

# Curriculum Vitae

## Paul Guèye

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### Professional Preparation

Associate Professor, Physics Department, Michigan State University, 2018-Present  
Scientist, National Superconducting Cyclotron Facility/Facility for Rare Isotope Beams, 2018-Present  
Chairperson, Physics Department, Hampton University, 2015-2018  
Assistant Professor, Physics Department, Hampton University, 2012-2018  
Research Faculty, Physics Department, Hampton University, 2000-2012  
Postdoctoral fellow, Nuclear Physics, Hampton University (Virginia, USA) 1995-2000  
Ph.D. in Nuclear Physics, University of Clermont-Ferrand (France), 1994  
M.S. in Physics and Chemistry, University of Cheikh Anta Diop (Senegal), 1990  
B.S. in Physics and Chemistry, University of Cheikh Anta Diop (Senegal), 1987

### Major Appointments

2017-2018 **Michigan State University:** Executive Director for the MoNA Collaboration  
2016-Present **Michigan State University:** Visiting Professor, National Superconducting Cyclotron Facility/Facility for Rare Isotope Beams  
**National Radio-Astronomy Observatory:** Research Scientist  
2015-Present **Hampton University Physics Department:** Chairperson  
**American Institute of Physics:** Chair, Liaison Committee for Under Represented Minorities of the  
2013-2018 **Hampton University Accelerator Physics Program:** Director  
**Hampton University Physics Department Outreach Program:** Coordinator  
2012-2015 **National Society of Black Physicists:** President  
2012-2015 **American Physical Society:** Member of the Advisory Board of the APS Bridge Program  
**Girls Inc. of the Greater Peninsula:** Member of the Advisory Board  
2012-2013 **Hampton University Graduate Medical Physics Program:** Interim Director  
2011-Present **Historically Black Colleges and Universities:** Coordinator of the Council for HBCU Physics Department Chairs  
2011-2013 **US Particle Accelerator School:** Minority/Outreach Coordinator  
**American Association of Physicists in Medicine:** member of the Portal Working Group  
2012 **American Physical Society:** Member of the Advisory Committee on the Graduate Education Conference  
2011 **American Association of Physics Teachers:** Coordinator of the NSF/AAPT 2011 SPIN-UP (Strategic Programs for Innovations in Undergraduate Physics) Regional workshop that focuses on Historically Black Colleges  
**American Association of Physics Teachers:** Member of the Advisory Committee on the Strategic Programs for Innovations in Undergraduate  
**Scientific Research Council of the African Union:** in consideration as a member  
2010-2016 **American Institute of Physics:** member of the Advisory Committee on Physics Education  
**American Association of Physics Teachers:** member of the Advisory Committee on the Strategic Programs for Innovations in Undergraduate Physics  
2010 **Materials Research Society:** member of the Sub-Committee in Africa  
**Hampton University Medical Physics Graduate Program:** head of Geant4 simulation group  
**US French Embassy:** Representative for the US Francophone Space Research Association

- 2009-2012 **American Association of Physicists in Medicine:** African Affairs Sub-Committee of the, Chair; International Affairs Committee, member  
**Geant4 Collaboration:** member; Steering Board Representative for the Low Energy Physics (2009-2011)  
**International Organization for Medical Physics:** Science Committee member
- 2007-2010 **American Physical Society:** member-at-Large for the Forum for International Physics; APS-FIP Newsletter Working Group, member
- 2007-2008 **Hampton University Presidential appointment:** Modeling and Simulation Planning Committee, member
- 2006-Present **National Society of Black Physicists:** Nuclear & Particle Physics Section, Co-Chair; Pre-College Programs Committee, Chair
- 2005-2013 **American Association for Physicists in Medicine Minority Recruitment:** Sub-Committee Founder and Chair  
**Geant4 Collaboration:** Geant4 North America User Organization (G4NAMU), initiator and Co-chair
- 2005-2008 **Advanced Laser Light Source (Varenes, Canada):** contact person for radiation safety, nuclear and accelerator physics program of the
- 2005-2007 **ECPI College of Technology:** Physics coordinator for all ECPI campuses
- 2005-2018 **Hampton University Physics Department:** Safety Radiation Officer
- 2002-2018 **Hampton University School of Science Recruitment Committee:** member

