Andrews Research Conference

Early Career Researchers in the STEM Disciplines

May 17-21, 2017 | Andrews University | Berrien Springs, Michigan

WELCOME

The Andrews University Office of Research and Creative Scholarship is pleased to host the fourth annual Andrews Research Conference: Early Career Researchers and Creative Scholars in the STEM Disciplines. Our focus this year includes agriculture, biology, chemistry, computer science, engineering, mathematics, physics, and related disciplines. Together, we seek to understand and engage God's creation and created order.

Our hope for this conference is to network young Adventist researchers and creative scholars, building relationships and partnerships that will enhance the professional careers of the participants while providing a place for them to share their research and creativity in the context of faith.

We are pleased to have two Andrews University faculty members as our keynote speakers this year—Dr. Jay R. Johnson and Dr. Rodney Summerscales. Dr. Johnson, who joined the Department of Engineering and Computer Science in July 2016, received a Ph.D. in physics from the Massachusetts Institute of Technology (MIT), studying turbulence in the auroral region. After postdocs at the University of Alaska and MIT, he became a member of the research staff at the Princeton Plasma Physics Laboratory in 1995. There he headed the space physics group from 2005 to 2016.

Dr. Summerscales is an assistant professor of computer science. He worked as a software engineer for Centroid and Leco corporations before pursuing a PhD in computer science at the Illinois Institute of Technology. For his dissertation he developed an intelligent system that learned to extract clinical results from the abstracts of medical research papers. Currently, he is developing Virtual Reality projects at Andrews University.

The Office of Research and Creative Scholarship is grateful for the help of Jeff Boyd, Research Support Specialist, and Mordekai Ongo, Research Integrity and Compliance Officer, in organizing this conference. We would also like to thank the conference planning committee:

Katherine Koudele, Professor of Animal Science, Chair, Department of Agriculture
H. Thomas Goodwin, Professor of Paleobiology, Chair, Department of Biology
David Nowack, Professor of Biochemistry, Chair, Department of Chemistry and Biochemistry
Hyun Kwon, Professor of Engineering, Chair, Department of Engineering & Computer Science
Lynelle M. Weldon, Associate Professor of Mathematics, Chair, Department of Mathematics
Margarita Mattingly, Professor of Physics, Chair, Department of Physics

Please visit us at *http://www.andrews.edu/research* to learn more about research and academic conferences at Andrews.

Gary Burdick
Dean of Research
Professor of Physics

CONFERENCE SCHEDULE

WEDNESDAY, MAY 17, 2017

5:00 – 6:00 p.m.	Registration, Whirlpool Room, Chan Shun Hall
6:00 – 7:15 pm	Dinner, Whirlpool Room, Chan Shun Hall
7:30 – 8:30 pm	Plenary Address, Room 108, Chan Shun Hall "Surveying the Natural Landscape" *Rodney Summerscales, Andrews University*

THURSDAY, MAY 18, 2017

7:30 – 8:30 am	Breakfast, The Gazebo, Campus Center
8:40 – 9:00 am	Devotional, Chan Shun 108 *Hyun Kwon, Andrews University*
	Session A: Technology, Society & Neuroscience, Chan Shun 108 *Chair: Katherine Koudele, Professor of Animal Science, Chair, Dept. of Agriculture*
9:00 – 9:20 am	"The HF-24 Marut, India, and the Indigenization of Western High Technology" *William A T Logan, Auburn University*
9:25 – 9:45 am	~~"Cybercrime and Computer Science Undergraduate Students in Private Universities in Nigeria: An Empirical Investigation"~~ ~~*Ifeoma Helen Ayeni, Babcock University*~~
9:50 – 10:10 am	"Analysis of the Production Chain of Alpaca Fiber in Peru" *Gladys Maquera, Universidad Peruana Unión*
10:10 – 10:30 am	Break
10:30 – 10:50 am	"Tabu Search Applied to Community-based Rural Tourism" *Gladys Maquera, Universidad Peruana Unión*
10:55 – 11:15 am	"Risky Decision-making in College-aged Cannabis Users: A Preliminary FMRI Analysis" *Adrian Paneto, Indiana University - Bloomington*
11:20 – 11:40 am	"PV Inhibitory Neurons First to Respond and First to Adapt" *Berquin Feese, Carnegie Mellon University*
12:00 – 1:30 pm	Lunch, Cafeteria, Badger Room, Campus Center
	Session B: Earth Science & Mathematics, Chan Shun 108 *Chair: Lynelle M. Weldon, Assoc. Professor of Mathematics, Chair, Dept. of Mathematics*
1:30 – 1:50 pm	"Multi Isotope Proxies in Paleoceanographic and Paleobiological Research" *Lucien Nana Yobo, University of Houston*
1:55 – 2:15 pm	"A Time-series Forecasting Model for Windhoek Rainfall, Namibia" *Godfrey T. Pazvakawambwa, University of Namibia*
2:20 – 2:40 pm	"A Generalized Linear Model for Marital Disruption in Namibia" *Lillian Pazvakawambwa, University of Namibia*
2:45 – 3:05 pm	"A Journey Towards Understanding Extension Theorems on Sobolev Space" *Christopher R. Loga, Southwestern Adventist University*
3:10 – 3:30 pm	Break

3:30 – 3:50 pm	"An Introduction to Quantum Networks" *Victoria Hudgins, Baylor University*
3:55 – 4:15 pm	~~"Looking at Harmonic Analysis from the Perspective of Pointwise Convergence"~~ ~~*Dewey D. Kemp III, Indiana University - Bloomington*~~
4:20 – 4:40 pm	"The Role of Links in the Study of 3-Manifolds" *Anthony Bosman, Rice University*
5:00 – 6:00 pm	Campus Tour
6:00 – 7:00 pm	Dinner, The Gazebo, Campus Center
7:30 – 8:30 pm	Plenary Address, Chan Shun 108 "Space Weather" *Jay Johnson, Andrews University*

FRIDAY, MAY 19, 2017

7:30 – 8:30 am	Breakfast, The Gazebo, Campus Center
8:40 – 9:00 am	Devotional, Chan Shun 108 *H. Thomas Goodwin, Andrews University*
	Session C: Medicine & Biochemistry, Chan Shun 108 *Chair: Lisa Ahlberg, Associate Professor of Chemistry, Dept. of Chemistry and Biochemistry*
9:00 – 9:20 am	"3D Printing of Heart with Congenital Defect for Pre-surgical Planning" *Jovicarole Raya, La Sierra University*
9:25 – 9:45 am	"Proton Radiation Therapy Cancer Treatment Optimization" *Jenny Kim, La Sierra University*
9:50 – 10:10 am	"Screening of Hybrid Heterocyclic Boronic Acids and Nonboronic Acid Aldehydes as Potential Anticancer Agents" *Jemma McLeish, Andrews University*
10:10 – 10:30 am	Break
10:30 – 10:50 am	"Study on MID-IR Spectroscopy on Whole Blood Samples for Human Glucose Quanitification Applications" *Gerardo S. Romo-Cardenas, Universidad Autónoma de Baja California*
10:55 – 11:15 am	"Applied Drug Development and Combinatorial Strategies for Antimicrobial Treatment" *Steven K. Lai Hing, Texas A & M University - College Station*
11:20 – 11:40 am	"SPF Estimation of Natural Oils, Butters and Creams" *Simone F. Walcott, University of the West Indies - St. Augustine*
12:00 – 1:30 pm	Lunch, Cafeteria, Badger Room, Campus Center
	Session D: Life Sciences & Physics, Chan Shun 108 *Chair: H. Thomas Goodwin, Professor of Paleobiology, Chair, Dept. of Biology*
1:30 – 1:50 pm	"The Visual Behavior of the Asian Citrus Psyllid" *Thomson Paris, United States Department of Agriculture*
1:55 – 2:15 pm	~~"Resistance of Two B. Japonicum Strains to Antibiotics and Their Effect with or without Solid Carriers on Growth and Biomass Yield of Cowpea"~~ ~~*Amarachi Grace Nwokocha Miss, Babcock University*~~
2:20 – 2:40 pm	"Herbivore Assemblages along an Altitudinal Gradient: Indicators of Climate Change?" *Darren Bito, Pacific Adventist University*

