April 9, 2014

Dear Faculty, Students, and Friends:

Welcome to the Sixteenth Annual Fisk Research Symposium!

Fisk is renowned for engaging students in research and scholarly endeavors. Empirical research and scholarship are grounded in our academic curriculum, campus support services, and community activities. Our faculty, students, and administrators emphasize the discovery and advancement of knowledge through research in the natural and social sciences, business, and the humanities.

Since its establishment, the Symposium has evolved into a first-rate venue for the dissemination and sharing of scholarly contributions with other researchers and scholars. As research contributions and best practices are presented from several disciplines, it provides opportunities for inter-disciplinary research and collaboration. The poster presentations and dialogue with the researchers demonstrates Fisk’s commitment for inquiry-based learning. Further, it strengthens the idea of serendipitous education – acquisition of knowledge in a positive and affirming learning environment.

You have my best wishes for an intellectually stimulating, rewarding and enjoyable Symposium.

Best Regards,

H. James Williams
President
April 9, 2014

Dear Fisk Scholars, Mentors, and Friends:

We are excited about hosting this 16th Annual Research Symposium. For the first time, we celebrate the inclusion of 100 abstracts in our research book! We applaud this milestone as we remember our humble start with 12 abstracts in 1998. Contributors include faculty, undergraduate and graduate students. This accomplishment would not have been realized without the support and encouragement of Fisk faculty members. They provide the foundation for excellence in the academic program.

Understanding the importance of sharing information in various formats, for the first time, we also feature oral presentations by students. It is anticipated this venue will grow as the Symposium continues to evolve and accommodate all disciplines. These oral presentations complement the poster presentations by their peer colleagues. Different poster presentations will be featured in the morning and afternoon. We invite you to come to all sessions. Our students and faculty have important and exciting information to share!

The Symposium has scholarly presentations from the School of Humanities and Behavioral Social Sciences, School of Natural Sciences, Mathematics and Business, the School of Graduate Studies and the Fisk-Meharry Wellness and Healthcare Project. The topics range from “Healthy Minds: Healthy Lives”, “Learning Styles” and “The Framing of Reality and the Need for Academic Activism” to “Crystallization of Two Manganese-Dependent Superoxide Dismutases from Staphylococcus aureus”, “Molecular Mechanisms of TSUA-58 Alkaloids in the Inhibition of Prostate Cancer Cells” and “Using Genetic Algorithm to Solve Fisk University’s Athletic Department Travel Routes”. There is something for everyone!

Members of the Fisk University faculty, staff and administration strive to provide our students with academic experiences which are unparalleled by liberal art institutions anywhere in the United States. We encourage collaborations with institutions that share our goal to educate and transform students to become scholars and leaders. In addition to undertaking research at Fisk University, our students have been afforded opportunities to work with outstanding scientists at Case Western Reserve University, Indiana University-Purdue University Indianapolis, Meharry Medical College, Tennessee State University, and Vanderbilt University.

Appreciation for their hard work is extended to all members of the Research Symposium Committee. Special thanks are given to Dr. Sajid Hussain, Chairperson of the Committee. He has surrounded himself with people willing to work for a common good and the results speak for themselves. I salute you all!

Regards,

Princilla Evans Morris, Ph.D.
General Chair
Fisk Research Symposium
“Research with Societal Impacts: Voting Rights Through Technology”

JUAN E. GILBERT, Ph.D.
Presidential Endowed Chair in Computing
Chair of the Human-Centered Computing Division in Clemson University

Abstract. In this keynote, Dr. Gilbert will discuss the career opportunities for Fisk graduates and their national peers, and how computational thinking and research applied to societal challenges can help transform our world. His particular example will be how research in voting technologies is changing the way people vote in the U.S.A.

Subsequent to the debacle of the 2000 U.S. presidential election, it became abundantly clear that America’s archaic voting system was in dire need of a major overhaul. In 2002, the Help America Vote Act (HAVA) was created to provide all citizens equal access to participate in the electoral process, regardless of ability. Dr. Gilbert testified before the Congress on the Bipartisan Electronic Voting Reform Act of 2008 for his innovative work in electronic voting.

Short Biography

Dr. Gilbert’s research spans spoken language systems, advanced learning technologies, Culturally Relevant Computing, and database mining. The impact of his research is manifest in his significant publication, speaking and funding successes.

Dr. Gilbert has been named one of the 50 most important African-Americans in Technology, a national role model by Minority Access Inc., Master of Innovation by Black Enterprise magazine, a Modern-Day Technology Leader by the Black Engineer of the Year Award Conference, the Pioneer of the Year by the National Society of Black Engineers and recipient of the Black Data Processing Association (BDPA) Epsilon Award for Outstanding Technical Contribution.

Dr. Gilbert is a National Associate of the National Research Council of the National Academies. In 2002, Dr. Gilbert was named one of the nation’s top African-American Scholars by Diverse Issues in Higher Education. In 2013, the Black Graduate and Professional Student Association at Auburn University named their Distinguished Lecture Series in honor of Dr. Gilbert.
16TH ANNUAL RESEARCH SYMPOSIUM
# TABLE OF CONTENTS

**LETTER FROM MR. PRESIDENT** .............................................................................................................................. 3

**GENERAL CHAIR MESSAGE** .............................................................................................................................. 4

**KEYNOTE: JUAN E. GILBERT, PHD** ......................................................................................................................... 5  
“Research with Societal Impacts: Voting Rights Through Technology”

**TABLE OF CONTENTS** .............................................................................................................................................. 7

**SYMPOSIUM AGENDA** ............................................................................................................................................. 17

**ORAL PRESENTATIONS**  
School of Humanities & Social Sciences .............................................................................................................. 18  
School of Natural Science, Mathematics & Business ............................................................................................. 19

**ORGANIZATION** ....................................................................................................................................................... 20

**JUDGES LIST** ........................................................................................................................................................... 22

**AUTHORS LIST** ......................................................................................................................................................... 23  
Undergraduate Students  
Graduate Students  
Fisk Faculty  
Fisk Staff  
Other Students  

**EXTERNAL COLLABORATORS** ................................................................................................................................. 24

**COLLABORATION: RESEARCH LABS & UNIVERSITIES** ........................................................................................ 25  
Apraku, John  
Department of Chemistry, Tennessee State University, Nashville, TN 37209
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Zhu, Lei; Professor  
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EXTERNAL GRANTS & FUNDING .......................................................... 26

CTSA Grant Vanderbilt UL1 RR024975-01
DoD grant W81XWH-12-1-0114
DOD-ARO W911NF-11-1-0156
DOD W81XWH-13-1-0397
Department of Education Title VII # P382G090004
Indiana University Simon Cancer Center Summer Research Program
NIH 1R25GM107754-01
NIH/NIHMS MARC-U*STAR 1T34GM10555
NIH grant 2 UL1 TR000445-06
NSF#-0932038
NSF-CREST HRD-0420516
NSF HBCU/TIP HRD# 1332432
NSF-STC DMR-0423914
ONR W911NF-13-1-0153
Fisk-Meharry HBCU Wellness Grant
STUDENT ABSTRACTS 2014

SCHOOL OF HUMANITIES & SOCIAL SCIENCES ................................................................. 27

Arts & Languages

1. Black Women and Beauty: Money, Power, Respect ......................................................... 27
   Bailey, Ja'Mika*
   English, Department of Arts & Languages, Fisk University, Nashville, TN 37208

2. Reading Between The Lines: Redlining, Gentrification, and the Cultural/Sociopolitical Exclusion of African-American Children in Urban Education 1954-Present ................................................................. 28
   Walker, Sabrina1,2*
   1English, Department of Arts & Languages, Fisk University, Nashville, TN 37208; 2Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208

3. Genitive Constructions in Picard: A Comparative Analysis with French ................................. 28
   Beuerlein, Eric*
   Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208

4. An Observation of the Process of Transfer of Literacy Skills Between L1 and L2 ......................... 29
   Zanolini, Rebecca*
   Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208

5. Academic Self-Efficacy: A Literature Review of Factors Contributing to the Academic Self-Efficacy of Latino College Students ................................................................. 29
   Zanolini, Rebecca*
   Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208

6. Learning Styles .................................................................................................................. 29
   Sims, Franklin H.*
   Music, Department of Arts & Languages, Fisk University, Nashville, TN 37208

Behavioral Sciences & Education

7. Curiosity Killed the Cat ....................................................................................................... 30
   Brown, Ashlee*; Kimball, Bre'Shey*
   Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

8. Out of Sight, Out of Mind .................................................................................................... 30
   Lackey, Lashonda*; Collins, Leslie V.
   Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

9. Project Revive ..................................................................................................................... 31
   Martin, Brea*; Collins, Leslie V.; Peters, Sheila
   Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

10. Good Things Come to Those Who Wait: A Study of Delayed Gratification in College Students ......... 31
    Mitchell, Roman*; Davis, Hannah; Toussaint, Layla; Wagner, Leah
    Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

    Parker, Cierra*; Brown, Ivory*; Collins, Leslie V.
    Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

12. Collective Research in Action: Documenting the Stories of Undocumented Youth .................. 32
    Robles, Rodrigo*
    Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

13. It Takes a Village to Raise a Child ..................................................................................... 32
    Rush, Marquida*; Burke, Kenneth*
    Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208
14. **Fisk University: A Tradition of Research** .............................................................. 33
   Mitchell, Reavis*
   History, Department of History & Political Science, Fisk University, Nashville, TN 37208

15. **The State of African-American College Student’s Political Awareness and Political Participation** ........ 33
   Thomas, Breanna1*; Hussain, Sajid2
   1History, Department of History & Political Science, Fisk University, Nashville, TN 37208; 2Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

16. **The Framing of Reality and the Need for Academic Activism** ....................................................... 34
   Frederiksen, Jens*
   Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208

SCHOOL OF NATURAL SCIENCES, MATHEMATICS, & BUSINESS .............................................................. 34

17. **An Unemployment Case Study (The Nigerian Story)** ................................................................. 34
   Adeshina, Grace*; Anyaeche, Vivian*
   Department of Business Administration, Fisk University, Nashville, TN 37208

18. **The Success of Black-Owned Businesses in the Greater Nashville Area** ........................................... 35
   Butler, Ashley1,2*; Carter, Ciera3*
   1Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; 2Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208; 3Department of Business Administration, Fisk University, Nashville, TN 37208

19. **Excel Model for Performance Measurement** .............................................................................. 35
   Obiokoli, Joy O.; Hagan, Alvin*; Umontuen, Nicholas
   Department of Business Administration, Fisk University, Nashville, TN 37208

20. **The Merit of Gentrification** ............................................................................................................ 36
   Umontuen, Bella*; Umontuen, Nicholas
   Department of Business Administration, Fisk University, Nashville, TN 37208

Life & Physical Sciences

21. **Molecular Mechanisms of TSUA-58 Alkaloids in The Inhibition of Prostate Cancer Cells** .................. 37
   Addai, Prince1,2*; McCarroll, Patricia1; Lu, Wenfu1; Yang, Qing2; Xie, Yingqiu2; Li, Bo2; Apraku, John3; Okoro, Cosmas1; Chen, Zhenbang2
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22. **Using Comparative Modeling to Analyze the Two Mn-Dependent Superoxide Dismutases of Staphylococcus Aureus** ................................................................. 37
   Amoah, Kofi1*; Thomas, Lana2; Nelms, Brian L.1; Damo, Steven2
   1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

23. **Regulation of Dopamine-Dependent Behavior by dat-1 and asic-1** ...................................................... 37
   Cambronero, Francis*; Kayode, Sarah*; Davis, Contessa*; Anthony, Dominique*; Sease, Ayesha*; Robinson, Sarah*
   Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

24. **C. elegans: SWIP Assay and Osmolarity** ......................................................................................... 38
   Clark, Jakiya*; Macon, Courtney*; Bankston, Marcus*; Chol, Nyadow*; Leggs, Brysonn*; McCleary, Olivia*; Robinson, Sarah
   Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
25. Dop-3; dat-1 mutant in C. elegans rescues dat-1 paralysis phenotype via SWIP .......................... 38
Crowder, Mark*; Lampkin, Jacarra*; Newson, Kashun*; Lee, Christina*; Robinson, Sarah
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

26. The FKH-8 transcription factor targets genes that play a role in regulating dopaminergic neurons ..... 39
Crowder, Mark*; Nelms, Brian L.
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

27. Impact of Neulasta on Lethally-Irradiated Mice ................................................................. 39
Johnson, Nia1*; McCarroll, Patricia1; Plett, Artur2; Chua, Hui L.2; Orschell, Christie2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Hematology and Oncology, IUPUI, Indianapolis, IN 46202

28. C. elegans as a Model for Dopamine Neuron Development .................................................. 40
Kayode, Sarah*; Nelms, Brian L.
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

29. Control of Dopamine Signaling by the FKH-8 Transcription Factor ........................................ 40
Nelms, Brian L.*
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

30. The Effect of Androgen-Regulated Oncomirs, miR-27a/b on Peroxisome Proliferator Activated Receptor gamma (PPARγ) Levels in Human Prostate Cancer Cells ........................................ 40
Odiese, Peace1*; Olokpa, Emuejevoke2; Stewart, LaMonica2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Biochemistry and Cancer Biology, Meharry Medical College, Nashville, TN 37208

31. The Neuromodulator Dopamine in the Presence of C. elegans ............................................... 41
Onamusi, Lashe*; Anderson, Alexi*; Stark, Clarissa*; Clemons, Lerae*
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

32. What is the Relationship Between Serum Vitamin D Levels and Mammographic Breast Density Among Medically Underserved Black Women Ages 40-73? ........................................ 41
Williams, Christian1*; Hota, Sanjukta2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

33. Synthesis and Characterization of Phosphonated Bisphenol A as a Precursor for Phosphonated Proton Exchange Membranes in Fuel Cells ......................................................... 42
Boyer, Maria*; Reid, Kemar R.; Arnett, Natalie
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

34. Synthesis of Bisphenol-A Tetrachlorocyclotriphosphazene (BATCCP) from Bisphenol-A and Hexachlorocyclotriphosphazene .............................................................. 42
Davies, Shannon*; Arnett, Natalie
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

35. Research as Pedagogy: Discovery at the Intersection of Traditional Disciplines ....................... 42
Limbird, Lee E.*
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Luitel, Kanchan*; Poland, James*; Arnett, Natalie
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

37. Synthesis and Characterization of Polyamide Polyetheramide Reverse Osmosis Membrane ........ 43
Wadsworth, Ophelia*; Arnett, Natalie
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

38. Synthesis and Characterization of Polyamide Polyetheramide Reverse Osmosis Membrane ........ 43
Williams, Rodayne*; Wadsworth, Ophelia; Arnett, Natalie
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
39. Reducing Community Exposure to Environmental Toxics: a Key Component in Building Healthy and Sustainable Communities
Wingfield, Robert*
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40. Multi-layered Films with Applications in Optical Data Storage
Zlibut, Emanuel;* Zhu, Lei; Zhang, Guoqiang
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41. Modeling the Thermal Properties of Multilayered Materials
Ali, Omar; Collins, Eugene
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

42. Toward Understanding the Role of Metal Sequestration in the Innate Immune Response
Damo, Steven*
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

43. Effects of Ag Nanoparticles on Optical Properties of ZnO-PVDF Composites
Davies, Brooke; Coca, Kenneth; Mayo, Anthony; Jones, Jennifer; Mu, Richard
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44. Crystal Growth and Fabrication of Radiation Sensors and Imagers for Portable and Mobile Applications
Matei, Liviu; Rowe, Emmanuel; Tupitsyn, Eugene; Groza, Michael; Bhattacharya, Pijush
Burger, Arnold Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

45. Introduction of Nanostructured Materials for Energy Transport, Conversion and Storage Research at Fisk
Mu, Richard; Jones, Jennifer; Mayo, Anthony
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46. Atmospheric Tests Through Use Of Sounding Rockets
Wallace, Bryan K.*
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

47. Thrust Profile Verification Through Static Motor Testing
White, Earl; Wallace, Bryan K.*
1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

49. Web-Based Middleware for Protein Annotation
Adeogun, Samuel; Hussain, Sajid
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

50. Tutacity: Web-based Tutoring Application
Adeogun, Samuel; Qian, Lei
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

51. Using Genetic Algorithm to solve Fisk University’s Athletic Department Travel Routes
Ambrose, Jayson; Hussain, Sajid
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

Mathematics & Computer Science
52. Using Visual-tile base Programming to Develop an Android App for Small Food Businesses .......... 49
   Ambrose, Jayson*; Qian, Lei
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

53. Applying a Genetic Algorithm to the Travelling Salesman Problem to Optimize Routes for a Tourist to Visit Key Icons in a Given Area ................................................................. 49
   Campbell, Kelson*; Hussain, Sajid
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

54. Using Simulated Annealing and Travelling Salesman Problem to Find Best Optimum While Minimizing Cost of Celestial Objects for Starlight Interferometer ............................................. 50
   Clemons, Damon*; Hussain, Sajid
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

55. Improving Fisk Communication Through MyOracle ........................................................................ 50
   Clemons, Damon*; Jackson, D’von*; Qian, Lei
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

56. InfoDaily: Ensuring Easy Access to Information ................................................................................. 50
   Dotu, Bright*; Qian, Lei
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

57. Optimization of the School Bus Routing Problem by Simulated Annealing ........................................ 51
   Dotu, Bright*; Hussain, Sajid
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

58. Using Genetic Algorithm in X-Ray Crystallography ........................................................................... 51
   Esedebe, Favour*; Hussain, Sajid
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

59. Designing a Multi-touch System for Controlling Nano-scale Scanning Microscopy Experiment .......... 51
   Eze, Michael*; Hussain, Sajid
   Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

60. ASP.NET SignalR: Developing Real-Time Web Functionality for Multifarious Web Applications .......... 52
    Fair, John*; Qian, Lei
    Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

61. Efficient Assembly of DNA Sequence Using Genetic Algorithm ....................................................... 52
    Ghimire, Parasher*; Hussain, Sajid
    Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

62. Transforming Computer Science Curriculum to Meet the Needs of Knowledge Economy ................ 53
    Hussain, Sajid*; Morgan, Steven*; Haque, Ziaul*
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    ²Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; ³Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

63. Progress of Fisk Research Symposium from 1998 - 2014 .................................................................... 53
    Hussain, Sajid*
    Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

64. Understanding the Brain: a Complex Combination of Algorithms ..................................................... 53
    Jackson, D’von*; Hussain, Sajid
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65. Making Radiation Detection Analysis Portable .................................................................................... 54
    Jackson, D’von*; Burger, Arnold¹; Matei, Liviu²
    ¹Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208;
    ²Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