### Other Appointments

- 2016-2017 Hampton University Task Force on Internationalizing its Community of Scholars: Chair
- 2011-Present Geant4 coordinator for NASA space radiation program
- 2010-Present American Association of Physics Teachers:
- 2009-Present Member of the Advisory Committee of the New Faculty Workshop lead by a joint effort between the American Association of Physics Teachers and the American Physical Society
- 2008-2009 Board member, Robert E. Lee elementary school, Hampton, VA
- 2008-Present Member of the International and Educational Activities of the American Association of Physicists in Medicine  
 Representative for the American Physical Society Division of Physics of Beams  
 Technical Executive Officer and Board Member of the National Society of Black Physicists  
 Coordinator for testing of the Low Energy Physics of the Geant4 Monte Carlo simulation toolkit collaboration
- 2007-Present AAPM representative to the American Institute of Physics Liaison Group on Under-Represented Minorities  
 Jefferson Lab Geant4 Steering Committee, Liaison
- 2005-Present Summer Undergraduate Fellowship Program Sub-Committee of the American Association for Physicists in Medicine, member  
 Education and Training of Medical Physicists of the American Association for Physicists in Medicine, member
- 2005-2007 ECPI College of Technology Curriculum Sub-Committee, member
- 2004-Present Medical Physics Section of the National Society of Black Physicists, Co-Chair

### Publications

More than 100 publications. The last three years are listed below.

#### 1. Peer-reviewed (out of 75)

- 1.1. S. B. L. Amar, O. Ka and P. Guèye, Meson Photo-Production in GEANT4 for  $E_\gamma = 0.225\text{--}3.0$  GeV using the  $\gamma + p \rightarrow p + \pi^0$  reaction, Eur. Phys. J. A **55**: 62 (2019)

- 1.2. **P. Guèye** et al., Dispersive Corrections to the Born Approximation in Elastic Electron-Nucleus Scattering in the Intermediate Energy Regim, arXiv:submit/2275115 [nucl-ex] (May 28, 2018) – in review with Eur. Phys. Jour. A
  - 1.3. V. Tvaskis et al., *Measurement of the separated longitudinal structure function  $F_L$  from hydrogen and deuterium targets at low  $Q^2$* , Phys. Rev. **C97**, 045204 (2018)
  - 1.4. Z. Ye et al., *Search for three-nucleon short-range correlations in light nuclei*, Phys. Rev. **C97**, 065204 (2018)
  - 1.5. Tesfamicael B Y, **Gueye P**, Avery S, Lyons D, Mahesh M. *A portable secondary dose monitoring system using scintillating fibers for proton therapy of prostate cancer: A Geant4 Monte Carlo simulation study*. Int. J. Cancer Ther. Oncol., **4**(2):4115 (2016).
  - 1.6. J. Allison et al., *Recent Developments in Geant4*, Nucl. Inst. Meth. Phys. Res. **A**, accepted (June 2016).
  - 1.7. D. Abbott et al., *Production of Highly Polarized Positrons Using Polarized Electrons at MeV Energies*, PRL **116**, 214801 (2016).
2. Conference proceedings and reports (out of 50)
    - 2.1. The MONA Report – T. Baumann et al. for the MONA Collaboration: report on the activities at the National Superconducting Cyclotron Facility of Michigan State University, February 10, 2016.
    - 2.2. N. Govi, **P. Gueye** and S. Avery, *Application of MAGAT polymer gel dosimetry in breast balloon – 7<sup>th</sup> International Conference on 3D Radiation Dosimetry (IC3DDose)*, Journal of Physics: Conference Series **444**, 012103 (2013).
3. Invited Talks (more than 100)
    - 3.1. APS Division of Nuclear Physics, Hawaii (2018)– invited talk on *Two Decadal Survey of Unbound Nuclei with the Mona-Lisa Detector: Past, Present and Future Outlook*
    - 3.2. APS March Meeting, New Orleans, LA (2017) – Marie-Curie: A 150<sup>th</sup> Birthday Celebration: invited talk on *The Curie Institute in Senegal to Nuclear Physics*
    - 3.3. Collaboration Meeting between DoE, CSU, ANL, FNAL and NSBP, Fermilab (2015) – invited talk on *NSBP Program Highlights. **Included follow-up discussions with LaDorris Harris of the US Department of Energy on improving minority groups in physics***
    - 3.4. 20<sup>th</sup> Geant4 Collaboration Meeting, Fermilab (2015): Co-Organizer – Welcome address and contributed talks
    - 3.5. **Office of Science and Technology Policy, Washington, DC (2014)** – invited to participate in the **Minorities in STEM Workshop** – provided a talk on a proposed Physicists Inspiring the Next Generation program
    - 3.6. APS Division of Nuclear Physics, (2013) – contributed talk on *Geant4 simulation: unbounds in a multi-layered target*
    - 3.7. APS March Meeting, Denver, CO (2013) – Organizer of the Minorities in Medical Physics Session and invited talk on *Drawing minority students into the physics community*
    - 3.8. APS April Meeting, Washington DC, (2010) – Organizer of the Panel Discussion on Physics in Africa
    - 3.9. **Senegalese Government: meeting with President Abdoulaye Wade** in Dakar, Senegal (2000) – invited talk on a physics based research facility for Senegal
4. Books review (3)
    - 4.1. Drexler, Wolfgang; Fujimoto, James G., *Optical Coherence Tomography: Technology and Applications (Biological and Medical Physics, Biomedical Engineering)*, Springer, 2008, ISBN: 978-3-540-77549-2
    - 4.2. Tokési, Károly; Sulik, Béla, *Radiation Damage in Biomolecular Systems: Proceedings of the 5<sup>th</sup> International Conference (RADAM 2008)*, Debrecen, Hungary, 13-15 June 2008, American

