

CURRICULUM VITAE

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Department of Physics & Astronomy
Middle Tennessee State University
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Date of Birth: December 28, 1970
Citizenship: American

HIGHER EDUCATION

- Ph. D. (Physics)** May 2003: University of Arkansas, Fayetteville, Arkansas.
Thesis Title: Quantum Coherence in the Interaction of Light with a Two-level Atom and Semiconductor Microstructures.
Thesis adviser: Dr. R. Vyas and Dr. S. Singh.
- M. S (Physics)** May 2002: University of Arkansas, Fayetteville, Arkansas.
Advanced Diploma (Condensed Matter Physics) September 1999: Abdul Salam International Center for Theoretical Physics (ASICTP), Trieste, Italy.
Thesis Title: Conductance and Mechanical Stability of Ballistic Wires.
Thesis Adviser: Dr. T. J. Antonio.
- M. S. (Physics)** July 1997: Addis Ababa University, Addis Ababa, Ethiopia.
Thesis Title: The Propagator Formulation of Parametric Oscillation.
Thesis Adviser: Dr. K. Fesseha.
- B. Sc. (Physics)** July 1990: Addis Ababa University, Addis Ababa, Ethiopia.

ACADEMIC POSITIONS

2014-Pres	Professor, Middle Tennessee State University, Murfreesboro, Tennessee
2009-2014	Associate Professor, Middle Tennessee State University, Murfreesboro, Tennessee.
2009-2009	Visiting professor, University of Texas, Medical School at Houston, Houston, Texas.
2003-2009	Assistant Professor, Middle Tennessee State University, Murfreesboro, Tennessee.
2000-2003	Graduate Research Assistant, University of Arkansas, Fayetteville, Arkansas.
1999-2000	Graduate Teaching Assistant, University of Arkansas, Fayetteville, Arkansas.
1997-1998	Lecturer, Alemaya University, Dire Dawa, Ethiopia
1990-1997	Lecturer, Nathareth Technical College, Nathareth, Ethiopia

TEACHING EXPERIENCE

Course taught: I have taught the following graduate and undergraduate courses

- **Lab Rotation (MOBI 7010):** a graduate lab course that introduces students to techniques and skills in experimental biophysics.
- **General Relativity (PHYS 4800):** to the mathematical methods to Einstein's theory of general relativity with a wide range of applications of the theory with a concentration on its physical

consequences.

- **Quantum Mechanics I (PHYS 4380):** the principles and calculation techniques of quantum mechanics intended for physics majors.
- **Quantum Mechanics II (PHYS 4390):** advanced quantum mechanics techniques as applied to advanced quantum systems; applied quantum mechanics intended for physics majors. It covers perturbation theory, real hydrogen atom, helium atom, quantum field theory and introduction to quantum information and teleportation.
- **Electricity & Magnetism I (PHYS 4310):** the principles and calculation techniques of electricity and Magnetism intended for physics majors. It covers the first six chapters of David J. Griffiths, Introduction to Electrodynamics book.
- **Electricity & Magnetism II (PHYS 4330):** a continuation of **PHYS 4310** it covers the remaining chapters of David J. Griffiths, Introduction to Electrodynamics book.
- **Advanced Physics Laboratory (PHYS 3910):** designed to help physics majors to develop the skills, art, and physics important in pursuing independent research.
- **Physics Practicum (PHYS 3900):** refine students' thinking, communication, and interpersonal skills through exposure to on-the-spot technical questions and a laboratory teaching experience.
- **Topics & Methods in Theoretical Physics I (PHYS 3150):** mathematical methods used for problem solving in physics with examples from classical mechanics, quantum mechanics, electricity & magnetism.
- **Topics & Methods in Theoretical Physics II (PHYS 3160):** a continuation of PHYS 3150..
- **University Physics I (PHYS 2054):** Introduction to the principles of mechanics, wave motion, temperature and heat, with calculus.
- **Non-Calculus Based Physics I Physics (PHYS 2020)/Problems Lab II (PHYS 2021):** introductory physics course and it is group-oriented problems and lab activities course (PHYS 2021 given in conjunction with the web-based discussion class PHYS 2020. It covers optics, modern physics, and electronics.
- **Physics Problems Lab I (PHYS 2011):** introductory physics course and it is group-oriented problems and lab activities. It covers kinematics, forces, momentum, angular motion, calorimetry, and sound waves.
- **Discovering Physics (PHYS 1300):** for students with weak or no physics backgrounds. It presents concepts and techniques of physics helping students to take Non-calculus based College Physics I.
- **Observing the Universe (Astronomy 1031):** observational astronomy through laboratory exercises and outdoor observing activities.

FUNDING HISTORY

- **NIH ACADEMIC RESEARCH ENHANCEMENT AWARD (R15) June 2014 (\$387,854):** "Assessing Efficacy of Sickle Cell Anemia Treatment by the magnetic and electrical properties at the cellular and molecular level" (not funded).
- **NCI Small Grants Program for Cancer Research (NCI Omnibus R03) June 2014 (\$133,562):** "Single cell Ionization by laser trapping for ultimate accuracy in medical dosimetry" A pilot study in breast and lung cancer" (not funded).
- **MTSU/NSF FirstStep Summer emersion 2014 (\$20,300):** "The Biophysical effects of Herbal Medicine in Human Breast Carcinoma" (funded).
- **NIH ACADEMIC RESEARCH ENHANCEMENT AWARD (AREA) February 2013 (\$387,854):**

“Assessing Efficacy of Sickle Cell Anemia Treatment by Utilizing a Biophysical Approach” (not funded).

