SACS-AAPT Fall 2018 Meeting
Clemson University, Clemson, SC
October 12th-13th, 2018

Meeting Program

Friday, October 12th – Kresge Hall
- 5:00pm – Registration
- 6:00pm – Dinner
- 6:30pm – Keynote Speaker, David Abbott, SUNY-Buffalo State College

Saturday, October 13th – Kinard Laboratory of Physics
- 7:00am – Registration
- 8:00am – Session 1 (Invited and Contributed Talks)
- 10:00am – Poster Session, Coffee and Pastries
- 10:40am – Session 2 (Invited and Contributed Talks)
- 12:30pm – Lunch and Business Meeting
- 2:00pm – Workshops
- 3:15pm – Planetarium Show

Questions, comments, suggestions:
Dr. Chad Sosolik
sosolik@clemson.edu
864-656-6916
### Session 1: 8:00 - 10:00

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<tr>
<th>Start</th>
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<tr>
<td>8:00</td>
<td>8:24</td>
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<td>8:36</td>
<td>8:48</td>
<td>Experiments in Ancient Chinese Science and Technology</td>
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<td>9:00</td>
<td>On the Importance of Teaching Physics as an Interdisciplinary Science</td>
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<td>9:12</td>
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<td>9:24</td>
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<td>10:00</td>
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### Poster Session: 10:00 - 10:30

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
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<td>2</td>
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<td>3</td>
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<tr>
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<tr>
<td>7</td>
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<tr>
<td>8</td>
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<td>9</td>
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<td>10</td>
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<tr>
<td>10:40</td>
<td>10:52</td>
<td>Physics Simulations for Class Preparation</td>
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<td>10:52</td>
<td>11:04</td>
<td>Mini-workshop for Teachers Using Bauder Grant Funding</td>
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<td>11:04</td>
<td>11:16</td>
<td>Avoiding Grade Inflation</td>
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<td>11:16</td>
<td>11:28</td>
<td>Specification Grading, Perusall and OpenStax</td>
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<td>11:28</td>
<td>11:52</td>
<td>Invited: Environmental Physics with Remotely Sensed Data and Cloud Computing</td>
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<td>11:52</td>
<td>12:04</td>
<td>Summer RET at Clemson University</td>
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<td>12:04</td>
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### Lunch and Business Meeting: 12:30 - 1:30

### Workshops: 2:00 - 3:00

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<th>Number</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>Perusall – Powerful tool for Flipped Learning Classrooms</td>
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<td>2</td>
<td>Optical Engineering</td>
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<td>3</td>
<td>Integrating Computation into Upper-Level Physics Courses (mechanics using Python/Jupyter)</td>
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Session 1
Saturday, October 13th
Kinard Laboratory of Physics, Room 101

8am-8:24am: **Invited Speaker** Gregory Boeshaar, boeshaarGo@wofford.edu

**Innovative Model for a Non-Science Astronomy Course:** “If you build it, they will come.”

Physics and Astronomy faculty at many small colleges and universities are asked to create captivating lab-course experiences, for non-science majors, that are simultaneously rigorous and approachable. These are typically umbrella courses, fulfilling a general education requirement, for students majoring in everything from Art History to Theater Studies. As one would imagine, this is no easy task and the results can vary wildly.

In this presentation, I will guide participants through the process of designing and implementing a *Themed Non-Science Astronomy Lab Course*. Using *Star Trek of the Mind* as an example (a course created by the Wofford College Physics Department), the instructor will take you through the initial steps of finding a theme, locating resources, developing a syllabus, and selecting lab/experiential activities. Emphasis is placed on a balance of lecture, video, and discussion in the classroom, supplemented by labs and homework exercises. An annotated directory of our department’s videos collection will be quickly reviewed and made available via email to anyone requesting a copy.