2:45 – 3:05 pm	"West Indian Manatee (Trichechus Manatus) Habitat Characterization Using Side-Scan Sonar" *Mindy J. McLarty, Andrews University*
3:10 – 3:30 pm	Break
3:30 – 3:50 pm	"Dilepton Distributions as a Probe for Dark Matter Properties at Particle Accelerators" *Rodolfo M. Capdevilla, University of Notre Dame*
3:55 – 4:15 pm	"Characteristic Signal of Neutron-Antineutron Oscillation in Argon Nuclei at DUNE" *Joshua L. Barrow, The Univeristy of Tennessee*
4:20 – 4:40 pm	"Laser Driven Fiber Optic Gyroscopes for Inertial Navigation of Aircraft" *Jonathan M. Wheeler, Stanford University*
6:00 – 7:00 pm	Dinner, The Gazebo, Campus Center
7:30 – 8:30 pm	Vespers, Chan Shun 108 "Are God and Faith Anti-Science and Anti-Reason?" *Gary Burdick, Andrews University*

SABBATH, MAY 20, 2017

8:30 – 9:30 am	Breakfast, Whirlpool Room, Chan Shun Hall
10:00 – 11:00 am	Sabbath School, Whirlpool Room, Chan Shun Hall
11:15 am – 1:00 pm	Pioneer Memorial Church (PMC) or One Place Worship
1:00 – 2:00 pm	Lunch, Cafeteria, Badger Room, Campus Center
3:00 – 5:00 pm	Activities
6:00 – 7:15 pm	Dinner, Whirlpool Room, Chan Shun Hall
7:30 – 8:30 pm	Vespers, Chan Shun 108 "The Limits of Science and Reason" *Anthony Bosman, Rice University*

SUNDAY, MAY 21, 2017

8:30 – 9:30 am	Breakfast, Whirlpool Room, Chan Shun Hall; Departure

PLENARY SPEAKERS

Rodney L. Summerscales
Assistant Professor of Computer Science, Andrews University

"Surveying the Virtual Landscape"

Abstract: Virtual Reality (VR) technology provides a new and potentially more engaging way for people to comprehend information. This information could be scientific, architectural, historical, medical, therapeutic and/or instructional. VR is a new field. Researchers and developers are working to identify best practices for using this technology. This talk will provide an introduction to VR, its potential and its pitfalls. It will highlight key discoveries and problems still to be solved. Computer Science students at Andrews have been active in VR research and development. Results from these projects will be presented.

Biography: Dr. Rodney Summerscales is currently an assistant professor in the Department of Engineering and Computer Science. He attended Andrews University as an undergraduate, earning a BS in computer science. After that he obtained an MS in computer science and engineering from Penn State. He worked as a software engineer for Centroid and Leco corporations before pursuing a PhD in Computer Science at the Illinois Institute of Technology. For his dissertation he developed an intelligent system that learned to extract clinical results from the abstracts of medical research papers.

Jay Johnson
Professor of Engineering, Andrews University

"Space Weather"

Abstract: Violent eruptive events originating at the sun are known to disrupt many aspects of modern technology including communications, navigation, and the power distribution grid. These "space weather" events are generally associated with geomagnetic storms, which involve strong interaction between the solar wind and the Earth's magnetosphere. These events ultimately lead to the development of strong magnetospheric current systems and increased particle fluxes in the outer radiation belt, which can be hazardous to satellites and manned missions. One of the key features of the radiation belt environment is the variability in response to geomagnetic storms. While some storms increase radiation belt fluxes, other storms can deplete the radiation belts. This talk will review some of the processes responsible for energization and loss of radiation belt particles and challenges involved in modeling space weather.

Biography: Dr. Jay R. Johnson joined the Department of Engineering and Computer Science in July 2016. Dr. Johnson earned his undergraduate degree in physics and math from the University of Colorado in 1987. He then attended the Massachusetts Institute of Technology, where under the direction of Dr. Tom Chang he received a PhD in physics in 1992, studying turbulence in the auroral region. After postdocs at the University of Alaska and MIT, he became a member of the research staff at the Princeton Plasma Physics Laboratory in 1995. In 2005 he became the head of the space physics group, which he led until 2016.

Dr. Johnson's areas of interest include theoretical plasma physics, particle energization and transport by waves in Earth's magnetospheric environment, auroral acceleration processes, magnetosphere-ionosphere coupling, and causality in complex systems. In addition to his extensive research work, he also enjoys woodworking, playing musical instruments, canoeing, hiking, skiing, and spending time with his family.

VESPERS SPEAKERS

Gary Burdick
Professor of Physics, Andrews University

Dr. Gary Burdick is Dean of Research and professor of physics at Andrews University. He joined the physics faculty in 1999 and was appointed Assistant Dean for Graduate Programs in the College of Arts and Sciences in 2007, and he became the Associate Dean for Research and Creative Scholarship in 2010.

Born in St. Joseph, Michigan, Dr. Burdick graduated from Southern Adventist University in 1985 with a Bachelor of Science in physics and mathematics. In 1991, he received his doctorate in physics from the University of Texas at Austin. After receiving his PhD, Dr. Burdick held postdoctoral positions in France, Hong Kong, and Virginia before joining the faculty at La Sierra University as assistant professor of physics. Dr. Burdick is a member of the American Physical Society, and Secretary of the Andrews-Whirlpool chapter of Sigma Xi: The Scientific Research Society.

In his research area of optical spectroscopy, dealing with electronic (optical) transitions of lanthanide elements in solid-state media, Dr. Burdick has established international collaborations with various research labs in New Zealand, Europe and the United States. He has more than fifty refereed scientific publications and many international conference presentations on his work.

Anthony Bosman
PhD Student, Rice University
Assistant Professor of Mathematics, Andrews University

Anthony Bosman recently competed his doctorate in mathematics at Rice University. He is interested in low dimensional topology, in particular, the study of knots and links and how they relate to 3 and 4-manifolds. He will be joining the Mathematics Department at Andrews University as an assistant professor this year. Having lived all his life in sunny states, he is fearfully anticipating his first winter.

PRESENTATION ABSTRACTS

SESSION A: TECHNOLOGY, SOCIETY & NEUROSCIENCE
Session Chair: Katherine Koudele, Professor of Animal Science, Chair, Department of Agriculture

The HF-24 Marut, India, and the Indigenization of Western High Technology
William A. T. Logan (Auburn University)

For ten years (1957 - 1967), the Indian government worked to create a high-performance fighter jet of domestic design and manufacture. In the early decades after winning independence from the British Empire in 1957, India tried to make its economy self-reliant by setting up industries to produce domestic substitutes for goods that would otherwise have to be imported. The HF-24 Marut indigenous jet fighter project was one of the government's more ambitious import-substitution programs. Designed by a joint German-Indian team, it was manufactured at the government-owned Hindustan Aeronautics Ltd. plant in Bangalore. As a fighter aircraft, the HF-24 was moderately successful. In 1971, HF-24s scored a few kills against Pakistani fighters in the war over Bangladesh. Yet as a weapon in India's war of economic independence, the HF-24 was not successful at all. The project suffered repeated delays, and the plane that was finally produced was underpowered for want of a suitable engine. As the Indian government was waiting for the large quantities of HF-24s that never materialized, they imported Russian-made fighters. This paper views the HF-24 Marut as a case study of the limits of technology transfer for sophisticated, capital-intensive technologies.