66. Web App for Fisk Research Symposium ............................................................................................. 54
    Lasebikan, Olatomiwa S.*; Adeogun, Samuel; Hussain, Sajid
    Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>JQuery Mobile for Design of Mobile Apps</td>
<td>54</td>
</tr>
<tr>
<td>Lenard, Travas*; Qian, Lei</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Exploring Popular Tourist Destinations Using Travelling Salesman Problem</td>
<td>55</td>
</tr>
<tr>
<td>Odumeru, Daniel*; Hussain, Sajid</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Building Zero-Energy Optical Logic Devices</td>
<td>55</td>
</tr>
<tr>
<td>Qian, Lei*</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Applying Simulated Annealing Algorithm to the Traveling Salesman Problem (TSP) to Optimize Shortest Path for Prospective Students on a Campus Tour</td>
<td>55</td>
</tr>
<tr>
<td>Saarah, Michael*; Hussain, Sajid</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>KiddieTranslate: Learn a Foreign Language Online for Kids</td>
<td>56</td>
</tr>
<tr>
<td>Saarah, Michael*; Qian, Lei</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Using Genetic Algorithm for Efficient Routing to Provide Timely Delivery for Pizza Company</td>
<td>56</td>
</tr>
<tr>
<td>Stewart, Quandarrius*; Hussain, Sajid</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Efficient Routing Algorithm for Sports Fans</td>
<td>56</td>
</tr>
<tr>
<td>Yagboyaju, Sultan*; Hussain, Sajid</td>
<td></td>
</tr>
<tr>
<td>Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Parachutes as Described via Mathematical Modeling</td>
<td>57</td>
</tr>
<tr>
<td>Adegbesote, Olamide A.1*; Davies, Brooke2; Howard, Whitney D.3; Lasebikan, Olatomiwa S.1; Hota, Sanjukta3</td>
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<td>1Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208; 2Chemistry, Department of Life &amp; Physical Sciences, Fisk University, Nashville, TN 37208; 3Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Could the Flap of a Butterfly’s Wings in Brazil set off a Tornado in Texas: The Chaotic Behavior of the Lorenz System</td>
<td>57</td>
</tr>
<tr>
<td>Hemphill, Elijah1*; Luitel, Kanchan2*; Olatokunbo, Aduralere2*; Hota, Sanjukta1</td>
<td></td>
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<td>1Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208; 2Chemistry, Department of Life &amp; Physical Sciences, Fisk University, Nashville, TN 37208; 3Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>An Optimal Control model of Epidemic Management with Treatment and Changing Behavior</td>
<td>57</td>
</tr>
<tr>
<td>Hota, Sanjukta*</td>
<td></td>
</tr>
<tr>
<td>Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>Drug Dosage – Ensuring a High Level of Effectiveness Through Applications of Loading Doses</td>
<td>58</td>
</tr>
<tr>
<td>Jackson, D’von*; Hota, Sanjukta</td>
<td></td>
</tr>
<tr>
<td>Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>The Development of Trigonometry: A Brief History</td>
<td>58</td>
</tr>
<tr>
<td>Townsend, Anna1*; Lawrence, Brianna1,2*; Hota, Sanjukta3</td>
<td></td>
</tr>
<tr>
<td>1Biology, Department of Life &amp; Physical Sciences, Fisk University, Nashville, TN 37208; 2Sociology, Department of Behavioral Sciences &amp; Education, Fisk University, Nashville, TN 37208; 3Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
<tr>
<td>The Beauty of the Log Plot</td>
<td>58</td>
</tr>
<tr>
<td>Yagboyaju, Sultan1*; Onabolu, Oreoluwa2; Hota, Sanjukta3</td>
<td></td>
</tr>
<tr>
<td>1Computer Science, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208; 2Biology, Department of Life &amp; Physical Sciences, Fisk University, Nashville, TN 37208; 3Mathematics, Department of Mathematics &amp; Computer Science, Fisk University, Nashville, TN 37208</td>
<td></td>
</tr>
</tbody>
</table>
80. Your Own Little Miracle: Decreasing the Infant Mortality Rate in African Americans

Anderson, Alexis\textsuperscript{1,2*}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project

81. The Ideal You: Increasing Infant Mortality Awareness

Anthony, Dominique\textsuperscript{1,2*}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project

82. Get Fit & Stay With It! Fighting Against Diseases of Obesity Among African American College Students

Brooks, Dana\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{3,2}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

83. Stroke of Genius

Davis, Contessa\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{1,2}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project

84. Healthy Men, Healthy Families

Gray, Destiny\textsuperscript{1,2*}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project

85. Saving Our Youth from Obesity

Humphrey-Davis, Avery\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{1,2}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

86. Project Big Bone: An Obesity Intervention

James, Amanishakhete\textsuperscript{1,2,3*}; McCarroll, Patricia\textsuperscript{4,3}; Spicer, Yvette\textsuperscript{3}

\textsuperscript{1}Department of Business Administration, Fisk University, Nashville, TN 37208; \textsuperscript{2}Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{3}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{4}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

87. Weigh Your Options: Pound for Pound with Childhood Obesity

Mead, Richard\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{3,2}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}History, Department of History & Political Science, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

88. The Cost Benefits of Good Health (Healthy Eating on a Budget)

Obiokoli, Joy O\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{1,2}; Spicer, Yvette\textsuperscript{3}

\textsuperscript{1}Department of Business Administration, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

89. Healthy Minds: Healthy Lives

Ojuka-Onedo, Jackie A\textsuperscript{1,2*}; Spicer, Yvette\textsuperscript{2}

\textsuperscript{1}Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project

90. Fool’s Gold: Asymptomatic STIs in African American College Students in Nashville, Tennessee

Smith, Lannie\textsuperscript{1,2*}; Stewart, Elizabeth\textsuperscript{2}; Spicer, Yvette\textsuperscript{2}; McCarroll, Patricia\textsuperscript{2,3}

\textsuperscript{1}Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
91. Determining the Role/Phenotype of the Transcription Factor fkh-8 in C. elegans in Dopamine Signaling................................. 63
   Brown-Smith, Ke'Ara1,2*; Nelms, Brian L.1,2
   1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

92. Investigating the role of FKH-8 in Regulating Expression of Dopaminergic neuron Target Genes in C. elegans................. 63
   Jones, Bobby1*; Nelms, Brian L.1,2
   1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

93. Forkhead-8 may Regulate Dopamine Transporter Expression and Function................................................................. 63
   Roach, Corey1*; Nelms, Brian L.1,2
   1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

94. The fkh-8 gene Encodes a Critical Modulator of Dopaminergic Neuron Function in the Model Organism C. elegans .................. 64
   Tross, Erica*; Nelms, Brian L.
   Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

95. Fabrication and Characterization of Poly(arylene Ether Sulfone): Benzyl-phosphonic Acid Composite Membranes for Application in Fuel Cells ..................................................... 64
   Reid, Kemar R.**; Arnett, Natalie
   Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

96. Crystallization of Two Manganese-dependent Superoxide Dismutases from Staphylococcus Aureus .................................................. 64
   Thomas, Lana1*; Warner, Rukiayah2; Damo, Steven1,3
   1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 3Department of Biochemistry, Vanderbilt University, Nashville, TN 37235

97. Development of a ZnO Nanowire-based Microfluidic Detection and Trapping Device .......................................................... 65
   Cook, Andrew1*; Giorgio, Todd2; Mu, Richard1
   1Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Department of Biomedical Engineering, Vanderbilt University, Nashville, TN 37235

98. Plasmon-Enhanced Photoluminescence in Ag-Decorated ZnO/MgO Core-Shell Nanowires ................................................. 65
   Mayo, Daniel1,2*; Marvinney, Claire1,2; Bililign, Ephraim S.3; McBride, James R.4; Haglund Jr., Richard F.2,5; Mu, Richard1
   1Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235; 3Department of Physics, North Carolina State University, Raleigh, NC 27695; 4Department of Chemistry, Vanderbilt University, Nashville, TN 37235; 5Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235

99. Defect Characterization of Cadmium Zinc Telluride ................................................................. 66
   Mcgrew, John*; Groza, Michael; Matei, Liviu; Burger, Arnold
   Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

100. Surface Plasmon - Phonon Interaction in Gold/Zinc Oxide Nanolayers and Time-Dependent Photoluminescence ................. 66
    Trenchard, Andrew1*; Mayo, Anthony1; Mayo, Daniel1,2; Jones, Jennifer1,2; Marvinney, Claire2; Mu, Richard1
    1Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235
# Fisk University Annual Research Symposium Agenda

"Cultivating Scholars and Leaders One by One"

**WEDNESDAY, APRIL 9, 2014**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>Posters Display</td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Oral Presentations</td>
</tr>
<tr>
<td></td>
<td>School of Humanities &amp; Social Sciences</td>
</tr>
<tr>
<td>11:30 a.m.</td>
<td>Dialogue with Student Researchers</td>
</tr>
<tr>
<td></td>
<td>Dept. of Life Sciences, HBCU Wellness, &amp; Graduate Studies</td>
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<td><em>(Students will be available to discuss posters)</em></td>
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<tr>
<td>1:00 p.m.</td>
<td>Oral Presentations</td>
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<tr>
<td></td>
<td>School of Natural Sciences, Mathematics, &amp; Business</td>
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<tr>
<td>2:30 p.m.</td>
<td>Dialogue with Student Researchers</td>
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<td>School of Humanities &amp; Social Sciences, Business Admin. &amp; Dept. of Mathematics &amp; Computer Science</td>
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<tr>
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<td><em>(Students will be available to discuss posters)</em></td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Reception</td>
</tr>
</tbody>
</table>

**Introduction of the Speaker**

Mark Crowder  
*Junior, Biology Discipline*  
*SGA President, 2014-15*

**Keynote Lecture**

Juan E. Gilbert, Ph.D.  
*Presidential Endowed Chair in Computing*  
*Chair of the Human-Centered Computing Division in Clemson University*

**Reception**

*All sessions are held in the Appleton Room of Jubilee Hall.*
Oral Presentations

School of Humanities & Social Sciences
Wednesday, April 9, 2014

9:00 a.m.  Fisk University: a Tradition of Research
            Reavis Mitchell

9:15 a.m.  An Observation of the Process of Transfer of Literacy Skills
            Between L1 and L2
            Rebecca Zanolini

9:30 a.m.  Genitive Constructions in Picard: A Comparative Analysis
            with French
            Eric Beuerlein

9:45 a.m.  Good Things Come to Those Who Wait: A Study of Delayed
            Gratification in College Students
            Roman Mitchell

10:00 a.m. Academic Self-Efficacy: A Literature Review of Factors
            Contributing to the Academic Self-Efficacy of Latino
            College Students
            Rebecca Zanolini

10:15 a.m. The Framing of Reality and the Need for Academic Activism
            Jens Frederiksen

10:30 a.m. Collective Research in Action: Documenting the Stories of
            Undocumented Youth
            Rodrigo Robles

10:45 a.m. Black Women and Beauty: Money, Power, Respect
            Ja’Mika Bailey

11:00 a.m. Reading Between the Lines: Redlining, Gentrification, and
            the Cultural/Sociopolitical Exclusion of African-American
            Children in Urban Education 1954-Present
            Sabrina Walker
## Oral Presentations

**School of Natural Sciences, Mathematics, & Business**  
**Wednesday, April 9, 2014**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 p.m.</td>
<td>Research as Pedagogy: Discovery at the Intersection of Traditional Disciplines</td>
<td>Lee E. Limbird</td>
</tr>
<tr>
<td>1:15 p.m.</td>
<td>Control of Dopamine Signaling by the FKH-8 Transcription Factor</td>
<td>Brian L. Nelms</td>
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<tr>
<td>1:30 p.m.</td>
<td>Introduction of Nanostructured Materials for Energy Transport, Conversion and Storage Research at Fisk</td>
<td>Richard Mu</td>
</tr>
<tr>
<td>1:45 p.m.</td>
<td>Study of Structure and Interfacial Polarization in Multilayered Dielectric Films and Polymer Nanodielectrics</td>
<td>Jennifer Jones</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Toward Understanding the Role of Metal Sequestration in the Innate Immune Response</td>
<td>Steven Damo</td>
</tr>
<tr>
<td>2:15 p.m.</td>
<td>An Optimal Control model of Epidemic Management with Treatment and Changing Behavior</td>
<td>Sanjukta Hota</td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td>Building Zero-Energy Optical Logic Devices</td>
<td>Lei Qian</td>
</tr>
<tr>
<td>2:45 p.m.</td>
<td>Reducing Community Exposure to Environmental Toxics: A Key Component in Building Healthy and Sustainable Communities</td>
<td>Robert Wingfield</td>
</tr>
</tbody>
</table>

*All sessions are held in Appleton Room, Jubilee Hall*
RESEARCH SYMPOSIUM
ORGANIZATION

General Chair

Princilla Evans Morris, Ph.D.
Associate Professor of Chemistry
Executive Vice President and Provost

Program Chair

Sajid Hussain, Ph.D.
Associate Professor of Computer Science

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Professor of English
Chair, Department of Arts and Languages

Arnold Burger, Ph.D.
Professor of Physics
Vice Provost of Academic Initiatives

W. Eugene Collins, Ph.D.
Professor of Physics
Director of NSF Crest Center

Leslie Collins, Ph.D.
Visiting Professor of Psychology

Steven Damo, Ph.D.
Assistant Professor of Chemistry

Alicia Henry, Ph.D.
Associate Professor of Art, Discipline Coordinator of Art

Lee E. Limbird, Ph.D.
Professor of Biochemistry
Dean, School of Natural Sciences, Mathematics and Business
Steering Committee (Cont’d)

Cathy Martin, Ph.D.
Associate Professor of Mathematics
Chair, Department of Mathematics and Computer Science

Reavis Mitchell, Ph.D.
Professor of History; Dean, School of Humanities and Social Sciences

Steven Morgan, Ph.D.
Professor of Physics
Chair, Department of Life and Physical Science

Brian Nelms, Ph.D.
Assistant Professor of Biology
Director of Graduate Studies in Biology

Lei Qian, Ph.D.
Associate Professor of Computer Science; Discipline Coordinator, Computer Science

Dani A. Smith, Ph.D.
Associate Professor of Sociology
Chair, Department of Behavioral Sciences and Education

Nicholas Umontuen
Lecturer in Management; Discipline Coordinator of Business Administration

Administrative Staff

Angie Ali
Administrative Assistant, Academic Excellence and Student Performance (AESP) Education

Marian Burns
Administrative Assistant, School of Natural Sciences, Mathematics, and Business

Blanchie Dobson
Administrative Assistant, School of Humanities and Social Sciences

Mabel Dumenyo
Coordinator of International Student Services

Gladys Truss
Administrative Assistant, Quality Enhancement Plan (QEP)
SYMPOSIUM
JUDGES

1. Adebanjo, Jennifer; Political Science, Department of History and Political Science
2. Arnett, Natalie; Chemistry, Department of Life and Physical Sciences
3. Autry, Philip; Music, Department of Arts and Languages
4. Bowers, Richard; Teacher Education, Department of Behavioral Sciences and Education
5. Bracks, Lean’tin; English, Department of Arts and Languages
6. Bumbulis, Valija; Music, Department of Arts and Languages
7. Cambronerò, Alfredo; Department of Business Administration
8. Cargill, Stafford; Department of Business Administration
9. Collins, Eugene; Physics, Department of Life and Physical Sciences
10. Collins, Leslie; Psychology, Department of Behavioral Sciences and Education
11. Damo, Steven; Chemistry, Department of Life and Physical Sciences
12. Davidson, JaCenda; Human Resources, Business Office
13. Evans Morris, Princilla; Chemistry, Department of Life and Physical Sciences
14. Hamberg, Cheryl; Library
15. Henry, Alicia; Art, Department of Arts and Languages
16. Holley-Bockelmann, Kelly; Physics, Department of Life and Physical Sciences
17. Hota, Sanjukta; Mathematics, Department of Mathematics and Computer Science
18. Ike, Justus; Biology, Department of Life and Physical Sciences
19. Limbird, Lee; Chemistry, Department of Life and Physical Sciences
20. Martin, Cathy; Mathematics, Department of Mathematics and Computer Science
21. McCarroll, Patricia; Biology, Department of Life and Physical Sciences
22. Mitchell, Reavis; History, Department of History and Political Science
23. Morgan, Steve; Physics, Department of Life and Physical Sciences
24. Mu, Richard; Physics, Department of Life and Physical Sciences
25. Nash, Gary; Music, Department of Arts and Languages
26. Nelms, Brian L.; Biology, Department of Life and Physical Sciences
27. Peters, Sheila; Psychology, Department of Behavioral Sciences and Education
28. Powers, Jill; English, Department of Arts and Languages
29. Qian, Lei; Computer Science, Department of Mathematics and Computer Science
30. Rasico, Nancy; Modern Foreign Languages, Department of Arts and Languages
31. Robinson, Sarah; Biology, Department of Life and Physical Sciences
32. Short, Demetrius; HCA Healthcare, Nashville
33. Stassun, Keivan; Physics, Department of Life and Physical Sciences
34. Umontuen, Nicholas; Department of Business Administration
35. Wallace, Bryan; Biology, Department of Life and Physical Sciences
36. Watson, Michael; Physics, Department of Life and Physical Sciences
37. Williams, Anthony; Music, Department of Arts and Languages
38. Wingfield, Robert; Chemistry, Department of Life and Physical Sciences
39. Wynn, Linda; Political Science, Department of History and Political Science
40. Yvette, Spicer; HBCU Wellness
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(BY NAME/ABSTRACT)

UNDERGRADUATE STUDENTS
Addai, Prince; 21*
Adegbesote, Olamide A.; 74*
Adeogun, Samuel; 49*, 50*, 66
Adeshina, Grace; 17*
Ali, Omar; 41*
Ambrose, Jayson; 51*, 52*
Amoah, Kofi; 22*
Anderson, Alexis; 31*, 80*
Anthony, Dominique; 23*, 81*
Anyaeche, Vivian; 17*
Bailey, Ja'Mika; 1*
Bankston, Marcus; 24*
Boyer, Maria; 33*
Brooks, Dana; 82*
Brown, Ashlee; 7*
Brown, Ivory; 11*
Burke, Kenneth; 13*
Butler, Ashley; 18*
Cambronerio, Francis; 23*
Campbell, Kelson; 53*
Carter, Ciera; 18*
Chol, Nyadow; 24*
Clark, Jakiya; 24*
Clemons, Damon; 54*, 55*
Clemons, Lerae; 31*
Crowder, Mark; 25*, 26*
Davies, Brooke; 43*, 74
Davies, Shannon; 34*

Davis, Contessa; 23*, 83*
Davis, Hannah; 10
Dotu, Bright; 56*, 57*
Esedebe, Favour; 58*
Eze, Michael; 59*
Fair, John; 60*
Ghimire, Parasher; 61*
Gray, Destiny; 84*
Hagan, Alvin; 19*
Hemphill, Elijah; 75*
Howard, Whitney D.; 74
Humphrey-Davis, Avery; 85*
Jackson, D’Von; 55*, 64*, 65*, 77*
James, Amanishakheti; 86*
Johnson, Nia; 27*
Kayode, Sarah; 23*, 28*
Kimball, Bre’Shey; 7*
Lackey, Lashonda; 8*
Lampkin, Jacarra; 25*
Lasebikan, Olatomiwa S.; 66*, 74
Lawrence, Brianna; 78*
Lee, Christina; 25*
Leggs, Bryanna; 24*
Lenard, Travas; 67*
Luitel, Kanchan; 36*, 75*
Macon, Courtney; 24*
Martin, Brea; 9*
McCleary, Olivia; 24*
Mead, Richard; 87*
Mitchell, Roman; 10*
Newson, Kashun; 25*
Obiokoli, Joy O.; 19*, 88*
Odiase, Peace; 30*
Odumeru, Daniel; 68*
Olatokunbo, Aduralere; 75*
Onabolu, Oreoluwa; 79
Onamusi, Lashe; 31*
Parker, Cierra; 11*
Robles, Rodrigo; 12*
Rush, Marquida; 13*
Saarah, Michael; 70*, 71*
Sease, Ayesha; 23*
Sims, Franklin H.; 6*
Smith, Lannie; 90*
Stark, Clarissa; 31*
Stewart, Quandarrius; 72*
Thomas, Breanna; 15*
Toussaint, Layla; 10
Townsend, Anna; 78*
Umontuen, Bella; 20*
Wadsworth, Ophelia; 37*, 38
Wagner, Leah; 10
Walker, Sabrina; 2*
Warner, Rukiayah; 96
White, Earl; 48*
Williams, Christian; 32*
Williams, Rodayne; 38*
Yagboyaju, Sultan; 73*, 79*
Zlibut, Emanuel; 40*