8:24am-8:36am: Steve Zides, zidessb@wofford.edu

**Do You Want to Build a Physics-Lit Class; Maybe Try to Add a Play?**

In his 1959 Rede Lecture, C.P. Snow outlined the “two cultures” intellectual division between scientific and humanistic thinking. Although Snow’s lament was not new, dating back to the Arnold-Huxley debates of the mid-nineteenth century, it generated a fervor of academic creativity centered on efforts to bridge the aforementioned intellectual gap. This creative rush of interdisciplinary course design lead to a myriad of humanistic courses covering everything from entropic themes in *The Crying of Lot 49* to the non-Euclidian geometries in the analysis of Braque’s cubist paintings. Unfortunately, most of these endeavors have come from the humanistic side of academia. Where are the reciprocal course offerings within the science community? In this talk, the speaker will present a metacognitive analysis of an experimental introductory physics class that attempts to teach a chronological/philosophical view of the standard physics syllabus through a diverse, optimally selected, set of literary readings. Discussion will include the course goals and objectives, the selection rubric used to identify potential readings, the day to day structure of the course, a special cross disciplinary collaboration with an English Romantic Literature course and a summative assessment of the entire enterprise.

8:36am-8:48am: Matt Marone, marone_mj@mercer.edu

**Experiments in Ancient Chinese Science and Technology**

We have developed a general education physics class for non-science majors based on the inventions and discoveries of ancient China. In this class, we explore these discoveries in their historical Chinese context and through the lens of our current scientific understanding. In the laboratory component of the class, we re-create several different inventions or technologies used by the Chinese in ancient times. Students then analyze the ancient technologies using modern methods and tools. Each experiment has a twofold lesson that addresses the ancient technology and modern laboratory techniques. Experiments include making paper, building a steelyard balance, silk spinning, magnetism, musical instruments, optics, astronomy and bronze casting.

8:48am-9am: Charles Dean, cdean@allenuniversity.edu

**On the Importance of Teaching Physics as an Interdisciplinary Science**

Physics can be a very challenging subject for students of all levels, but especially those at an introductory one. Many teachers rely on a math heavy version, which can easily scare away students before they really start. I have found that a heavy conceptual approach tends to ease most students in and get them hooked. This process includes many aspects from improved pedagogy (Peer Instruction, the Modern Approach, and JITT) as well as a focus on everyday concepts and technical skills (sports, Acoustic Physics, analog devices, and computational/analytical sciences). Even when introducing the mathematical language, it can be beneficial to do so in a way that is flawed in rigor, but simplified and more easily digestible. These all combine to make Physics much more engaging and interactive than the classic lecture approach.
Why was Sir Isaac Newton sitting under the apple tree

When Sir Isaac Newton was sitting under the Apple Tree thinking about the Universe, an apple fell on his head and he invented The First Newton’s Law... Was it Newton’s acceptance of Rene Descartes’ “Cogito ergo sum”? Why was Sir Isaac Newton still sitting under the apple tree thinking about the Universe instead of doing something useful to feed his family? Wasn’t Newton himself giving credit for his First Law to Galileo for seeing that the zero net force leads to rest, or uniform motion? It is essential that in teaching Physics we bring to the students’ attention that Newton’s approach brought physics to the level of understanding of similarity of events that look very different and differences of events looking very much similar. Sir Isaac Newton didn’t “invent Calculus to solve mathematical problems”, but to make concepts of Physics be visible through similarity and differences. This way Newton helps to achieve what Galileo could only complain about: “There are those who reason well, but they are greatly outnumbered by those who reason badly.” Physics is a very convenient field of knowledge for learning logic of making decisions, as it is the study of the Universe described in the language of mathematics and logic. It is essential to teach cadets General Physics to grow them into Generals. This presentation is my another attempt to show the power of reasoning in making conclusions based on research as opposed to descriptions of the “seen events”, to emphasize the power of mathematics as the lasonic language of Physics.


Using the book "The Physics of Star Trek" to Introduce Students to modern physics topics

In 1995, “The Physics of Star Trek” was written by Lawrence Krauss. The second edition of the book was published in 2007. In 1997 the book was used for the first time in my classes to introduce the high school physics students to modern physics topics. These include time travel, the theory of relativity, the Michelson-Morley experiment, the expansion of space, spacetime, the conversion of mass into energy, quarks, antimatter, and more. Strategies that can be used in a high school physics class and introductory college courses to introduce modern physics topics to students will be presented.