Institute of Physics, 2009, ISBN: 978-0-7354-0611-7

- 4.3. Robert Splinter, *Handbook of Physics in Medicine and Biology*, Taylor & Francis, ISBN: 9781420075243 (2010).

### Grants

#### 1. National Science Foundation

- a. **Award #1713589**: RUI: Collaboration to Enhance Participation of Minority and Undergraduate Students in Nuclear Science – PI: P. Gueye: 0.1 person-month per year, \$218,995 (05/01/17-05/31/20)
- b. **Award #1649878**: NSF/HBCU-UP EAGER: Undergraduate Astronomy Research and Education through Observation of Jupiter Impact Flashes to Characterize Small-Body Populations in the Outer Solar System – PI: K. Sayanagi, Co-PI: P. Gueye: 0 person-month per year, \$259,157 (09/15/16-08/31/18)

2. **Jefferson Science Associates Minority/Female Undergraduate Research Assistantship/Thomas Jefferson National Accelerator Facility**: award to Ms. Maya Watts to support the development of a Gas Photo-Multiplier (GPM) system as a next generation neutron detector– PI: P. Gueye: 0 person-month per year, \$6,000 (09/01/19-12/31/20)

3. Pending

- a. **National Science Foundation**: Windows on the Universe: Study of Open Quantum Systems in Atomic Nuclei, \$6,000,000 (08/15/20-08/14/23)

### Research accomplishments

#### Nuclear Physics

- Staff scientist, National Superconducting Cyclotron Facility/Facility for Rare Isotope Beams
- Executive Director, MoNA Collaboration for the National Superconducting Cyclotron Laboratory/Facility for Rare Isotope Beams
- Co-PI on a project to understand the nature of dark matter in a new experiment (Dark Light Invisible) that will search for a heavy boson using the Free Electron Laser facility at Jefferson Lab.
- Development of a segmented target with Michigan State University to understand neutron rich nuclei at or beyond the drip line.
- Development of a novel technique that utilizes the convolution product and Lyapunov stability to extract hadronic form factors. The work involve an international collaboration from the US, Canada and Europe. This work will eliminate current approximations and extrapolation techniques used for this purpose. Proposals are in the work to be submitted to national and international facilities for experimental and theoretical work.
- Measurements of low energy polarized cross sections using the 5 MeV Mott polarimeter of the injector at Jefferson Lab.
- Co-PI of a research program aims at measuring elementary cross sections for electron scatterings (from 20 eV to +10 GeV) and low energy neutrons production. This work involves an international collaboration with several groups in the US (Jefferson Lab, Stanford Linear Accelerator, National Institute of Standards and Technology, Harvard University, University of Pennsylvania, etc.), Canada (Laval, Sherbrooke, and McGill Universities, Advanced Laser Light Source), France (Atomic Energy Commission CEA-Saclay, National Center for Scientific Research CNRS/IN2P3, etc.), Switzerland (European Center for Nuclear Research CERN, University of Basel, etc.), Japan (High Energy Accelerator Research Organization KEK) and Italy (Nuclear Physics Institute INFN) among others.
- Period coordinator for the first strangeness experiments (e93018) in Hall C. Produced seven PhD students.
- Analysis and Monte Carlo simulations for unpolarized and polarized  $A(e,e'K)$  experiments for Hall C.
- Co-PI on an experimental program to study  $s=0$  strange narrow resonance states, kaon color transparency and  $\Sigma^-$  production in  $A(e,e'K)BY$  ( $Y=[\Lambda, \Sigma^0, \Sigma^-]$ ) Reactions. This program is an international effort with US institutions, France, the Czech Republic, Italy and India.