The * character denotes presenter of the abstract.
GRADUATE STUDENTS
Brown-Smith, Ke'Ara; 91*
Coca, Kenneth; 43
Cook, Andrew; 97*
Mcgrew, John; 99*
Ojuka-Onedo, Jackie A.; 89*
Poland, James; 36*
Reid, Kemar R.; 33, 95*
Thomas, Lana; 22, 96*
Trenchard, Andrew; 100*
Tross, Erica; 94*

FISK FACULTY
Arnett, Natalie; 33, 34, 36, 37, 38, 95
Beuerlein, Eric; 3*
Burger, Arnold; 45, 65, 99
Collins, Eugene; 41
Collins, Leslie V.; 8, 9, 11
Damo, Steven; 22, 42*, 96
Frederiksen, Jens; 16*
Haque, Ziaul; 62
Hota, Sanjukta; 32, 74, 75, 76*, 77, 78, 79
Hussain, Sajid; 15, 49, 51, 53, 54, 57, 58, 59, 61, 62*, 63*, 64, 66, 68, 70, 72, 73
Limbird, Lee E.; 35*
McCarroll, Patricia; 21, 27, 82, 83, 85, 86, 87, 88, 90
Mitchell, Reavis; 14*
Morgan, Steven; 62
Mu, Richard; 43, 46*, 97, 98, 100
Nelms, Brian L.; 22, 26, 28, 29*, 91, 92, 93, 94
Peters, Sheila; 9
Qian, Lei; 50, 52, 55, 56, 60, 67, 69*, 71
Robinson, Sarah; 23*, 24, 25
Spicer, Yvette; 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90
Umontuen, Nicholas; 19, 20
Wallace, Bryan K.; 47*, 48
Wingfield, Robert; 39*
Zanolini, Rebecca; 4*, 5*

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Bhattacharya, Pijush; 45*
Groza, Michael; 45*, 99
Jones, Jennifer; 43, 44*, 46, 100
Matei, Liviu; 45*, 65, 99
Mayo, Anthony; 43, 44, 46, 100
Rowe, Emmanuel; 45*
Stewart, Elizabeth; 90
Tupitsyn, Eugene; 45*

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Jones, Bobby; 92*
Roach, Corey; 93*
Zhang, Guoqiang; 40

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Apraku, John; 21
Chen, Zhenbang; 21
Chua, Hui L.; 27
Giorgio, Todd; 97
Haglund Jr., Richard F.; 98
Li, Bo; 21
Lu, Wenfu; 21
Marvinney, Claire; 98, 100
Mayo, Daniel; 98*, 100
McBride, James R.; 98
Okoro, Cosmas; 21
Olokpa, Emuejevoke; 30
Orschell, Christie; 27
Plett, Artur; 27
Stewart, LaMonica; 30
Xie, Yingqiu; 21
Yang, Qing; 21
Zhu, Lei; 40
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Xie, Yingqiu
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Yang, Qing
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Zhu, Lei; Professor
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EXTERNAL GRANTS & FUNDING

CTSA Grant Vanderbilt UL1 RR024975-01
   # 30

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   Abstract# 21, 30

DOD-ARO W911NF-11-1-0156
   Abstract# 43, 98, 46, 100

DOD W81XWH-13-1-0397
   Abstract# 97

Department of Education Title VII # P382G090004
   Abstract# 29

Indiana University Simon Cancer Center Summer Research Program
   Abstract# 27

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   Abstract# 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90
1. Black Women and Beauty: Money, Power, Respect
Bailey, Ja’Mika*
English, Department of Arts & Languages, Fisk University, Nashville, TN 37208

The research project Black Women and Beauty: Money, Power, Respect investigates beauty and self-image as key factors for Black women in America from the Reconstruction Period (1867 - 1877) to the 21st century. The research collected focuses on the question: Where does the Black woman fit with the beauty standards that America has formulated and how does the Black woman define beauty when she is not included in that
standard of beauty. Research sources include books, magazines, scholarly texts and interviews by other Black women who share similar interests and experiences. Black women did not fit the standards of American beauty, but as they progressed in the areas of political and social equality, from Reconstruction to the 21st century, they subsequently achieved much more than what many naysayers thought. During the 1920s until the 1950s, Black women had to overcome not only racial oppression but also backlash from Black men about beauty, the standard of beauty, who was to define that standard of beauty, and beauty as an economic industry operated primarily by men, regardless of the product.

Black women developed skin bleaching agents, hair straightening systems, and makeup in an effort to fit the White and Black male standard of beauty. In discovering and creating their own standards and methods to achieve beauty, Black women also obtained money, power, and respect through their inventions, businesses, financial gains, and most important the freedom to meet their own standards of beauty in a society where they did not fit the mold of beauty.

Classification: Senior  Presentation: Oral
Faculty Advisor: Bracks, Lean’tin

2. Reading Between The Lines: Redlining, Gentrification, and the Cultural/Sociopolitical Exclusion of African-American Children in Urban Education 1954-Present
Walker, Sabrina

1English, Department of Arts & Languages, Fisk University, Nashville, TN 37208; 2Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208

The purpose of this research is to identify the function of public education and its evolution in the city of Chicago along with the effects redlining and gentrification have had on the academic performance of urban children by looking at the policies distributed both federally and locally to manipulate it. It also explores the cultural and sociopolitical factors that make urban education distinct from all other forms as a method by which the needs of the students are met intellectually, culturally and socially. Many researchers have given account for the economic impact that redlining and gentrification have had on the academic performance of urban children while ignoring the impact of the social and cultural ignorance in educational policy-making and have subsequently missed a very important part of the measurement of academic growth and its influences. By denying the opportunity for social and cultural inclusion in curriculum alongside economic equity between urban students and their suburban/rural counterparts, the system of education in America has continually failed its urban students and will continue to do so. Language and literacy are the most common resources by which the educational gap can be filled but it is also the most neglected in favor of other subjects by which support may come. By providing more curricular opportunities to for the cultivation of Language Arts in a way that is culturally relevant to urban students, more research can be done to explore how to best serve them and achieve greater academic excellence.

Classification: Senior  Presentation: Oral
Faculty Advisor: Bracks, Lean’tin

3. Genitive Constructions in Picard: A Comparative Analysis with French
Beuerlein, Eric

Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208

In the modern Romance languages, possession is typically expressed in one of two ways, i.e. with a possessive adjective/pronoun or with a preposition. Most of these languages have very well established patterns that can be observed in the selection of the mode of expression of these genitive constructions, which is often due to a well-established tradition of language standardization. However, what we observe in less commonly spoken Romance languages such as Picard is that these patterns are not as well concretized as in their more common counterparts and they may often use a completely different system for expressing the genitive. This paper examines genitive constructions of two closely related Romance varieties, French and Picard, to see in what ways these two languages are similar in their expression of the genitive and also in what ways they diverge from
one another. We use descriptions provided by grammarians of the two varieties from various time periods to gain an historical perspective on the difference of these two languages. Finally we combine historical accounts with modern language data to determine not only how these languages’ genitive constructions diverged, but also why this might have happened.

Classification: Faculty
Presentation: Oral

4. An Observation of the Process of Transfer of Literacy Skills Between L1 and L2
Zanolini, Rebecca*
Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208
The purpose of this paper is to explore the factors that impact language learners in gaining literacy in their target language. Specifically, this paper looks at the transfer of literacy skills between students’ first and second languages and the implications this has on current and future educational practices. Furthermore, this paper discusses the lack of conclusive research found in the field to determine the process by which one learns how to read in a second language. Thus, the purpose of this research is to investigate this issue further in an attempt to better seek out the accepted findings of second language literacy acquisition in the field and to identify gaps in the research that currently exist.

Classification: Faculty
Presentation: Oral

5. Academic Self-Efficacy: A Literature Review of Factors Contributing to the Academic Self-Efficacy of Latino College Students
Zanolini, Rebecca*
Modern Foreign Lang., Department of Arts & Languages, Fisk University, Nashville, TN 37208
The resiliency, motivation, and ability to self-regulate that an individual expresses are all examples of self-efficacy. For students in higher education, their level of self-efficacy may ultimately be tested when they are met with foreign challenges and obstacles in their new environment. While self-efficacy is a concept widely accepted cross-culturally, this paper focuses on the self-efficacy of Latinos in higher education. Based on the theoretical framework as pioneered by Albert Bandura, this paper reviews literature that observes self-efficacy factors of Latinos in higher education that may contribute to disproportionate retention and graduation rates.

Classification: Faculty
Presentation: Oral

6. Learning Styles
Sims, Franklin H.*
Music, Department of Arts & Languages, Fisk University, Nashville, TN 37208
The teaching process has been developing and growing over the years to better adapt with the variety of students in the world. Every teacher and /or student of a subject has his or her own unique way of learning and instructing. When speaking of teaching an instrument, more specifically string based instruments, there are a variety of ways to approach a lesson. My goal through this research is to find better ways to understand your student and their personality so adjustments can be made to the more general approach of teaching strings. The new lesson plans will incorporate methods for teaching more visual learning students as well as methodical or idealistic learning styles. With this new more personal level of instruction, whatever lesson you are trying to teach your student he or she will appreciate and have that much better understanding of the newly learned skill or technique. My research will include pre-designed lesson plans for different learning styles to show how students interpret information differently and apply their new skill set. These lesson plans will help guide other instructors in finding new and improved methods of teaching their student. With this new structure for teaching strings, a pupil will have a better understanding of the subject matter as well as show improvement in their overall playing ability. The desired outcome for my research will result in students playing and enjoying their instruments longer while reaping the psychological and emotional benefits of learning a musical instrument.

Classification: Senior
Presentation: Poster
Faculty Advisor: Autry, Philip
7. **Curiosity Killed the Cat**  
Brown, Ashlee*; Kimball, Bre’shey*

Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

The objective of this study is to add to the discussion of what makes certain people take risks more than others. This study will determine if there’s a relationship between a person’s temperament and their willingness to take a risk. We studied 30 Fisk University students between the ages of 18 and 25. Using an experimental design, the Keirsey Temperament Sorter (KTS2) (1996) was used to determine the participants’ temperaments. This temperament sortor classified four temperaments: Artisan, Guardian, Idealist, & Rational. The participants were given food incentives and an opportunity to gain more incentives or lose all of their incentives in a game of chance. We hypothesized that Artisans and Rationals would be more willing to take the risks but all of the Idealists took the risk. If the study could be done over we would conduct our experiment on a less hectic week at the university and prevent any chance of maturation.

Classification: Junior  
Presentation: Poster

*Faculty Advisor: Collins, Leslie V.*

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8. **Out of Sight, Out of Mind**  
Lackey, Lashonda*; Collins, Leslie V.

Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

Recent studies and surveys has shown over the course of 10 years, the current generation and those to come are so heavily influenced and involved in technology, our social and communication skills are dwindling in every aspect including, friends, social life, peer pressure, and of course love life. So with this study, I have conducted a correlation with Social media and relationships and how it may be helping or harming the relationship with a significant other. This study is based on if people are more willing to date someone online, or in person and how it correlates to the saying, Out of Sight, Out of Mind. It consisted of 74 students from Fisk University, with a survey of 25 open and closed-ended questions that consisted of demographics, attitudes, and beliefs on online dating and behaviors on relationships. This was based on length of relationships, intimate and friendships and point of entry of the respondent’s relationship. Major findings included the point of entry with relationships states that relationships last longer in a traditional, face-to-face setting, than an online or web-based setting. 65% never had an online relationship, and only 5% had a relationship online for a year. We used the Independent T-test to analyze the data because it separates the analysis into two parts to show the statistics of each question with multiple answers.

Classification: Junior  
Presentation: Poster

*Faculty Advisor: Collins, Leslie V.*
9. **Project Revive**  
**Martin, Brea*; Collins, Leslie V.; Peters, Sheila**  
Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

A University Counseling Center started the Project Revive project in response to the alarming number of suicide attempts and increased referrals for counseling during the 2012-13 academic year. Project Revive was designed to alleviate stress amongst the student body; thereby, possibly decreasing the number of campus suicide attempts. The plan, as the counseling staff, was to improve the student morale and decrease stress through campus events and workshops that were thought to be beneficial to students and faculty on campus. This study focuses on survey data to examine the relationship between support groups and student’s emotional and/or mental well-being. Findings are based on forty one surveys administered to workshop participants during the fall 2013 semester. The survey was designed to measure the effectiveness. Results from the questionnaires reveal that programs/workshops affected the participants in a positive way.

Classification: Junior  
Presentation: Poster  
Faculty Advisor: Collins, Leslie V.

10. **Good Things Come to Those Who Wait: A Study of Delayed Gratification in College Students**  
**Mitchell, Roman*; Davis, Hannah; Toussaint, Layla; Wagner, Leah**  
Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

This study investigates whether or not a student’s desire to pursue post graduate studies is connected to their family background. The psychological concept that is under investigation is the concept of modeling. Using this theory we hypothesized that participant’s whose parents attended or graduated from a college or university will be more likely to delay gratification after undergraduate studies, and attend graduate school. Moreover, we also examined other variables such as socioeconomic status, classification, grades, income, and their effects on a student’s decision to delay gratification. We collected data from 33 students from diverse backgrounds and classifications. A small sample size limited the conclusions that could be drawn from this study however; the study raises important questions for future studies. This research could be used as a guide to encourage further research on a larger scale.

Classification: Senior  
Presentation: Oral  
Faculty Advisor: Collins, Leslie V.

11. **Beauty Is in the Eye of the Beholder: Is Colorism Relevant?**  
**Parker, Cierra*; Brown, Ivory*; Collins, Leslie V.**  
Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

Colorism is an intra-racial discrimination based on skin color (Thompson and Keith, 2001). For example, individuals with lighter complexions tend to receive preferential treatment and regard. Understanding its dynamics and consequences is important because it helps to understand how prejudice amongst African Americans can impact them individually and collectively. Specifically, we can discern whether and how intra-group discrimination such as colorism influences individual self-esteem in the African American community. The purpose of this study is to investigate the relationship between colorism and self-esteem in young adults who identify as Black or African American. Using a correlational design we will compare participants scores from the Implicit Associations Test (IAT) and an online self esteem survey measure to make determinations about the following: 1) the existence of a relationship between scores and 2) if there is a difference between groups. We hypothesize that participants will tend to preference lighter skin and participants in the dark skin group will have lower self-esteem scores regardless of preference. Finally, we believe that in terms of beauty, lighter skin, non kinky hair textured males and females are preferred.

Classification: Senior  
Presentation: Poster  
Faculty Advisor: Collins, Leslie V.
12. Collective Research in Action: Documenting the Stories of Undocumented Youth
Robles, Rodrigo*
Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

Currently in the United States there are approximately 4.4 million undocumented immigrants under the age of 30 (Passel & Lopez, 2012) who are facing a constant threat of deportation and the inability to pursue many of their dreams (Castro-Salazar & Bagley, 2010; DeGenova, 2010; Torres & Wicks-Asbun, 2013). To humanize the debate on immigration and challenge narratives of illegality, we collected stories of undocumented youths’ experiences in the U.S. A research team comprised of individuals from Fisk University and the Tennessee Immigrant Refugee Rights Coalition (TIRRC) are conducting a participatory action research project in which all members of the research team designed a semi-structured interview protocol and proceeded to interview 19 undocumented youth. We found that many undocumented youth face hardships in acquiring basic social needs such as, driver’s licenses, healthcare, and a college education. However, we also found that there are many stories of resilience and empowerment resulting in engagement in activism. We suggest that although undocumented youth face social inequities, they are determined to change exclusionary and oppressive policies.

Classification: Freshman  
Presentation: Oral  
Faculty Advisor: Collins, Leslie V.

13. It Takes a Village to Raise a Child
Rush, Marquida*; Burke, Kenneth*
Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208

Over the past 10 years charter schools have grown tremendously (Duncan, 2014). Most of these schools have adopted a multi-faceted, community service model (i.e., offering social services for students and their families as well as education), which operates under the assumption that student’s educational attainment is influence by issues beyond the classroom. Using Brofenbrenner’s ecological theory, our research examines the relationship between community engagement and educational outcomes. Ecological theory focuses on the impact that environment plays on the growth and development of an individual. Through case study design, we examined how Urban Preparatory Academy located in a large Midwestern metropolitan area promotes successful educational attainment by providing its alumni extended community services throughout college. Data from organizational artifacts and surveys from 15 former students were analyzed. The data illustrated that the school provided several vital services for college success such as: financial resources, social networks, mentors, etc. Additionally, the data revealed that alumni utilized most services during college matriculation and believed that Urban Prep Academy does in fact culminate in the alumnus success in college as stated. Implications for program design are discussed.

Classification: Junior  
Presentation: Poster  
Faculty Advisor: Collins, Leslie V.
14. Fisk University: A Tradition of Research
Mitchell, Reavis*
History, Department of History & Political Science, Fisk University, Nashville, TN 37208

From its inception research has always been an integral part of the Fisk University Experience. Initially, Fisk Free Colored School was a research project itself. Many believed that the former slave were not educable, and their process of evolving into educated humans was observed, measured, and studied. The research experience provided a remarkable outcome that has been celebrated for the last one-hundred and forty-eight years. Research methodology was undoubtedly apart of the early curriculum. As time progressed Fisk students became noted American researchers. W.E.B. DuBois, Charles Harris Wesley, Thomas Talley John Hope Franklin, and James Raymond Lawson are examples of those great scholars who all developed their research skills in the classrooms of Fisk University. By the 20th century, noted researchers would become members of the faculty. Thus expanded research opportunities were offered to their students. This tradition of scholarly research carried out by the Fisk faculty of academic scholars continues to the present day, and will be a focus of this study. The data will be compiled through a literature review and survey of the current faculty of researchers.

Classification: Faculty
Presentation: Oral

15. The State of African-American College Student’s Political Awareness and Political Participation
Thomas, Breanna1*; Hussain, Sajid2
1History, Department of History & Political Science, Fisk University, Nashville, TN 37208; 2Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

When examining the current state of race relations compared to the state of race relations preceding the Civil Rights Movement, the progress made between the two eras and the hindrance of progress are questioned. Liberals blame structuralism for less progress: “The system purposefully harms us. We have made attempts to make progress but the system constantly thwarts our attempts.” Conservatives blame behaviorism: “The problem is us: we do not watch the news, we are uninformed, and we do not vote and that hurts our progress.” To investigate behaviorism, I have conducted research, including a survey, to measure the political awareness and political participation of African-American college students, groups possibly disenfranchised by Voter ID Laws. In North Carolina, 34% of 316,000 registered voters without a state-issued ID and 36% of 138,000 voters without IDs at the polls in 2012 were African-Americans. Some Voter ID Laws in the US accept gun licenses as forms of IDs instead of Student IDs. Based on the survey conducted, Black college students voice their political opinions through voting, demonstrations including marching, and volunteering in campaigns. Only 4% of surveyors are politically inactive and do not vote. Looking at analyses of the 2012 Presidential Election, Black Voter Turnout exceeded White Voter Turn-Out for the first time. Young, black women had the highest turnout of any minority group. 70% of surveyors pay attention to the news. 63% of surveyors believed that unfair legislation has passed
but 65% of surveyors will continue to vote. Even if students do not plan to vote, 46% of surveyors will not become apathetic. The research indicates that structuralism hinders progress more than behaviorism.