- **MTSU/NSF FirstStep Summer emersion 2013 (\$20,300):** “Utility of Optical Trapping to Determine the Malignant Potential of Cancer Cells” (funded).
- **FRCPC Synergy October 2013 (\$40,000)** “Utility of Optical Laser Trapping to Determine the Malignant Potential of Cancer cells” (not funded).
- **MTSU/NSF FirstStep Summer emersion 2012 (\$15,300):** “Response to Optical Trapping by Red Blood Cells from a Transfused Sickle Cell Patient” (funded).
- **MTSU/NSF FirstStep Summer emersion 2012 (\$15,300):** “Testing an Innovative “Solar Black-hole”: A Step forward to the cheapest, greenest, and the most efficient Solar to Electrical Converter?” (not funded).
- **MTSU/NSF FirstStep Summer emersion 2011 (\$15,300):** “Investigating the Similarities and Differences between Normal Human and Mice Red Blood Cells Using Biophysical Techniques” (not funded).
- **NIH ACADEMIC RESEARCH ENHANCEMENT AWARD (AREA) (R15) October 2010 (\$448,566):** “A Biophysical Study to the Efficacy of Stem Cell Targeted gene Therapy of Murine Sickle Cell Disease and Beta Thelassemia” (not funded).
- **STEP^{MT} May 2010 (\$12,000):** a proposal entitled “Efficacy of Gene Therapy in BERK Sickle Cell Mouse Model as Measured by the Response of the Red Blood Cells to Shear Deformation” to STEP^{MT} to conduct a research for summer 2010. (Not funded)
- **US DOE Higher Education Research Experiences June 2008 (\$17,765):** “Spectral effects in quantum teleportation and quantum distillation”. This grant was for faculty and student team summer research at ORNL. (funded)
- **NSF Career Award July 2007 (\$511,562):** “A Study of Morphology and Mechanical Response of membrane Proteins in Human Blood Cells by Integrated Optical Tweezer-Ellipsometry.” (Not funded).
- **STEP^{MT} January 2007 (\$17,100):** a proposal entitled “Can we land and stop an airplane on a frictionless surface and generate electricity?” to STEP^{MT} to conduct a research for summer 2007. (funded)
- **Faculty Research and Creative Project October 2006 (\$5,238):** a proposal entitled “Study of Elasticity of Equine Blood Cells and Formation of Desired Microscopic Structures Using Optical Tweezers” to FRCPC to conduct research in summer 2007. (funded)
- **Faculty Research and Creative Project October 2005 (\$5,238):** a proposal entitled “Stretching, Folding, and Coiling Polymers Using Optical Tweezers” to FRCPC to conduct research in summer 2006. (funded)
- **Faculty Research Grant April 2004 (\$10,000)** (funded)

RESEARCH HIGHLIGHTS/ACCOMPLISHMENTS

Current Research Projects: Although I am a theorist by training, since I began working at MTSU I have trained myself to be an experimentalist. I have been involved in both theoretical and experimental projects highlighted below:

- **Biomedical Optics in sickle cell disorder (experimental):** Sickle cell disease (SCD) and β -thalassemia is a devastating inherited disorder of hemoglobin that both shortens and reduces the quality of life. Beginning in early childhood, chronic vaso-occlusive events lead to a central nervous system vasculopathy causing impaired intellectual development and, in some patients, devastating strokes. Regular blood transfusion and Hydroxyurea therapy diminishes the frequency of crisis but

curative therapies are desperately needed. Although bone marrow (BM) transplantation is an established curative therapy, it is limited by the availability of appropriate donors. It is gene therapy that holds the promise for curative therapy for patients with SCD. The therapeutic efficacies of these therapies is measured by hematological and biochemical test. We are interested in developing biophysical test based on the application of laser and magnetic tweezers that measures the efficacies of therapies in SCD. These measurements are focused on the study of the static and dynamic physical properties of the red blood cells (RBCs) at the cellular and molecular level. Recently we have reported a study in therapeutic efficacies of blood transfusion in sickle cell anemia (SCA) patients based on laser tweezers biophysical measurements. [*Direct laser trapping for measuring the behavior of transfused erythrocytes in a sickle cell anemia patient, Biomedical Optics Express 3, P 2190–2199.*]

- **Biomedical optics in human carcinoma (experimental):** recently in collaboration with Dr. Ying Gao at the Tennessee Center for Botanical Medicine Research in the department of Biology at MTSU, we have initiated a new project in cancer research. The primary goal of this project is to conduct a study in the application of a new technique for more accurate measurement of radiation dose (RD) at a cellular level that subsequently can be used in radiation therapy for cancer treatment. This new technique is based on a new procedure for laser trapping (LT) technique that we recently discovered in our laboratory while working on the study of sickle cell. The secondary goal is to apply this new technique to quantitatively measure the level to which antitumor herbal extracts from Traditional Chinese Medicines (TCM) enhance the radiosensitivity of the tumor cells while reducing radiation toxicity in the normal cells. Currently we are working on breast and lung cancer.
- **Synthetic Photonic Crystals (experimental):** Colloidal particles, such as silica, are particles having size ranging between several nanometers and several millimeters and can be suspended in a liquid. Because of their tunability, in size, shape, as well as in chemical composition, and their ability to self-assemble they find applications in the development of advanced materials like photonic crystals. Typically, colloids self-assemble into face centered cubic (FCC) or body centered cubic (BCC) structures which determines their optical and electrical properties. We have demonstrated that by changing the chemical composition of the liquid in which the colloids are suspended in and using optical tweezers, it is possible to assemble the colloids in a new structure [*Formation of synthetic structures with micron size silica beads using optical tweezer, J. of Modern Optics, 54, P 1529-1536*]. We are interested in developing three dimensional stable synthetic structures by trapping and manipulating different sizes of silica beads using optical tweezers that leads to new optical and electrical properties.
- **Quantum optics and quantum information (Theoretical):** In quantum teleportation process information can be transmitted from one place to another using the principle of quantum mechanics. Fully entangled particles are the key for a faithful transmission of information in quantum teleportation. Quantum distillation is a protocol which is useful to produce fully entangled state from partly entangled states. In quantum distillation by operating locally on a large number of identical partly entangled pairs, one can concentrate their entanglement into a smaller number of maximally entangled pairs. Polarization entangled photons produced by spontaneous parametric down conversion (SPDC) can be used in quantum distillation. These photons are also spectrally entangled that depends on the spectral composition of the pump photons and the nature of optical isotropy of the crystal used in SPDC. We have reported that these factors affect the degree of polarization entanglement of the photons [*Pump Spectral Bandwidth, Birefringence, and Entanglement in Type-II parametric Conversion, Optics Research Letter, Volume 2009, Article ID 387580*]. I am interested in theoretical study of various quantum optical schemes that optimize the entanglement and squeezing of the twin photons produced by SPDC for quantum teleportation protocol. In particular, I am interested in the effect of spectral

entanglement of SPDC photons for quantum teleportation scheme where across the universe where frequency shift due to Doppler-effect and theory of general relativity determine the fidelity of the teleportation.

