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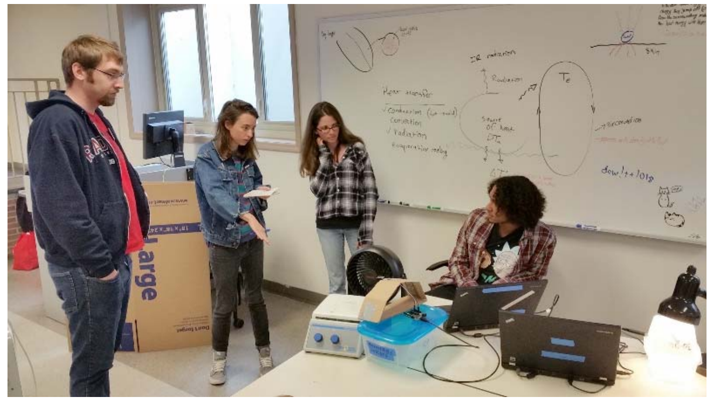
Physics REALISE Postdoc Leads Make-a-Thon

On Saturday, Oct. 27, Dr. Todd Rutkowski led a make-a-thon for students and faculty interested in addressing the question, “Why do only some animals sweat?” Dr. Rutkowski is our REALISE Teaching Postdoc for the HHMI Inclusive Excellence grant.

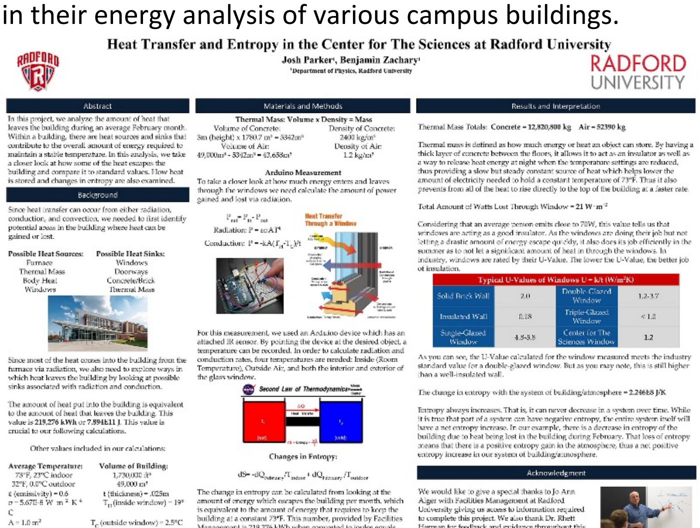
Workshop participants were given Arduino microcontrollers and several temperature & thermal sensors, plus Vernier LabPros with other sensors, to address the question. They spent the next few hours designing experiments and building experimental equipment.



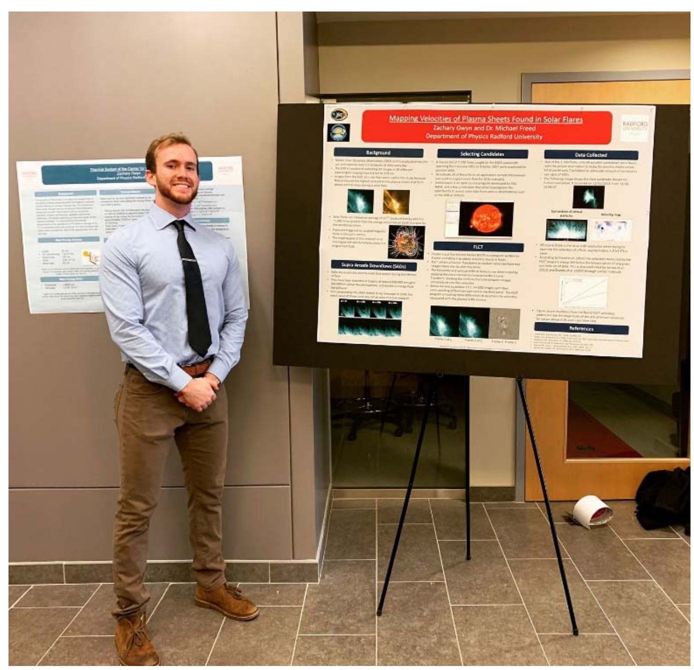
Freshman physics majors Sam Williams (seated above) came up with an interesting use of an Arduino with an IR surface temperature sensor. He used this setup to determine the colling curve for Biology Department-supplied samples of both fur and hair. His results showed that fur was more efficient at losing heat and thus anaimals with fur would have less need to sweat in order to cool off. This work may lead to a publication along with a potential for creating cross-disciplinary labs.