Classification: Freshman  
Faculty Advisor: Hussain, Sajid

16. The Framing of Reality and the Need for Academic Activism  
Frederiksen, Jens*  
Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208

We live in tumultuous times confronted by a set of challenges that demand our fullest attention and yet the mainstream media seems near obsessed with stories whose impact might readily (at the risk of sounding insensitive) be considered trivial. At a time when time is dually of the essence - one, because we literally only have a minute for the news and two, because time is not on our side, we have to resist the media's framing of reality and act. Growing income inequalities, the rule of special interests, environmental doom, and the continued marginalization of certain demographics (domestically as well as internationally) just to name a few, are issues that cannot wait for us to emerge from our current slumber. As members of the academy, I think we are faced with the somewhat precarious task of needing to remind one another and most importantly students of the importance of activism. Precarious because as the saying goes, teachers are those who cannot do and yet, it seems, time is ripe for things to be done differently.

Classification: Faculty  
Presentation: Oral

17. An Unemployment Case Study (The Nigerian Story)  
Adeshina, Grace*; Anyaeche, Vivian*  
Department of Business Administration, Fisk University, Nashville, TN 37208

Unemployment is a vital issue that every nation attempts to end. Nigeria, of course, is not an exception. Hence, this research seeks to enumerate and explain in-depth the causes and determinants of unemployment in
Nigeria. Aside from enlightening the causes of unemployment, it highlights the disparity between genders in the Nigerian Labor force. These goals would be achieved by covering the various economic policies and measures that have been taken by the Nigerian Government to alleviate the unemployment problem and the results they have yielded over time. By showing the correlation between high unemployment rate and the ever widening spread of poverty in the country, the differences between rural employment and urban employment would be further explained. In conclusion, the paper will discuss the long term effects of the high unemployment rate on the Nigerian economy and some predicted far reaching consequences. Better solutions and measures that could curb the rate of unemployment and stabilize the Nigerian economy would be proposed.

Classification: Freshman
Presentation: Poster
Faculty Advisor: Umontuen, Nicholas

18. The Success of Black-Owned Businesses in the Greater Nashville Area
Butler, Ashley1,2*; Carter, Ciera3*
1Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208;
2Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208;
3Department of Business Administration, Fisk University, Nashville, TN 37208

The purpose of this project was to interview and survey the owners of black-owned businesses in the Greater Nashville area, but more specifically the Jefferson Street businesses. This was so that we could do a measurement of success of the black-owned businesses, over time to the present day. We did this in hopes of building a network between Fisk University and the local black establishments surrounding the Fisk area.

Methods used were to develop a survey of questions in regards to how the owners run their businesses. The most influential questions of the survey consisted of: the marketing strategies utilized, the longevity of the business, annual income, obstacles faced, and mutual feelings of support from the local community and the Tennessee State University (TSU) and Fisk University communities. Also, another method we used was holding interviews with the owners. Throughout the interviews, we were able to answer other questions related to the history of the business and Jefferson Street, the purpose, and the overall goals.

The majority of the businesses network very well, by means of using business cards, ads, and social media. Also, most of the owners have been in business for at least five years or more. Annual income varied widely because most of the owners were not quite comfortable in answering that particular question. The views regarding support from the local, Fisk, and TSU communities were mixed, because some of the owners felt neutral towards receiving support from those communities, while others agreed.

Classification: Junior
Presentation: Poster
Faculty Advisor: Umontuen, Nicholas

19. Excel Model for Performance Measurement
Obiokoli, Joy O.*; Hagan, Alvin*; Umontuen, Nicholas
Department of Business Administration, Fisk University, Nashville, TN 37208

Spreadsheets are the most common software tool managers use to analyze data and model quantitative problems. They have also become one of the preferred tools for teaching quantitative methods to business school students. In this presentation, I introduce an Excel model for aggregate performance measurement, characterized by its great flexibility and formulas, which in many cases allow us to find the optimal solution for a given set of conditions.

Classification: Senior
Presentation: Poster
Faculty Advisor: Umontuen, Nicholas
20. The Merit of Gentrification

Umontuen, Bella*; Umontuen, Nicholas
Department of Business Administration, Fisk University, Nashville, TN 37208

Harlem, New York is known for its connection to African American history, art, and culture. In a recent speech, director Spike Lee denounced the social changes in the neighborhood, as more white people move into predominantly black areas. He began by disagreeing with a New York Times article about the benefits of gentrification. He went on to raise basic questions related to the matter. “Why did it take this great influx of white people to get the schools better? Why’s the garbage getting picked up more regularly?” [1] Lee’s comments are related to a larger issue: what is the merit of gentrification?

Gentrification is “the process of renewal and rebuilding accompanying the influx of middle-class or affluent people into deteriorating areas that often displaces poorer residents.” [2] As communities begin to transition, a conversation arises about the changing environment. Local governments praise the added tax revenue in the area, and individuals laud the growth and expansion of the city. However, these sentiments do not include those of individuals who are forced to leave these areas. Frequently, the poorer residents are ignored and are further marginalized by others with more purchasing power.

This study will analyze the community changes in terms of population, ethnic diversity, household income, and changes in businesses. In addition, it will compare the community’s response as cited by area news outlets. The cities that will be included are Nashville, New York, Atlanta, Washington, D.C., Charlotte and San Francisco.

Classification: Sophomore  Presentation: Poster
Facility Advisor: Umontuen, Nicholas

Life & Physical Sciences

Dr. Arnold Burger  Dr. Eugene Collins  Dr. Steven Morgan  Dr. Bryan Wallace
21. Molecular Mechanisms of TSUA-58 Alkaloids in the Inhibition of Prostate Cancer Cells
Addai, Prince1,2*; McCarroll, Patricia1; Lu, Wenfu2; Yang, Qing2; Xie, Yingqiu2; Li, Bo2; Apraku, John3;
Okoro, Cosmas1; Chen, Zhenbang2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Biochemistry and
Cancer Biology, Meharry Medical College, Nashville, TN 37208; 3Chemistry, Department of Life & Physical
Sciences, Tennessee State University, Nashville, TN 37209

Prostate cancer is the second leading cause of cancer-related deaths in American men. Aberrant regulations of
multiple genes and pathways are found in prostate cancer. EZH2 and H3K27me3 are abnormally up regulated
in prostate cancer. Here we show that TSUA-58, a derivative of TSUA-58 alkaloids, on its own, suppresses
the proliferation of C4-2B and PC-3 cells. We discover for the first time that TSUA-58 decreases H3K27me3 to
suppress cancer cell proliferation. Findings of this project will point out new research directions in which a novel
chemotherapy can be generated to treat prostate cancer.

Classification: Sophomore                     Presentation: Poster
Faculty Advisor: McCarroll, Patricia

Grants: NIH grant 2 UL1 TR000445-06; DoD grant W81XWH-12-1-0114

22. Using Comparative Modeling to Analyze the Two Mn-Dependent Superoxide Dismutases of
Staphylococcus aureus
Amoah, Kofi1*; Thomas, Lana2; Nelms, Brian L.1; Damo, Steven2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Chemistry,
Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Staphylococcus aureus is a bacterium that infects almost every part of the human body and a common cause
of skin infections, food poisoning and respiratory diseases. The emergence of antibiotic-resistance forms of
pathogenic S. aureus and its involvement in hospital-acquired infections presents a significant problem to
modern healthcare. For S. aureus to survive and replicate in the host, it must acquire essential nutrients. In the
immune response, the host combats invading pathogens by limiting the availability of essential nutrients such
as the transition metal manganese. Due to the highly adaptive nature of bacteria, pathogens have evolved in
order to overcome the host defense mechanisms. For example, S. aureus has two Mn-dependent superoxide
dismutases (Sod A and Sod M), which are known to be virulence factors. However, the molecular mechanism of
this redundant enzymatic system remains unknown.

In order to understand the structure function relationships of Sod A and Sod M in S. aureus, we employed a
computational comparative modeling approach. We generated homology models of both Sod A and Sod M
using the known protein structures of homologous SODs from other organisms on the SWISS Model server. A
detailed sequence level and structural comparison between S. aureus SODs and those of other bacteria such as
Escherichia coli and Bacillus subtilis reveal that although the overall fold of SODs is the same, subtle differences
in sequence structural conformation may provide insight into the mechanism of SOD action.

Classification: Freshman                     Presentation: Poster
Faculty Advisor: Damo, Steven

23. Regulation of Dopamine-Dependent Behavior by dat-1 and asic-1
Cambronero, Francis*; Kayode, Sarah*; Davis, Contessa*; Anthony, Dominique*; Sease, Ayesha*;
Robinson, Sarah*
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopamine (DA) signaling is critical to normal functioning in humans, regulating behaviors such as learning,
memory, reward, and motor control. Disruption of DA signaling is associated with a variety of conditions including
Parkinson’s disease, depression, and schizophrenia. Caenorhabditis elegans is a common model system used to
study dopamine signaling, largely due its genetic simplicity and rapid reproductive capacity. The DA signaling
pathway of C. elegans has been greatly elucidated in recent years, and a host of associated genes have also been
identified. In this study, we examine the role of the dopamine transporter gene dat-1 as well as the presynaptic
degenerin/epithelial (DEG/ENaC) sodium channel gene asic-1 in DA signaling. We use the swimming-induced paralysis (SWIP) assay to evaluate the behavioral phenotype of dat-1(ok157) and asic-1(ok415) mutants whose associated genes have been rendered dysfunctional. SWIP will occur when there is over-stimulation of motor neurons. This study reaffirms that dat-1(ok157) significantly increases the occurrence of SWIP relative to the wildtype; paralysis can be reduced by exposing the worm to sucrose. Finally, asic-1(ok415) partially reduces the paralysis seen in dat-1(ok157) mutants when introduced concomitantly. Our results indicate that DAT is required for the termination of DA signaling. Furthermore, since the disruption of ASIC-1 channel activity helps terminate DA signaling and its associated paralysis, ASIC-1 most likely enhances DA release in wild type animals.

Classification: Senior
Presentation: Poster
Faculty Advisor: Robinson, Sarah

24. C. elegans: SWIP Assay and Osmolarity
Clark, Jakiya*; Macon, Courtney*; Bankston, Marcus*; Chol, Nyadow*; Leggs, Brysson*; McCleary, Olivia*; Robinson, Sarah
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
Dopamine is a biogenic amine which effects motor activity, reward and working memory. The synthesis pathway of dopamine begins with tyrosine to which the enzyme tyrosine hydroxylase; known as cat-2 in C. elegans, is added to form L-dopa to which dopa-decarboxylase is added ultimately producing dopamine. When the synthesis pathway of dopamine is disrupted, such as there being a mutation in cat-2, no dopamine is produced. However when the dopamine transporter loses its function (dat-1 ok157) to be able to serve as a channel for dopamine reuptake, the access of dopamine will overstimulate motor neurons leading to paralysis. A SWIP Assay tests for swimming induced paralysis caused by the inhibition of motor neurons due to the lack of the dopamine transporter in C. elegans. The act of swimming causes dopamine to be released in C. elegans therefore in the absence of the dopamine transporter C. elegans will paralyze in water due to the overstimulation of motor neurons. A SWIP Assay can also test for swimming induced paralysis due to osmolarity. Osmolarity measures the number of solute particles per unit volume of solution (Osm/L). Ionic compounds such as sodium chloride dissociate in solution whereas non-ionic compounds like sucrose do not dissociate in solution. The effect of increasing osmolarity on a SWIP Assay using both wild-type (N2) and mutant (dat-1) C. elegans was also tested.

Classification: Senior
Presentation: Poster
Faculty Advisor: Robinson, Sarah

25. Dop-3; dat-1 mutant in C. elegans rescues dat-1 paralysis phenotype via SWIP
Crowder, Mark*; Lampkin, Jacarra*; Newson, Kashun*; Lee, Christina*; Robinson, Sarah
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
Background: Dopamine is a neurotransmitter responsible for a host of functions in animals from cognition to arousal and even motor control. In patients with Parkinson's disease, the neurons that produce dopamine die and therefore these areas are left uncontrolled. As a result, people with the disease begin to shake uncontrollably (a hallmark behavior of the disease). In C. elegans, a dopamine dependent phenotype known as swimming induced paralysis (SWIP) has been observed in worms with a knock-out of the dopamine transporter (DAT), a channel that recycles dopamine (DA) back into the pre-synaptic terminal. A worm undergoing SWIP shows no movement. In humans with low levels of dopamine and in worms with high levels of dopamine (it's not being recycled into the pre-synaptic terminal in dat-1 mutant worms), we see loss of motor control. Our goal was to prevent paralysis of the dat-1 mutant worm.

Methods: Our data were acquired from the SWIP assay which requires picking worms for two minutes and placing them in a drop of water in a multi-well glass plate for nine minutes. At the end of nine minutes, we observed the worms to see how many were paralyzed and how many were still swimming.

Results: When combined with the dop-3 knockout (as a dat-1; dop-3 double mutant), the dat-1 worms did not paralyze and swam at levels consistent with N2 (wild type) worms.
Conclusions: The dop-3 receptor is critical to binding DA and is the receptor responsible for the SWIP phenotype. When it is knocked out (of a dat-1 worm), the worm regains its motor control. Hopefully, this will lead to method of Parkinsons patients regaining their motor control.

Classification: Junior  
Presentation: Poster

Faculty Advisor: Robinson, Sarah

26. The FKH-8 transcription factor targets genes that play a role in regulating dopaminergic neurons
Crowder, Mark*; Nelms, Brian L.
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Background: Dopamine (DA) is a neurotransmitter that plays a role in motor control, arousal, cognition, reward, etc. However, when the neurons that produce DA undergo a loss of function or die (as in Parkinson’s disease), the activities they control become sporadic. In this study, we have chosen to examine a transcription factor that is highly expressed in DA neurons and crucial to the development and differentiation of DA neurons: FKH-8. We are attempting to determine the effect of loss of FKH-8 on expression of DA neuron-specific genes, particularly those that are related to Parkinson’s disease.

Methods: We will identify target genes and then use quantitative real time polymerase chain reaction (qrtPCR) to measure the fold differences in expression between three worm types: a wild type worm (N2), a dopamine transporter (dat-1) mutant, and a fkh-8 mutant. RNA will be isolated from the worms and will then be converted to cDNA by regular PCR. The cDNA will then be placed in the rtPCR machine and allowed to run for the allotted time. The data will be collected at the end of the cycle.

Results and Conclusions: Although we have identified a number of candidate genes to test and have begun to design primers for qrtPCR and isolate RNA, we have not analyzed gene expression levels yet.

Classification: Junior  
Presentation: Poster

Faculty Advisor: Nelms, Brian L.

27. Impact of Neulasta on Lethally-Irradiated Mice
Johnson, Nia1*; McCarroll, Patricia1; Plett, Artur2; Chua, Hui L.2; Orschell, Christie2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Hematology and Oncology, IUPUI, Indianapolis, IN 46202

In the event of lethal radiation exposure, knowledge of the radiation dose received is important for appropriate medical treatment. There are currently no effective biodosimeters for determining dose. The absolute neutrophil count (ANC) relative to absolute lymphocyte count (ALC) has been proposed as a tool for early assessment of radiation dose due to the greater radiosensitivity of ALC relative to ANC. Early administration of a pegylated-granulocyte-colony stimulating factor (peg-G-CSF, Neulasta), will likely impact the ANC:ALC ratio. For instance, non-human primate (NHP) studies show a more rapid decline in ANC after administration of Neulasta, in apparent contrast to Neulasta’s ability to significantly enhance survival. In this study, we investigated whether 1) the same rapid decline of ANC occurs in lethally-irradiated mice treated with Neulasta, and 2) whether Neulasta acts by expanding bone marrow (BM) hematopoietic progenitor cells (HPC), or whether stimulation of HPC by Neulasta leads to their depletion. To this end, lethally-irradiated (8.62 Gy) mice (n=34) were injected subcutaneously with 1mg/kg Neulasta 24 hours post-irradiation, and subgroups analyzed on set time points for: 1) complete blood cell counts (CBC), and 2) BM HPC. Results show that in contrast to NHP, the ANC was 2 and 4-fold higher in Neulasta mice than controls on days 2 and 3 respectively, but dropped to below control ANC on days 4 and 7. ANC in Neulasta mice significantly increased thereafter. Results of HPC assays show that Neulasta-treated mice possessed more BM HPC than vehicle-treated mice and Neulasta-treated mice had a higher ANC:ALC ratio.

Classification: Sophomore  
Presentation: Poster

Faculty Advisor: McCarroll, Patricia

Grant: Indiana University Simon Cancer Center Summer Research Program
28. *C. elegans* as a Model for Dopamine Neuron Development  
Kayode, Sarah*; Nelms, Brian L.  
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The development of neurons into specific types is a highly regulated process. Dopaminergic (DA) neurons, which in humans control movement and cognition, must have precise levels of signaling molecules, which are controlled by transcription factors. We are investigating the role of the Forkhead-8 (FKH-8) transcription factor, which is expressed in DA neurons in the model organism Caenorhabditis elegans. *C. elegans* is used to study DA neurons because of its simplicity, ease of experimental manipulation, and because it still has many genes similar to humans. Other work in our lab has shown that worms without FKH-8 have a DA-related movement defect.

To assist our research, I developed a quick technique of determining whether our mutant worms contain the deletion within the fkh-8 gene. Because manganese exposure has been linked to potential increased risk for Parkinson's-like symptoms, I am currently testing the effects of manganese chloride in fkh-8 mutant worms in order to know if the gene protects the worms from oxidative stress or makes the worms more sensitive to oxidative stress. We hope that the outcome of this research will give insight into Parkinson's disease, schizophrenia, dystonia, ADHD (Attention deficit hyperactivity disorder) and other diseases that are related to DA neurons.

Classification: Sophomore  
Presentation: Poster

Faculty Advisor: Nelms, Brian L.

29. Control of Dopamine Signaling by the FKH-8 Transcription Factor  
Nelms, Brian L.*  
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopamine is a neurotransmitter used in many important day-to-day functions (such as voluntary movements, thought processes, learning, and mood control) in humans and other animals. The neurons that produce and regulate the amount of dopamine that is released must develop correctly and maintain appropriate levels of all the genes involved in regulating dopamine (many of which are still not understood). Loss or improper regulation of these neurons can lead to disorders such as Parkinson's disease, ADHD, schizophrenia, and drug addiction, so understanding the genes involved in normal function could help us to decipher or treat these disorders. In order to test what genes might be involved in the regulation of these neurons and dopamine levels, we have turned to the model organism Caenorhabditis elegans, a microscopic worm that despite a very different anatomy still shares the fundamental molecular and genetic properties of the dopamine signaling system found in humans. This worm's relative simplicity, transparent body, fast life cycle, and wealth of genetic resources make it a great system that we can experimentally manipulate to discover new genes involved that may be relevant to human health. Using this strategy, we have discovered a transcription factor, named FKH-8, which is found in dopamine-producing neurons and is necessary for normal dopamine-dependent behaviors. We are in the process of further identifying how this factor works and what target genes it may regulate. These efforts may uncover new factors that have important counterparts in humans.