Teaching Physics of Global Climate Change and General Education Competencies

The course Physics of Global Climate Change is increasingly popular among Clemson University students. It can satisfy two general education requirements: (1) as a Natural Science Course without lab and (2) as Science and Technology in Society (STS) requirement. I have designed two major assignments that address each of these requirements. First, students will download and analyze individually 60-year time series of daily temperature records using Microsoft Excel to study warming trends. Each student produces a report with quantitative results, graphs and discussion. For the second assignment, students work in groups to create and publish an ESRI Story Map using web-based editing tools. They will choose and research a topic, typically a particular climate impact on the environment and/or society. Students receive dedicated in-class training by instructors from the Clemson Center for Geospatial Technologies how to use the Story Map software.

Graduate Mechanics with Differential Geometry

At the start of graduate studies in physics the mechanics course offers the opportunity to expose students to basic aspects of differential geometry. The geometry of physics permeates almost all aspects of the structure of modern physics, and should be taught as early as possible. The undergraduate curriculum may introduce Lagrangian (and even Hamiltonian) approaches, but usually without a clear explanation of how the transition from familiar vector analysis to the calculus of analytical mechanics occurs. Teaching mechanics with the geometric perspective has many advantages, as this talk will present.
A Comparative Study of Particle Identification Techniques
Cody Brown, Mireya Flores, Kalanie Wilson, and Dr. Nathan Harrison

Typical medium and high energy experiments in nuclear and particle physics involve collisions between different subatomic particles. The goal of these collisions is to force the particles to break apart into their constituents, thus giving insights into the structure of matter at the smallest known scales. In order to "see" the products of a collision, complex particle detector systems are built around the collision point such that the final state particles travel through the different detectors leaving behind some measurable signal. Each detector is designed to measure a particular property of the different particles. From these detector responses it is possible to deduce a particle's kinematics and type (e.g. electron, proton, pion, kaon, etc.). This particle identification process is essential for any high level analysis, however, due to effects such as detector resolution and inefficiencies it can be highly non-trivial. This work is a comparative study of the following particle identification techniques: (1) the traditional cut-based approach, (2) a machine-learning approach, and (3) a probability-based approach. Results suggest that recent advancements in machine-learning algorithms may provide significant improvements over more traditional techniques, with the best results likely coming from a combination of multiple techniques.

A Flexible Model for Investigating the Properties of Starspots: 
Comparison of Model Predictions to Observed Data
Amanda Ash, Jessica Hamilton, Dr. Gregory Feiden

Accurate age estimates provide a wealth of information on various astrophysical processes, such as giant planet formation timescales. However, accurate age estimates remain elusive. Properties predicted by stellar evolution models frequently diverge from the measured properties of real stars, especially when considering cool, late-type stars. There is speculation that starspots – typically unaccounted for in theoretical predictions – may explain the discrepancies between model predictions and observations. To examine the impact of starspots on observed stellar properties, we use a flexible starspot model to generate stellar evolution isochrones that account for the effects of starspots. These new isochrones are then compared against photometric data for the Pleiades and Praesepe open clusters. Three unique classes of starspot models are used to explore the impact of the assumed starspot formation mechanism. We demonstrate that one class of models are inconsistent with the observed data, placing constraints on the depth at which starspots form within a star. Two classes of models are able to reproduce the observed photometric data, with both exhibiting starspot temperatures consistent with expected values, but requiring different surface coverages. Further work will focus on diminishing the effects of observational bias and testing additional observational properties. These efforts will allow us to determine the viability of the remaining starspot models and further examine the question of how starspot formation mechanisms affect stellar structure.
**Irregularities In Young Stellar Models: Are Starspots To Blame?**