- **Quantum optics and quantum information (Experimental):** More recently, the experience I developed in experimental biomedical optics research has helped me to design and integrate an experimental component to my theoretical research on quantum optics and quantum information. Currently, I am working in completing the experimental set-up that can be used, in the near future, to conduct basic quantum information research such as generation and measurement of quantum entanglement that would eventually be used to conduct quantum teleportation research.

THESIS SUPERVISED

I have supervised the thesis's of undergraduate students listed below. (In most cases, these thesis have led to peer reviewed publications)

1. "Single Cell Ionization by Laser Trap for Accurate Radiotherapy", Michele Kelley (May 2016).
2. "Creation of Entangled Twin Photons from Parent Photon", Andy N Black (May 2016).
3. "Quantum Entanglement via Type-I Down Conversion and Continuous Wave Pump", Rance Solomon (2015).
4. "Laser Trapping for Single Cell Ionization", James Cooper(2015).
5. "Characteristic Response of BT-20 Breast Cancer Cells to Periodic Exposure of Infrared Laser", Price Stalled (2014)
6. "An Analysis of the Mechanical Properties of Hemolytic Leukemia Cells and Normal White Blood Cells using Optical Tweezers", Omar Mohammed (2014).
7. "The response of Erythrocytes with homozygous Hb C to a distributed stress force", Trey England (2013).
8. "Relativistic effects in spin entangled electrons", Daniel Bonior (2013)
9. "Efficacies of Hydroxyurea and Gene Therapy as Measured by Laser Tweezers", Ian Hajizadeh (2012).
10. "Effects of Refrigeration on Elasticity of Human Erythrocytes Under Shear Stress in Human Blood Serum", Keaten Holley (2012).
11. "Assessment of a Cure for Sickle Cell Disease in Mice by Study of the Elasticity of Red Blood Cells under Shear Stress", George Carter (2011).
12. "Quantum Teleportation using Two Entangled Photon Pairs", Hanna Norris (2010)
13. "Optimization of Spontaneous Parametric Down Conversion Parameters", Alexander Pegram (2009)
14. "Effect of Environment on the Elasticity of Human Erythrocytes", Taylor A. Barnes (2009).
15. "Construction of Three Dimensional Synthetic Structures Using Optical", Jeremy Curtis (2008).
16. "An Optical Tweezers based Study of the Effect of Antibodies Concentration on the Viscosity of Blood Serum", Samuel Elrod (2007).
17. "Application of optical tweezers to form crystalline structure and manipulate red blood cells using 3.1micron silica spheres", Adam Shulman (2006).

PUBLICATIONS

Part I: Experimental Biophysics and others

A. Peer Reviewed Journal Publications

1. T. Barnes, A. Shulman, A. Farone, M. Farone and **D. Erenso** (2013) Assessment of the Elasticity of Erythrocytes in Different Physiological Fluids by Laser Traps, *Optics and Photonics Journal*, Vol. 3 No. 2, 2013, pp. 211-216.
2. A. Pellizzaro, G. Welker, D. Scott, R. Solomon, J. Cooper, A. Farone, M. Farone, R. S. Mushi, M. Aguinaga, and **D. Erenso** (2012) Direct laser trapping for measuring the behavior of transfused erythrocytes in a sickle cell anemia patient, *Biomedical Optics Express* 3, P 2190–2199.
3. **D. Erenso**, A. Shulman, J. Curtis, and S. Elrod. (2007) Formation of synthetic structures with micron size silica beads using optical tweezer, *J. of Modern Optics*, 54, P 1529-1536.

B. Peer Reviewed Proceeding Publications

4. R. Solomon, A. Pellizzaro, D. Devito, C. A. Brown, J. Cooper, H. Crogman, J. Revalee, A. Farone, M. Farone, Y. Gao, and **D. B. Erenso** (2014) Cancerous Lung Cells Treatment by Herbal Medicines Measured by the Response to Compressional Force Induced by a Laser Trap, in Biomedical Optics 2014, OSA Technical Digest (online) (Optical Society of America, 2014), paper BM3A.6.
5. C. Brown, R. Solomon, J. Cooper, D. Devito, J. Revalee, A. Pellizzaro, A. Farone, M. Farone, Y. Gao, H. Crogman, and **D. B. Erenso** (2014) Response of Human Breast Carcinoma (BT20) Cell Lines to Compressional Force Induced by a Laser Trap, in Biomedical Optics 2014, OSA Technical Digest (online) (Optical Society of America, 2014), paper BT3A.43.
6. J. Cooper, D. Devito, R. M. Solomon, C. A. Brown, H. Crogman, A. Farone, M. Farone, M. Aguinaga, and **D. B. Erenso** (2014) Laser Trapping for Single Red Blood Cell (RBC) Ionization and Measurement of Charge, in Biomedical Optics 2014, OSA Technical Digest (online) (Optical Society of America, 2014), paper BT3A.34.
7. R. Solomon, J. Cooper, E. Aguilar, G. Welker, C. Pennycuf, D. Scott, B. Flanagan, and **D. Erenso** (2013) Physical and Mechanical Properties of the Human Red Blood Cells with Different Hemoglobin Types, *Proc. of The National Conference On Undergraduate Research (NCUR) 2013 University of Wisconsin - La Crosse April 11-13, 2013*.
8. R. Solomon, J. Cooper, E. Aguilar, A. Farone, M. Farone, M. Aguinaga, and **D. Erenso** (2013) Relative deformability of red blood cells in sickle cell trait and sickle cell anemia by trapping and dragging, *Proc. SPIE 8803, Medical Laser Applications and Laser-Tissue Interactions VI*, 880307; doi:10.1117/12.2032591; <http://dx.doi.org/10.1117/12.2032591>.
9. J. Cooper, R. Solomon, S. Elrod, T. Barnes, C. Crawford, A. Farone, M. Farone, and **D. Erenso** (2013) Application of a laser trap as a viscometer, *Proc. SPIE 8797, Advanced Microscopy Techniques III*, 87970H; doi:10.1117/12.2033507; <http://dx.doi.org/10.1117/12.2033507>.
10. **D. Erenso**, R. Solomon, J. Cooper, G. Welker, E. Aguilar, B. Flanagan, C. Pennycuff, D. Scott, M. d. P. Aguinaga, R. Mushi, A. Farone, and M. Farone, (2013) Heterozygotes and homozygotes genotypes human red blood cells response to trap and drag Force, in *Optics in the Life Sciences, OSA Technical Digest (Optical Society of America, 2013)*, paper JT2A.25.
11. **D. Erenso**, A. Pellizzaro, G. Welker, O. Mohammed, A. Farone, M. Farone, and M. d. P. Aguinaga (2012) Response to Optical Trapping by Red Blood Cells (RBCs) from a Transfused Sickle Cell Patient, in *Biomedical Optics and 3-D Imaging, OSA Technical Digest (Optical Society of America, 2012)*, paper BSu3A.38.
12. K. Holley, **D. Erenso**, E. Scott, A. Farone, M. Farone (2010) Refrigerated Versus Fresh Human Red Blood Cells Response to Sheer Stress, *Biophysical Journal*, Volume 98, Issue 3, Pages 732a-732a.
13. **D. Erenso**, S. Elrod, T. Barnes, A. Farone, M. Farone (2009) Viscosity Measurement of Biological Fluids Using Optical Tweezer, *Biophysical Journal*, Volume 96, Issue 3, Pages 313a-314a.