Classification: Faculty  
Presentation: Oral

Grant: Department of Education Title VII # P382G090004

30. The Effect of Androgen-Regulated Oncomirs, miR-27a/b on Peroxisome Proliferator Activated Receptor Gamma (PPARγ) Levels in Human Prostate Cancer Cells  
Odiase, Peace1*; Olokpa, Emuejevoke2; Stewart, LaMonica2  
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Biochemistry and Cancer Biology, Meharry Medical College, Nashville, TN 37208

Peroxisome Proliferator Activated Receptor Gamma (PPARγ) is a ligand-activated transcription factor that acts as a tumor suppressor in many cancers and regulates adipocyte differentiation. PPARγ exhibited anti-cancer activities in prostate cancer cells in vitro and in vivo. Furthermore, conditional knockout of PPARγ in the prostatic epithelium of mice resulted in focal hyperplasia which developed into mouse prostatic intraepithelial...
neoplasia (mPIN), a precursor of prostate cancer. Preliminary data from our lab suggests that the androgen, dihydrotestosterone (DHT), regulates PPARγ expression in the androgen independent prostate cancer cell line C42. The mechanism by which DHT suppresses PPARγ remains to be elucidated. MicroRNAs (miRs) actively participate in the progression of many cancers by pairing with messenger RNAs (mRNAs) of tumor suppressors and inhibiting the expression of their proteins. Previous studies have shown that miR-27a and miR-27b target the PPARγ mRNA and inhibits its expression. We report that androgens via the androgen receptor facilitate the production of miR-27a and miR-27b. The basal levels of both miRs vary across the human prostate cancer cell lines: PC-3, 22RV-1 and C4-2. These data suggest that androgens regulate PPARγ expression by inducing the production of miR-27a and miR-27b, thereby promoting the proliferation of prostate cancer cells.

Classification: Sophomore  Presentation: Poster  Faculty Advisors: Stewart, LaMonica; Adebamjo, Jennifer W.

Grants: CTSA Grant Vanderbilt UL1 RR024975-01; DoD grant W81XWH-12-1-0114

31. The Neuromodulator Dopamine in the Presence of C. elegans
Onamusi, Lashe*; Anderson, Alexis*; Stark, Clarissa*; Clemons, Lerae*
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208
Caenorhabditis elegans also known as C. elegans have become a major experimental organism in many research areas. C. elegans are a useful model for the study of humans and their homologous structures and proteins. The ability to identify mutations affecting their proteins, structures, and characterization of their genotypes and phenotypes at the cellular and molecular levels help to display the various interactions relevant to the human being (Introduction to C. elegans). Dopamine is an important neuromodulator in both vertebrates and invertebrates. It has been found that reduced dopamine signaling can cause a distinct abnormality in the behavior of the C. elegans, which has only eight dopaminergic neurons. In C. elegans, an excess of synaptic dopamine results in a loss of movement in water, which is known as Swimming-Induced Paralysis (SWIP). Mutants defective in dopamine signaling also frequently exhibited both abnormally high and low average speeds, ultimately causing paralysis. Swimming Induced Paralysis allows researchers to determine the mutant genes that cause dopamine signaling. By utilizing this type of research in C. elegans, researchers could benefit human beings in the near future as well.

Classification: Junior  Presentation: Poster  Faculty Advisor: Robinson, Sarah

32. What is the relationship between serum vitamin D levels and Mammographic Breast Density Among Medically Underserved black women ages 40-73?
Williams, Christian1*; Hota, Sanjukta2
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208
The topic of this research was about the correlation between vitamin D levels and breast cancer in medically underserved black women. Breast cancer is an uprising epidemic amongst African American women. Breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death among black women aged 45-64. Black women are an understudied population that is predisposed to vitamin D deficiency and to more advanced stages of breast cancer at diagnosis. Previous research has suggested that there is a link between higher vitamin D levels and lower mammographic breast density. The higher the breast density level, the more likely one is to develop breast cancer. There have been other studies on the relationship between breast cancer and vitamin D; however the question of why are underserved women at a higher risk of developing breast cancer, has yet to be successfully answered. Some reasons may be due to a lack of knowledge or to poor nutrition. Most of the data for this research is from a compilation of prior research studies, and analyzing these results. Much literature review and a detailed analysis of the results were performed to update and further the research. With this research, hopefully a better understanding of the correlation between vitamin D levels and the development of breast cancer in medically underserved black women will be gained.

Classification: Junior  Presentation: Poster  Faculty Advisor: Hota, Sanjukta
33. Synthesis and Characterization of Phosphonated Bisphenol A as a Precursor for Phosphonated Proton Exchange Membranes in Fuel Cells

Boyer, Maria*; Reid, Kemar R.; Arnett, Natalie

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Proton exchange membrane fuel cells (PEMFC) are alternative energy devices that convert chemical energy into electrical energy. Although hydrogen fuel cells have demonstrated 50-60% conversion efficiency with zero pollutants emitted, the standard PEMFC membranes, Nafion®, are limited to operating temperatures below 100°C. Our research investigates the synthesis of phosphonated bisphenol A (bis A) precursors for poly(arylene ether sulfone) membranes. Phosphonated membranes allow higher device operating temperatures and good proton conductivity in the dry state to achieve higher fuel cell efficiencies. A two-step procedure was used to prepare phosphonated bisphenol A: (1) Bromination of bisphenol A and (2) Phosphonation using triethylphosphite. 13C-NMR peak at 111 ppm confirmed the successful formation of brominated bisphenol A. GC-MS analysis also showed a molecular weight of 207.1 m/z corresponding to that of Br2OH suggesting that dibrominated bisphenol A was formed. Phosphonated bisphenol A was formed by Lewis mediated Michaekis-Arbugon reaction using zinc bromide catalyst, and confirmed with PNMR with a peak at 10 ppm.

Classification: Sophomore  Presentation: Poster
Faculty Advisor: Arnett, Natalie

34. Synthesis of Bisphenol-A Tetrachlorocyclotriphosphazene (BATCCP) from Bisphenol-A and Hexachlorocyclotriphosphazene

Davies, Shannon*; Arnett, Natalie

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The purpose of this research was to synthesize bisphenol-A tetrachlorocyclotriphosphazene (BATCCP) hybrid monomers and to evaluate the effect of substituting dodecane for toluene as the organic phase of the reaction. BATCCP monomers in this research were prepared by an interfacial procedure in a water/dodecane system with the assistance of a phase transfer catalyst, tetaoctylammonium bromide. 1H and 31P NMR confirmed the production of BATCCP monomer by the appearance of chemical shifts at 7.18 and 5.35 ppm in the 1H NMR and 14.3 and 23.4 ppm in the 31P NMR, respectively. A 14% decrease in the isolated product yield resulted when dodecane was used in place of toluene as the organic phase.

Classification: Sophomore  Presentation: Poster
Faculty Advisor: Arnett, Natalie

35. Research as Pedagogy: Discovery at the Intersection of Traditional Disciplines

Limbird, Lee E.*

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Scientific discovery historically followed a prescribed ‘scientific method’ that included developing hypotheses based on extant data, and then pursuing whether or not those hypotheses are valid via a series of complementary methodological approaches. However, this approach to discovery is evolving, as the most paradigm-shifting advances are occurring at the interface of traditional disciplines. Furthermore, the existence of computational and ‘virtual’ approaches allow scientists to use so-called “Big Data” to generate hypotheses in an unbiased fashion, and then test those hypotheses as a second, rather than first, step in the process of generating new knowledge.

Not only has scientific research and discovery accelerated, but the understanding of how scientists are ‘formed’ is also an emerging area of research. It is clear that to become a ‘scientist’ goes beyond the classroom and standard protocol-driven laboratories, but requires students in K-12 and undergraduate school to ‘behave’ as scientists, and engage in authentic research.

The research basis of ‘research as pedagogy’ will be discussed briefly as a prelude to showcasing Fisk’s evolving programs to support the maturation of our students as discoverers - skills that readily map to other disciplines for preparation of ‘Fiskites’ for a plethora of careers.

Classification: Faculty  Presentation: Oral

Luitel, Kanchan*; Poland, James*; Arnett, Natalie

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The synthesis of novel disulfonated polysulfone-polyamide copolymers for proton exchange membranes (PEM) in fuel cells were investigated in this research. PEM polymers investigated were synthesized from disulfonated bis[4-(3-aminophenoxy)phenyl] sulfone (S-BAPPS) and unsulfonated bis[4-(3-aminophenoxy)phenyl] sulfone (BAPPS) precursors and isophthaloyl chloride. S-BAPPS and BAPPS were synthesized via nucleophilic aromatic substitution in dimethylacetamide (DMAc) at elevated temperatures. The structure of the unsulfonated monomer (BAPPS) was confirmed by FTIR and 13CNMR. The ratios of S-BAPPS and BAPPS in the disulfonated polyamide-polysulfone copolymers were varied to control proton conductivity and improve mechanical stability. An unsulfonated homopolymer (BAPPS-IC) prepared from BAPPS and isophthaloyl chloride (IC) was synthesized by solution polymerization at room temperature in dichloroethane. Thin films of BAPPS-IC were prepared by the solution-evaporation method. Further analysis of S-BAPPS and BAPPS polymers will be carried out using FTIR, 1H NMR, DSC, and TGA.

Classification: Sophomore
Presentation: Poster
Faculty Advisor: Arnett, Natalie

37. Synthesis and Characterization of Polyamide Polyetheramide Reverse Osmosis Membrane

Wadsworth, Ophelia*; Arnett, Natalie

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Scientific research into developing more economic and performance efficient water desalination membranes is driven by the scarcity of adequate drinking water in poor and arid regions globally. Reverse Osmosis (RO) is the sought after water desalination method due its lower energy consumption when compared to other desalination techniques. This project seeks to synthesize a polyamide-polyetheramide (PAPEA) thin film composite (TFC) membrane using p-phenylenediamine (PPD), trimesoyl chloride (TC) and an ether amine to improve the characteristics of the thin layer. Interfacial polymerization occurred at room temperature on the surface of a polysulfone support. The membrane was then soaked in DI water to prevent dehydration and Infrared Attenuated Total Reflectance (IR ATR) was conducted to verify polymer synthesis. Preliminary ATR analysis indicated that the PAPEA thin film layer was not synthesized on the polysulfone support. These results will be further confirmed with Scanning Electron Microscope (SEM) analysis to verify the presence of the thin layer on the support. Additionally, methods will be explored to separate the thin layer from the support to analyze via ATR.

Classification: Sophomore
Presentation: Poster
Faculty Advisor: Arnett, Natalie

38. Synthesis and Characterization of Polyamide Polyetheramide Reverse Osmosis Membrane

Williams, Rodayne*; Wadsworth, Ophelia; Arnett, Natalie

Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Scientific research into developing more economic and performance efficient water desalination membranes is driven by the scarcity of adequate drinking water in poor and arid regions globally. Reverse Osmosis (RO) is the most widely water desalination method due its lower energy consumption when compared to other desalination techniques. This project seeks to synthesize polyamide-polyetheramide (PAPEA) thin film composite (TFC) membranes using p-phenylenediamine (PPD), trimesoyl chloride (TC) and an ether amine to improve the characteristics of the thin layer. Interfacial polymerization occurred at room temperature on the surface of a polysulfone support. The membrane was then soaked in DI water to prevent dehydration and Infrared Attenuated Total Reflectance (IR ATR) was conducted to verify polymer synthesis. Preliminary ATR analysis indicated that the PAPEA thin film layer was synthesized on the polysulfone support. These results will be further confirmed with Scanning Electron Microscope (SEM) analysis and the membrane will be subjected to crossflow filtration testing to ascertain its water flux and salt rejection.

Classification: Sophomore
Presentation: Poster
Faculty Advisor: Arnett, Natalie
39. Reducing Community Exposure to Environmental Toxics: a Key Component in Building Healthy and Sustainable Communities

Wingfield, Robert*
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Reducing exposure to environmental toxics is very critical to achieving success in building healthy and sustainable communities. The reality is that certain populations have historically suffered and continue to suffer disproportionate exposure to environmental toxics. Often these same populations suffer disproportionately from poor health outcomes from diseases in which there are disparities in the incidence of their occurrence. It is most important that the voice of the community be heard in addressing these issues.

The work of many researchers has shown the presence of toxic materials in the body of community residents worldwide. The toxicology of many of these substances has been studied, whereas the health impact of the various mixtures of toxic substances remains under investigation. Children represent a very vulnerable population. Despite programs and efforts to reduce exposure to toxic substances, toxic substances still are still released into the environment in millions of pounds a year from both point and non-point sources. These toxic substances move throughout the environment and undergo chemical transformations sometimes to less desirable chemical substances. Persistent bioaccumulative toxics, neurotoxics, developmental toxics and carcinogens are of significant concern. New environmental toxics are being identified each year as new materials are being introduced into use by our society. The environmental fate and toxicity of both pharmaceuticals and nanoparticles released into the environment are being studied. Both indoor and outdoor air pollutants are of concern. Access to clean and sustainable water now ranks as high as the need for sustainable energy in importance to the development of communities and countries.

Classification: Faculty
Presentation: Oral

40. Multi-layered Films with Applications in Optical Data Storage

Zlibut, Emanuel1,2*; Zhu, Lei2; Zhang, Guoqiang2
1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Department of Macromolecular Science and Engineering, Case Western Reserve University, Cleveland, OH 44106

Noble metal nanoparticles such as gold and silver have drawn a large amount of attention and have been intensely studied in recent years due to their unique properties in optics, electronics and biomaterials. Our work takes advantage of the photothermal effect of silver nanoparticle (Ag NPs) to build up new multilayered film for optical data storage. To this end, polystyrene (PS) capped silver nanoparticles with narrow size distribution and well dispersion in polymer matrix need to be prepared and well characterized, as well as certain important parameters in the course of synthesis have to be methodically studied.

Therefore, three thiol PS (Mn=5k, 13k and 23k) have been designed and synthesized via reversible addition-fragmentation living/controlled polymerization. PS capped Ag NPs of varied PS brush lengths and stoichiometric ratio of silver nitrate to PS ([Ag]: [PS-SH] 8:1, 16:1 and 32:1) were prepared in the presence of DMF, by superhydride reduction and characterized using ultraviolet/visible spectroscopy, thermogravimetric analysis (TGA) and transmission electron microscopy (TEM).

The currently collected data displayed that 8:1, 16:1 are favorable ratios with little to no aggregation and an average particle size of 4nm, while 32:1 has a larger amount of aggregation with a wide range of particle sizes.

Classification: Junior
Presentation: Poster
Faculty Advisor: Arnett, Natalie

41. Modeling the Thermal Properties of Multilayered Materials

Ali, Omar*; Collins, Eugene
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The purpose of this research is to study the thermal properties of a multilayered mixture of two materials. Each of the two materials alone has different thermal properties from the other. The goal is to model how these thermal properties vary depending on the amount of each material present in the mixture, and the way the
materials are mixed. Mathematica is used to visualize how the thermal properties vary depending on the different proportions of the two materials and how they are arranged. The first case studied is the alternate stacking of the two materials, called “1” and “2.” Materials 1 and 2 are a general representation of two materials with different properties. In the second case, the materials are stacked, with the second layer being a mixture of the two materials. The third case entails stacking the two materials with an intermediate area of mixing. The graphs shown depict thermal conductivity “H” for Case B as a function of “f,” which is a parameter related to the amount of material 2 compared to material 1. The results show that adding a small fraction of highly conductive material can significantly increase the thermal conductivity in a direction perpendicular to the layers (vertically). The conductivity also increases moderately in the direction parallel to the layers.

Classification: Sophomore
Faculty Advisor: Collins, Eugene

42. Toward Understanding the Role of Metal Sequestration in the Innate Immune Response
Damo, Steven*
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The S100A8/S100A9 heterodimeric protein calprotectin (CP) is expressed abundantly in neutrophils and plays a key role in the innate immune response. CP contributes to the control of pathogens by sequestration of nutrient metals which serves to inhibit microbial growth. A detailed understanding of the molecular mechanisms of this immune response will inform the development of new antimicrobial therapies which are critical in light of increasing antibiotic resistance among human pathogens. A highly interdisciplinary approach combining biophysical, biochemical, and microbiological methodologies demonstrate that CP binds the transition metals manganese (Mn) and zinc (Zn) with nanomolar affinity and this metal binding results in direct antimicrobial activity. The high resolution x-ray crystal structure of Mn bound CP determined to 1.6 angstroms resolution reveals an unprecedented Mn coordination site comprised of six histidine residues arranged in a perfect octahedral geometry. Mutants of CP with redacted metal binding properties were used to dissect the relative contributions of Mn and Zn sequestration in CP’s antimicrobial activity. The results show that Mn sequestration by CP is required for maximal antimicrobial activity against a broad spectrum of bacterial pathogens.

Classification: Faculty
Faculty Advisor: Damo, Steven

43. Effects of Ag Nanoparticles on Optical Properties of ZnO-PVDF Composites
Davies, Brooke1*; Coca, Kenneth2; Mayo, Anthony2; Jones, Jennifer2,3; Mu, Richard2
1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 3Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235

Polyvinylidene fluoride (PVDF) is known to exhibit piezoelectric properties in beta phase and other polar phases. However, PVDF is energetically favorable to remain in the non-piezoelectric alpha phase at room temperature. One of the big challenges is how to retain and stabilize the beta phase to make PVDF viable for piezoelectric applications. Zinc Oxide (ZnO), on the other hand, is one of the few semiconductors that also displays piezoelectric properties. The proper combination of PVDF and ZnO nanoparticles (NPs) may lead to increased materials functionality and further enhancement of piezoelectric properties. Our preliminary research of ZnO + PVDF nanocomposites has shown a huge optical emission enhancement resulting from the addition of ZnO nanostructures. The current effort is to incorporate Ag nanoparticles into the ZnO-PVDF nanocomposite to further enhance the band edge emission of the encapsulated ZnO NPs so that the ZnO-PVDF nanocomposite may be used as a viable multifunctional piezophotonic material.

Classification: Senior
Faculty Advisor: Mu, Richard

Grants: NSF-STC DMR-0423914; NSF-CREST HRD-0420516; DOD-ARO W911NF-11-1-0156; ONR 911NF-13-1-0153; NIH/NIGMS MARC-U*STAR 1T34GM10555
44. Study of Structure and Interfacial Polarization in Multilayered Dielectric Films and Polymer Nanodielectrics

Jones, Jennifer¹,²*; Mayo, Anthony¹
¹Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; ²Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235

High energy density capacitors based on dielectric polymers are a focus of increasing research effort motivated by the possibility to realize compact and flexible energy storage devices. Multilayered ferroelectric polyvinylidene fluoride (PVDF) systems and PVDF thin film nanocomposites with ZnO nanofillers are shown to increase energy storage efficiency and improved device performance compared to single layer films. To understand the physics of why these multilayered and nanocomposite systems perform better than single layer PVDF we are developing characterization techniques using confocal second harmonic generation (SHG), electric field induced second harmonic (EFISH) and Raman laser spectroscopy.

