

Dr. Moussa N'GOM

PERSONAL DATA

PLACE OF EMPLOYMENT: Rensselaer Polytechnic Institute (RPI)
Physics, Applied Physics, & Astronomy
ADDRESS: Jonsson Rowland Science Center
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RESEARCH INTEREST

Quantum Optics: Experimental and Theoretical understanding of light matter interaction

Quantum Entanglement: Entangled photons with orbital angular momentum

Wavefront Shaping: To modulate coherent transport of light through scattering media

EDUCATION

MAY 2009 Ph.D. in APPLIED PHYSICS | Advisor: Theodore B. Norris
University of Michigan – Ann Arbor
Thesis: “Novel Approach to the Study of Surface Plasmon Resonance
and Field Enhancement Properties of Noble Metal Nanostructures”

WINTER 1999 B.S. Physics and Electrical Engineering,
University of Wisconsin – Milwaukee

CAREER HISTORY AND RESEARCH CONTRIBUTIONS

Current AUG. 2018	<p>Assistant Professor RENSSELAER POLYTECHNIC INSTITUTE, <i>Physics, Applied Physics, & Astronomy</i></p> <p>Study the nonlinear interactions between an ultrafast, ultrashort optical pulse strongly coupled to novel, nonlinear hybrid material systems for the development of a push-button source of single photon and/or a single pair of entangled photons. Wavefront Shaping to image through turbid media:</p> <p>Introduce and characterize optical angular momentum beams for light control in multimode fibers for endoscopic imaging and optical fiber communication</p> <p>Combine wavefront shaping together with near field optical imaging</p>
OCT 2015 JULY 2018	<p>Assistant Research Scientist UNIVERSITY OF MICHIGAN <i>Coherent Light Scattering Through Random Media</i></p> <p>Demonstrated control of light propagation through scattering media. To advance novel methods for focusing and imaging inside biological tissues by fundamentally modulating the light path to minimize scattering</p> <p>Computational optics: algorithm development for holographic imaging and phase retrieval methods</p>
OCT 2011 SEPT 2015	<p>Senior Research Scientist CORNING INCORPORATED <i>Research and Development</i></p> <p>Science lead in the laser processing and measurement innovation group.</p> <p>Charged with applying fundamental scientific understanding of ultrafast lasers to design, develop, and implement laser processing systems, measurement, and inspection for various glass and ceramic materials.</p> <p>Our group delivered systems tailored to the needs of development and innovation projects at Corning, with the goal of providing the tools needed to enable process and product development as well as the strategy and roadmaps required to ensure continued success in late stages towards manufacturing.</p>
JUNE 2009 OCT 2011	<p>Research Staff Member INSTITUTE FOR DEFENSE ANALYSES, <i>Science and Technology Division</i></p> <p>Investigate and model scientific phenomena and conduct technical characterizations and evaluations of devices and systems. Test and assess the limits of system performance within their operational environment. Conduct technology assessments critical to research and development programs, acquisition decisions, technology planning, and technology proliferation.</p>
JUNE 2005 MAY 2009	<p>Graduate Research Assistant UNIVERSITY OF MICHIGAN, <i>Thesis Advisor: Theodore B. Norris</i></p> <p>Explored the fundamental optical properties of noble metal (gold and silver) nanostructures.</p> <p>Operated state of the art electron energy loss spectroscopy in the transmission electron microscopy to characterize surface plasmon resonance of single nanostructures and thin film samples. (Lawrence Berkeley National Laboratory)</p> <p>Utilized electron beam lithography to fabricate well organized nanostructures on sapphire substrates for optical characterization (Cornell Nanoscale Facilities).</p> <p>Used ultrafast and ultrashort laser pulses to probe single and clusters of noble metal nanostructures</p> <p>Explored the enhancement properties of optical fields and non linear processes (e.g. third harmonic generation).</p>
SEPT 2002 JUNE 2005	<p>Graduate Research Assistant UNIVERSITY OF MICHIGAN, <i>Research Supervisor: Herbert G. Winful</i></p> <p>Investigated quantum tunneling theory: used Dirac's relativistic quantum theory to provide a physical explanation of the tunneling process and to resolve the mystery of apparent superluminality.</p>
JAN 1999 JUNE 2002	<p>Optical Measurement Engineer CORNING INCORPORATED, <i>Fiber and Photonics Manufacturing</i></p> <p>Designed and developed fully automated optical and electrical measurement system for optical transport products. Provided operational evaluations; generated concepts and designs for measurement systems; implemented designs through procurement, fabrication, installation, and commissioning.</p>
JUNE 1997 SEPT 1999	<p>Undergraduate Research Assistant UNIVERSITY OF WISCONSIN – MILWAUKEE, <i>Research Supervisor: John Norbury</i></p> <p>Investigated meson production in proton-proton, proton-nucleus, and nucleus-nucleus collision. The intended results were used in transport codes to simulate radiation due to cosmic rays experienced in space flight, this research was funded by NASA.</p>

TEACHING EXPERIENCE

- **Professor of Physics:** Introduction to Quantum Mechanics (Advanced Undergraduate Course), RPI, Fall 2020
- **Professor of Physics:** Fundamental of Optics (Undergraduate Course), RPI, Spring 2019
- **Teaching Assistant:** Ultrafast Optics (Graduate Course), University of MI, Winter 2008
- **Teaching Assistant:** Classical Optics (Graduate Course), University of MI, Fall 2007