Jessica Hamilton, Amanda Ash, Dr. Gregory Feiden

Starspots are dark areas on a star’s surface formed by intense magnetic fields that actively suppress the flow of energy, causing the area to become cooler and darker than its surroundings. Starspots threaten a star’s equilibrium because they prevent energy from leaving the star, causing a buildup of pressure. The prevailing assumption is that increased pressure will cause the star to inflate, producing a cooler and larger star. For this reason, starspots have been proposed to explain why some stars appear cooler and larger than we expect. This requires energy blocked by a spot to be trapped deep within the star where it cannot easily escape. However, the location of trapped energy directly relates to physical processes that produce starspots, but the process is still highly debated. To establish where in a star energy becomes trapped, we developed a mathematical toy model that predicts how starspots affect a star’s color and brightness using six adjustable parameters that directly relate to starspot formation processes. We present results of a systematic study exploring how a star’s color and brightness are affected by each model parameter, linking spot formation theories to direct observables. We find that starspots cause unique observational changes depending on whether energy is trapped near the stellar surface or deeper within the star. When compared against properties of real stars, our model can distinguish between different starspot formation theories, contributing a way to test whether starspots are responsible for the anomalous properties of young stars.

**Using X-Ray Fluorescence To Determine Heavy Metal Content In Spiderwebs As A Measure Of Air Quality**

Isabel Montero, Mark Leggiero, Naomi Nicholson, Chloe Blount

The goal of this research is to utilize spider webs and x-ray fluorescence spectroscopy (XRF) to assess environmental conditions and air quality in and around the University of North Georgia (UNG) Dahlonega campus. We aim to verify the hypothesis that spider webs are more effective substrates for collecting particulates from the air than conventional air filters because of the natural electrostatic charge carried by the spider webs. Additionally, we will demonstrate the proof of principle that XRF analysis of spider webs can be achieved with a portable, handheld system such that air quality through the analysis of spider webs can be done on location. To detect and quantify microscopic amounts of elements in different environments, a Monochromatic Micro-X-ray Fluorescence Spectroscopy (MμXRF) system is utilized, which allows for heavy metal particles to be detected in small or abundant quantities to measure air quality. Additionally, this project has been expanded to include improvement to the current instrumentation. We will explore the applications and benefits of 3D printing, which offers low material costs and allows rapid prototyping in designing essential parts to research. We will implement 3D printing to manufacture effective mountings for the spider web samples, x-ray lenses, and x-ray detector equipment. Using elemental standards, a calibration curve will be developed to compare heavy metal content in between samples collected from areas with heavy traffic and areas with minimal traffic which will allow a determination of air quality and the relation to its environment, i.e. caused by human impact or nature. Spider webs are a unique material in that they are able to filter heavy metals without contributing to environmental pollution, unlike conventional air filters. This MμXRF system has the potential to become the standard for air quality measurement as it is inexpensive and portable.
Poster Session (continued)

A Preliminary Star Catalog for the ASTRA Spectrophotometric Telescope Constructed by Web-Scraping
Austin B. Jowers, James Andrus, Saul J. Adelman

Dr. Saul J. Adelman obtained a Major Instrumentation Grant from the National Science Foundation to build an automated 20” telescope. Its spectrophotometer is a low-resolution spectrograph which cross-disperses the light with a prism and records it using a small CCD. It observes as a photometric instrument covering the region 3400 Angstroms to 7200 Angstroms with a resolution of 14 Angstroms in the first order and 7 Angstroms in the second order. Observations of faint naked-eye stars should take about 20 seconds. The ASTRA Spectrophotometric telescope should have its first light in the next few months. Based on its observing location in Southern New Mexico, that the faintest single stars observed in an hour will be about V = 10th magnitude, that it will observe stars from near the North Celestial Pole to declinations near 30 degrees South of the Celestial equator, and that cannot separate close binary stars of nearly equal magnitude, Cadet Austin B. Jowers constructed the basis of a catalog of observable stars which are referred to by their HD (Henry Draper Catalog) number as almost all potentially observable stars are listed in that catalog. Due to the instrument’s power and location the catalog used for ASTRA was assembled using a web-scaper written in Python by James Andrus. The scraper collected the HD number, HR number, ICRS coordinates, B and V magnitudes, and spectral type of all HD stars in SIMBAD between declination -35 and 90, with B and V magnitudes less than 10. Several methods utilizing the SIMBAD and Vizier websites were then used to gather stars within the coordinate and magnitude range that were not listed in the HD catalogue, and to collect the Separation values of double stars. All this data was later organized in Microsoft Excel.