Analysis of the Production Chain of Alpaca Fiber in Peru
Gladys Maquera (Universidad Peruana Unión)

Currently, the Peruvian government and the regional government of Puno are giving strong emphasis on productive chains and clusters to give added value and thus create competitiveness. Carabaya Province (Puno) has one of the highest rate of extreme poverty and yet has the greatest production of alpacas and alpaca fiber in the world. There is no coordination between the actors in the production chain of alpacas. There are two companies that control the oligopoly of the alpaca fiber in Peru. The producers do not know the market opportunities that exist nationally and internationally. Challenges: (a) absence of state policies for preserving biodiversity in the Peruvian Andes, (b) no Internet visibility through products and byproducts of the alpaca, (c) no transfer of technology to the entire chain, and (d) universities and educational institutions do not investigate this issue and if it fails to make producers.

Cybercrime and Computer Science Undergraduate Students in Private Universities in Nigeria: An Empirical Investigation
Ifeoma Helen Ayeni (Babcock University)

The increasing rate of cybercrimes in Nigeria and other countries of the world has given scholars great concern. Cybercrime, which is a criminal act perpetuated by individuals who have gained expertise in information and communication technology, is a major threat to development. With the successful reduction of the world to a global village via information technology, computer science and its related disciplines have continued to attract more students. Sadly, numbers of these students use their acquired knowledge to perpetuate crimes. The purpose of this study was to explore cybercrime and computer science undergraduate students in private universities in Nigeria. The study adopted a cross sectional survey design with a sample size of 480 students, cutting across six (6) private universities in Ogun State. Upon consent, participants were asked to complete the "Intent Towards Internet Fraud Scale" (ITIFS). Data was analyzed using simple percentage, t-test and multiple regression. The participants demonstrated a high intent to engage in cybercrime. The results indicated no meaningful difference between male and female undergraduates' computer students. Also, age and student level was found to be a significant factor predicting intent to engage in cybercrime. The study recommends that the educational system should place as great an emphasis on moral development as it has on intellectual and social development because this will help shape the minds of students toward productive ventures rather than criminal activities.

Tabu Search Applied to Community-based Rural Tourism
Gladys Maquera and *Óscar Mendoza* (Universidad Peruana Unión)

Community-based Rural Tourism (CBRT) has been consolidated as a socially and environmentally responsible alternative in Peru for generating income opportunities for the rural sector. The development of CBRT is still incipient in Peru, and therefore the information generated by public and private institutions is insufficient and in some cases does not exist. Worldwide, 91% of people use the Internet to find places to visit. However, the use of the Internet brings new challenges for the tourism industry. With regard to information on ecotourism and/or historic tourism in the Puno region of Peru, there is no information on the web, much less routes according to the needs of tourists. The objective of this work is to develop an Intelligent Digital Platform to apply data science and big data to find smart routes that satisfy tourists' requirements. To obtain the route, a nearest neighbor heuristic was implemented, using 2-opt and a Tabu Search metaheuristic implemented in Python programming language. Computational results demonstrate the efficiency of the Tabu Search algorithm when using data found in the literature and when using real data, guaranteeing the reduction of distances traveled in the shortest time possible, reducing travel costs.

Risky Decision-making in College-aged Cannabis Users: A Preliminary FMRI Analysis
Adrian Paneto (Indiana University - Bloomington)

Decision-making has been shown to differ in drug users compared to drug-naive controls (Bechara et al., 2002). Specifically, risky decision-making has been found to have a strong association to substance use disorders (SUDs). Participants comprised 17 current cannabis users (CB) and 13 healthy and age-matched controls (HC), aged 18-30. Participants completed the balloon analog risk task (BART)--a task designed to examine risky decision-making--during functional magnetic resonance imaging. The CB group showed a slower reaction time, but otherwise showed no behavioral differences from the HC group. Our neuroimaging results indicate a replication of regional brain effects in the right anterior cingulate cortex (rACC) found initially by Fukunaga et al., 2012. Furthermore, a regression analysis found that activity in the precuneus (PCUN) was modulated by cannabis use severity based on the cannabis use disorder identification test (CUDIT-R). Additionally, cannabis users showed greater neural activity than healthy, aged-matched control during balloon explosions in the Left Inferior Frontal Gyrus (L.IFG). Taken together, these findings suggest that chronic cannabis users may experience increased sensitivity to negative outcomes.

PV Inhibitory Neurons First to Respond and First to Adapt
Berquin Feese (Carnegie Mellon University)

Activity of cortical inhibitory interneurons is rapidly reduced in response to monocular deprivation during the critical period for ocular dominance plasticity, as well as to salient events encountered during learning. In the case of primary sensory cortex, a decrease in mean evoked firing rate of parvalbumin-positive (PV) inhibitory neurons is causally linked to a reorganization of excitatory networks following sensory perturbation. Converging evidence indicates that deprivation, not an imbalance between eye inputs, triggers rapid plasticity in PV neurons; however, this has not been directly tested in vivo. Using two-photon guided cell-attached recording, we examined the impact of closing both eyes for 24 hours on PV neuron response properties in mouse primary visual cortex. We found that binocular deprivation induces a 30% reduction in stimulus-induced mean evoked firing rate. We further examined whether this reduction in stimulus-induced mean evoked firing rate was dependent upon the receptor tyrosine kinase ErbB4. If ErbB4 is absent, then the visual system does not undergo ocular dominance plasticity. PV neurons lacking ErbB4 do not exhibit a reduction in firing rate following closing both eyes, which is likely why ocular dominance plasticity does not occur. These data establish that open-eye inputs are not required to drive deprivation-induced weakening of PV neuron evoked activity but that ErbB4 is required.

SESSION B: EARTH SCIENCES & MATHEMATICS

Session Chair: Lynelle M. Weldon, Associate Professor of Mathematics, Chair, Department of Mathematics

Multi Isotope Proxies in Paleoceanographic and Paleobiological Research

Lucien Nano Yobo (University of Houston)

Today's anthropogenic activities are altering the global environmental system at alarming rates, thus quantification of their effects on the global environment is very critical. These processes are often complex and thus require the integration of field and laboratory research observation, as well as mathematical modeling to provide answers to some of the fundamental questions. In this talk I will highlight some of my research work in carbonate geology, involving the use of various traditional and non traditional isotopes (δ44/40Ca, δ18O, δ88/86Sr, 87Sr/86Sr) in investigating some of the relationships between some major geologic extinction events and the effects of rapid changes in atmospheric pCO2, global warming and ocean acidification on the marine carbonate budgets (e.g. Oligocene- Miocene carbonate factory and Cretaceous Oceanic Anoxic Events-OAEs).