Part II: Quantum optics and quantum information

A. Peer Reviewed Journal Publications

14. **D. Erenso** (2009) Pump Spectral Bandwidth, Birefringence, and Entanglement in Type-II parametric Conversion, *Optics Research Letter*, Volume 2009, Article ID 387580.
15. A. Mitra, **D. Erenso**, and R. Vyas (2007) Generation and evolution of entanglement in coupled quantum dots interacting with quantized cavity field, *Phys. Rev. A* 76, 052317. **This paper has also been selected for publication on:**
 - *The December 2007 issue of Virtual Journal of Nanoscale Science & Technology.*
 - *The December 2007 issue of Virtual Journal of Quantum Information.*
16. **D. Erenso** (2007) Enhanced Squeezing in the transmitted fields in Parametric Oscillation with Injected Squeezed light at the pump frequency, *J. Opt. Soc. Am. B* 24, 867-876. **This paper has also been selected for publication on:**
 - *The March 2007 issue of Virtual Journal of Quantum Information.*
17. S. Siddiqui, **D. Erenso**, R. Vyas, and S. Singh (2003) Conditional measurement as probes of quantum dynamics, *Phys. Rev. A* 67, 063808.
18. **D. Erenso**, R. Vyas, and S. Singh (2003) Quantum well in a microcavity with injected squeezed vacuum, *Phys. Rev. A* 67, 013818. **This paper has also been published on:**
 - *Virtual Journal of Nanoscale Science & Technology - February 10, 2003, V. 7, I. 6*
19. **D. Erenso** and R. Vyas (2002) A two-level atom coupled to a squeezed vacuum inside a coherently driven cavity, *Phys. Rev. A* 65, 063808.
20. **D. Erenso**, R. Vyas, and S. Singh (2001) Higher order sub-Poissonian photon statistics, *J. Opt. Soc. Am. B* 19, 1471.
21. **D. Erenso**, R. Adams, H. Deng, R. Vyas, and S. Singh (2001) Nonclassical effects in photon statistics of atomic optical bistability, *Phys. Rev. A* 64, 043806.
22. H. Deng, **D. Erenso**, R. Vyas, and S. Singh (2001) Entanglement, interference and measurement in a degenerate parametric oscillator, *Phys. Rev. Lett.* 86, 2770.
23. **B. Daniel** and K. Fesseha (1998) The Propagator Formulation of the Degenerate Parametric Oscillator, *Opt. Commun.* 151, 384.

B. Peer Reviewed Proceeding Publications

24. **D. Erenso**, D. Bonior, B. Bunnell, and H. Norris, Polarization encrypted quantum teleportation using two type-II Parametric Down Converters, in *The Rochester Conferences on Coherence and Quantum Optics and the Quantum Information and Measurement meeting, OSA Technical Digest (online) (Optical Society of America, 2013)*, paper W6.22.
25. **D. Erenso**, J. Dodson, and F. Kassahun, Semiclassical entanglement analyses in a non-degenerate parametric oscillator (NDPO), in *The Rochester Conferences on Coherence and Quantum Optics and the Quantum Information and Measurement meeting, OSA Technical Digest (online) (Optical Society of America, 2013)*, paper M6.44.
26. **D. Erenso**, D. Bonior, B. Bunnell, J. Bentley, and H. Norris (2012) Spectral Effects in Polarization-Entanglement Swapping, in *Research in Optical Sciences, OSA Technical Digest (Optical Society of America, 2012)*, paper JT2A.13.
27. **D. Erenso**, A. Mitra, R. Vyas, and S. Singh (2008) Time Evolution of Entangled Excitonic State in Two Coupled Quantum Dots Interacting with a Squeezed Coherent Field, *Proc. of the Rochester Conference on quantum information.*
28. **D. Erenso** (2008) Intensity Correlation in a degenerate parametric oscillator injected with a squeezed vacuum at the pump frequency, *Conference and Quantum Optics IX, Edited by N. P. Biglow, J. H. Eberly, and C. R. Stroud, Jr., Springer*, P 487-488.

29. **D. Erenso**, R. Vyas, and S. Singh (2003) Atomic inversion for an atom coupled to squeezed vacuum in a coherently driven cavity, *Coherence and Quantum Optics VIII: Proc. of the Eighth Rochester Conference on Coherence*, Edited by N. Biglow, J. H. Eberly, C. R. Stroud, and I. A. Walmsley, Springer, P 351-352.
30. **D. Erenso**, H. Deng, R. Vyas, and S. Singh (2003) Photon correlations in the homodyne detection of squeezed light, *Coherence and Quantum Optics VIII: Pro. of the Eighth Rochester Conference on Coherence*, Edited by N. Biglow, J. H. Eberly, C. R. Stroud, and I. A. Walmsley, Springer, P 451-452.
31. **D. Erenso**, R. Adams, H. Deng, Reeta Vyas, and S. Singh (2004) Higher order photon statistics of intracavity second harmonic generation, *Coherence and Quantum Optics VIII: Pro. of the Eighth Rochester Conference on Coherence*, Edited by N. Biglow, J. H. Eberly, C. R. Stroud, and I. A. Walmsley, Springer, P 513-514.