- e<sup>+</sup>/e<sup>-</sup> experiment at the Saclay Linear Accelerator (ALS), France. Performed a study on the validity of the correction terms of the Plane Wave Born Approximation (PWBA) in a comparison of electron and positron cross sections of <sup>12</sup>C and <sup>208</sup>Pb.

#### Accelerator Physics

- Collaborator on a team to develop an electron-heavy ion collider at MSU
- Collaborator on a team to investigate the production of a positron beam at Jefferson Lab.
- Design, development and construction of a Low Energy Linear Accelerator at Hampton University. This research results from a recent collaboration between the Accelerator Division at Jefferson Lab and the Physics Department at Hampton University. It is based on a 100 keV thermionic electron gun that was graciously provided by the Accelerator Division to develop an on-campus mini-facility.
- Development of a PARMELA/Geant4 sandwich code for beam transport and online monitoring system to be used for the 12 GeV upgrade at Jefferson Lab. This research is a spin-off of the medical research activity using scintillating materials.
- Spearheading and effort on the development of an electron micro-beam facility (analog to the microbeam facility developed in Bordeaux and in which single ion can interact with biological systems). Work being done in collaboration with the University of Bordeaux Gradigan (France) and the Gun group at Jefferson Lab.
- Involved in ongoing experiments in the experimental hall C at Jefferson Lab. Assist in the analysis of the data and for beamline information (beam energy and energy drift, beam position, and fast raster). Developed the Hall C energy measurement software (that was duplicated and implemented in Hall A).
- Developed a (Hall C) energy drift software to provide online and offline analysis correction of the reconstructed beam energy drift due to phase matching offset within the CEBAF machine. This software plays a crucial role for the hypernuclear spectroscopy program at Jefferson Lab.
- Construction (design, built and electronics) and Monte Carlo simulation of a 50x50 wire grid monitor for the end stations C at Jefferson lab. This monitor could provide a high level of precision for beam monitoring (150 μm, 1 μrad). It uses a ceramic frame and 7 μm carbon fibers. A first prototype was been implemented in the Hall C beam-line by the winter of 1997 and the first stage of experiments were completed in 1998. Two middle school and two undergraduate students have been supervised during this project and one publication produced.

#### Medical Physics

- Development of the 1<sup>st</sup> ever K-12 outreach demonstration kit in medical physics under the Minority Recruitment Sub-Committee of the American Association of Physicists in Medicine.
- Head of the Brachytherapy R&D Group of the Center for Advanced Medical Instrumentation of Hampton University.
- Development of a 3D detector for absolute calibration of beta and gamma Brachytherapy sources. Work being done in collaboration with the National Institute of Standards and Technology (NIST).
- Development of 3D and 4D detectors for ex-vivo and in-vivo dose distribution measurements using scintillating based material. The method provides modification of Brachytherapy catheters to become sensitive devices. Applications range from heart diseases (intravascular Brachytherapy) to cancer (breast, prostate, neck, head etc.). Work being done (among others) in collaboration with local hospitals (Eastern Virginia Medical School, DePaul Hospital), UPenn, Varian and Cytyc.
- Research coordinator for the capability to extract 3D structural information of cancer cells from 2D images.
- Co-PI on a research studying the response of cancer cells to polarized beam. Work being done in collaboration with EVMS.
- Co-PI on a research that enhanced the immune response of the body via a non-ionizing radiation. The work is done in collaboration with EVMS.

- Collaborator on a dedicated PET imager for prostate cancer. Work in collaboration with Jefferson Lab, Johns Hopkins University, and the University of Maryland.
- Development of a Kaon therapy based cancer treatment study. The strange quark content of this hadron allows in-vivo online monitoring of the beam within a body with micron accuracy and picoseconds timing.
- Geant4 Monte Carlo simulation for Brachytherapy applications and imaging capabilities.
- Collaboration work with UPenn in the development of Geant4 Monte Carlo simulations for their proton therapy system.