Physics Students Present at ACSAT Forum

Physics students counted for one-fourth of the 60+ presentations at the December 6 Artis College of Science and Technology’s Research Forum. Dr. Sandra Liss had two students present the results of their research projects from her “Energy and the Environment” class. Cory Ashworth (Physics May ’19) presented his ongoing research with Dr. Huston and the Scanning Tunneling Microscope. Dr. Herman’s Thermodynamics & Statistical mechanics class presented their semester-long projects in their energy analysis of various campus buildings.



Zach Gwyn (pictured below, Physics May ’19) presented his ongoing research with Dr. Freed and their studies of solar fluid dynamics. Zach hopes that this work with fluids – albeit exotic plasma fluids! – will lead to his goal of going to graduate school in aerospace engineering.

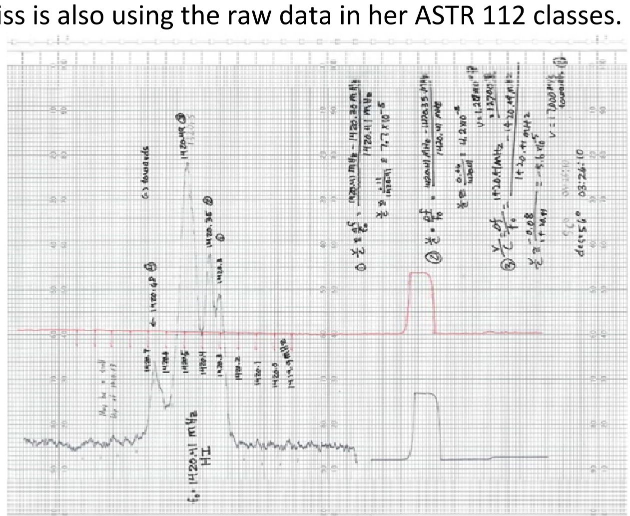


Green Bank 2019

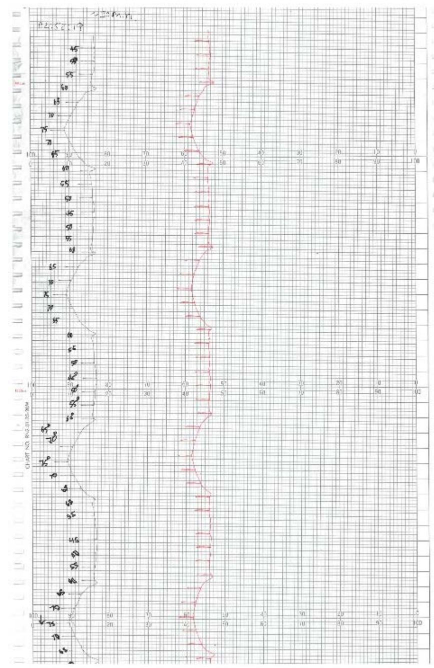
On the weekend of January 18-20, 2019, 6 members of the Radford University Society of Physics Students and three faculty members traveled to the National Radio Astronomy Observatory at Green Bank, West Virginia, to learn about radio astronomy.

We obtained more data than usual because this was on the weekend prior to the start of the semester. The group arrived at Green Bank on Friday afternoon in the entirely unusual circumstances of it being ***still light outside***! This was the first year that we had 3 faculty members join the students – Drs. Freed (below, far left), Liss (2nd from left), and Herman (far right).

We obtained data on the frequency shifts of various interstellar hydrogen clouds. We used the data to calculate their radial speeds relative to us. However, Dr. Freed was then able to use these data in his ASTR 422 class to calculate the total mass of the clouds using the intensity of the peaks (note the 500 Jansky calibration peaks) as well as a few straightforward assumptions. Dr. Liss is also using the raw data in her ASTR 112 classes.