A Time-series Forecasting Model for Windhoek Rainfall, Namibia

Godfrey T. Pazvakawambwa (University of Namibia)

The objective of the study was to use time series forecasting techniques to model Windhoek rainfall based on secondary monthly data from 1891 to 2011. Descriptive summary statistics in the form of measures of centrality and dispersion, time series plots, and autocorrelation functions were generated using R time series statistical software. The Box Jenkin's ARIMA modelling procedure (model identification, model estimation, model validation) was used to determine the best models for the data. Model diagnostics based on residual analysis were performed to assess the adequacy of the identified models. The final model was then used to forecast monthly rainfall for Windhoek up to year 2047. The forecast values suggest that for instance in the 2046/47 , the winter season monthly rainfall point estimates are around 15mm (June 14.5mm; July 14.5 mm; and August 14.3mm) which can technically be higher than expected. However, the lower 95% confidence limits for the same winter months are zero highlighting the possibility of no rainfall during those periods. Based on the ARIMA modelling of the Windhoek rainfall, despite the seasonal and irregular fluctuations, the mean monthly rainfall levels did not suggest an upward or downward trend over the century. Even though the results indicate constant mean monthly rainfall, the limitation of the results is that the analysis is based on a small spatial area to completely rule out climate change effects. Therefore, more adaptive governance initiatives should be explored on the available secondary sources for water security and the sustainable development of the USB.

A Generalized Linear Model for Marital Disruption in Namibia

Lillian Pazvakawambwa (University of Namibia)

Marital disruption has attracted wide attention among researchers. In recent years, the world has experienced reductions in marriage rates, along with significant increases in cohabiting unions, divorce and separation, leading to rising conjugal and family instability. While some have seen this as a sign of social and moral disruption with a potential to shatter the family institution and the foundations of society itself, others have embraced these trends as signaling increased individual liberty and the loosening of suffocating social mores. There is limited research on the factors influencing marital disruption in Namibia. This paper used the Namibia Demographic and Health Survey (NDHS) 2013 data to establish patterns, trends and determinants of marital disruption among women, using generalized linear models. Results indicated that marital disruption is influenced by region, socio-economic status, employment status and birth cohort. Policy efforts should encourage one lifetime partner in marital relations. Information and education on the negative effects of divorce and separation should be targeted towards the younger generation, richer women, employed women and those from vulnerable regions.

A Journey Towards Understanding Extension Theorems on Sobolev Space
Christopher R. Loga (Southwestern Adventist University)

In terms of application, no area of mathematics is more widely used than partial differential equations (PDE). Understanding such equations is thus of the utmost importance. One such method for studying PDE is to use various spaces of function solutions, such as Sobolev space. In this talk I address a critical estimate for Sobolev space functions, which is called an extension. This will include the motivation and prerequisites for the Sobolev space of functions as well as brief synopsis of the results from my doctoral research in extension theorems. This talk should be accessible to anyone with a thorough experience in undergraduate mathematics.

An Introduction to Quantum Networks
Victoria Hudgins (Baylor University)

A network (or graph) is a set of nodes with connections between them. A quantum network describes the behavior of waves in a network of wires. One may study the spectrum of a quantum network, which is akin to determining the set of frequencies of waves on a network of guitar strings joined together. The usefulness of these quantum networks has been enhanced by the ability to study the spectrum by relying on closed paths of the network. In the last few decades, quantum networks have been a model of increasing interest in mathematical physics, chemistry, and engineering; some examples of application include nanotechnology, wave guides, and quantum chaos. The talk will serve as an introduction to the topic of quantum graphs and their spectral properties. A family of graphs which are particularly amenable to demonstrate these network spectral connections are binary quantum graphs, the topic of my current research.

Looking at Harmonic Analysis from the Perspective of Pointwise Convergence
Dewey D. Kemp III (Indiana University - Bloomington)

Harmonic analysis, also known as Fourier analysis, is a field of mathematics premised upon the following very fruitful idea. Quite often, when studying a function, it can be helpful to break it up into pieces of a certain type, and then study those pieces individually in order to obtain a statement about the original function. A slight extension of this idea is to “break up” a function by way of approximation. Specifically, one might find it advantageous to find a sequence of functions which ultimately converge to the given function that one is studying. If this sequence of functions is “nice” in some precise sense, then such an approximation can be very beneficial. This talk will seek, in as concise and far-reaching a manner as possible, to capture this summary of harmonic analysis with a specific example, that of Bochner-Riesz operators. After introducing the basic tool of harmonic analysis--the Fourier transform--we will jump immediately into considering a ground-breaking convergence result that was only recently discovered. This material solves part of the Bochner-Riesz conjecture. If time permits, I will try to motivate a little why such “frequency-analysis” results as this one are important to (mathematical) analysts, as well as scientists from other disciplines.

The Role of Links in the Study of 3-Manifolds
Anthony Bosman (Rice University)

3-manifolds are spaces that locally resemble Euclidean 3-dimensional space. The study and classification of such manifolds is of central concern in topology and geometry. We introduce the notion of surgery on a link as a means of obtaining 3-manifolds; a deep result of Lickorish and Wallace tells us that all sufficiently nice 3-manifolds can be obtained by such surgery. We then offer a new generalization of a well-known result on how a relationship between links gives information on how their associated zero surgery manifolds are related.

SESSION C: MEDICINE & BIOCHEMISTRY

Session Chair: Lisa Ahlberg, Associate Professor of Chemistry, Dept. of Chemistry and Biochemistry

3D Printing of Heart with Congenital Defect for Pre-surgical Planning

Jovicarole Raya (La Sierra University)

As 3D printing becomes more accurate and more accessible, the field of medicine has greatly benefited in ways that were once unimaginable. Digital computed tomography (CT) scans can now be transformed into accurate, tangible 3D models which surgeons can then use in pre-surgical planning. In this project we 3D printed a heart with a congenital defect from an anonymized patient from Loma Linda University Medical Center. The patient had an interrupted aortic arch as a baby and underwent a Damus procedure where the pulmonary artery and aorta were joined and the blood is allowed to exit the combined right and left ventricular chambers through the pulmonary valve and up the aorta (as one outlet). By 3D printing the heart, the surgeons will have an accurate life-size replica of the patient's heart for use when planning for another reconstructive heart surgery on the patient in the future.

Proton Radiation Therapy Cancer Treatment Optimization

Jenny Kim (La Sierra University)

Since the first installation of a hospital-based proton treatment facility at Loma Linda University (LLU) Medical Center in 1990, proton radiation therapy has become a rapidly expanding form of cancer treatment. This highly precise treatment modality spares more healthy tissues and allows higher tumor dose than conventional radiation therapy. This is possible due to the proton's finite range in matter and the concept of the Bragg peak: a relatively low entrance dose is followed by a high-dose peak positioned in the tumor tissue. To maximize the inherent advantages of proton therapy, the range of protons (proton relative stopping power [RSP]) inside the patient's body must be determined to its optimum accuracy. In existing proton treatment centers, the information on the proton's relative stopping power is derived using the patient's x-ray computed tomography (CT) images, which are reconstructed based on the photon's relative linear attenuation coefficients, values known as Hounsfield units (HU). As protons and photons interact differently with matter, this conversion process can lead to uncertainties in dose calculations. Finding ways to solve this issue has led to the development of proton computed tomography (pCT). In 2004, a group led by Reinhard W. Schulte of LLU proposed a conceptual design of a pCT scanner for radiation therapy. The pCT would image the patient directly using the same proton beam used for treatment. The group's prototype pCT scanner has been successfully tested with phantoms and is anticipated to reach its clinical trials stage within the next couple of years. The aim of this research is to conduct a computer simulation study of proton computed tomography system using the Monte Carlo-based Geant4 simulation toolkit.