#### Radiation Biology

- Development of polarized Brachytherapy sources involving cell lines. This research aims at assessing the polarization state differences between cancer cells and healthy cells. Work being done in collaboration with EVMS.
- Development of mono-energetic Brachytherapy sources and radiation biology research involving cell lines. This research aims at addressing the energy response of cancer tumors in the keV to MeV range. Work being done in collaboration with EVMS and Jefferson Lab. The work entails among others the creation of bio-dosimeters to better assess radiation exposure.
- PI on a Geant4-DNA tracking validation project (an extension of the European Space Agency funded Geant4-DNA project) that will provide tracking of particles within cells using ultrafast lasers. The work is done in collaboration with Hampton University, CNRS/IN2P3-CENBG-Bordeaux Gradigan, the University Cheikh Anta Diop, Thales Optronique, Laser Solutions Unit, the European Space Agency, Eastern Virginia Medical School, the French Embassy in Washington DC, the French Space Agency and the US National Aeronautics Space Agency.

#### Plasma Physics

- First Peta Watt Conference (May 2007, Washington, DC): co-organizer and session chair.
- PI on a radiation monitoring tool to address biological radiation issues for the Advanced Laser Light Source (ALLS) international facility located in Varennes, Canada. This tool will comprise a set of radiation monitors and associated data acquisition systems, a dedicated simulation tool (G4ALLS) for experiments specific issues, and dedicated experiments for radiation effects study in a wide dynamic range. Work being done in collaboration with Jefferson Lab.
- PI on a detector development for characterization of lepton and hadron beams produced by ultrafast Tera Watt lasers. This cutting-edge non-conventional acceleration technique allows (in principle) acceleration gradient on the order of a few GeV/cm. These beams are believed to become the next generation of accelerators for nuclear/high energy physics research. This work is being done in collaboration with the University of Michigan, the University of Nebraska Lincoln and the Advanced Laser Light Source.
- Construction (design, built and electronics) of a QQD beam-line and spectrometer analyzer for a laser-plasma induced electron beam at the Center for Ultrafast and Optical Science (CUOS) at the University of Michigan (Ann Arbor). A dedicated 32x16 scintillating fiber array detector has been built to characterize the spatial and energy distribution of the electron beam, as well as a Faraday cup for the total number of particles. A CAMAC data acquisition system is used for data taking. A Lab View based program is also used to remotely control the setting of the four magnets. Since its starting stage, routinely two undergraduate students are being supervised to gain experience in experimental physics. A Geant4 Monte Carlo (EBS) has also being developed to help optimizing the experimental aspect.

#### Space Radiation

- Geant4 coordinator for NASA space radiation program with Hampton University. This collaboration aims at using the Geant4 Monte Carlo simulation toolkit to benchmark some of the transport codes used by NASA for its space radiation program.

- Nominated as the coordinator for the French-speaking space user community. Work being performed for the French Space Agency and coordinated by the French Embassy in Washington DC.

### **Synergic Activities**

- Develop a (PEGAGUS) program to increase HBCU undergraduate students participation into graduate programs and/or postdoctoral positions at major institutions through a series of 2-3 days visits (to expose them to campuses of Michigan State University, Purdue University, Yale University and Brown University).
- Spearheaded an effort to increase the participation of minority students at national facilities, especially in the area of nuclear physics through various collaborations with Jefferson Lab, NSCL/FRIB and ANL.
- Spearheaded an effort to create of an Accelerator Physics Section under the National Society of Black Physicists and an accelerator physics courses within several HBCUs (Hampton University, Norfolk State University, Virginia Common University, Virginia Union University, Elizabeth City State University and Howard University).
- Development of a comprehensive effort between physics societies to address disabilities in physics. The work entails the development of tools within societies to assist more people with disabilities and includes the National Society of Black Physicists, the National Society of Hispanic Physicists, the American Association of Physicists in Medicine, the American Physical Society and the American Institute of Physics.
- Initiator and leader of an international project to assess and validate the physical processes governing the interaction of particles with the DNA using the Geant4 Monte Carlo simulation toolkit and ultrafast laser technology. This is an extension of the European Space Agency funded Geant4-DNA project for the modeling of biological effects of radiation and shielding. The project received seed money in the Spring 2010 from the Science and Technology Mission of the French Embassy in Washington, DC. The partners include: Eastern Virginia Medical School (US), the National Aeronautics and Space Administration (US), the Advanced laser Light Source (Canada), the Centre d'Etudes Nucléaires de Bordeaux Gradignan (France), the Groupe de Recherche Interdisciplinaires (Senegal), and the European Organization for Nuclear Research (Switzerland).
- Geant4 Monte Carlo Tutorial School: Jefferson Lab: organizer and lecturer (May 2006); Paris/France - co-organizer and lecturer (June 2007); Annecy/France: co-organizer and lecturer (June 2008); Dakar/Senegal: organizer and lecturer (November 2009).
- Initiator and Co-Chair of a Medical Physics for Africa 2006 session held at the World Congress of Medical Physics and Biomedical Engineering (Soul, Korea) on August-September 2006. Speakers involved: IOMP (General Secretary and Science Committee chair), AEIA, iThemba Labs Director, LTL Strategies and representatives from UNESCO, World Bank and African Union.
- Initiator and Co-leader of an international project aimed at constructing two research facilities in the United States and Africa. These multidisciplinary research centers will house a 500 TW ultrafast laser system, a cyclotron and accelerator mass spectrometry systems. The research areas will cover astrophysics, nuclear/high energy physics, plasma physics, material sciences, optical sciences as well as medical applications for cancer treatment and imaging.
- Initiator and chair of Medical Physics Focus sessions at the American Physical Society 2006 March meeting held in Baltimore (MD). Speakers involved: NIH Directors of NCI, NIBIB, NCHDM and the Presidents of AAPM and ASTRO. This session explored opportunities and vistas in medical physics research and practice, teaching medical physics to undergraduates, medical physics curriculum as a recruiting tool for physics departments, and the prospect of establishing a Division of Medical Physics within the American Physical Society. Three similar sessions were held during the 2007 APS March meeting with speakers from Massachusetts General Hospital, Fox Chase Center, Eastern Virginia Medical School, and the University of Columbia. Four sessions were done at the 2008 conference.
- Co-chair of the Nuclear and Particle Physics Section of the National Society of Black Physicists.