Precision Top Quark Mass Extraction From Boosted Jets
Mac Sanders and Seth Iwan

The top quark mass, \( \sim 173 \text{ GeV} \), is an important fundamental parameter of the Standard Model of particle physics. The uncertainty in its value affects precision fits, limiting the ability to test the Standard Model and constrain new physics. At the Large Hadron Collider (LHC), the most precise experimental top mass extractions are based on the kinematic reconstruction of the top quark through its decay products which yields enhanced sensitivity to the top quark mass. Theoretical calculations of such observables are complicated by non-trivial selection cuts in the collider environment, multiple disparate energy scales, and non-perturbative effects. We perform Monte Carlo simulation studies of a related observable, the boosted top jet mass spectrum, based on a new theoretical framework that address the previously mentioned issues. We investigate the sensitivity of this observable to the top quark mass and compare the simulation results to theoretical predictions.

Brownian Motion Study in the Introductory Physics Laboratories
Tatiana Krivosheev and Tommy Stell

We present a computational and experimental study of Brownian motion designed for the use in the Introductory Physics Laboratories. The experimental study is performed by suspending the 1μm polystyrene nanoparticles in distilled water at a 3 drops/50mL concentration. The motion of the spheres is captured using a microscope fitted with a Moticam X camera. The resulting videos are used to track the particles using Tracker 5.0.2 software with a subsequent statistical analysis performed in Jupyter electronic notebooks, and accompanied by a numerical simulation of two dimensional Brownian motion.
Poster Session (continued)

**Acousto-Optical Bragg Imaging of Organic and Inorganic Materials, with Schlieren Imaging Applications**
Gunther Martin

I constructed an Acousto-Optic Bragg imaging system in the Solid State lab of the Department of Physics and Astronomy. Our main objective was to construct an inexpensive and stable imaging system and be able to image a biological object using ultrasound. For this purpose, we constructed a 7 MHz square transducer using a 3D printer available at the College. The propagation of a high frequency wave and metal objects were successfully imaged using this newly constructed system. The next step is to image a biological object such as a leaf. Image processing techniques were utilized to enhance the images obtained. The schlieren photographic technique was also used to study the interaction between an ultrasound beam and laser light.

**Constructing Neural Circuits: An Integrated Optical Tweezer Microelectrode Array System for Directing the Axonal Cytoskeleton and Modulating Synaptic Strength**
Bradley Scammon, Elizabeth Carman, Rachel Eiman, MacKenna Judge, Kimberly O’Brien, Landon Phemister and Dr. Joshua Alper

The effectiveness of computational metaphors for describing brain function has motivated models that promote the neuron as the fundamental functional unit of the brain, asserting that memory and cognition emerge from the spatial arrangement of neurons into networks. The evolution of such models has led to network models capable of mimicking limited forms of learning and intelligence while methods for manipulating and recording neural activity have become increasingly precise. Despite these developments, our only means of constructing neural circuits with single-cell resolution resort to physically confining the cells, compromising the very adaptability underlying the learning mechanisms we seek to understand. To avoid this compromise, we developed an integrated optical tweezer microelectrode array system (MEA) that adjusts intracellular Ca$^{2+}$ to reconfigure the axonal cytoskeleton to effectively direct the growth cone of live neurons. Moreover, the optical tweezer enables the precise arrangement of individual neurons onto the surface of an MEA, which permits the electrical excitation and recording of neural activity. This system will be used to relate the electrical and mechanical characteristics of optically-induced synapses to structural changes in the cytoskeletal components of the growth cone. Additionally, we will investigate changes in polymerization rate and density of post-synaptogenic actin to changes in intracellular Ca$^{2+}$ explored as a potential method for directly modulating synaptic strength.