Screening of Hybrid Heterocyclic Boronic Acids and Nonboronic Acid Aldehydes as Potential Anticancer Agents

Jemma McLeish (Andrews University)

Breast cancer is one of the most frequently occurring cancers and the second leading cause of cancer-related deaths in women. Several risk factors and genetic mutations play a significant role in its occurrence as well as influence the development and implementation of anticancer therapy. This research is focused on the synthesis and anticancer evaluation of novel hybrid organic compounds containing the heterocycles rhodanine and 2, 4-thiazolidinedione covalently linked to boronic acids or nonboronic acid aldehydes. The synthesis of these compounds were accomplished by calcium oxide-promoted Knoevenagel condensation followed by NMR and IR spectroscopic analysis for structure confirmation. Eleven compounds were screened for anticancer effects on the AU565 HER-2/neu overexpressing breast cancer cell line by using the CellTiter-Blue® cell viability assay. Six of the compounds showed a decrease in cell viability which suggest anticancer activity while five of the compounds showed an increase in cell viability suggesting no anticancer activity. Overall, the results suggest that the position of the boronic acids and nonboronic acid aldehydes on the aromatic ring of the hybrid compounds may play a role in determining anticancer activity.

Study on MID-IR Spectroscopy on Whole Blood Samples for Human Glucose Quanitification Applications
Gerardo S. Romo-Cardenas (Universidad Autónoma de Baja California)

The importance of a systematic glucose monitoring in order to keep a steady control for diabetic patients has been established. Several medical studies accept the necessity of exploring alternatives for the traditional digital glucometer, given the pain and discomfort related to the application of this technique, which can lead to a compromised control of the disease. Several efforts based on the application of IR spectroscopy have been done with favorable, yet not conclusive results. Therefore it's necessary to apply a comprehensive and interdisciplinary study based on the biochemical and optical properties of the glucose in the human body in order to understand the interaction between this substance, its surroundings, and IR light. This study proposes a comprehensive approach of the glucose and IR light interaction, considering and combining important biochemical, physiological and optical properties such as the effect of glucose regulation compounds and data mining based chemometrics techniques. The results of this work would help to define the right parameters, aiming to obtain an optical glucose quantification or classification system, as well as the protocol for the purpose.

Applied Drug Development and Combinatorial Strategies for Antimicrobial Treatment
Steven K. Lai Hing (Texas A & M University - College Station)

Streptococcus mutans JH1140 is a strain of bacteria which produces a lantibiotic product, named mutacin 1140. Mutacin 1140 has been shown to be effective at inhibiting Gram-positive bacterial infections caused by *Staphylococcus aureus* and *Streptococcus pneumoniae*. Mutacin 1140 is a ribosomally synthesized peptide antibiotic that undergoes extensive posttranslational modifications (PTM). We have found that Mutacin 1140 and an aminoglycoside, Kanamycin, when combined together, act synergistically against *Staphylococcus aureus*. This was determined by performing serial kill curve dilution overlays on solid media, followed up with kill curve by microdilution plate, and most recently confirmed with kill curve CFU count plates on Thyex media over time points in a 24 hour period. All three methods are independently consistent with their results: in combination with Kanamycin, Mutacin 1140 kills at an improved rate than either compound individually. Synergistic behavior opens many interesting opportunities for altered treatment strategies (lowered doses necessary for efficacy) and decreases the risk of developed resistance by *Staphylococcus aureus* against either 1140 or Kanamycin by providing multiple effective drug targets to account for.

SPF Estimation of Natural Oils, Butters and Creams
Simone F. Walcott (University of the West Indies - St. Augustine)

The use of natural products in the treatment of disease has been an important component of medicinal therapy for centuries. Indeed, for many centuries, drugs were entirely of natural origin and were composed of herbs, animal products and inorganic materials. Depending on the mode of preparation, these drugs could have been applied topically (suspended in a base) or taken internally. The interest in natural products continues to grow as people are not only concerned about avoiding synthetic compounds in medicines but are also seeking more natural foods, and there is also a growing interest in natural skin-care formulations as well. In this study, eleven different plant oils, five butters and their combinations were investigated for their sun protection factor (SPF), with a view to determining which oil/butter combination is most efficient and effective at shielding one from UVA and UVB rays. Also, two plant extracts of saffron and turmeric and homemade face creams made with these oil/butters were examined for their SPF activity. A UV Checker was used to monitor the UV Irradiance of the various samples.

SESSION D: LIFE SCIENCES & PHYSICS

Session Chair: H. Thomas Goodwin, Professor of Paleobiology, Chair, Dept. of Biology

The Visual Behavior of the Asian Citrus Psyllid

Thomson Paris (United States Department of Agriculture)

The Asian citrus psyllid (ACP) has spread citrus greening or huanglongbing (HLB) to every citrus-growing region in the United States. HLB has cost the state of Florida billions of dollars in damage. Little is known concerning the behavioral ecology of ACP towards visual cues. We conducted visual assays wherein ACP were exposed to visual targets made of filters that allowed a complex array of wavelengths. Our findings indicate that ACP are attracted to ultraviolet (UV) light, which in nature, is primarily found in the sky. The attraction of ACP to UV may provide some insight into the reason, metalized mulch is repellant, by confusing the ACP delineation of the solar and antisolar of the horizon. UV was found to enhance the attraction of targets in the green and yellow portions of the visual spectrum, but not the blue. This study represents the first example of ACP attraction to color targets and demonstrates that ACP are attracted to a combination of long and short wavelengths. The ecological implications of these findings as well as potential applications for monitoring ACP through visual traps will be discussed. Our results of ACP visual behavior involving UV light contribute to a better understanding of ACP visual behavior.

Resistance of Two B. Japonicum Strains to Antibiotics and Their Effect with or without Solid Carriers on Growth and Biomass Yield of Cowpea

Amarachi Grace Nwokocha (Babcock University)

Biological Nitrogen Fixation (BNF) is one of the major sources of nitrogen to inherently low tropical soils (Bohool et al.,1992). The level of resistances of microorganisms to different concentrations of antibiotics is a factor for determining the degree of tolerance of microbes to stressful environments, especially microbes which take part in BNF. Carriers are also required for effective inoculant preparation to facilitate the survival and multiplication of rhizobium strains(microbes). Parent rhizobium strains USDA 3384 and USDA 3451 were exposed to antibiotics at different concentrations to determine their intrinsic resistance level. These were further seeded into three different solid carriers (peat, composted maize cob and cowdung). The developed mutant strains inoculated with the solid carriers and mutant strains inoculated without the solid carriers were evaluated in the laboratory and pot experiments and their effect with or without solid carriers on growth and dry matter yield of cowpea (Ife bimpe) were assayed. Data on plant growth and dry matter yield of cowpea were analysed using ANOVA and means were separated using Duncan Multiple Range Test (DMRT) at 5 % probability level. USDA 3384 and USDA 3451 were resistant to Ampicillin trihydrate pensy at 500 mg/l and Streptomycin sulphate at 1000 mg/l respectively.

Herbivore Assemblages along an Altitudinal Gradient: Indicators of Climate Change?

Darren Bito (Pacific Adventist University)

I will be presenting the results from a baseline study I conducted as part of an expedition in a subtropical forest in Queensland, where 55 scientists from 14 countries came together to conduct specific projects that would identify arthropods and plant groups that may become suitable indicator species for monitoring long-term changes in the different forest types. This study focused on host-specialist and generalist moth larva (caterpillars) feeding on the understory plants along the elevational gradients of South Queensland's Lamington National Park. My hypothesis was that species from the lower elevational forests were more likely to migrate up the elevation as the climate warms up. I surveyed the range of related trees species that a particular moth species feeds on along the elevation gradient (300 m to 1100 m above sea level. The average temperature change between the altitudes ranged from 1.5°C to a full range of approximately 7.5°C. The caterpillars were collected by hand from target tree species and bred through to the adult in the field. An estimate of the leaf loss by tree species, altitude and canopy stratum was calculated using image analysis techniques. The host feeding preference of the caterpillars that were collected included species, family, and supra-family specialists. Species specialists showed a mid-altitudinal peak at 700 m a.s.l. and were dominant at all altitude. The overall species richness, and abundance also peaked at the 700 m elevational forest site. The results may have considerable implications in attempting to predict ecological changes which will accompany predicted global warming.