PRESENTATIONS

Part I: Experimental Biophysics and related

A. Personal Presentation

1. **D. B. Erenso**, R. Solomon, J. Cooper, G. Welker, E. Aguilar, B. Flanagan, C. Pennycuff, D. Scott, M. d. P. Aguinaga, R. Mushi, A. Farone, and M. Farone (2013) Heterozygotes and homozygotes genotypes human red blood cells response to trap and drag Force, *Optics in the life sciences, Waikoloa Beach, Hawaii, April 14-18*.
2. **D. Erenso**, A. Pellizzaro, G. Welker, O. Mohammed, A. Farone, M. Farone, and M. Aguinaga (2012) Response to Optical Trapping by Red Blood Cells (RBCs) from a Transfused Sickle Cell Patient, *Biomedical Optics (BIOMED), Miami, Florida, April 28. (International Meeting)*.
3. **D. Erenso (2012 Invited)**. Genetic guest lecturer for BIO3250, MTSU, Murfreesboro, TN, Feb 13.
4. **D. Erenso (2011 Invited speaker for National Sickle Cell Day)** Laser Tweezers for Probing the Mechanical Properties of Erythrocytes: From Normal Erythrocytes in Humans to Genetically Corrected Sickle Erythrocytes in Mice, *Meharry Medical College, Nashville, June 17*.
5. **D. Erenso (2011 Invited)**. Laser Tweezers for Probing the Mechanical Properties of Erythrocytes: From Normal Erythrocytes in Humans to Genetically Corrected Sickle Erythrocytes in Mice, *La Sierra University, Riverside, CA, April 17*.
6. **D. Erenso**, K. Holley, G. Carter, I. Hajizadeh, T. Pestina and D. Persons Efficacy of gene therapy in Berk Sickle Cell Mouse Model as measured by the response of the Red Blood Cells to Shear Deformation, American Biophysical Society 54th Annual Meeting, *March 5-9 in Baltimore, Maryland*.
7. **D. Erenso**, S. Elrod, T. Barns, A. Farone, and M. Mary (2009) Viscosity Measurement of Biological Fluids Using Optical Tweezer. *APS March meeting, Pittsburgh, PN, Mar. 16-20*.
8. **D. Erenso**, S. Elrod, T. Barns, A. Farone, and M. Mary (2009) Optical Tweezer as a Viscometer. *APS March meeting, Pittsburgh, PN, Mar. 16-20*.
9. **D. Erenso** (2008) Measurement of mechanical deformation of human erythrocytes without force probes. *Joint meeting of the biophysical society 52nd annual meeting & 16th international biophysical congress, Long Beach, California February 2-6*.
10. **D. Erenso (2007 invited)** Laser Tweezers for Probing the Mechanical Properties of Human Red Blood Cells. *Department of Physics, University of the South, Sewanee, TN Nov. 07*.

B. Students' Presentation

11. R. Solomon, A. Pellizzaro, C. Brown, Y. Gao, and **D. Erenso** (2014) Alternative New Approaches to Early Detection and Effective Treatments of Cancer, Posters on the Hill, Washington DC, DC, April 29-30.

12. C. Brown, R. Solomon, A. Pellizzaro, Y. Gao, and **D. Erenso** (2014) Alternative New Approaches to Early Detection and Effective Treatments of Cancer, MTSU Scholars Week, Murfreesboro, TN, March 21.
13. R. Solomon, A. Pellizzaro, D. Devito, C. Brown, J. Cooper, H. Crogman; J. Revalee, A. Farone, M. Farone, Y. Gao; **D. Erenso** (2014) Human Lung Carcinoma Cells Treatment by Herbal Medicines Measured by the Response to Compressional Force Induced by a Laser Trap, *Biomedical Optics (BIOMED)*, Miami, Florida, April 29.
14. C. Brown, R. Solomon, J. Cooper, D. Devito, H. Crogman, A. Pellizzaro, J. Revalee, A. Farone, M. Farone, Y. Gao, and **D. Erenso** (2014) Response of Human Breast Carcinoma (BT20) Cell Lines to Compressional Force Induced by a Laser Trap, *Biomedical Optics (BIOMED)*, Miami, Florida, April 28.
15. J. Cooper, D. Devito, R. Solomon, C. Brown, H. Crogman, A. Farone, M. Farone, M. Aguinaga, and **D. Erenso** (2014) Laser Trapping for Single Red Blood Cell (RBC) Ionization and Measurement of Charge, *Biomedical Optics (BIOMED)*, Miami, Florida, April 28..
16. A. Pellizzaro and **D. Erenso** (2012) Response to Optical Trapping by Red Blood Cells from a Transfused Sickle Cell Patient, *Tennessee Tech, TAAPT Annual Meeting, Cookeville, March 23-24*.
17. J. Cooper and **D. Erenso** (2012) Optical Tweezers as a Viscometer? *Tennessee Tech, TAAPT Annual Meeting, Cookeville, March 23-24*.
18. J. M. Beer and **D. Erenso** (2012) Comparative Statistical Study in the physical properties of different hemoglobin variant in Sickle Cell Anemia, *Tennessee Tech, TAAPT Annual Meeting, Cookeville, March 23-24*.
19. A. Pellizzaro and **D. Erenso** (2012) Response to Optical Trapping by Red Blood Cells from a Transfused Sickle Cell Patient, *MTSU Scholars Week, Murfreesboro, TN, March 30*.
20. J. M. Beer and **D. Erenso** (2012) Comparative Statistical Study in the physical properties of different hemoglobin variant in Sickle Cell Anemia, *MTSU Scholars Week, Murfreesboro, TN, March 30*.
21. A. Pellizzaro and **D. Erenso** (2012) Response to Optical Trapping by Red Blood Cells from a Transfused Sickle Cell Patient, *Posters-at-the-Capitol, Nashville, TN, February 8*.
22. Keaten Holley, Casey Carter, **D. Erenso** (2010) Effects of Refrigeration on Elasticity of Human Erythrocytes Under Shear Stress in Human Blood Serum, *UT Martin, TAAPT Annual Meeting, March 26-27*.
23. Brandon Slayton and **D. Erenso** (2010) A study of Photonic Band Gaps in Synthetic Opals, UT Martin, TAAPT Annual Meeting, March 26-27.
24. K. Holley, E. Scott and **D. Erenso** (2010) Refrigerated versus Fresh Human Red Blood Cells Response to Sheer Stress, American Biophysical Society 54th Annual Meeting, *San Francisco, California Feb. 20 – 24*.
25. I. Hajizadeh (2011) K. Holley and **D. Erenso** (2010) Effects of Refrigeration on Elasticity of Human Erythrocytes Under Shear Stress in Human Blood Serum, *Posters at the Capitol, Nashville, TN, Feb. 3*.
26. J. Curtis, A. Shulman, and **D. Erenso** (2008) Formation of synthetic structures with micron size silica beads using optical tweezer. *Undergraduate Research Posters on Capitol Hill, Washington DC, April 30*.
27. D. Solus, C. Archer, B. Malone, N. Chesterfield, L. Jackson and **D. Erenso** (2008) Can airports be a green source of energy? *April Meeting of the American Physical Society, April 14*.
28. J. Curtis, A. Shulman, S. Elrod, and **D. Erenso** (2008) Formation of synthetic structures with micron size silica beads using optical tweezers. *April Meeting of the American Physical Society, April 14*.
29. C. Archer, D. Solus, and **D. Erenso** (2008) Can airports be a green source of energy? *MTSU Scholars Week, Murfreesboro, TN, March 31-April 4*.