**Connection Between Electrostatic Interactions and Binding Affinity of Dynein and Microtubules**
Hailey Lovelace, Matheu Spencer, Jared Eller, Hugo Sanabria and Joshua Alper

Cytoplasmic dynein motor proteins move cargo along microtubules to drive cellular processes. A recent computational study suggested that long-range electrostatic interactions between microtubules and dynein affect their binding affinity and regulate the function of the motor. However, these associations must be validated with experimental evidence. We expressed several wild-type and mutant microtubule binding domains (MTBD), the sub-domain of dynein that interacts directly with microtubules, with variegated predicted binding energies. We are imaging the expressed GFP-tagged MTBDs as they interact with microtubules using epifluorescence and total internal reflection fluorescence (TIRF). We will determine the binding affinity through quantitative image analysis. We are also using fluorescence correlation spectroscopy (FCS) to independently confirm the binding affinity. The results will help us determine the importance of long-range electrostatic interactions in dynein’s ability to carry cargo along microtubules.
Session 2
Saturday, October 13th
Kinard Laboratory of Physics, Room 101

10:40am-10:52am: Christopher Wozny, cwozny@dalcnonstate.edu
Physics Simulations for Class Preparation
Many collections of physics simulations have been created over the years, including the PHet collection, ActivPhysics and physlets. This new, free collection I have developed are specifically designed to mimic the experiments students will complete in the laboratory, with an emphasis on data collection and analysis.

10:52am-11:04am: Bon Powell, bpowell@westga.edu
Mini-workshop for Teachers Using Bauder Grant Funding
The authors received funding from the Bauder Fund of the American Association of Physics Teachers (AAPT) in January, 2018 to do a mini-workshop on “Motion and Measurement” for in-service early childhood and middle teachers using Physics Teacher Resource Agent (PTRA) techniques. These ten hours of professional development were delivered on June 4-5, 2018 on the campus of the University of West Georgia. Kinematics provided content driven activities and engineering, literature, and technology lessons. The participants were provided with lesson plans and “make and take” activities for their schools to share with their students and peers. All activities are correlated with the Georgia Performance Standards (GPS). The standard AAPT/PTRA standard evaluation form was used. Participants circled the number 7 (very satisfied) for survey questions dealing with materials, facilities, leaders, content, and usefulness of the content.

11:04am-11:16am: Alexis Nduwimana, anduwimana1@gsu.edu
Avoiding Grade Inflation
Have you wondered whether your grading is too generous or too harsh? Are students running away from your class or towards you for an “easy A”? This talk will give you a strategy on how to strike a proper balance.

11:16am-11:28am: Ted Forringer, eforringer@ggc.edu
Specification Grading, Perusall and OpenStax
Specification Grading, as discussed in the book of the same title by Linda B. Nilson, is a grading system which allows us to increase the rigor of an introductory course while at the same time improving student success. Specification grading is comparable with any teaching pedagogy, as it only addresses how student grades are assigned. In short, the basic tenants are: give many short quizzes rather than few tests. Require a minimum competency (typically 80%) to “pass” a quiz. Allow student to retake quizzes which are not passed on the first try. Assign grades based on the number of quizzes passed rather than a weighted average of quiz grades. This system eliminates partial credit, attendance points, homework points, and all other ways of earning a grade without mastering the material. At the same time, it gives students multiple chances to demonstrate mastery and an incentive to keep studying until they learn.
My talk will show how I implemented specification grading in my course using Perusall and the OpenStax physics textbook. As a part of this process, I have authored “specification documents” with a summary of the required skills, practice problems, textbook reading, and example quizzes. These documents will be released under a Creative Commons license. The work has been supported by an Affordable Learning Georgia grant.