Classification: Research Staff
Presentation: Oral

45. Crystal Growth and Fabrication of Radiation Sensors and Imagers for Portable and Mobile Applications

Matei, Liviu*; Rowe, Emmanuel*; Tupitsyn, Eugene*; Groza, Michael*; Bhattacharya, Pijush*; Burger, Arnold
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

We will demonstrate held and portable devices that are being developed at MSAG and to be used for a wide range of radiation measurement applications. They used to measure radiation levels, luggage scanners, medical imagers and astrophysics and planetary exploration. The display will also feature examples from the crystal growth technology that is critical to the fabrication of improved devices.

Classification: Research Staff
Presentation: Exhibit & Demo
Faculty Advisor: Burger, Arnold
Grant: NSF#-0932038

46. Introduction of Nanostructured Materials for Energy Transport, Conversion and Storage Research at Fisk

Mu, Richard¹*; Jones, Jennifer¹,²; Mayo, Anthony¹
¹Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; ²Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235

Understanding the physics of energy transport and conversion pathways at atomic and nanometer scales is critically important to address the energy issues facing humanity. Proper and intentional design and tailor of the materials structure at nanoscale may hold the solution for effective use and conservation of energy, and result in minimal harm to the world for future generations. An introduction with a few examples will be given in the talk on the group's energy research and applications and future directions as well.

Classification: Faculty
Presentation: Oral
Grants: NSF-STC DMR-0423914; NSF-CRESTHRD-0420516; DOD-AROW911NF-11-1-0156; ONRW911NF-13-1-0153

47. Atmospheric Tests Through Use Of Sounding Rockets

Wallace, Bryan K.*
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

The Fisk University rocket team also known as the Fisk Altitude Achievement Missile Team conducts atmospheric tests through use of sounding rockets. The demonstration rocket is 16 1/2 feet tall and weigh 65 pounds when fully loaded. It carries electronics suite that allows it to take velocity, acceleration, atmospheric pressure, and earth magnetic field strength readings during flight. Through use of telemetry this rocket can collect data in real-time and transmit to a ground receiver for data collection and analysis. This rocket also has the capability of carrying an atomic clock for time dilation experiments. In addition to atmospheric studies, the Fisk rocket team engages in outreach with inner-city youth. The purpose of this outreach is to enhance achievement and
urban youth through engaging them with stem curriculum in the areas of rocketry and astronomy. This model rocket has attained an altitude of 1800 feet carrying a robot payload as well as the after mentioned experiments. Atmospheric data was successfully collected and used for analysis.

Classification: Faculty Presentations: Exhibit & Demo

48. Thrust Profile Verification through static motor Testing
White, Earl1*; Wallace, Bryan K.2
1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

In rocketry there are many different computer applications. The application that is used in this research is a website called Rocksim which is used to project how high in altitude a rocket can go. The problems with these motors on this application and some others are that different motors that are designed for the different model rockets are not tested adequately and once the motors are inserted into the rocket, the actual thrust of the rocket either isn’t as powerful as, or more powerful than the application portrays. The people who invented the rocket motors have tested them in model rockets, but there are a few modifications that have to be made in the efficiency of the tests. One of the approaches that have been taken to clear up confusion about the rocket motors is to test the rockets on a platform that is placed on a force plate. The plates are then attached to the ground, and the thrust is read on a scale. A thrust curve is then matched with the efficiency of the motor and determines thrust as a function of time. An assumption that is frequently made during the research is that the altitude of the rocket is dependent on the size of the rocket and the thrust of the motor as shown on Rocksim. The impact of the research will implement another way of efficiently testing motors without physically going to a launch site and not knowing the power of the motor.

Classification: Sophomore Presentation: Poster
Faculty Advisor: Wallace, Bryan K.

Department of Mathematics and Computer Science

49. Web-Based Middleware for Protein Annotation
Adeogun, Samuel*; Hussain, Sajid
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The annotation of protein function at genomic scale is essential for day-to-day work in biology and for any systematic approach to the modeling of biological systems. Currently, functional annotation is essentially based on the expansion of the relatively small number of experimentally determined functions to large collections of proteins. The task of systematic annotation faces formidable practical problems related to the accuracy of the input experimental information and the reliability of current systems for transferring information between related sequences. These technical difficulties merely lie on the surface of the deeper problem of the evolution of protein
function in the context of protein sequences and structures. Given the mixture of technical and scientific challenges, it is not surprising that errors are introduced, and expanded during process of manual annotation. Thus, to solve this challenge in annotation of protein function, a full scale automation of the entire annotation process has to be done. This automation is done by developing a web based interface, which allows, users input complete protein sequence in fasta format as well as the annotated genome information saved in gff format. On the backend of this application, is a series of algorithms implemented to query such databases as swissprot and pfam, in order to correctly annotate the different proteins present in the gene.

This application has been used to identify the different protein domains in over thirty-six poxviridae genomes during a comparative genomics analysis and the application also determines the homology of the different genes present in the genome.

Classification: Sophomore
Presentation: Poster
Faculty Advisor: Hussain, Sajid
Grant: NSF HBCU/TIP HRD# 1332432

50. Tutacity: Web-based Tutoring Application
Adeogun, Samuel*; Qian, Lei
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Software developers and Computer Scientists have reached a milestone in online delivery of information as regards distance learning. While several online courses exist across multiple platforms like udacity and coursera, there remains a challenge that is still yet to be addressed. Although, learned professors and distinguished professionals put together courses with detailed and well-thought-out assignments and exercises, very little has been done with helping students enrolled in distance learning programs. The main source of communication between instructors and their students largely remains email, while in a few cases, students and professors interact through online forums set up for the course being taken. Tutacity aims to address this problem of interaction between professors or providers of knowledge and the students or receivers of knowledge. Tutacity seeks to bridge a wide opening gap and solve a challenge that is facing learning and delivery of online or distance learning education.

Tutacity is a web-based platform that takes advantage of web technologies in approaching a learning challenge. Tutacity acts as a web-based tutoring application that allows for online whiteboard sharing, video chat and channels provision which users can subscribe to. It allows professors or experts work on and through problems with students or learners in real-time. The technologies employed in tutacity are fairly new and evolving. It makes use of HTML5 technologies, databases and webRTC (Real Time Communication). Tutacity has been designed to make it easier to offer real-time tutoring and assistance to knowledge seekers anywhere and at anytime.

Classification: Sophomore
Presentation: Exhibit & Demo
Faculty Advisor: Qian, Lei

51. Using Genetic Algorithm to solve Fisk University’s Athletic Department Travel Routes.
Ambrose, Jayson*; Hussain, Sajid
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At Fisk University, all teams under the athletic department can only travel to cities or states within a certain radius to keep the loss of funds to a minimum. But there is not a primary strategy on which route to pursue in relation to the circuit of cities that the teams have to travel. The framework behind the team’s travelling system reveals that the teams travel in their own directions to several cities and states to promote the university’s athletic department, which it does, but it also causes the department expenses to increase due to the inconsistency of distances and lack of controlled travel range. In this thesis, we re-introduce the concept of genetic algorithm through the Travelling Salesman Problem, using its evolution of genes procedure to generate the best routes for each team to travel the minimum amount of miles. We chose the technique of genetic algorithm because it is efficient when dealing with complex problems. It can reduce the initial distance by approximately 44.5% after...
processing several times to generate the best distance. We implemented a body of codes that continuously executes and stores the total distances of each route created to display the results in descending order where the smallest number of distance is the best route. We expect this new approach to be beneficial to the university’s athletic department as well as others who may encounter this problem because it finds the shortest route to travel which reduces the rate of money loss drastically.

Classification: Freshman  Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432

52. Using Visual-tile base Programming to Develop an Android App for Small Food Businesses
Ambrose, Jayson*; Qian, Lei  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

In the community of small food businesses in The Bahamas, manually recording data into books is the primary practice in an era where technology is growing rapidly. Book keeping is a good practice but should be secondary reference because it slows down the production, is likely to be less efficient and can become unorganized if a lot of errors were made as opposed to using a form of technology. The framework behind the small food businesses reveals that manual book keeping is preferred because most of the owners do not have the tools to create an app or knowledge on how to maintain a food business based android app. We re-introduce visual-tile based coding through the Pizza Party with Fusion Table tutorial that applInventor2 provides. The tutorial codes forming the foundation are useful to the project because they allow us to construct an efficient data processing and storage android app that records names, orders, time, date and background accounting all in one click. We test the coding through applInventor2 error check icon that displays that the code is currently functioning. Following completion of the android food app, tests will run on an android operated device to see the full implementations. We expect this new approach to be useful to small food businesses owners because it is fast, saves time and provides mass storage, hence it is more efficient than manual book keeping.

Classification: Freshman  Presentation: Poster  
Faculty Advisor: Qian, Lei

53. Applying a Genetic Algorithm to the Travelling Salesman Problem to Optimize Routes for a Tourist to visit Key Icons in a Given Area
Campbell, Kelson*; Hussain, Sajid  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

Throughout the years, people have been wondering and trying to optimize routes in which a tourist or citizen can take to visit key points or monuments within an area. It is next to impossible for a person to find the absolutely best route to take; however, they can find alternate routes which are closest to that of the best. Since there are numerous routes a tourist can take, and these still are affected by a lot of factors in the geography of the area, it is computationally in-feasible and humanly impossible to ascertain the best route. We used the well-known TSP (Travelling Salesman Problem) and Genetic Algorithm, one of the best algorithms in the Computer Science field to solve the problem and find a very efficient, even if not optimal solution. We start with a random route, and evolve that path using techniques and mechanisms of natural evolution, so that after a lot of generations, a very efficient route is found. Our approach helps anyone who wants to visit a city navigate more effectively and efficiently.

Classification: Sophomore  Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432
54. Using Simulated Annealing and Travelling Salesman Problem to find best Optimum while Minimizing Cost of Celestial Objects for Starlight Interferometer

Clemons, Damon*; Hussain, Sajid

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In NASA, there is a need to find the best route for the sequence of celestial objects to be imaged in space while minimizing cost, or fuel. When trying to detect celestial objects in space and sending satellites to image them it cost tons of fuel therefore costing more money. So there is a need to help save money in the NASA program. Even though NASA may have an algorithm on how to obtain the best routes to minimize distance there can always be a better solution to improve their methodology. In order to tackle this problem we are using Simulated Annealing, or SA, and the Travelling Salesman Problem (TSA) as an example. SA allows us to find the best local optimums. Using Simulated Annealing and TSA together we find the best routes for a salesman to tour a number of cities while reducing the distance and/or cost. In this research, the cities represent the celestial objects, and the minimal distance, or route, represents the cost function. While using this approach we are showing how SA is a more efficient way at solving this problem based on the number of nodes, dense or spaced area, and other parameters. We expect this approach to dramatically help lower the amount of fuel needed for satellites to detect celestial objects.

Classification: Sophomore  
Presentation: Poster

Faculty Advisor: Hussain, Sajid

Grant: NSF HBCU/TIP HRD# 1332432

55. Improving Fisk Communication Through MyOracle

Clemons, Damon*; Jackson, D’von*; Qian, Lei

Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

At Fisk University, many students have complained about not knowing enough information around campus. Students are misinformed about events, which buildings to go, food in cafeteria, and other information. People have tried to solve the problems by putting up posters, handouts, and even tried to put everything on the Fisk website but the problem is students have no time for it. Since most, if not all, use their phones to solve this problem, we are creating a mobile app called “MyOracle”. This enables students to have all the information stored on their mobile devices. Currently, we are using Java Android Development kit to create the app but eventually it will expand to Windows and IPhone users. With this app, students will be able to use features on the app to communicate with students, available tutors and faculty members to know ask questions about homework, things going around on campus, and better yet students will not have to search campus just to be lost and not know what is occurring. This is especially beneficial for incoming freshmen, transfers, or people who are new to the campus. It is still in the beginning stages, but so far on the app we have created where students and faculty can send messages to each other, as well as email each other. After MyOracle is completed it should revolutionize communication amongst members of this institution and bring the campus closer together.

Classification: Sophomore  
Presentation: Poster

Faculty Advisor: Qian, Lei

56. InfoDaily: Ensuring Easy Access to Information

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The need for regular information is vital for daily commerce and for keeping track and staying updated on trends. It could be argued that this is no longer a problem since the internet is now readily accessible to a greater percentage of the populace; and even easier for those who own portable smart devices. However, not everybody has a smart phone, tablet, or a laptop. Also for those who own these devices, there are times when difficulties arise in accessing the internet for information. These problems are the basis on which InfoDaily, a web application, is developed. InfoDaily delivers information on demand - regardless of any technical difficulties. As long as a user is subscribed to the application and has a working cellphone number, information will be available to that user. InfoDaily will disseminate financial data, weather data, news and sports updates. This is made possible by making
API calls to the related databases and then sending the data from the query to users through Twilio's SMS API. Core HTML was used to design the front end and Javascript, Node.js, and jQuery were used for the backend to query, format, parse, and send the data from the API calls. Currently, InfoDaily only delivers financial data to users. User-defined stock market quotes are pulled from Yahoo Finance's database, parsed, and sent out via text messaging after the stock market closes every day.

Classification: Sophomore  
Presentation: Poster  
Faculty Advisor: Qian, Lei

57. Optimization of the School Bus Routing Problem by Simulated Annealing
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In this paper, we describe an approximation algorithm for the problem of finding the optimum route for school buses that must pick up students from various bus stops and deliver them to school by a given time window. Since this is a variation of the Travelling salesman Problem, it also has the NP-hard characteristic. As such, the Simulated Annealing algorithm was applied to the Travelling Salesman Problem in order to find an optimum solution to the School Bus Routing Problem. The applied algorithm provides a means to escape local optima by allowing hill-climbing moves in hopes of finding a global optimum. After various iterations of the algorithm, results lead to reduction in transportation times with on-time delivery to school.

Classification: Sophomore  
Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432

58. Using Genetic Algorithm in X-Ray Crystallography
Esedebe, Favour*; Hussain, Sajid  
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The structure of a crystalline material, which is usually obtained by X-ray diffractometer, is determined by the measurement of the intensity of X-ray reflections of the crystal from various positions. Because up to hundreds of thousands positions have to be realized in order to successfully deduce a crystal's structure, a method to efficiently determine sequences of these positions in minimal time is an active area of research. Genetic Algorithm (GA) is commonly used to obtain approximate solutions for time consuming hard problems. In GA, a random set of positions is taken to create a path. The path is evolved using techniques of natural evolution, so that after a number of generations, a significantly more efficient route is obtained. The simulation results show significant decrease in computation time. Several experiments were conducted using different random network sizes, number of nodes, different GA parameters in order to validate and verify the results.

Classification: Freshman  
Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432

59. Designing a Multi-touch System for Controlling Nano-scale Scanning Microscopy Experiment
Eze, Michael*; Hussain, Sajid  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

Scanning Probe Microscopy (SPM) is a very powerful tool which has the ability to optically image nanostructures, measure surface topology and map out interactions between the nanostructure and the probe. We image the Nano crystals by optically exciting them with a laser and view their photoluminescence on a CCD camera. The scanning probe technique used is called Atomic Force Microscopy (AFM). This technique measures the interaction force between the surface and the tip of the probe potentially giving Nano scale resolution. This research is aimed at developing a multi-touch system that we can use to demonstrate the intuitive interface between the SPM and simple hand gestures. The program languages needed for the interface include python,
a platform like pyMT or Kivy to run the module, lab view and C++. Our goal at the end is to develop a multi-touch system that we can use to analyze and control the SPM by gestures.

Classification: Junior
Presentation: Poster
Faculty Advisor: Hussain, Sajid

60. ASP.NET SignalR: Developing Real-Time Web Functionality For Multifarious Web Applications
Fair, John*; Qian, Lei
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With technology enhancing and communication becoming more indispensable, real-time interaction with one another creates a fast way of transferring information to different officiating parties. Majority of companies now depend on emails, phones, and social media to connect with employees and customers. While these are formal means of communication they can come at a cost of reliability and dependability. SignalR is a library for ASP.NET and allows bi-directional communication between server and client. SignalR uses web sockets, introduced in HTML5, which is a persistent connection between the client and the server and both parties can start sending data at any time. Implementing SignalR onto a website creates live feed from client to server to create an uninterruptible chat between two or parties to transmit data quickly and efficiently so that the host and client can be interconnected. What I’ve created is a simple website which utilizes a database in which users can insert movie information. In theory, the website can be a host for people who collects sneakers, and users can enter shoe information in the database and others can buy it. The SignalR blog can be used for users to interact with one another to sell shoes or see someone’s description of a certain type of shoe. That way everyone can share information about different subjects. When adding multiple databases to the site I open up a whole new area of interest for the user. So not only does he or she have to talk about sneakers and enter information in the database for others to see but also they can upload information in other subject databases.

Classification: Senior
Presentation: Poster
Faculty Advisor: Qian, Lei

61. Efficient Assembly of DNA sequence using Genetic Algorithm
Ghimire, Parasher*; Hussain, Sajid
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Genetic Sequencing, assembly of smaller fragments of genome to determine the larger sequence, is an Non-deterministic Polynomial (NP) hard problem as it takes huge amount of computational resources to obtain accurate result. The assembly of genomes is further complicated by errors occurred while reading fragments. In this work, we present the Genetic Algorithm (GA) that is able to assemble DNA sequence from smaller fragments of DNA. It also handles the error that that occurs while reading a smaller reads of DNA. Initially, A preprocessing algorithm is used in order to combine highest overlapping fragments and reduce the amount of data subjected. After the preprocessing step, fragments that do not have single overlap are excluded. These excluded fragments account for the positive errors, fragments that are not part of the original sequences. In GA, each chromosome is encoded with a possible order of fragments representing a solution and a pool of chromosomes (population) is selected at random without repetition. The fitness of each chromosome is based on the contiguous overlap between the fragments in the chromosome and the length of the fragments in chromosome. For a given population size (e.g. 2500), the process is repeated several hundred times (generations) until the change in fitness is below minimal threshold. The efficiency of the proposed GA is validated by reassembling the DNA sequence of dorsophila fkh. The results show that the proposed GA could be used with longer and more random fragments of DNA to efficiently assemble a DNA sequence.

Classification: Freshman
Presentation: Poster
Faculty Advisor: Hussain, Sajid
Grant: NSF HBCU/TIP HRD# 1332432
62. Transforming Computer Science Curriculum to Meet the Needs of Knowledge Economy

Hussain, Sajid*; Morgan, Steven*; Haque, Ziaul*

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We propose to transform Computer Science (CS) at Fisk University by using a four-objective plan to innovate CS curriculum and the pedagogical techniques in order to create awareness, interest and success in CS as a discipline, ultimately contributing to the sophisticated workforce needed in our knowledge economy. A central feature is to turn our curriculum ‘upside down’, so that students will use the latest CS tools and techniques to develop real-life and relevant products in their introductory courses, in contrast to our past curriculum, where exciting features were introduced in sophomore or junior years, too late to keep students in the majors. Our specific objectives are to: 1) Introduce computational thinking in CS courses for non-majors; 2) Introduce ‘appealing’ tools in introductory courses for CS majors, and foster their use in course-embedded projects; 3) Integrate computing into targeted mathematics and physics ‘cognate’ courses in the CS major pathway, and 4) Utilize peer mentoring/coaching to foster deeper learning of computer science in targeted CS, mathematics, and physics courses to serve as ‘coaches’ in course-assigned projects. The pilot data affirm the value of these curricular and pedagogical changes on student interest.

Classification: Faculty  Presentation: Poster

Grant: NSF HBCU/TIP HRD# 1332432


Hussain, Sajid*

Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

In this poster, we review the progress of Fisk Research Symposium over many years, 1998-2014. We analyze data based on year, discipline, department, and school. The work would be beneficial in identifying the potential challenges for future events.

