biology and Pharmacology at the McGovern Medical School and the Graduate School of Biomedical Sciences at the University of Texas in Houston. His laboratory studies biomolecular dynamics and protein-membrane interactions by combining molecular simulations and biophysical methods, with the goal of discovering therapies for unmet health challenges. He has published extensively on a range of topics including on the design of anti-cancer drugs. His research has been continuously funded by grants from the National Institutes of Health and the Cancer Prevention and Research Institute of Texas. Over the last 15 years, Dr Gorfe mentored scientists, postdoctoral fellows, graduate students, and undergraduate students many of whom have gone on to hold senior level positions in academia or industry. Dr Gorfe won Dean's Teaching Excellence award every year since 2016 for his classroom teaching. He is co-Director of a MD/PhD Training Program and participates in seven externally funded pre- and post-doctoral training programs including as an executive committee member. Nationally, Dr Gorfe rendered services to the Biophysical Society Committees, a National Institute of Cancer-Frederick National Laboratory Advisory Committee, an NCI/DOE Collaboration Task Force. Currently, he serves on the Scientific Advisory Committee for NCI/DOE AI-Driven Multiscale Investigation of RAS-RAF Activation Lifecycle and on the editorial board of multiple scientific journals including the Biophysical Journal.

Dr. Hagos Weldegebreal Zeweldy

My name is Hagos W/Ghebriel Zeweldi born in Tigray and attended Agazi Comprehensive Secondary School Adigrat. Currently I am an associate professor of Physics at Mekelle University, College of Natural and Computational Sciences. I completed my BSc (1990) and MSc (1996) degrees in Addis Ababa University Physics Department. My PhD in materials science, using computational techniques, is from the University of Pune, India. I started my career in teaching high school physics at Shambu Secondary School Wellega after I completed a two year diploma program from Bahir Dar University in 1984. Having my first degree I was employed at Arba-Minch University and served for three years till I joined my MSc degree in 1993. Since 1996, I am teaching different physics courses: example, Computational Physics, Mathematical Methods of Physics, Advanced Methods of Teaching Physics and Condensed Matter Physics at Mekelle University for undergraduate and post graduate students. Besides teaching I am advising students at the post graduate program and produced more than 16 research articles published in reputable journals. Community participation is part of my university engagement, hence most of my time goes to work with high school physics teachers in training and mentoring. Luckly, I got a chance to teach Sustainable Sources of Energy in the undergraduate program and become motivated to the field of Environmental Sciences. Hence, I am teaching courses on Environmental Physics and advising students in the field at the post graduate program. My administrative responsibilities range from a department headship to a College Dean and University Academic Programs Director and participate actively in university affairs. I am a member of Ethiopian Space Society, where I am the chair of the general assembly organized annually in Addis Ababa, and Ethiopian Physical Society. My research interest spans the fields of Computational Condensed Matter Physics as applied to nanostructure, Environmental Physics and Physics Education.

Jifar Raya Jemal

Jifar is Academic staff a Ph.D. student (Astronomy-Astrophysics) in the Department of Physics at Jimma University, Ethiopia. He received a Master of Science degree in Astrophysics from Jimma University in 2019 and a Bachelor of Science degree in Physics from Bahir Dar University in 2013. Before joining Jimma University, he has been a Teacher of Physics at Different Elementary and Secondary School. His Msc research focuses on the Gravitational Lensing in the Standard of LambdaCDM Cosmology. The recent active research areas hin Ph.D Work is on Radio Astronomy specifically on the area of Radio Galaxies by Using MeerKAT Telescope data Source. He have participated on International School, BIUST-MPG African Astronomy School 2023 that held from June 26 to July 7 at Botswana. He has a deep interest in working with Secondary school students and undergraduates in Astronomy Outreach and STEM at national and international levels from basic to applied science.

Habtamu Getachew Kumie

My name is Habtamu Getachew Kumie. I am a PhD student at Bahir Dar University, College of Science, Department of Mathematics.

Chalachew Lingerew

I am Chalachew Lingerew. PhD candidate in Atmospheric physics from Bahir Dar University.

Dr. Tesfakiros Weldu Gebreab

I am Tesfakiros Woldu (PhD) in Physics of Materials currently working in Mekelle University, College of Natural and Computational Sciences, in the Department of Physics as instructor. My research areas of interest are multiferroics, photocatalysis and nonlinear optics.

Derejaw Gardew Dubale

Derejaw Gardew Dubale is a Lecturer at Debark University and a PhD student at BDU in Solid state physics.

Woubshet Bahru

I was born in Arsi, Ethiopia in 1986. I have got my B.Sc. in physics from Asmara University, and my M.Sc. from Addis Ababa University. I taught physics in different secondary schools and worked being lecturer at Dilla University and Hawassa University. Currently I am head of Physics department at Hawassa University.