11:28am-11:52am: Invited Speaker: JB Sharma, jbs.sharma@ung.edu
Environmental Physics with Remotely Sensed Data and Cloud Computing
The confluence of advances in sensors+platforms, computing, broadband and algorithms and the data deluge of free satellite and aerial remotely sensed data presents new possibilities for physics education. Platforms like the Google Earth Engine are accessible via broadband and provide scalable cloud computing. All the public domain satellite and aerial data for the entire world is available along with a powerful javascript based image processing API for developing particular applications. This talk will begin with a presentation of examples of GEE in remote sensing, research and education, with a particular focus on physics education, undergraduate research and outreach. This will be followed by hands on activities including the GEE Explorer, data exploration, supervised classification, and an introduction to a GEE-API based coding environment. The talk will end with a discussion in which the participants will share their thoughts on how GEE may be used in their educational, research and
outreach efforts. Curricula developed for remote sensing applications using GEE will be shared with the participants. All participants should have a Gmail address and need to request a ‘trusted tester’ access to GEE. This will give participants access to the JavaScript coding environment within GEE. Coding experience is not necessary and participants will have activities with modifying existing code. The trusted tester access can be requested at least a week in advance from: https://signup.earthengine.google.com/#!/.

11:52am-12:04pm: Rob Sheffield, rsheffield@laurens55.org
Summer RET at Clemson University
A discussion documenting the partnership between Laurens County School District 55 and the College of Physics and Astronomy at Clemson University. Particular attention will be paid to the professional development provided for Laurens County teachers by Dr. Chad Sosolik and Dr. Sean Brittain. Additionally, Rob Sheffield of Laurens District 55 High School in Laurens, SC will share his experiences of the past two summers as a part of the “Summer Research Experience” for Teachers hosted by Dr. Rod Harrell and Dr. Sosolik as an extension of their Summer Undergraduate Research Experience (SURE) Program: Solid-State Devices for Electronics, Photonics, and Magnetics Technology.

12:04pm-12:16pm: Christian Hawkins, hawkinscg@g.cofc.edu
Coalescence and phase transitions of sulfur hexafluoride in microgravity under a shallow quench
Critical fluids have a variety of applications from manufacturing high-tech materials like aerogel to industrial lubrication and extracting oils from foods. Phase separation of critical fluids cannot be studied on earth due to the rapid increase in compressibility near the critical point and stratification of fluids by density in gravity. We used direct imaging to record snapshots of phase separation that takes place in sulfur hexafluoride, SF6, under weightlessness conditions on the International Space Station (ISS). The system was already at liquid-vapor equilibrium slightly below the critical temperature and further cooled down by a 0.2-mK temperature quench that produced a new phase separation. Both full view and microscopic views of the direct observation cell were analyzed to determine the evolution of the radii distributions. In addition, in microscopic view, we found the interface line to move at 449 nm per second and measured the diameter of droplets and bubbles in the system throughout multiple coalescence events leading to further support of the coalescence-induced-coalescence model.

12:16pm-12:28pm: Tatiana Krivosheev, TatianaKrivosheev@clayton.edu
Brownian Motion Study in the Introductory Physics Laboratories
We present a computational and experimental study of Brownian motion designed for the use in the Introductory Physics Laboratories. The experimental study is performed by suspending the 1μm polystyrene nanoparticles in distilled water at a 3 drops/50mL concentration. The motion of the spheres is captured using a microscope fitted with a Moticam X camera. The resulting videos are used to track the particles using Tracker 5.0.2 software with a subsequent statistical analysis performed in Jupyter electronic notebooks, and accompanied by a numerical simulation of two dimensional Brownian motion.
Perusall – Powerful tool for Flipped Learning Classrooms
Dragos Amarie, Georgia Southern University
Contact: damarie@georgiasouthern.edu

As Flipped Learning Classrooms become more common, its implementation as part of our teaching strategies is not as easy as it may seem. The effectiveness of this technique is determined by students’ preparation before class, this way the classroom time is used to deepen students’ understanding. By using Perusall, a flexible platform for pre-class preparation, Instructors extend the in-class experience to between classes. Perusall is enabling students: to proactively engage with each other about class materials, to get instant feedback to their questions from both peers and Instructor, to prepare them better by giving them personalized guidance and by allowing them to motivate each other, and to enjoy the texting experience, so much imprinted in our Generation Z’s DNA. One other major advantage of Perusall is the one-page summary of concepts that our students had trouble with, or most engaged them, along with selected examples of the best thoughts Instructor can praise in class. Perusall not only helps the students, but also helps the Instructors by allowing me to start my class by discussing the automatically generated “student confusion report”. This way I customize the in-class experience to actively help students where they need help with. In this workshop I will talk the audience though the process of creating a new class, a new pre-class assignment and welcome everyone become my “student” for a hands-on experience.