- Initiator and Co-Chair of the Pre-College Programs Committee of the National Society of Black Physicists. In 2006, PPC launched a science show that involved researchers, faculty and students from minority institutions and K-12 teachers and students from local schools. The 2007 included K-12 students from the Boys & Girls Clubs of the Boston area and was done in collaboration with the Physics Circus of the University of Texas at Brownsville. A dedicated K12 mini-conference was launched at the 2008 conference. This is an APS-like conference for kids, departing from current science fairs.
- Initiator and Chair: Minority Recruitment Sub-Committee of the American Association for Physicists in Medicine established in 2005.
- Initiator and Co-Chair: Medical Physics Section of the National Society for Black Physicists (2003-present).
- Geant4 North America Medical Users Organization (G4NAMU): initiator and Co-chair. G4NAMU was officially launched at the 2005 AAPM annual meeting. Head of the Brachytherapy section.
- PI of a joint HU/Jefferson Lab accelerator physics course for minority students. The program will be linked to an ongoing NSF proposal focusing on the construction of a Low Energy Linear Accelerator (LELIA) that is a reproduction of the Jefferson Lab injector setup. The collaboration involves the Injector group, the SRF group, the Operation group and the Accelerator Division.
- PI on a proposal aimed at establishing partnerships among institutions of higher education (primarily HBCUs), and local rural and urban school districts by strengthening the development of mathematics and science for K-12 students through the implementation of a K-12 Instructional Development in Science program. This is a proposal to be submitted to the National Science Foundation under the National Society of Black Physicists.
- Chair of weekly meetings for graduate students at Jefferson Lab in 1997-2001. These meetings aimed at supervising graduate students during their analysis. It regrouped a total of about 20 students from national and international universities, and covers various topics related to electron scattering experiments (polarized and unpolarized experiments, elastic scattering, and meson ( $\pi$ ,  $k$ ,  $\omega$ ,  $\rho$ ) production).
- Lecturer: K-12, colleges.
- Science Fairs: judge, collaborator.
- Physics demonstrations: supervisor of undergraduate and graduate students for local schools/centers.

### **Teaching Experience**

- Michigan State University (2019-Present)
  - o Undergraduate students courses: Introduction to Physics (PHY194)
- Hampton University (1996-2018)
  - o Undergraduate students courses: Introduction to Physics (PHY201, PHY202); Modern Physics (PHY211, PHY212); Analytical Mechanics (PHY301, PHY302); Experimental Physics (PHY306)
  - o Graduate students courses Math Methods in Physics (PHY521); Diagnostic Imaging (PHY625); Advanced studies in Intermediate Energy (PHY740)
- ECPI College of Technology (Adjunct Faculty, 2000-2015): Undergraduate Physics courses – PHY101, PHY120, PHY125.
- Strayer University (Adjunct Faculty, 2001-2015): Undergraduate Physics courses – Statistics (MAT300, MAT540), Introduction to Physical Science (SCI110)
- Elizabeth City State University (Adjunct Faculty, 2008-Present): Undergraduate Physics courses – General Physics II (PHY182)
- Texas Southern University (Consultant, 2009-2013): development of small scale research using the Geant4 Monte Carlo toolkit and experiments (for validation)
- University of Pennsylvania (Consultant, 2008-2001): development of a Geant4 simulation tool for their proton therapy center.