30. J. Curtis and **D. Erenso** (2008) Formation of Synthetic Structures with Micron Size Silica Beads Using Optical Tweezers. *MTSU Scholars Week, Murfreesboro, TN, March 31-April 4.*
31. T. Barns, T. Farone, and **D. Erenso**. (2008) Measurement of Mechanical Deformation of Human Erythrocytes without Force Probes. *MTSU Scholars Week, Murfreesboro, TN, March 31-April 4.*
32. T. Barns and **D. Erenso** (2008) Measurement of Mechanical Deformation of Human Erythrocytes without Force Probes in PBS and Serum. *TAAPT Annual Meeting, March 27-29.*
33. T. Barns and **D. Erenso** (2008) Measurement of Mechanical Deformation of Human Erythrocytes without Force Probes in PBS and Serum. *Poster exhibit at the State Capital, Nashville, Tennessee, February 6.*
34. A. Shulman and **D. Erenso** (2007) Measurement of the Elasticity of Red Blood Cells using Optical Tweezers. *Poster exhibit at the State Capital, Nashville, TN, Feb. 9.*
35. J. Curtis and **D. Erenso** (2007) Construction of a three dimensional diamond-like structure from 3.1 micron silica spheres using optical tweezers. *Poster exhibit at the State Capital, Nashville, TN, February 9.*

Part II: Quantum optics and quantum information

A. Personal Presentation

36. **D. B. Erenso**, D. Bonior, B. Bunnell, and H. Norris (2013) Polarization encrypted quantum teleportation using two type-II Parametric Down Converters, *Coherence and Quantum Optics and Quantum Information and Measurement*”, Rochester, New York, June 17-20.
37. **D. Erenso**, Jordan Dodson, and Kassahun Fesseha (2013) Semiclassical entanglement analyses in a non-degenerate parametric oscillator (NDPO), *Coherence and Quantum Optics and Quantum Information and Measurement*”, Rochester, New York, June 17-20.
38. **D. Erenso**, S. Humble, and W. Grice (2009) Pump spectral bandwidth, birefringence, and entanglement in type-II parametric down conversion, TAAPT Annual Meeting, *Oak Ridge, TN, Mar. 27-28.*
39. **D. Erenso** (2007) Time evolution of entangled excitonic state in two coupled quantum dots interacting with a squeezed coherent field. *International conference in quantum information, Rochester, New York, June 13-15.*
40. **D. Erenso** (2007) Intensity correlation in a degenerate parametric oscillator injected with a squeezed vacuum. *Ninth Rochester conference on coherence and quantum optics, Rochester, New York, June 10-13.*
41. **D. Erenso** (2006) Nearly perfect squeezing of the signal mode in parametric oscillation with coherent and squeezed pumping. *APS March meeting, Baltimore, MD, Mar. 13-17.*
42. **D. Erenso** (2005) Subharmonic generation with squeezed and coherent pumping, *MTSU Scholars Day, Murfreesboro, TN, Nov. 2.*
43. **D. Erenso** (2004) A Wigner function formalism for a degenerate parametric oscillator with injected squeezed vacuum. *SESAPS Annual Meeting, Oak Ridge, TN, Nov. 11-13.*
44. **D. Erenso** (2004) Conductance in Ballistic Wires. *MTSU Scholars Day, Murfreesboro, TN, Oct. 26.*
45. **D. Erenso**, S. Siddiqui, R. Vyas, and S. Singh (2003) Conditional detection of quantum fluctuations. *OSA Annual Meeting, Tucson, AZ, Oct. 5-9.*
46. **D. Erenso**, R. Vyas, and S. Singh (2003) Photon statistics of cavity field interacting with two entangled quantum dots, *OSA Annual Meeting, Orlando, FL, Sept. 29-Oct. 4.*
47. **D. Erenso**, R. Vyas, and S. Singh (2002) Collapse and revival of entanglement in coupled Quantum Dots, *OSA Annual Meeting, Orlando, FL, Sept. 29-Oct. 4.*
48. **D. Erenso**, R. Vyas, and S. Singh (2002) Collapse and revival of entanglement in coupled Quantum Dots, *OSA Annual Meeting, Orlando, FL, Sept. 29-Oct. 4.*