Classification: Faculty  Presentation: Poster

64. Understanding the Brain: a Complex Combination of Algorithms

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The mind is an indispensable asset for every human movement, thought, or behavior. For this reason, the focus study and problem is to model the basic functions of the brain: sorting, storing, and recalling information. For this study, a computer program was developed to represent such functions. In this program a random set of memories were generated for this study on a scale from 1 to 50. These values were sorted into Binary Search Trees thus also sorting the memories. These trees were considered to only contain permanent memories therefore the memories cannot be replaced, only shifted. New memories were then added randomly firstly occupying a temporary tree in which the values can be swapped and deleted. Once these memories have reached a certain significance value it will be pushed into a permanent tree. Afterwards, a retrieval program runs to find certain memories. If the memory is found its value slightly increases, if not the value of the other memories decrease so that the memory may move closer to the root node so that on the next attempt it has a higher chance of being found.

Although this program does not take every factor into consideration, it describes the basic processes such that several phenomena such as temporarily forgetting, sudden remembrance, instinctual reactions and much more can be easily explained. The acquired data suggests that there are strong correlations between the amount of times a memory is recalled and its retrieval rates.

Classification: Sophomore  Presentation: Poster

Faculty Advisor: Hussain, Sajid

Grant: NSF HBCU/TIP HRD# 1332432
65. Making Radiation Detection Analysis Portable

Jackson, D’von1*; Burger, Arnold2; Matei, Liviu2

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Radiation detection is becoming increasingly important in today’s societies in terms of bomb prevention and exposure control. To determine the best materials for detection and their specific properties, there must be tests in which these detectors can be evaluated. At Fisk there are two main devices used to perform such evaluations: Osprey and Lynx. These two devices gather data from the detectors and translate it into meaningful information that generally is only accessible to computers to which they are directly connected. This necessary connection to a computer makes both the system and the data static or non-portable. By using a small router, the system for detection analysis becomes much smaller and the data is accessible through indirect connections. This only made it available to nearby computers but by using a remote desktop control program the information is accessible from anywhere if two Wi-Fi connections can be used at once. This is generally impossible but by using a fairly unknown program called Microsoft’s Virtual Wi-Fi it becomes possible. With this extra connection a user can both remote into the laptop within the Osprey’s or Lynx’s proximity but also with the Osprey or Lynx itself thus controlling the experiment. These advances help make the detection system a more portable and ideal.

Classification: Sophomore
Presentation: Poster
Faculty Advisor: Burger, Arnold

66. Web App for Fisk Research Symposium

Lasebikan, Olatomiwa S.*; Adeogun, Samuel; Hussain, Sajid

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A Web App is developed for Fisk Research Symposium (FRS) in order to provide easy browsing for abstracts related information. In current practice, the FRS information is distributed in printed documentation, or as a PDF file at the website. The app is developed using standard open software tools such as HTML5, JavaScript, jQuery Mobile, PHP, and MySQL. As it is a web-based app, it can be viewed in all smart phones (e.g., Android, iOS, Windows) and all computer systems (e.g., Windows, Mac, Linux). Further, it can be used as a mobile app for Android and Windows based smart phones. The user can browse abstracts based on: Faculty Advisors, Discipline, Department, School, or by presentation type (poster, oral, demo, faculty). The app provides information related to Keynote speaker, Faculty advisors, judges, and steering committee members. Moreover, there are links for FRS related photos, videos, and Fisk Map for driving directions. The web app is also used in generating the printed program. Due to its modular design, it would be easy to use the code for other events. In future, we would like to develop our own abstract submission system that would be integrated with the web app.

Classification: Senior
Presentation: Poster
Faculty Advisor: Hussain, Sajid

67. JQuery Mobile for Design of Mobile Apps

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This project involves using the jQuery Mobile interface to create apps and websites viewable on smartphones, tablets and desktop browsers. Coding with jQuery mobile is a combination of Javascript, jQuery and HTML-5. JQM is simpler to code in than other mobile languages because you do not need an editor as required in Objective C or Java for Android tools. jQuery Mobile can be colored and designed with the ThemeRoller where colors for backgrounds, edges and buttons can be selected. I am developing a mobile app template for recording physical activity like push-ups, sit-ups and vertical leap distance. The same template should be applicable for many other uses such as restaurant or statistical showcases. JQM is also a valuable tool for prototyping or wire-framing new apps. It has been used for creating enterprise level apps such as the Stanford University and Lending Tree apps. By combining JQM with PhoneGap you can make use of all the features of a smartphone when programming an app. I expect the ongoing use of JQM to significantly increase development speed and deployment time for app creation.

Classification: Senior
Presentation: Poster
Faculty Advisor: Qian, Lei
68. Exploring Popular Tourist Destinations using Travelling Salesman Problem
Odumeru, Daniel*; Hussain, Sajid
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For many who want to make the most of their holiday, travelling to different tourist destinations is a must and spending a lot of time and money on travelling itself is enough to ruin the holiday. This is a subset of the travelling salesman problem which tries to figure out a cost effective and time saving method of achieving this goal. This is done by mapping out in what order the tourist destinations are going to be visited in order to reduce cost. An optimization technique known as Genetic Algorithm, which mimics the process of natural selection is used. From this test, the best route with the shortest travel time and possibly the least amount of expenses will be selected. With this approach, it is expected that people will be able to travel more efficiently to multiple destinations in the shortest time period. This will benefit people planning holiday tours, people who plan business trips and people who plan excursions for schools for whom time is of essence, and yet still spend less.
Classification: Freshman Presentation: Poster
Faculty Advisor: Hussain, Sajid
Grant: NSF HBCU/TIP HRD# 1332432

69. Building Zero-Energy Optical Logic Devices
Qian, Lei*
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Logic devices using zero energy became a goal of Computer Science when that possibility was first discussed by Landauer and Bennett 40 years ago. They showed that traditional Boolean logic gates must dissipate energy of at least per gate. That energy was needed to erase a single output bit as required by such gates. After decades of attempting to find a way to do Boolean logic with zero energy, two independent ways, Directed Logic (DL) and GOLE (Generalized Optical Logic Elements) to achieve the goal was found. Both solutions were optical for obvious reasons: light is self-propagating and has numerous kinds of passive components that can be used. However, both DL and GOLE elements are difficult to composite as their inputs and outputs are encoded with difficulty types of physical signals. Our research aims to study how to cascade the fundamental passive optical logic elements into complex devices. A new cascading method for GOLE is designed. The method makes it possible to build complex GOLE devices and make zero-energy optical logic devices possible.
Classification: Faculty Presentation: Oral

70. Applying Simulated Annealing Algorithm to the Traveling Salesman Problem (TSP) to Optimize Shortest Path for Prospective Students on a Campus Tour
Saarah, Michael*; Hussain, Sajid
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208
In this work, we discuss how to achieve a shortest possible route that student tour guides and prospective students can take to visit all key college facilities including dorm halls, lecture halls, library, research laboratories, during a campus tour. Finding the shortest path when given a list of places(nodes) and the distances between each pair has been a hard problem to solve computationally and is humanly impossible since the algorithm for TSP increases superpolynomially (or exponentially) with the number of places(nodes). Nevertheless, we used Simulated Annealing which is one of the most efficient algorithms in Computer Science to calculate the best route to take. How the algorithm works is to first have an objective function, which is to minimize the length of the journey (the sum of the distances between all the nodes in a specified order). Thereafter, we followed a three-step protocol, namely: 1) Configuration setting: This is the permutation of the nodes from 1 to N, given in all orders. Selecting an optimal one between these permutations is our aim. 2) Rearrangement strategy: here we replace sections of the path, and replace them with random ones to retest if this modified one is optimal or not. 3) The objective function (which is the aim of the minimization): This is the sum of the distances between all the cities for a specific order. After an iterative implementation of these three steps, our approach produces the optimal/shortest route that makes the campus tour less time-consuming and efficient.
Classification: Sophomore Presentation: Poster
Faculty Advisor: Hussain, Sajid
Grant: NSF HBCU/TIP HRD# 1332432
71. **KiddieTranslate: Learn a Foreign Language Online for Kids**  
*Saarah, Michael*; Qian, Lei  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208  
There are many reasons to learn a foreign language including working in another country or acquiring bilingual jobs, traveling and secret communication. And the best time to learn a foreign language is during childhood. Therefore, KiddieTranslate is a simple web application that seeks to help kids learn a foreign language through fun and interactive activities like using virtual flash cards. Technically, KiddieTranslate is a tool that automatically translates text from one language to another language (e.g. Spanish to English) by making API calls using GoSlate python module to scrape the Google Translate website. The app is built on the App Engine platform and I used Jinja2 to handle the templating for the front-end design (i.e. HTML, CSS). At the moment, the app is able to accept text input from users and translate to one of over 50 supported languages. Future features of KiddieTranslate will involve virtual flashcards and games to actively engage kids to learn a foreign language.

Classification: Sophomore  
Presentation: Poster  
Faculty Advisor: Qian, Lei

72. **Using Genetic Algorithm for Efficient Routing to Provide Timely Delivery for Pizza Company.**  
*Stewart, Quandarrius*; Hussain, Sajid  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208  
Over the past decades, small pizza businesses have been trying to figure out the best way to provide the best route to deliver pizza. Today’s pizza delivery drivers take at least a half hour to deliver pizza that could lead to losing potential customers; however this time can be decreased by using different routes that provide faster delivery times. Previous companies have failed at finding an answer to this problem, and still struggle today to come up with a better way to address this problem manually. We have used a Genetic Algorithm to optimize the best routes for delivery guys in order to reduce the time it takes to get to a destination in a timely manner. First, we start from the companies' location and use geographic tools to find the best destination to and from each house. Our method could be used by any company who is in need of a solution for delivering pizza's in a shorter time and diminish complaints from customers.

Classification: Sophomore  
Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432

73. **Efficient Routing Algorithm For Sports Fans.**  
*Yagboyaju, Sultan*; Hussain, Sajid  
Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208  
In recent times, it has become a popular trend for sport fans to visit all parks or stadia of major teams in their country. But a problem arises, when fans waste useful resources because they cannot find optimal routes to go through all the parks/stadia and return home. Although several algorithms and techniques such as Brute force, linear programming, dynamic programming have been used to tackle this problem, their time complexities are quite large and for this reason these algorithms are considered infeasible for the problem. In this research, we would be using a heuristic search technique called the Genetic Algorithm. The genetic algorithm uses the evolutionary idea of using an initial population to generate better population but in this case, an initial result to generate better results and finally an optimal result. We ran the genetic algorithm technique several times changing several parameters and found that in each case, the genetic algorithm ran considerably faster than other techniques and also produced better results. We expect that this technique would use less computing power and also help people get better travelling routes in a far promptly time.

Classification: Freshman  
Presentation: Poster  
Faculty Advisor: Hussain, Sajid  
Grant: NSF HBCU/TIP HRD# 1332432
74. Parachutes as Described via Mathematical Modeling
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Since the early 1930’s the idea of using parachutes to deliver materials and man power to a specific area has changed dramatically. Parachutes today are round and fairly stable, made of a heavy nylon fabric and a static line. While the materials and structure of this tool have changed, the basic mathematics and mechanics of the fall are still only understood at the most basic level. Differential equations, with the use of software like Mathematica can be used to model a varying amount of problems. This experiment will employ differential equations to model the Parachute Problem. The value of the terminal velocity, time for the diver to hit the ground, and the distance traveled before and after the parachute deployment can be determined using a system of mathematical equations and the principles of falling body.

Classification: Junior
Faculty Advisor: Hota, Sanjukta
Presentation: Poster

75. Could the Flap of a Butterfly’s Wings in Brazil Set off a Tornado in Texas: The Chaotic Behavior of the Lorenz System
Hemphill, Elijah1*; Luitel, Kanchan2*; Olatokunbo, Aduralere2*; Hota, Sanjukta1
1Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208; 2Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

The theory of Lorenz system analyzes how a small change in initial conditions creates a large difference in the corresponding solutions. The Lorenz system consists of a set of three nonlinear ordinary differential equations, first developed by Edward Lorenz (1917-2008) to study atmospheric convection.

The mathematical model developed in this project investigates the Lorenz Attractor, a strange chaotic dynamical system. Using Mathematica we ran a number of simulations and discussed some fundamental and interesting properties of Lorenz Attractor including the famous ‘Butterfly effect’. We show that the common belief that tiny perturbations in a system only amount to tiny changes over time is not always true. We found that with a minute change in initial conditions, the solution of the Lorenz system undergoes a significant change showing an irregular oscillation pattern without any repetition. In addition, the solution displays a bounded figure that bounces back and forth between two different planes, thus resulting in a 3-D butterfly graph and justifying Lorenz’s memorable question “could the flap of a butterfly’s wings in Brazil set off a tornado in Texas?”

Classification: Sophomore
Faculty Advisor: Hota, Sanjukta
Presentation: Poster

76. An Optimal Control Model of Epidemic Management with Treatment and Changing Behavior
Hota, Sanjukta*
Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

The effects of treatment and changing behavior are important in epidemic outcomes and management. Biomedical approaches to prevention, such as early identification and usage of medication, help to reduce the number of new infections substantially. Recently enormous advances in HIV/AIDS treatment regimens have fundamentally changed the natural history of the disease and have sharply reduced HIV-related morbidity and mortality in countries where such treatments are available. Along with treatment, equally important is the influence of human behavior on the spread and the control of infectious disease, as in case of pandemic influenza, the effect of pseudo-rational opposition to vaccines. If through effective public education campaign, people’s behavior towards prevention measures will change then it will deeply affect the dynamics of the epidemics and the endemics. In this talk, I will present a mathematical model of epidemic
management developed with the inclusion of these two dynamic effects as two control measures. Optimal Control Theory and the forward-backward sweep method are used on the system of differential equations to achieve the goal of 1. Minimize the infected population and 2. Slow down the epidemic outbreak.

In conclusion, I will highlight on my research involvement in biomathematics, my collaborators and my students’ achievements in biomathematics research, and finally our recent initiatives at Fisk in developing a Bio-track curriculum.

Classification: Faculty  Presentation: Oral

77. Drug Dosage — Ensuring a High Level of Effectiveness through Applications of Loading Doses
Jackson, D’von*; Hota, Sanjukta
Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

The medical field is quickly expanding. As people attempt to push the assumed boundaries of life longevity, medical research continues to find new cures for what was once thought to be incurable diseases. These cures are only valuable when dosage research is conducted alongside it so that the drug can be effective yet non-toxic. In this research study, a pharmacokinetic mathematical model was developed to observe different dosing regimens to determine the effects of a loading dose. A loading dose is simply the initial dose which varies from the doses thereafter. Pharmaceutically-relevant parameters for the drug were determined from the experimentally established data of the drug. Computation and simulation was performed using Mathematica. Loading dosage formulas were developed through the use of limits, other mathematical properties that were applicable, and biological principles. The time between each dose was made constant and was discovered through mathematical processes for each drug. The study shows inferior levels of initial efficiency for regimens without loading doses while those containing such dosage display a certain amount of efficiency that can be guaranteed throughout its administration. With this variation in initial dosage it becomes theoretically possible to keep the drug perfectly potent throughout its maximum possible effective time. When restricting the initial dose with known biological principles of safe medical practices, thus making it practical for actual administration, the drug will still maintain a very high level of efficiency throughout its application without ever becoming toxic.

Classification: Sophomore  Presentation: Poster
Faculty Advisor: Hota, Sanjukta

78. The Development of Trigonometry: A Brief History
Townsend, Anna1*; Lawrence, Brianna1,2*; Hota, Sanjukta3
1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; 3Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

Mathematics is an essential part of everyday life, a major part of history, and key in the development of different cultures. The desire to understand the world fueled the development of mathematics as we know it today. This project explores the history of trigonometry, with reference to mathematical astronomy, origin, the notable pioneers; and includes the time line of the progression of trigonometry

Classification: Junior  Presentation: Poster
Faculty Advisor: Hota, Sanjukta

79. The Beauty of the Log Plot
Yagboyaju, Sultan1*; Onabolu, Oreoluwa2; Hota, Sanjukta3
1Computer Science, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 3Mathematics, Department of Mathematics & Computer Science, Fisk University, Nashville, TN 37208

Log Plot is a graphing technique that uses a logarithmic scale as the scale of measurement. The scale displays the value of a physical quantity using intervals corresponding to orders of magnitude, instead of a standard linear scale. A log plot is useful for the analysis of skewness of data towards extremely large or extremely small values
and also it helps to visualize and compare the percent change. One of the various ways the log plot differs from the linear plot is that it enables for easy analysis of data and functions that involve large quantities, as in the case of rapid growth of organisms, such as, Bacteria or virus growth.

In this project, our goal is to analyze the various aspects of the log plot including the advantages, disadvantages and most importantly, the misuse and abuse of log plot. We discuss the use of the semi log plot, a hybrid of a linear graph and a logarithm graph and also the double log plot.

Classification: Freshman
Presentation: Poster
Faculty Advisor: Hota, Sanjukta

FISK-MEHARRY MEDICAL COLLEGE HBCU WELLNESS

Wellness & Healthcare

80. Your Own Little Miracle: Decreasing the Infant Mortality Rate in African Americans

Anderson, Alexis¹,²; Spicer, Yvette²

¹Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; ²Fisk-Meharry Wellness & Healthcare Project

Infant mortality is a health disparity that has become ubiquitous with African Americans. Infant Mortality rates in the African American community are two times higher than the rates in other communities. This initiative is designed to teach college-aged African American women about infant mortality and how a woman’s overall health and wellness can contribute to the rates.

Classification: Senior
Presentation: Poster
Faculty Advisor: Spicer, Yvette
Grant: Fisk-Meharry HBCU Wellness Grant

81. The Ideal You: Increasing Infant Mortality Awareness

Anthony, Dominique¹,²*; Spicer, Yvette²

¹Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; ²Fisk-Meharry Wellness & Healthcare Project

Infant mortality rates in the United States have seen a decline, but the rates in the African American community are still two times higher than those in the White and Hispanic communities. Infant mortality rates greatly impact African-American's because of factors such as stress, unawareness, and an unhealthy lifestyle. The focus of the project is to increase awareness, teach women on how to manage stress, and introduce them to a healthier lifestyle.

Classification: Senior
Presentation: Poster
Faculty Advisor: Spicer, Yvette
Grant: Fisk-Meharry HBCU Wellness Grant
82. Get Fit & Stay with It! Fighting Against Diseases of Obesity Among African American College Students

Brooks, Dana1,2*; McCarroll, Patricia3,2; Spicer, Yvette2

1Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; 2Fisk-Meharry Wellness & Healthcare Project; 3Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

This project was designed to inform African-American college students about the potential disease implications of obesity. Increasing knowledge, changing attitudes and behaviors allow students to make healthier decisions. With the assistance of community partners, a health awareness seminar was planned to address obesity. The event featured a health educator, a nutritionist and a meditation session hosted by a certified Tai Chi instructor. Pre- and post-assessments were conducted to determine if the desired educational markers were met. Participants gained an understanding of healthy diets, exercise and maintaining proper weight in reducing or eliminating the onset of obesity related diseases.