- Other Tutoring experience (Senegal/France/USA): elementary school to Ph.D. in mathematics, physics, chemistry, biology and French.

**Thesis Advisor and Committees**

- Ph.D. thesis
  - o Dayah Chrisman, Ph.D. candidate in Nuclear Physics, Michigan State University (2021)
  - o Bineta Amar-Lo, Ph.D. candidate in Nuclear Physics, University Cheikh Anta Diop (2020).
  - o Adeleke Adeyemi, Ph.D. in Accelerator Physics, Hampton University (2016). **First ever African-American PhD student to obtain a PhD in Accelerator Physics from an HBCU and JLab.**
  - o Nebi Demez, Ph.D. candidate in Medical Physics, Hampton University (2015).
  - o Biniam Tesfamicael, , Ph.D. in Medical Physics, Hampton University (2013).
  - o Nanda Karthik, India, Ph.D. in Medical Physics, Hampton University (2013).
  - o Jerry George, Ph.D. in Medical Physics, Hampton University (2012).
  - o Carlos Velasco, Mexican, Ph.D. in Medical Physics, Hampton University (2008).
  - o Nnenna Onumah, African, Ph.D. in Medical Physics, Hampton University (2007). **First ever African-American PhD student to obtain a PhD in Medical Physics from an HBCU.**
  - o Jean-Francois Carrier, Caucasian, Ph.D. in Medical Physics, member of the thesis committee, University of Laval (2005). Currently staff on the Radiation Oncology Department of the University of Montreal.
  - o Dr. Mark Harvey, African-American, Ph.D. in Nuclear Physics, member of the thesis committee, Hampton University (2002). Currently a physics faculty at Texas Southern University.
- M.S. thesis
  - o Malinga Rathnayake, M.S. candidate in Nuclear Physics, Hampton University (2021). Work on LAr-TPC active target for the MoNA Collaboration.
  - o Rachel Black, African-American, M.S. candidate in Nuclear Physics, Hampton University (2013). **Recipient of a 2006 NSF Fellowship for her thesis work focusing on radiation biology (the first for Hampton University Physics).**
  - o Bineta Amar-Lo, M.S. candidate in Nuclear Physics, University Cheikh Anta Diop (2012).
  - o Lawrence Tynes, African-American, MS in Medical Physics, Hampton University (2010).
  - o Ariano Munden, African-American, M.S. in Physics, Hampton University (2007).
- B.S.
  - o Angel Christopher, B.S. in Physics, Hampton University (2020). Work on LAr-TPC active target for the MoNA Collaboration. **Recipient of a 2018 NSCL/FRIB Fellowship**
  - o Letrell Harris, B.S. in Physics, Hampton University (2019). Work on a joint GEM detector design project for a new GEM-Be segmented target for the MoNA Collaboration. **Recipient of a 2018 NSCL/FRIB Fellowship**
  - o Brittany Maynard, B.S. in History, Minor in Physics, Hampton University (2019). Work on the history of nuclear science. **Recipient of a 2018 NSCL/FRIB Fellowship**
  - o Bilal Jones, B.S. in Physics, Hampton University (2016). Work on plasma physics.
  - o Miles Campbell, B.S. in Pre-Med, Hampton University (2014). Work on radiation dosimetry research related to the Hampton University low energy linear accelerator in 2013.
  - o Keith Tukes, B.S. in Physics, Hampton University (2014). Work on the development of a low energy linear accelerator (LELIA) at Hampton University in 2013.
  - o Guy Jackson, B.S. in Physics, Hampton University (2014). Work on cellular biology project to address HIV treatments.
  - o Thoth Gunter, B.S. in Physics, Hampton University (2014). Work on the development of a low energy linear accelerator (LELIA) at Hampton University (2013). **Recipient of 2011 the Jefferson Science Associates/Minority Undergraduate Research Assistantship.**