West Indian Manatee (Trichechus Manatus) Habitat Characterization Using Side-Scan Sonar
Mindy J. McLarty (Andrews University)

In this study, the reliability of low-cost side-scan sonar to accurately identify soft substrates such as grass and mud was tested. Benthic substrates can be hard to classify from the surface, necessitating an alternative survey approach. A total area of 11.5 km2 was surveyed with the sonar in a large, brackish mangrove lagoon system. Individual points were ground-truthed for comparison with the sonar recordings to provide a measure of accuracy. Five substrate types were identified: Dense seagrass, sparse seagrass, mangrove soil, mangrove soil with rock, and silt. A zoned benthic substrate map was created from the sonar recordings. Dense seagrass was most accurately identified. Sparse seagrass had the lowest accuracy. A bathymetric map was also created from the sonar recordings. Manatee sighting locations were overlaid on these maps to make a preliminary assessment of habitat use. Most manatee sightings occurred in areas 2–6 meters deep and characterized as mangrove soil.

Dilepton Distributions as a Probe for Dark Matter Properties at Particle Accelerators
Rodolfo M. Capdevilla (University of Notre Dame)

We study a family of simplified models in which dark matter (DM) interacts with both quarks and leptons through a renormalizable Yukawa interaction with a fermion's partner. The partner is a complex scalar field if DM is a fermion and a Dirac field if DM is a scalar. We study how these type of interactions can reshape the spectra of the lepton pair production at the Large Hadron Collider (LHC). We found that the dilepton invariant mass allows one to distinguish the spin of the DM particle in the limit in which the mediator and the DM mass are highly degenerate. Also, using the angular distribution measured from the Collin-Soper frame (cos CS), it is possible to identify the relative chirality between the Standard Model (SM) fermions and the DM particle (fermionic DM) or the mediators (scalar DM). We set bounds on the Yukawa coupling between DM, partner and SM fermions and the DM mass in the cases in which the mediator masses are between 10 and 100 percent above the DM mass.

Characteristic Signal of Neutron-Antineutron Oscillation in Argon Nuclei at DUNE
Joshua L. Barrow (University of Tennessee)

Babu et al. have recently proposed a model of post-sphaleron baryogenesis following the electroweak phase transition. Their theory naturally gives rise to a plausible baryon abundance and a $\Delta B=2$ six-quark operator which allows for the generation of nbar from n. Using n bound in Ar, DUNE currently plans to include n-nbar events in their nucleon decay searches. Using GENIE, modeling is underway on intranuclear interactions mimicking n-nbar annihilation in Ar nuclei. Eliminating atmospheric ν background from such events will be a challenge for liquid Ar TPCs at DUNE, so simulation work must be considered for ν interactions in Ar nuclei, which produce similar signals to n-nbar annihilation. Key to understanding possible experimental signals will be the integration of these two for a proper robust analysis, which will determine the viability of any detection of this process above background levels.

Laser Driven Fiber Optic Gyroscopes for Inertial Navigation of Aircraft
Jonathan M. Wheeler (Stanford University)

The fiber optic gyroscope (FOG) utilizes a Sagnac interferometer to infer a rotation rate, and can serve as the rotation sensor in an inertial navigation system (INS). In a FOG, a coupler splits input light into two ends of a coiled loop of fiber that interfere upon return. In the absence of rotation, they travel through the same optical path and interfere constructively. Under rotation, due to the relativistic Sagnac effect, the two signals undergo slightly different optical paths, which alter the interferometer output power. The rotation rate is inferred by this power change. Ring laser gyroscopes (RLG) are less expensive and more sensitive than FOGs, but are inherently less reliable and suffer shorter lifetimes due to their high-voltage electrodes and mechanical dithering. Thus, the FOG is used where reliability is essential but low-cost is not a requirement, such as in military aircraft, submarines, missiles, and space exploration. The Digonnet group at Stanford recently demonstrated a new type of FOG driven by a broadened laser instead of a less stable incoherent Erbium-doped superfluorescent fiber source (SFS). My research aims to reduce noise, improve the long-term stability, and reduce the overall cost of this novel FOG, in part to make it more competitive against the RLG, and in part to produce more precise navigation systems, particularly for use in aircraft.

ABOUT THE PRESENTERS

Ifeoma Helen Ayeni (Babcock University)

Ifeoma Helen Ayeni is the Assistant Registrar at Babcock University. She is currently the School Officer of Benjamin S. Carson (SNR) School of Medicine at Babcock University in Nigeria. Ifeoma, who holds an master's degree in mass communication, has published and presented papers at international conferences and also published a peer reviewed journal article. She is passionate about the security and well-being of women and children.

Joshua L. Barrow (Univeristy of Tennessee)

Joshua Barrow is a native of Chattanooga, Tennessee. He graduated Summa Cum Laude from Southern Adventist University in 2015 with Bachelor of Science degrees in mathematics and physics. His senior theses included work in partial differential equations and quantum chemistry, respectively, and the latter became cover material for *The International Journal of Quantum Chemistry* in July 2016. Josh joined the University of Tennessee Physics Department as a graduate student and Birkhoff Fellow in Fall of 2015. After passing qualifying exams, he joined Dr. Kamyshkov as a graduate research assistant in the fall of 2016. Josh currently works on neutron-antineutron oscillation searches for the DUNE collaboration in the Nucleon Decay Working Group under Michel Sorel and Jennifer Raaf of Fermilab. He hopes to show that a viable signal could exist in the future 40-kiloton liquid argon time-projection chambers given Monte Carlo generated data and reconstruction simulations. Initial results seem promising. He also currently works on magnetic field characterizations for the HFIR Cold Beam Room, where future searches for neutron—mirror-neutron seem plausible.

Darren Bito (Pacific Adventist University)

Dr. Darren Bito is currently the Dean of the School of Science and Technology in Pacific Adventist University. His research interest has been in the areas of invasive plants and their herbivore insect communities and host-specificity of moths on invasive and native host trees.

Anthony Bosman (Rice University)

Anthony is completing (recently competed) his doctorate in mathematics at Rice University. He is interested in low dimensional topology, in particular, the study of knots and links and how they relate to 3 and 4-manifolds. He will be joining the Mathematics Department at Andrews University as an assistant professor this year. Having lived all his life in sunny states, he is fearfully anticipating his first winter.

Rodolfo M. Capdevilla (University of Notre Dame)

Rodolfo's education includes a bachelor's degree in physics from the University of Atlantico, Colombia (2010) and a master's in physics from the Institute of theoretical Physics of the Paulista State University, Brazil (2013). He is currently a PhD student in physics at the University of Notre Dame, USA. Rodolfo has experience in Elementary Particles Physics and Field Theory. His PhD research focus on Higgs phenomenology, Supersymmetric extensions of the Standard Model of Particle Physics, and Dark Matter signals in particle colliders. Rodolfo also enjoys teaching physics: Besides his experience teaching in different institutions, Rodolfo is currently running an outreach project to teach Quantum Physics concepts for high schoolers. His project was awarded with the Ganey Community Based Stipend of the Center for Social Concerns at the University of Notre Dame.