Optical Engineering
Ann Robinson, Sharon Kirby, and David Todd, University of West Georgia
Contact: arobinso@westga.edu

The objective of this workshop is to help teachers convey a sense of excitement about technology in a short period of time. Initial demonstrations will be given that can quickly capture the attention of their students. After that the field of technology called “optical engineering” will be introduced. To illustrate what optical engineering is all about silicon wafers, silicon lens, lasers, flashlights, Slinkys, polarizers, and liquid crystals will be used in several activities. Fields of engineering such as mineral, civil, mechanical, computer and ceramic are used to develop the optics demonstrated in the workshop. Also, technical degrees in physics, chemistry, electronics and photonics are necessary if students would like to work with optics. Participants will have group discussions, hands-on activities, and will take home theme packets as well as some materials to be used in their classrooms.

Integrating Computation into Upper-Level Physics Courses (mechanics using Python/Jupyter)
Larry Engelhardt, Francis Marion University
Contact: LEngelhardt@fmarion.edu

In this workshop, we will introduce participants to activities and strategies for integrating computation into their upper-level physics courses. For several years, we have been integrating computational activities into our upper-level courses at FMU. Before the workshop, we will ask participants which specific upper-level courses are of interest to them: Mechanics, EM, Quantum Physics, Thermal Physics, or Computational Physics. During the workshop, participants will be introduced to, and will work through, computational activities for the courses that they selected. We will also introduce participants to additional support that is available from PICUP (the “Partnership for Integration of Computation into Undergraduate Physics”: www.gopicup.org)
Parking

Friday, October 12, 2018 (Kresge Hall)
Parking at Kresge Hall is available without a permit (Google map).

Directions to Kresge Hall (GPS Coordinates: 34.620832, -82.846473)

- From US 76 proceed 4.5 miles down State Rd. S-4-56 (also called W. Queen St.) to Charlie White Trail (entrance to Clemson Outdoor Lab)
- Turn left onto Charlie White Trail – Kresge Hall will be at the end of the road (0.8 miles)

Saturday, October 13, 2018 (Kinard Laboratory of Physics)
Registered participants will be given parking permits for Clemson University campus at Friday night dinner or Saturday morning at Kinard Laboratory of Physics (Google map). [GPS Coordinates 34.677794, -82.835122]

Parking near Kinard Laboratory of Physics is available in lots E-6 (the Sikes lot) and E-15 (the Cooper library lot).

Hotels

A block of rooms has been reserved at Hotel Tillman and the Holiday Inn Express and Suites. We have secured conference rates at both hotels -- mention the SACS-AAPT meeting when reserving rooms.

<table>
<thead>
<tr>
<th>Hotel</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel Tillman</td>
<td>1303 Tiger Blvd.</td>
<td>(864) 653-6000</td>
</tr>
<tr>
<td>Holiday Inn Express and Suites</td>
<td>1381 Tiger Blvd.</td>
<td>(864) 654-9410</td>
</tr>
</tbody>
</table>

Campus WiFi Connection

Clemson University has guest WiFi access that should allow you to connect your laptops, tablets or cell phones to our network. For those of you attending a workshop that requires network access, this should be sufficient.

1. Open your wireless connections and click "clemsonguest"
2. Wait for a dialog box to pop up with a checkbox to accept the terms. Please read through the terms, then you must check the box to agree and press login.
   If this does not pop up automatically, you may need to manually open your web browser and try to navigate to a webpage before it will redirect you here.