Classification: Senior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant

83. Stroke of Genius

Davis, Contessa1,2*; McCarroll, Patricia1,2; Spicer, Yvette2

1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Fisk-Meharry Wellness & Healthcare Project

Stroke is the fourth leading cause of death in the United States and this statistic is grimmer for African Americans. African American adults are fifty percent more likely to have a stroke than their white adults' counterparts. African Americans who suffer with obesity, hypertension, high cholesterol and diabetes are at an increased risk for stroke. Stroke of Genius is an intervention designed to increase awareness of stroke in low-income populations; identify three risk factors and the warning signs of stroke. Pre and post assessments were administered before and after the event. The goal of this study was to education one hundred participants about stroke prevention.

Classification: Senior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant

84. Healthy Men, Healthy Families

Gray, Destiny1,2*; Spicer, Yvette2

1Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Fisk-Meharry Wellness & Healthcare Project

According to the Mayo Clinic, “prostate cancer is one of the most common types of cancer in men.” Prostate cancer is the leading cause of death among men not including skin cancer. Many African American men today are being diagnosed with prostate cancer. However, many are not aware of the symptoms, signs or steps to prevent the disease from developing. This project will serve to provide both men and women with information about prostate cancer and the roles that need to be played to bring about change.

Classification: Senior
Presentation: Poster
Faculty Advisor: Spicer, Yvette
Grant: Fisk-Meharry HBCU Wellness Grant

85. Saving Our Youth from Obesity

Humphrey-Davis, Avery1,2*; McCarroll, Patricia3,2; Spicer, Yvette2

1Political Science, Department of History & Political Science, Fisk University, Nashville, TN 37208; 2Fisk-Meharry Wellness & Healthcare Project; 3Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Thirty eight point six percent of public school students are obese or overweight. When obesity or overweight is not addressed, it can lead to health related diseases included hypertension, diabetes and heart disease.
Through education of the students in a meaningful and fun awareness program, participants will have increased awareness of a healthy nutrition and exercise.

Classification: Junior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant

86. Project Big Bone: An Obesity Intervention
James, Amanishakhete\textsuperscript{1,2,3*}; McCarroll, Patricia\textsuperscript{4,3}; Spicer, Yvette\textsuperscript{3}
\textsuperscript{1}Department of Business Administration, Fisk University, Nashville, TN 37208; \textsuperscript{2}Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{3}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{4}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Obesity rates are steadily increasing in the United States. In many states, obesity rates have been lowered, but the rates are still frighteningly high, Tennessee is among them. Obesity can lead to other health issues, such as diabetes, high cholesterol, hypertension and stroke. Many initiatives have focused on changing diets and encouraging exercise to reduce obesity. Project Big Bone will explore another factor important in combating obesity among Black women. This research will explore the relationship between self-perception of body type and obesity among Black women.

Classification: Junior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant

87. Weigh Your Options: Pound for Pound with Childhood Obesity
Mead, Richard\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{3,2}; Spicer, Yvette\textsuperscript{2}
\textsuperscript{1}History, Department of History & Political Science, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Overall obesity rates have seen a slight decrease but the racial and ethnic disparities still exist amongst this population. Weigh Your Options is designed to positively impact obesity rates of African American youth ages 11 to 17, through educating and enabling them to make informed healthy decisions, As a result of participating in this intervention, participants will understand the importance of a healthy diet and exercise.

Classification: Junior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant

88. The Cost Benefits of Good Health (Healthy Eating on a Budget)
Obiokoli, Joy O.\textsuperscript{1,2*}; McCarroll, Patricia\textsuperscript{3,2}; Spicer, Yvette\textsuperscript{2}
\textsuperscript{1}Department of Business Administration, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Stroke is highly prevalent in the African-American population. African Americans have twice the risk for first time stroke when compared to whites. as individuals age, the risk increases. According to the Tennessee department of Health, cardiovascular diseases resulted in 6448.5 million in health expenditures and lost productivity in 2008. This intervention seeks to compare the cost of a gym membership and healthy eating to living with the efforts of stroke.

Classification: Senior
Presentation: Poster
Faculty Advisor: McCarroll, Patricia
Grant: Fisk-Meharry HBCU Wellness Grant
89. Healthy Minds: Healthy Lives  
Ojuka-Onedo, Jackie A.\textsuperscript{1,2*}; Spicer, Yvette\textsuperscript{2}  
\textsuperscript{1}Psychology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project  
Depression is common in people, especially women. It affects general health and can affect health of pregnant women and their unborn children. Untreated, maternal depression can impact a woman’s ability to adequately care for her infant which may be detrimental to her infant’s life. This study will investigate the state of depression in college women and their knowledge of depressions link to infant mortality. The sample will be taken from a liberal arts educational institution. Participants will primarily be African American college students.  
Classification: Graduate  
Faculty Advisor: Spicer, Yvette  
Grant: Fisk-Meharry HBCU Wellness Grant

90. Fool’s Gold: Asymptomatic STIs in African American College Students in Nashville, Tennessee  
Smith, Lannie\textsuperscript{1,2*}; Stewart, Elizabeth\textsuperscript{2}; Spicer, Yvette\textsuperscript{2}; McCarroll, Patricia\textsuperscript{2,3}  
\textsuperscript{1}Sociology, Department of Behavioral Sciences & Education, Fisk University, Nashville, TN 37208; \textsuperscript{2}Fisk-Meharry Wellness & Healthcare Project; \textsuperscript{3}Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208  
The objective of, Fool’s Gold, is to increase awareness of asymptomatic sexually transmitted infections (STIs) among African American college students in Nashville, TN. Fool’s Gold also aims to inform college aged African Americans about the importance of regular testing. Through Fool’s Gold, health education session will be conducted. Program participants will be connected with local health service organizations. Information gathered through this preliminary study will be used to develop an intervention that will result in an increased awareness of asymptomatic STIs, increase in regular STI testing, and ultimately lead to the decrease in risky sexual behaviors among college students.  
Classification: Senior  
Faculty Advisor: McCarroll, Patricia  
Grant: Fisk-Meharry HBCU Wellness Grant

\textbf{SCHOOL OF GRADUATE STUDIES}

\begin{center}
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\end{center}

\begin{itemize}
  \item Dr. Lee Limbird (Dean)
  \item Dr. Brian L. Nelms (Biology)
  \item Dr. Natalie Arnett (Chemistry)
  \item Dr. Richard Mu (Physics)
\end{itemize}
91. Determining the Role/Phenotype of the Transcription Factor fkh-8 in C. elegans in Dopamine Signaling. 
Brown-Smith, Ke’Ara1,2*; Nelms, Brian L.1,2
1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopamine (DA) is a small neurotransmitter molecule found in the brain that functions in many processes including memory, cognition and motor control. Imbalances in dopamine can lead to several diseases and disorders including Parkinson's disease (PD). PD is a neurodegenerative disease that leads to the inability to control movement of the body. Previous studies have identified a family of transcription factors (proteins that control whether a gene is active or inactive) involved in dopamine signaling that are very similar between the model organism C. elegans and humans. One of these genes is forkhead-8 (fkh-8), whose involvement in the dopaminergic pathway is still largely uncharacterized. The goals of my project are to further characterize a phenotype for fkh-8 by studying dopamine-dependent behaviors in C. elegans. A more complete phenotypic analysis will help shed light on the pathway location and function in C. elegans and possible conservation in humans. I am also assessing the role of fkh-8 in response to manganese exposure or oxidative stress, both of which have been associated with increased risk for PD.

Classification: Graduate 
Presentation: Poster
Faculty Advisor: Nelms, Brian L.

92. Investigating the Role of FKH-8 in Regulating Expression of Dopaminergic Neuron Target Genes in C. elegans 
Jones, Bobby1*; Nelms, Brian L.1,2
1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopaminergic (DA) neurons are important for a wide array of functions such as motor control, behavior, cognition, and mood. Defects of DA neuron function can lead to serious neurological disorders such as Parkinson's disease, schizophrenia, ADHD, and drug addiction. An important factor in dopaminergic neuron function is proper fate specification and maintenance through transcriptional control of dopaminergic neuron-specific genes. Finding transcription factors that are involved in regulating dopaminergic neuron gene expression could help us understand how dopaminergic neurons are made, leading to better potential therapies. We are using the model organism C. elegans to study a forkhead family transcription factor, FKH-8, which is expressed in dopaminergic neurons. Other work in our lab has shown a dopamine-dependent phenotype in fkh-8 deletion mutants. We originally hypothesized that FKH-8 may regulate the expression of the dopamine transporter gene, dat-1. Through fluorescent reporter genes that allow for visualization of gene expression and by qRT-PCR, I am examining regulation and expression of potential FKH-8 target genes, including dat-1, cat-1, cat-4, and other genes, also attempting to identify FKH-8-specific DNA binding sites.

Classification: Graduate 
Presentation: Poster
Faculty Advisor: Nelms, Brian L.

93. Forkhead-8 may Regulate Dopamine Transporter Expression and Function 
Roach, Corey1*; Nelms, Brian L.1,2
1Fisk-Vanderbilt Masters-PhD Bridge Program, Vanderbilt University, Nashville, TN 37235; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopaminergic (DA) signaling is vital to normal locomotion, cognition, and mood regulation. A dysfunction in DA signaling can result in disorders such as Parkinson's disease, ADHD, and schizophrenia. Forkhead-8 (FKH-8) is a novel transcription factor in the nematode worm C. elegans. Our lab has shown that FKH-8 is enriched in DA neurons, and plays a role in DA signaling. We hypothesize that FKH-8 may modulate dopamine transporter (DAT) activity. We used 6-hydroxydopamine (6-OHDA), a DAT specific neuro-toxic substrate, to assay for neurodegeneration, and to determined if a loss of FKH-8 alters DAT activity. When administered to worms whose neurons are marked by green-fluorescent protein (GFP), neuronal degeneration can be monitored by a loss of fluorescence. We originally predicted that DAT activity would be diminished in fkh-8 mutants because
fkh-8 and dat mutants phenocopy DA-specific behaviors. Surprisingly, our preliminary data suggest that fkh-8 mutants are sensitive to 6-OHDA toxicity. These findings indicate FKH-8 mutants foster heightened DAT activity. To expand upon our 6-OHDA experiments, RNA-Seq will be used to generate a cell-specific gene expression profile in FKH-8 mutants. DA neurons will be isolated from whole worm preparations using fluorescence-activated cell sorting. The RNA-Seq data will be compared between strains with and without FKH-8 to assess changes in gene expression. By examining FKH-8's regulatory capacity, we may uncover genes required for proper DA neuron function, and therefore new pharmaceutical targets designed to treat DA-related disorders.

Classification: Graduate  Presentation: Poster  
Faculty Advisor: Nelms, Brian L.

94. The fkh-8 Gene Encodes a Critical Modulator of Dopaminergic Neuron Function in the Model Organism C. elegans  
Tross, Erica*; Nelms, Brian L.  
Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Dopaminergic neurons are specialized cells in the brain that produce the neurotransmitter dopamine. This neurotransmitter is important for many functions in humans and other animals, including sleep, mood, learning and movement. In order for dopaminergic neurons to function properly, they must commit to a cell fate and express precise levels of genes encoding signaling molecules and receptors for their response to stimuli. The choices neurons make to become a specific neuron type and express certain molecules is thought to be largely controlled by transcription factors, but only a handful of the factors are known. We have identified a likely role for a member of the conserved and developmentally important forkhead transcription factor family, fkh-8, in regulating the function of dopaminergic neurons. Disruption of the fkh-8 gene, which we have demonstrated is expressed in dopaminergic neurons, exhibit a swimming-induced paralysis phenotype indicative of altered levels of dopamine transport or production. To test our hypothesis that fkh-8 regulates critical aspects of DA neuron function, I am carrying out pharmacological, genetic, and phenotypic analyses. This is significant because it may be possible to use fkh-8 to help generate a program for dopamine neuron development, which could help with future studies to direct stem cells to a dopaminergic fate. This could potentially prevent or reverse diseases like Parkinson’s, which is caused by progressive loss of dopaminergic neurons.

Classification: Graduate  Presentation: Poster  
Faculty Advisor: Nelms, Brian L.

95. Fabrication and characterization of poly(arylene ether sulfone):benzyl-phosphonic acid composite membranes for application in fuel cells  
Reid, Kemar R.*; Arnett, Natalie  
Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Polymer electrolyte membrane (PEM) fuel cell technology holds promise for clean, efficient energy production. However, in efficiencies in performance and the high cost associated with device membrane assemblies, limit widespread commercialization. Low cost materials and novel membrane design approaches that allow proton conduction in the dry (low humidity) state is perhaps the greatest challenge. In this work, inorganic phosphonic acids and poly(arylene ether sulfone) composites are fabricated and characterized for suitable use as fuel cell membranes. The effect of fractional composition on ion-exchange capacity (IEC), water uptake, oxidative and thermal stability is examined. A molecular basis for membrane performance is also presented.

Classification: Graduate  Presentation: Poster  
Faculty Advisor: Arnett, Natalie

96. Crystallization of Two Manganese-dependent Superoxide Dismutases from Staphylococcus aureus  
Thomas, Lana 1*; Warner, Rukiayah 2; Damo, Steven 1,3  
1Chemistry, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Biology, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 3Department of Biochemistry, Vanderbilt University, Nashville, TN 37235

Staphylococcus aureus is a bacterial pathogen that poses risks to human health varying from mild infections
to mortality. Bacterial infections are often treated with antibiotics. However, several S. aureus strains, such as MRSA, have become antibiotic resistant, thus highlighting an emerging problem of global health concern. This research is grounded in the hypothesis that understanding the molecular mechanisms of bacterial pathogenesis will reveal targeted strategies for developing new antibiotics. This project focuses on the redundancy of the superoxide dismutase (SOD) enzymes in S. aureus and their role in virulence. Superoxide dismutases (SODs) protect cells from oxidative damage by reducing superoxides, a highly reactive oxygen species that is extremely toxic biologically, to oxygen, hydrogen peroxide, and water. SODs require metal cofactors to function. In most bacteria, such as E. coli, several SODs are expressed, each requiring a metal cofactor such as Cu, Fe, Mn, Ni, or Zn. However, S. aureus expresses two SODs (SodA and SodM) which both require manganese as a cofactor. The overarching hypothesis is that this redundancy in Mn-SOD can be explained by subtle structural differences between SodA and SodM that lead to functional differences. In order to address this question, high-resolution x-ray crystallographic studies will be performed. A nickel affinity purification protocol was developed to purify SodA and SodM to >95% homogeneity. Finally, vapor diffusion experiments resulted in preliminary microcrystals. Together, these results represent an important first step toward high-resolution structural determination of SodA and SodM.

Classification: Graduate
Presentation: Poster
Faculty Advisor: Damo, Steven
Grant: NIH 1R25GM107754-01

97. Development of a ZnO Nanowire-based Microfluidic Detection and Trapping Device
Cook, Andrew1*; Giorgio, Todd2; Mu, Richard1
1Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Department of Biomedical Engineering, Vanderbilt University, Nashville, TN 37235

Circulating tumor cells (CTCs) can be very useful for early stage detection of cancer and provide valuable information on originating tumors. However, in order to analyze and culture CTCs, they must be removed from the blood stream. It has been demonstrated that a microfluidic channel can be effectively used to perform this task via external-magnetic-field-assisted cell selection and separation with cells tagged with magnetic nanoparticles. To further develop this microfluidic technology, we propose to use ZnO nanowires (NWs) functionalized with magnetic materials to serve as cell trapping sites. The NWs can effectively increase trapping volume within a three-dimensional architecture. In addition, we plan to analyze the trapped cells with both Raman and photoluminescence spectroscopy, since ZnO NWs are very effective waveguide materials. In this poster, I will present some of our very first preliminary results on microfluidic device fabrication and testing.

Classification: Graduate
Presentation: Poster
Faculty Advisor: Mu, Richard
Grants: NSF-CREST HRD-0420516; DOD W81XWH-13-1-0397

98. Plasmon-Enhanced Photoluminescence in Ag-Decorated ZnO/MgO Core-Shell Nanowires
Mayo, Daniel1,2*; Marvinney, Claire1,2; Bililign, Ephraim S.3; McBride, James R.4; Haglund Jr., Richard F.2,5; Mu, Richard1
1Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208; 2Interdisciplinary Materials Science Program, Vanderbilt University, Nashville, TN 37235; 3Department of Physics, North Carolina State University, Raleigh, NC 27695; 4Department of Chemistry, Vanderbilt University, Nashville, TN 37235; 5Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235

Zinc oxide has emerged as one of the most promising optoelectronic materials due to its wide, direct bandgap of 3.37 eV and large exciton binding energy of 60 meV. These properties yield a more efficient near-UV emitter at elevated temperatures than the widely used semiconductor GaN. Room temperature photoluminescence (PL) spectra for ZnO exhibit a sharply defined exciton recombination peak centered at 3.3 eV and a broad visible defect peak centered around 2.3 eV. Through different growth, annealing, and doping conditions, ZnO emission has been tuned for a wide range of optoelectronic devices, including LEDs, lasers, and sensors. However, one
of the most effective methods for selective enhancement of ZnO PL is through coupling of localized surface plasmons of metal nanoparticles to the ZnO luminescent centers. In this research, ZnO nanowires are decorated with Ag nanoparticles, with an insulating MgO interlayer used to differentiate plasmon-mediated emission due to hot-electron transfer from that due to local field effects. In addition, at specific MgO thicknesses, Fabry-Perot resonators within the core-shell nanowires result in dramatic enhancement of the band-edge PL while the visible emission remains unaffected. Plasmonic coupling between the Ag nanoparticles and the ZnO luminescent centers then further enhances the near-UV emission, establishing the metal-nanoparticle-decorated core-shell nanowire architecture as a strong candidate for efficient optoelectronic applications.

Classification: Research Staff  
Presentation: Poster  
Faculty Advisor: Mu, Richard  
Grants: NSF-STC DMR-0423914; NSF-CREST HRD-0420516; DOD-ARO W911NF-11-1-0156; ONR 911NF-13-1-0153

99. Defect Characterization of Cadmium Zinc Telluride  
**Mcgrew, John*; Groza, Michael; Matei, Liviu; Burger, Arnold**  
Physics, Department of Life & Physical Sciences, Fisk University, Nashville, TN 37208

Cadmium zinc telluride (CZT) is a widely used semiconductor radiation detector material for medical, astrophysical, and security applications. CZT’s advantages include high energy resolution for gamma radiation and ambient-temperature operation. However, fabrication of large volume CZT crystals remains difficult, as current CZT growth techniques result in crystals with defects and other nonuniformities in composition. This poses challenges in isolating which factors contribute the most to overall detector performance. Detector performance factors are not fully understood, but three important factors within the crystal volume can be identified: concentration of zinc, location and size of tellurium inclusions, and internal stress regions. The goal of this project is to conduct a fully battery of characterization techniques to correlate these physical features to detection performance.

Classification: Graduate  
Presentation: Poster  
Faculty Advisor: Burger, Arnold  
Grant: NSF#-0932038

100. Surface Plasmon — Phonon Interaction in Gold/Zinc Oxide Nanolayers and Time — Dependent Photoluminescence  
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It is possible to synthesize ZnO nanostructures that vary widely in both morphology and optical properties for use within many unique and important applications. The focus of this research has been to develop cheap, simple, scalable and smart substrate templates for nanowire growth through careful control of material structures and processing. Thus, understanding the physics of basic interactions within an Au/ZnO system is a very important first step. In this poster presentation, we will report how the smart templates are fabricated and present initial findings in fundamental physics.

Classification: Graduate  
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Faculty Advisor: Mu, Richard  
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