Berquin Feese (Carnegie Mellon University)

Berquin Feese is a fifth year PhD candidate in the Biological Sciences Department at Carnegie Mellon University in Pittsburgh, PA. He plans to finish his PhD in 2017 and then plans to become a professor. He earned his BS in chemistry from William Carey University in 2011. His research focuses on understanding the role of parvalbumin expressing (PV) inhibitory neurons in development and plasticity within the visual cortex of mice. He uses in vivo electrophysiology paired with deprivation paradigms and molecular perturbations to probe the responses of PV neurons to different stimuli and conditions. He is a member of the Society for Neuroscience, faculty for undergraduate neuroscience, the Center for the Neural Basis of Cognition, and other organizations.

Steven K. Lai Hing (Texas A & M University - College Station)

Steven Lai Hing was born and raised in Huntsville, Alabama. He attended Oakwood University (Huntsville, AL), where he received a bachelor's degree in biochemistry. Following his time at Oakwood, he accepted a research fellowship to Texas A&M University (College Station, TX) where he completed a master's degree in biochemistry, and where he is currently writing his dissertation for a doctorate in microbiology. His research interests are in antibiotic design, drug combination therapies, and natural products. He also greatly enjoys teaching.

Victoria Hudgins (Baylor University)

Originally from Columbia, Maryland, Tori Hudgins graduated from Union College in May 2011 with a BS in mathematics education. She then taught high school mathematics at North Star High School in Lincoln, Nebraska. In pursuit of the ability to continue teaching mathematics at higher levels, she moved to Waco, Texas, in 2014 and began graduate school at Baylor University. Having completed her coursework, she received her MS in mathematics in May 2016, and is now currently working on dissertation research in quantum graphs and random matrix theory.

Dewey D. Kemp III (Indiana University - Bloomington)

Dominique's study of pure mathematics began during his freshman year at Stanford University. He completed a Bachelor of Science degree there with honors, focusing coursework and research primarily on analysis and problems in differential geometry. Dominique is now finishing his second year of doctoral study at Indiana University, where his research is focused in restriction theory and decoupling under the advising of Ciprian Demeter. He has been a Seventh-day Adventist all his life. Dominique grew up in Lansing, Michigan, where he attended the Lansing SDA Church. Other passions that Dominique has maintained throughout his life are a love for playing piano and an enthusiasm for basketball.

Jenny Kim (La Sierra University)

Young Ji (Jenny) Kim is a fourth-year student at La Sierra University. She is majoring in biophysics and will be graduating with honors this June. Jenny is an academic/administrative Residential Assistant at Calkins Hall. She has been involved in various research projects in the Physics and Honors Departments. After graduation, Jenny plans to spend the summer traveling before entering the Loma Linda University School of Medicine in the fall.

Christopher R. Loga (Southwestern Adventist University)

Dr. Christopher "Ryan" Loga teaches as an assistant professor of mathematics at Southwestern Adventist University in Keene, TX. Prior to moving to Texas, he spent his whole life in East Tennessee, where he attended Southern Adventist University in Collegedale for his undergraduate studies. This is also where he met his wife Amanda. He also recently concluded his graduate studies at the University of Tennessee in Knoxville, where he earned his PhD in mathematics. Besides teaching and researching mathematics, Ryan also enjoys writing, playing guitar, and gaming.

William A. T. Logan (Auburn University)

Dr. William Logan completed his PhD in the History of Technology program at Auburn University in 2016. His dissertation was about Indian industrialization during the Cold War. As part of his graduate studies, he spent extensive time in India, and he can speak, read, and write Hindi. Before studying history in graduate school, William earned a bachelor's degree in mechanical engineering from Walla Walla University. His technical training continues to influence the way he thinks about technology as a historian.

Gladys Maquera (Universidad Peruana Unión)

Dr. Gladys Maquera has a PhD in production engineering from the Federal University of Rio de Janeiro (UFRJ - Brazil) and a master's degree in electrical and computer engineering from the State University of Campinas (UNICAMP - Brazil). Gladys also earned degrees in mathematics and physical education from the Universidad Peruana Unión (UPeU - Peru), and she holds a post-doctorate in production engineering from the Universidade Federal Fluminense (UFF-Brasil). She has published in indexed magazines of world-wide reputation, as well as presenting different works in events of science, extension and university projection. In 2012 she was recognized by the National Assembly of Rectors of Peru as "Scientific Woman of Peru." She is a founder of the Regional Council of Science, Technology and Innovation of the Puno Region. She is principal investigator and external evaluator of the National Council of Science, Technology and Technological Innovation of Peru (CONCYTEC). She has experience in the following areas of production engineering: production chains, operations research, production planning and control, traditional logistics and reverse logistics; and computer science and artificial intelligence.

Mindy J. McLarty (Andrews University)

Mindy McLarty recently completed her MS in biology at Andrews University. Her research areas of interest include ecology, marine biology, and wildlife biology.

Jemma McLeish (Andrews University)

Jemma McLeish is a graduate student in the Andrews University Biology Department.

Amarachi Grace Nwokocha (Babcock University)

Amarachi Grace Nwokocha started her training in 2002 at Michael Okpara University of Agriculture (Umudike, Abia State Nigeria), where she obtained her bachelor's degree in agriculture (soil science and agroclimatology) in 2006/2007. After serving at Babcock University, She proceeded for her master's degree in soil microbiology in 2013 at the University of Ibadan, and completed her program in 2015, when she began her PhD program. Currently, Amarachi works as a research scientist in Babcock University (Ilishan Remo, Ogun State). She has contributed to knowledge through publications to reputable Journals with respect to sustainable agriculture in sub-sahara Africa and the likes.

Adrian Paneto (Indiana University - Bloomington)

Adrian Paneto is a graduate student in the cognitive neuroimaging lab in the Department of Psychological and Brain Sciences at Indiana University-Bloomington. His research interests include understanding the role of executive functions (e.g., working memory) in problem-solving in both clinical and non-clinical populations, with a special interest in utilizing brain imaging techniques (i.e., fMRI & EEG).

Thomson Paris (United States Department of Agriculture)

Dr. Thomson Paris's interest in butterflies was aroused when his mother read to him at the age of five a book about butterfly collecting called *Eyes for Benny* by Anna Weaver. With the support of his parents, his interest in Lepidoptera grew and developed. Field trips with the Kentucky Lepidopterists' Society and the Lepidopterists' Society Meetings in Colorado advanced his entomological knowledge still further. During these field trips, he several notable acquaintances including Dr. Charles Covell and Dr. Thomas Emmel. In the spring of 1999, Thomson participated in a Lepidoptera expedition to Bolivia with Dr. Emmel, which further heightened his interest in the study of Lepidopterology. Thomson continued to develop his love for nature by beginning a life list of birds in 2002. In May 2008 he graduated cum laude with a BS in biology from Southern Adventist University. In 2011 he completed a Master of Science at the University of Florida in the Entomology and Nematology Department. Thomson began working at the Division of Plant Industry a state organization of the Florida Department of Agriculture and Consumer Services. Here Thomson was introduced to psyllids through his supervisor, Dr. Susan Halbert. In 2016 Thomson received his PhD under Dr. Stansly at the University of Florida in Immokalee, FL. In the spring of 2017, Thomson began his post-doctoral studies involving research gene-based targeting of microbes in Asian citrus psyllids at the USDA Research Lab in Fort Pierce, FL.

Godfrey T. Pazvakawambwa (University of Namibia)

Godfrey Tichaona Pazvakawambwa is a PhD engineering student and the Infrastructure Planning Manager at Namibia Water Corporation. Godfrey has a Bachelor of Science in civil engineering (1992), and a Master of Science in water resources engineering and management (2000). His research interests are in water resources (engineering, management and governance). He has managed water projects in both Zimbabwe and Namibia.