49. **D. Erenso**, R. Vyas, and S. Singh (2002) Exciton in a microcavity injected with squeezed vacuum, *OSA Annual Meeting, Orlando, FL, Sept. 29-Oct. 4*.
 50. **D. Erenso**, R. Vyas, and S. Singh (2002) Exciton with injected squeezed vacuum in a microcavity, *16th Annual National Conference of Black Physics students, AL A&M, Huntsville, AL, Mar. 13-17*.
 51. **D. Erenso**, R. Adams, H. Deng, Reeta Vyas, and S. Singh (2001) Higher order photon statistics of intracavity second harmonic generation, *Coherence and Quantum Optics VIII, Rochester, NY, Jun. 13-16*.
 52. **D. Erenso**, H. Deng, R. Vyas, and S. Singh (2001) Photon correlations in the homodyne detection of squeezed light, *Coherence and Quantum Optics VIII, Rochester conference, Rochester, NY, Jun. 13-16*.
 53. **D. Erenso**, R. Vyas, and S. Singh (2001) Atomic inversion for an atom coupled to squeezed vacuum in a coherently driven cavity, *Coherence and Quantum Optics VIII, Rochester conference, Rochester, NY, Jun. 13-16*.
 54. **D. Erenso**, R. Vyas, and S. Singh (2001) Conditional detection of interference and squeezing, *OSA Annual Meeting, Long Beach, CA, Oct. 14-18*.
 55. **D. Erenso**, R. Vyas, and S. Singh (2001) A single two-level atom in a coherently driven cavity and damped by a squeezed vacuum, *OSA Annual Meeting, Long Beach, CA, Oct. 14-18*.
 56. **D. Erenso**, R. Vyas, and S. Singh (2001) Nonclassical effects in homodyne detection of light from a coherently driven cavity with a single two-level atom, *OSA Annual Meeting, Long Beach, CA, Oct. 14-18*.
 57. **D. Erenso**, R. Vyas, and S. Singh (2000) Non-classical effects in photon-statistics of atomic optical bistability, *APS the Texas Section Fall Meeting, Houston, TX, Oct. 27-29*.
- B. Students' Presentation**
58. D. Bonior and **D. Erenso** (2012) Spectral Effects in Polarization-Entanglement Swapping, *Quantum Information and Measurement (QIM) Berlin, Germany, March 12*.
 59. D. Bonior and **D. Erenso** (2012) Spectral and Polarization Entanglement Swapping in Two-Pair Twines Photons from two Independent Spontaneous Parametric Down Conversion Sources, *Tennessee Tech, TAAPT Annual Meeting, Cookeville, March 23-24*.
 60. D. Bonior and **D. Erenso** (2012) Spectral and Polarization Entanglement Swapping in Two-Pair Twines Photons from two Independent Spontaneous Parametric Down Conversion Sources, *MTSU Scholars Week, Murfreesboro, TN, March 30*.
 61. D. Bonior and **D. Erenso** (2012) Spectral and Polarization Entanglement Swapping in Two-Pair Twines Photons from two Independent Spontaneous Parametric Down Conversion Sources, *Posters-at-the-Capitol, Nashville, TN, February 8*.
 62. H. Norris and **D. Erenso** (2010) Quantum Teleportation of Information via Two Pairs of Entangled Photons, *UT Martin, TAAPT Annual Meeting, March 26-27*.
 63. H. Norris and **D. Erenso** (2010) Quantum Teleportation of Information with Two Photon Pairs, Posters at the Capitol, *Nashville, TN, Feb. 3*.
 64. A. Pegram, **D. Erenso**, R. Bennek, and W. Grice (2008) Optimization of Spontaneous Parametric Down Conversion Parameters. *DOE Science and Energy Research Challenge (SERCh) competition Oak Ridge, TN, Nov. 9-10*.
 65. A. Mitra, **D. Erenso**, and R. Vyas (2006) Generating entanglement via interaction of coupled quantum dots with a quantized field. *OSA Annual Meeting, Rochester, NY Oct. 09-11*.
 66. A. Quan, **D. Erenso**, and R. Vyas (2005) Cold atoms in three-dimensional confinement formed by gravity and atomic mirrors. *SESAPS Annual Meeting, Gainesville, FL, Nov. 10-12*.
 67. J. Pair, S. Elrod, A. Quan, and **D. Erenso** (2005) A Quantum Study of a Ball Sliding on a Frictionless Hoop. *Undergraduate Research Symposium, MTSU, Murfreesboro, TN, Apr. 16*.

CONFERENCES AND WORKSHOPS ATTENDED

- Conference: From DNA-Inspired Physics to Physics-Inspired Biology, Trieste, Italy 2009.
- American Association of Physics Teachers, Syracuse, NY July 2006
- ACTS Collection Workshop Robust and High Performance Tools for Scientific computing, Lawrence Berkeley National Laboratory September 4-7, 2002.

HONORS, AWARDS, AND RECOGNITION

A. Personal

1. 2015-2016 Middle Tennessee State university, College of Basic & Applied Sciences Distinguished Research Award.
2. 2016–2017 Fulbright Scholar Award.
3. Guest speaker, “MT Conversations” (2016): This TV show, hosted by Gina Logue at the MTSU Office of News and Media Relations, highlights the many fascinating efforts of MTSU professors [<https://youtu.be/EF99IsFqcQU>].
4. Featured Faculty Member, MTSU website (2015): <http://www.mtsu.edu/featuredfaculty/>.
5. Fulbright Award Alternate (2015–2016): My proposal successfully passed the scientific peer-review process and was recommended for the 2015–2016 academic year, but was ultimately selected as an alternate by the Public Affairs Section at the U.S. Embassy in Ethiopia.
6. 2013-Cited as a person at MTSU who makes a real difference by graduating seniors.
7. 2011-Middle Tennessee State university, College of Basic & Applied Sciences Excellence in Teaching award.
8. 2010-Cited as a person at MTSU who makes a real difference by graduating seniors.
9. 2009-10 Middle Tennessee State university, College of Basic & Applied Sciences Excellence in Teaching & Excellence in publication (Honorable Mention).
10. 2009-Cited as a person at MTSU who makes a real difference by graduating seniors.
11. 2009-Appointed as doctoral member of the graduate Faculty at MTSU.
12. 2008-Middle Tennessee State University Foundation Creative Projects Award.
13. 2003-Sigma Xi the Scientific Research Society Aubrey E. Harvey Outstanding Graduate Research Award.
14. 2001-International Center for Scientific Culture (ICSC) World Laboratory Scholarship Award.
15. 1998-Abdul Salam International Center for Theoretical Physics (ASICTP) Award.

B. Mentored students

16. R. Solomon winner in a national competition sponsored by the Council on Undergraduate Research (CUR) “Posters on the Hill”, Washington, DC (2014).
17. R. Solomon and C. Brown 1st Place award in the MTSU Scholar's Week undergraduate poster competition (2014).
18. R. Solomon 1st place award in the TAAAPT Annual Meeting undergraduate poster competition (2013).
19. A. Pellizzaro 2nd place award in the TAAAPT Annual Meeting undergraduate poster competition (2012).
20. H. Norris 2nd place award in the MTSU Scholar's Week undergraduate poster competition (2010).
21. K. Holley 1st place award in the MTSU Scholar's Week undergraduate poster competition (2010).
22. K. Holley 1st place award in the TAAAPT Annual Meeting undergraduate poster competition (2010).
23. T. Barnes 1st place award in the TAAAPT Annual Meeting undergraduate poster competition (2009).