- Brent Gills, B.S. in Physics, Hampton University. Work on the development of a low energy linear accelerator (LELIA) at Hampton University (2013).
- Brent Giles, B.S. in Physics, Hampton University (2013). Work on science policy.
- Minnae Chabwerra, B.S. in Physics, Hampton University. Work on comparing NASA transport codes to Geant4 Monte Carlo simulation (2013). *2012 NASA/VSGC fellow*.
- Eric Forman, B.S. in Physics, Hampton University. Work on the production of polarized positron beams at Jefferson Lab (2012).
- Sharae Williams, B.S. in Physics, Hampton University. Work on the development of an in-vivo fiber based monitoring system for proton therapy (2012).
- Siai-Ann Robert, B.S. in Physics, Hampton University. Work on the interaction of particles with the DNA as part of collaboration with several international partners: IN2P3, ESA, NASA, EVMS, ALLS (2011).
- Leslie Upton, African-American, B.S. in Physics, Hampton University (2008). Worked on a nuclear physics research.
- Clarissa Freeman, African-American, B.S. in Physics, Hampton University (2008). Worked on a medical physics related research jointly with Jefferson Lab.
- Melissa Baruzza, B.S. in Physics, Old Dominion University (2007). Worked on medical physics research.
- Thomas Cudjoe, African-American, B.S. in Biology, Hampton University (2006). Worked on medical physics research.

### **Outreach**

- Physicists Inspiring the Next Generation ([www.nsbping.org](http://www.nsbping.org)): aims at increasing the interest from pre-college students in pursuing a STEM career. A pilot program for an application in nuclear physics was conducted at NSCL/FRIB in the summer 2019 (<https://frib.msu.edu/news/2019/next-gen-program.html>).
- Eureka ([http://girlsincogreaterpen.com/?page\\_id=622](http://girlsincogreaterpen.com/?page_id=622)): was initiated in 2013 through a partnership between Girls Inc of the greater Peninsula and the Physics Department at Hampton University. It is part of the Girls Inc. National ([www.girlsinc.org](http://www.girlsinc.org)) program and is expected to provide a new venue to significantly increase the participation of girls in STEM fields.
- Physics Day Camp (<http://science.hamptonu.edu/physics/sps.cfm>): is a collaboration between various STEM organizations to expose pre-college students and the public to STEM fields and is held twice a year at the Hampton Roads Convention Center (Hampton, VA) towards the end of the Spring and Fall semesters. This initiative was established in the Fall 2012 and has impacted close to 500+ students.
- Selected as one of the “50 Nifty” scientists to perform demonstrations across K-12 schools in the Virginia-DC-Maryland area during the US Science Festival (October 2010).

### **Patents**

U.S. Patent Application for "*Apparatus and Method for Brachytherapy Radiation Distribution Mapping*"; Ref: 2044323-5002US.

### **Others**

- Martial Art instructor: Vovinam VietVoDao (Vietnamese martial art) at Jefferson Lab and Boys and Girls Club. 3<sup>rd</sup> degree black belt – Purple belt in TaeKwonDo. Brown belt in Judo. A teaching activity based on this martial art was tested 2007-2008 academic year on the campus of Hampton University.
- Expertise in: Data acquisition (CAMAC, VME), data analysis software (ROOT, CERN-PAW, Lab View, Fortran, C, C++), visualization toolkits (Tcl/tk, VTK, VRML, etc.), web developer, Monte Carlo simulation.

### **Professional Societies:**

National Society of Black Physicists (NSBP, [www.nsbp.org](http://www.nsbp.org))

Institute of Electrical and Electronics Engineers (IEEE, [www.ieee.org](http://www.ieee.org))  
American Association of Physicists in Medicine (AAPM, [www.aapm.org](http://www.aapm.org))  
American Mathematical Society (AMS, [www.ams.org](http://www.ams.org))  
American Physical Society (APS, [www.aps.org](http://www.aps.org))  
Division of Nuclear Physics of APS (DNP, <http://units.aps.org/units/dnp>)  
Division of Plasma Physics of APS DPP, <http://units.aps.org/units/dpp>)  
Division of Physics of Beam of APS (DBP, <http://units.aps.org/units/dpb>)  
Division of Laser Sciences of APS (DLS, <http://units.aps.org/units/dls>)  
Forum for International Physics of APS (FIP, <http://units.aps.org/units/fip>)

***Reviewer***

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***Adjunct faculty***

Eastern Virginia Medical School (Norfolk, VA)

ECPI College of Technology (Virginia Beach, VA)

Strayer University (Newport News, VA)

Elizabeth City State University (Elizabeth City, NC)

Texas Southern University (Houston, TX)