Lillian Pazvakawambwa (University of Namibia)

Dr. Lillian Pazvakawambwa holds a PhD in applied statistics from the University of Namibia, a master's degree in statistics, and a BSC with honors in statistics from the University of Zimbabwe. She has taught theoretical and applied statistics at Mutare Polytechnic, Africa University, Midlands State University, and is currently a senior lecturer and statistical consultant in the Department of Statistics and Population Studies at the University of Namibia in southern Africa. Her research interests are in family health and wellbeing, biostatistics, and epidemiology. She has collaborated with other researchers, presented research, and published in peer-reviewed national and international journals. She aspires to be a full professor in the near future.

Jovicarole Raya (La Sierra University)

Jovicarole Raya is a fourth-year student at La Sierra University in southern California. Throughout her undergraduate career, she has been involved with various research projects in both the Neuroscience and Physics Departments. She is majoring in biophysics and hopes to pursue a career in the medical field after graduation this June.

Gerardo S. Romo-Cardenas (Universidad Autónoma de Baja California)

Gerardo S. Romo-Cardenas completed a degree in physical engineering from Tecnológico de Monterrey and a Master of Science in optics from CICESE. He has teaching experience at CETYS University and the University of Montemorelos. He is currently a PhD student at UABC in the area of biomedical optics with a project detecting and quantifying biomaterials by spectroscopical techniques.

Simone F. Walcott (University of the West Indies - St. Augustine)

Dr. Simone Walcott completed her PhD in organic chemistry–natural product research in 2013. During the course of study, four plant extracts from Mollinidia and Croton were examined resulting in the isolation of some seventeen (17) compounds of which four (4) were novel. Her natural product work has since continued with Solanum stramoniifolium of the Solanaceae family (collaboration with researchers in the Czech Republic). Most recently, she has started testing various natural oils for their SPF activity.

Jonathan M. Wheeler (Stanford University)

Jonathan Wheeler received his bachelor's in physics and mathematical studies, and his bachelor's in engineering at Andrews University in 2016. He is currently pursuing an MS in electrical engineering at Stanford University.

Lucien Nana Yobo (University of Houston)

Lucien Nana Yobo is currently a PhD candidate in Geology. He is interested on the investigation of stratigraphy, sedimentology an geochemestry of carbonate sediments. Outside of his formal school training, Lucien is also interested in issues of faith and science, and he volunteers for a number of community organization and always seeks for opportunities for community engagement. He currently serves as the NAD Student President for Adventist Christian Fellowship.

ANDREWS UNIVERSITY:
STEM PROFESSOR RESEARCH INTERESTS

AGRICULTURE

- *Katherine Koudele* (koudelej@andrews.edu): Dairy management practices; Archaeological faunal remains
- *Ralph Reitz* (reitzr@andrews.edu): Heirloom food plants
- *Garth Woodruff* (woodrufg@andrews.edu): Landscape architecture "sense of place"

BIOLOGY

- *H. Thomas Goodwin* (goodwin@andrews.edu): Systemics, historical dynamics, and paleobiology of fossils; Taphonomy of microvertabrate assemblages
- *Daniel Gonzalez-Socoloske* (gonzalezd@andrews.edu): Behavioral ecology and plasticity of tropical mammals
- *Peter Lyons* (lyons@andrews.edu): Proteolysis regulation of protein and peptide activity
- *David Mbungu* (mbungu@andrews.edu): Neural and hormonal regulation of phonotaxis in crickets
- *Marlene Murray* (mmurray@andrews.edu): Molecular targets of antibipolar drugs
- *Benjamin Navia* (bnavia@andrews.edu): Neural basis of auditory behavior in crickets
- *Denise Smith* (denises@andrews.edu): Breast cancer
- *Brian Wong* (wongb@andrews.edu): Chinese herbs and cancer
- *Robert Zdor* (zdor@andrews.edu): Bacteria-plant interactions
- *James Hayward, Emeritus* (hayward@andrews.edu): Community ecology and paleoecology; History of science

CHEMISTRY & BIOCHEMISTRY

- *D. David Nowack* (nowack@andrews.edu): Cancer marker discovery; Metabolic enzyme inhibition
- *Lisa Ahlberg* (lahlberg@andrews.edu): Organic chemistry; Medicinal chemistry; Culinary chemistry
- *Ryan Hayes* (hayesr@andrews.edu): Synthesis and analysis of dendrimers; Commercialization of novel chemical technologies; Identification of heterocyclic amines from burnt plant proteins
- *Getahun Merga* (mergag@andrews.edu): Synthesis and characterization of noble metal nanoparticles
- *Desmond Murray* (murrayd@andrews.edu): Properties of organic functional groups; Synthesis of small molecules with densely juxtaposed functional groups; Molecular sensing; Hybrid biologics
- *David Randall* (randalld@andrews.edu): Bioinorganic chemistry and spectroscopy; Green inorganic chemistry; Computational chemistry
- *John Rorabeck* (rorabeck@andrews.edu): Forensic chemistry

ENGINEERING & COMPUTER SCIENCE

- *Hyun Kwon* (hkwon@andrews.edu): Biosensors; COMSOL simulation; Sensors with mobile technology
- *Jay Johnson* (jrj@andrews.edu): Stellar activity; Plasma sheet
- *Gunnar Lovhoiden* (gunnar@andrews.edu):
- *Boon-Chai Ng* (ngb@andrews.edu): Materials testing; Intermetallic materials
- *Rodney Summerscales* (summersc@andrews.edu): Natural language processing; Machine learning; Virtual reality
- *Stephen Thorman* (sthorman@andrews.edu): Computer graphics algorithms; OpenGL
- *Roy Villafane* (villafan@andrews.edu): Data mining; High performance computing; Distributed computing; Operating systems
- *William Wolfer* (wolferb@andrews.edu): Human aspect of software development; Software development methodologies and life cycles

MATHEMATICS

- *Lynelle Weldon* (weldon@andrews.edu): Mathematical modeling and data analysis; Mathematics education, especially for resistant learners
- *Anthony Bosman* (anthony.bosman@rice.edu): Low dimensional topology; Knot theory; 3- and 4-manifolds
- *Shandelle Henson* (henson@andrews.edu): Dynamical systems and bifurcation theory applied to animal behavior and population ecology
- *Joon Kang* (kang@andrews.edu): Nonlinear elliptic and parabolic partial differential equations
- *Robert C. Moore* (moorer@andrews.edu): Teaching and grading mathematical proofs
- *Yun Myung Oh* (ohy@andrews.edu): Riemannian geometry; Submanifold theory
- *Amanda Umlauf* (umlauf@andrews.edu): Psychology of teaching mathematics

PHYSICS

- *Margarita Mattingly* (mattingl@andrews.edu): High energy particle interactions and jets
- *Gary Burdick* (gburdick@andrews.edu): Theoretical and experimental optical spectroscopy; Faith and science
- *Jay Johnson* (jrj@andrews.edu): Stellar activity; Plasma sheet
- *Mickey Kutzner* (kutzner@andrews.edu): Photoionization of atoms
- *Lauber Martins* (lauber@andrews.edu): Fuel cells; Thermodynamic optimization; Sustainable energy; Constructal Theory; Power systems
- *Tiffany Summerscales* (tzs@andrews.edu): LIGO and gravitational waves
- *Stephen Thorman* (sthorman@andrews.edu): Solar astronomy
- *Robert Kingman, Emeritus* (kingman@andrews.edu): Special and general relativity; Cosmology; Laboratory equipment design

NOTES

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