24. D. Solus and C. Archer 1st place award in the MTSU Scholar's Week undergraduate poster competition (2008).
25. J. Curtis winner in a national competition sponsored by the Council on Undergraduate Research (CUR) "Posters on the Hill", Washington, DC (2008).

UNIVERSITY SERVICE

- Serving as event coordinator in MTSU Science Olympiad (physics) since 2003.
- TLSAMP mentor for several minority students (since 2003).

SERVICE TO PROFESSIONAL ORGANIZATIONS

- I have been serving as a reviewer for several scientific journals that includes: Physical Review A, Journal of Optics A, Journal of Optics B, Journal of Physics D, Journal of Semiconductor Science and technology, Journal of Biomedical Optics and Proceedings of The National Conference on Undergraduate Research. I have also served as book reviewer for Addison-Wesley/Benjamin Cummings publishing company.

MEMBERSHIPS

- American Biophysical Society (member).
- American Physical Society (member).
- Optical Society of America (member).
- American Association of Physics Teachers (member).
- Sigma Xi, The scientific Research Society (member).
- Sigma Pi sigma the Physics Honor Society (member).
- Ethiopian Physics Society-North America (member).

SKILLS

- Microscopic manipulation of colloidal particles and living cells using optical, magnetic tweezers, and fluorescent imaging.
- Micro image analyses using Imagepro, graphical data analyses using Origin, Labview, Mathematica, Code V files.
- Using Molecular dynamics software such as NAMD and VMD.
- Mathematical Techniques in quantum optics: Fokker-Planck equation, quantum Langevine equation.
- Working in Linux and Windows operating system.

Extracurricular Interest and Hobbies

- Exercising to stay healthy and fit: long distance running (have done seven half-Marathons) and going regularly to the gymnasium.
- Watching American football, Soccer, and college football and basketball, and more recently golfing.

PERSONAL REFERENCES

<p>1st Dr. Surendra P. Singh Dept. of Physics, University of Arkansas, Fayetteville, AR 72701 Tel: 479-575-5930 Fax: (479) 575-4580 E-mail: ssingh@uark.edu</p>	<p>2nd Dr. Tom Cheatham, Director Tennessee STEM Education Center (Former Dean of College and Applied sciences) Middle Tennessee State University Murfreesboro, TN 37132 Office: 615-494-8738 tom.cheatham@mtsu.edu</p>	<p>3rd Dr. Maria del Pilar Aguinaga Dept. of Obstetrics and Gynecology Associate Director, Sickle Cell Center, Meharry Medical College Nashville, TN 37208 Phone: 615-327-6591 Fax: 615-327-6593 Email: maguinaga@mmc.edu</p>
<p>4th Dr. Mary B. Farone Department of Biology Middle Tennessee State University Murfreesboro, TN 37132 Tel: 615 904-8341 Fax: (615) 898-5093 E-mail: Mary.Farone@mtsu.edu</p>	<p>5th Dr. Reeta Vyas Dept. of Physics, University of Arkansas, Fayetteville, AR 72701 Tel: 479-575-6569 Fax: (479) 575-4580 E-mail: rvas@uark.edu</p>	<p>6th Dr. Anthony L. Farone Department of Biology Middle Tennessee State University Murfreesboro, TN 37132 Tel: 615 898-5343 Fax: (615) 898-5093 E-mail: Anthony.Farone@mtsu.edu</p>
<p>6th Dr. William M. Robertson Dept. of Phys. & Astr., Middle Tennessee State University Murfreesboro, TN 37132 Tel: 615 898-5837 Fax: (615) 898-5303 E-mail: wroberts@mtsu.edu</p>	<p>7th Dr. Alemayehu Gorphe Dept. of Integrative Biology & Pharmacology, University of Texas Medical School at Houston 6431 Fannin Street, Houston, Texas 77030 Tel: 713 500 7538 Alemayehu.G.Abebe@uth.tmc.edu</p>	<p>8th Dr. Mesfin Tsige Department of Polymer Science Goodyear Polymer Center 1021 The University of Akron Akron, OH 44325-3909 Telephone: 330-972-5631 Fax: 330-972-5290 Email: mtsige@uakron.edu</p>
<p>9th Dr. Ying Gao Department of Biology Middle Tennessee State University Murfreesboro, TN 37132 Phone: 898-5339 Email: Ying.Gao@mtsu.edu</p>	<p>10th Dr. Robert Carlton Dept. of Phys. & Astr. Middle Tennessee State University Murfreesboro, TN 37132 Tel: 615 898-5411 Fax: (615) 898-5303 E-mail: carltonr@mtsu.edu</p>	<p>11th Dr. M. Suhail Zubairy Department of Physics 4242 Texas A&M University College Station, TX 77843-4242 Tel: (979)-862-4047 Fax: (909)-458-1235 E-mail: zubairy@physics.tamu.edu</p>
<p>12th Dr. Fesseha Kassahun Dept. of Physics, Addis Ababa University, Addis Ababa, Ethiopia Email: fessehakassahun@gmail.com</p>	<p>13th Dr. Ragendra Gupta Department of Physics University of Arkansas Fayetteville, AR 72701 Tel: 479-575-5933 Fax: (479) 575-4580 E-mail: rgupta@uark.edu</p>	<p>14th Dr. H. J. Carmichael Dan Walls Chair in Theoretical Physics The University of Auckland New Zealand Tel: 64-9-373 7599 Fax: 64-9-373 7445 E-mail: h.carmichael@auckland.ac.nz</p>
<p>15th Dr. William G. Harter Dept. of Physics, University of Arkansas, Fayetteville, AR 72701 Tel: 479-575-6567 Fax: (479) 575-4580 E-mail: wharter@uark.edu</p>	<p>17th Dr. Min Xiao Department of Physics University of Arkansas Fayetteville, AR 72701 Tel: 479-575-6568 Fax: (479) 575-4580 E-mail: mxiao@uark.edu</p>	