Dr. Tolu Biressa

I am an astrophysicist from Ethiopia, Africa. Educational Background: BSc. in physics and MSc. in physics (astrophysics) both from Addis Ababa University, Ethiopia. My PhD is in physics (Astrophysics, Cosmology) from Addis Ababa University in collaboration with the Observatory of Nice, France. My PhD thesis work is entitled “Dynamical aspects of the universe in the context of cosmological constant”. My career research area includes topics in cosmology, active galactic nuclei, stellar evolution and astrophysical compact objects and their environments. My other research interests and publications include: Cultural astronomy, astrobiology, DFT and science education. Currently, I am an academic staff of Jimma University, the head of Physics department. I have supervised more than 60 MSc. students in Astrophysics and space science. Presently, I am supervising MSc. and PhD students independently and as well with international collaborations. In addition, I am offering courses including General relativity, different astrophysics courses, electrodynamics, Quantum mechanics, mathematical methods of physics and other advanced courses both at undergraduate and graduate levels. My teaching career extends over 28 years including high school physics and mathematics teaching for 7 years. I have also contributed in the development and revision of Ethiopian national curricula, from Bachelor to PhD degrees in Physics. My career contribution in space science and astronomy development in Ethiopia include project developer, manager, curriculum developer and academic staff.

Mrs. Bekelu Abeba

Bekelu Abeba is a lecturer of Physics and Applied Geophysics at Haramaya University, Ethiopia. She did her BSc. Degree at Wolkite University and awarded gold medal during her graduation and Masters at Addis Ababa University, Ethiopia. She has been active in teaching, doing research, and community service. She is conducting research using Geophysical Methods. She has a good knowledge of WinResist, Oasis Montaj 6.4.2, AutoCAD, Matlab, Latex, Surfer, Julia, and Underworld software's to analysis Geophysical Data and her interest is assessing natural resources beneath the subsurface.

Dr Fekadu Gashaw Hone

Dr. Fekadu Gashaw is an Associate Professor of Physics and currently working at Addis Ababa University department of Physics as Researcher and lecturer. He has obtained his first degree in Physics from Debub University in 2001 and his MSc degree from AAU in Laser Spectroscopy (2006). He got his PhD degree from KNUST (Ghana) (2015). Dr Fekadu was also a Postdoctoral researcher at the University of the Free State, (South Africa) from 2016 to 2020. So far, four PhD students have graduated under his supervision, and eight more PhD research projects are ongoing. He has also advised more than 35 MSc students in Solid State Physics and Materials science since 2016. Moreover, He published more than 60 articles in ISI-Accredited Journals and 2 book chapters with h-index of 14. He currently serve as both the chair of the Physics department (AAU) and the president of the Ethiopian Physical Society (EPS). In addition, He is a member of the Harla journal advisory board. His research mainly focuses on the development and characterization of novel nanomaterials for various applications such as Energy storage and conversion, Gas sensors and Antimicrobial activities.

Dr Yikdem Mengesha Gebrehiwet

I received my PhD in astronomy and astrophysics from AAU (Entoto Observatory and research center). I am working on runaway stars from star clusters. Now I am working as head of the department of physics, CNCS, MU.

Acknowledgement

Thank you for your participation in this year's virtual summer school! The executive committee would like to thank all presenters and participants for their time and contributions. We extend our thanks to all EPSNA members and supporters. Special thanks to Middle Tennessee State University for providing the Zoom platform for the summer school.

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Graduate study opportunity

The Atmospheric Science program under the Department of Physics and Applied Science & Technology PhD Program at North Carolina A&T State University is looking to recruit 2 PhD and 2 MS students with a solid background in Atmospheric Science & Meteorology, Physics, applied mathematics and/or engineering and a deep interest in tropical climate variability and change with a focus on African monsoon and Atlantic tropical cyclones. The research assistantships will be supported from recent research awards. Attractive packages are available to cover the cost of living (stipends) and tuition and university fees. You are expected to have a basic knowledge of programming (programming in any one or more of the following: Python, MatLab, R, GrDAS, etc.). Knowledge of higher-level statistical packages is a plus. Our research integrates observational analysis with theoretical and modeling studies using Weather Research and Forecast (WRF) and US Department of Energy's Energy Exascale Earth System Model (E3SM). Our Graduate College requires GRE and TOEFL.

Interested students may contact Prof. Ademe Mekonnen at amekonne@ncat.edu or call at 336-285-2222.

EPSNA 2023 Mentorship Program

EPSNA mentorship application for 2023 is open. The purpose of the EPSNA mentorship program is to provide financial aid and information that can help Ethiopian students who would like to peruse post graduate study abroad. Eligibility: BSC or MSC degree in Physics, Engineering and Mathematics from higher education institutions in Ethiopia.