PUBLICATIONS

“Mode Control in a Multimode Fiber Through Acquiring its Transmission Matrix from a Referenceless Optical System”,

M. N’Gom, T. B. Norris, E. Michielssen, and R. R. Nadakuditi
Optics Letters, Vol. 43, No. 3, 419 (2018)

“Controlling Light Transmission Through Highly Scattering Media Using Semi-Definite Programming as a Phase Retrieval Computation Method”,

M. N’Gom, M. B. Lien, N. M. Estakhri, T. B. Norris, E. Michielssen, and R. R. Nadakuditi
Nat. Sci. Rep. Vol. 7, No. 1, 2518 (2017)

“Electron Beam Mapping of Plasmon Resonances of Electromagnetically Coupled Gold Nanorods”,

M. N’Gom, S. Li, G. Schatz, R. Erni, A. Agarwal, N. Kotov and T. Norris
Physical Review B 80, 113411 (2009)

“Exploring the Emerging Frontier at the Intersection of Optics and Electron Microscopy”,

M. N’Gom and T. B. Norris, invited article S & T: SPIE Newsroom 10.1117/2.1200901.1493

“Single Particle Plasmon Spectroscopy of Silver Nanowires and Gold Nanorods”,

M. N’Gom, J. Ringnalda, J. F. Mansfield, A. Agarwal, J. Ye, N. Kotov, N. J. Zaluzec, T. B. Norris.
Nanoletters vol. 8, No. 10, 2008, 3200 – 3204.

“Relation Between Quantum Tunneling Times for Relativistic Particles”,

H. G. Winful, M Ngom, N. Litchinitser, Phys. Rev. A 70, 052112 (2004)

“Parameterization of Inclusive Cross Sections from Pion production in Proton-Proton collision”,

S. R. Blattnig, S. R. Swaminathan, A. T. Kruger, M. Ngom, and J. W. Norbury
Physical Review D. vol 62, pg 094030 (2000)

CONFERENCE PROCEEDINGS

“Wavefront Shaping: A New Tool in Optics”,

Invited Oral Presentation: Abstract Number: 152, Program Number: C3+C2+C1-ThM5
International Conference on Metallurgical Coatings and Thin Films (ICMCTF) 2019.

“Non-Holographic Method to Compute the Transmission Matrix of a Multimode Fiber for Mode Control”,

Oral Presentation: Postdeadline Papers I (FTh4A)
Frontiers in Optics (OSA) 2017; Postdeadline Papers: FTh4A.

“Wavefront Shaping Through Scattering Media Using Semi-Definite Programming as a Phase Retrieval Computation Method”,

Oral Presentation: Mathematics in Imaging
Imaging and Applied Optics Conference (OSA) 2017 paper: MTu2C. 2.

“Plasmon Resonance Variation from Strongly Interacting Gold Nanorods”,

Oral Presentation CLEO/QELS 2009 conference.
International Quantum Electronics Conference (IQEC) 2009 paper: JWE4

“Enhanced Surface Third Harmonic Generation from Gold Nanorods”,
Oral Presentation CLEO/QELS 2009 conference.
International Quantum Electronics Conference (IQEC) 2009 paper: IMK4.

“Correlation Spectroscopy of Third-Harmonic Generation by Single Nanorods”,
Conference on Lasers and Electro-Optics (CLEO) 2009 paper: CThK3.

“Single Particle Plasmon Spectroscopy of Silver Nanostructures”,
Oral Presentation CLEO/QELS 2008 conference.
Quantum Electronics and Laser Science Conference (QELS) 2008 paper: QFK4.

“Electron Energy Loss Spectroscopy of Individual Noble Metal Nanostructures”,
Oral Presentation OSA/Plamionics/Metamaterials 2008 conference.
Plasmonics and Metamaterials (META_PLAS) 2008 paper: MMC2.

PATENTS

- Application#: WO 2017/027784 A1 [Granted]
Title: Method and System for Printing 3D Objects
- Application#: 62/072,682 (Corning docket no. SP14-325) [Granted]
Title: Edge Sealing of Laminate Glass Using Laser Glass Welder
- Application#: US 14/993,236 (U.S. Attorney Docket No.: SP14-311) [Granted]
Title: Laser Cutting of Thermally Tempered Substrate
- Application# 61/917,092 (U.S. Attorney Docket No.: SP16-236) [Granted]
Title: Electrochromic Coated Glass Articles and Methods for Laser Processing The Same.
- Application#: 62/137,443 (U.S. Attorney Docket No.: SP15-107) [Granted]
Title: Laser Cutting and Processing of Display Glass Composition

PROFESSIONAL AFFILIATIONS

National Society of Black Engineers
National Society of Black Physicists.
Optical Society of America Member
American Physical Society Member
AAAS Member

AWARDS AND HONORS

NextProf Alumnus (2016)
JASON Intern (Summer 2010; Study Leader: Professor Robert D. Grober – Yale University)
Horace G. Rackham Merit Fellowship, University of Michigan
Wisconsin Space Grant Consortium recipient, UW-Milwaukee
Tau Beta Pi honor society

LANGUAGES

OUOLOFF: Mothertongue
ENGLISH: Fluent
FRENCH: Native