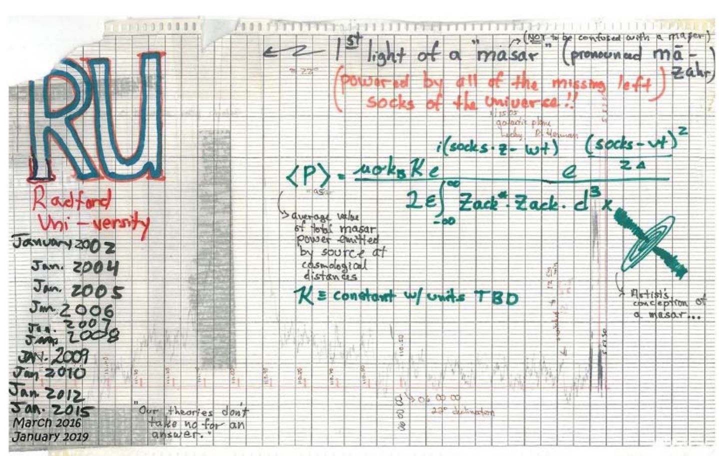


This year saw a concerted effort to “paint” the radio sky and obtain data on a grid that encompassed the plane of the galaxy. Typically we point the declination-only (no axial [side-to-side] motion) 40-foot teaching telescope at a point in the sky and obtain spectral data. Or, we let Earth’s rotation carry the antenna across an object.



This time we used both Earth’s rotation as well as the antenna’s declination motor to make a grid in the sky – we would run the declination in one direction for 30° in 2 minutes, and then backwards for the next 2 minutes. This gave the pattern in the image to the right, which shows 4 such 2-way sweeps. Note that the antenna’s declination is marked by hand on the scan. Dr. Freed’s ASTR 422 class is using this to create a 2d intensity map of our galaxy’s plane, the results of which we hope to publish in the next newsletter.

Many of you have been on this trip, and some have even used this trip as a springboard to careers in this field! We will certainly continue with these trips!

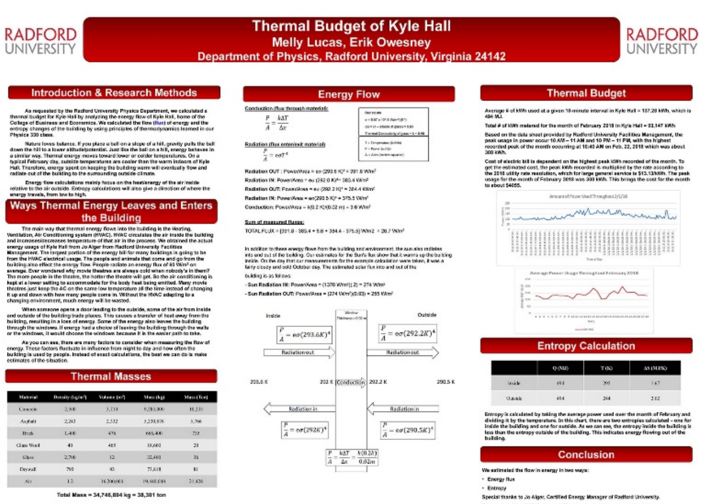


Project Based Learning

Project Based Learning (PBL) is a mathod of learning in which classes are given real world problems to explore and potentially solve through well defined milestones throuhgout the semester. Unlike the old-style semester-long projects, PBL involves continual faculty involvement and feedback as the various intermedite milestones are achieved.

PBL has been shown to increase student learning by giving students an active role in their curriculum, and by providing them with an experience that goes beyond the traditional lecture- and cookbook-lab-based academic setting. [Filkins and Doyle, 2002; Kuh, 2008] PBL has also been shown to increase the academic success of women, students of color, and low-income students.

PBL was piloted in PHYS 330 – Thermodynamics and Statistical Mechanics in the fall of 2018. This project was presented to the class as a "memo" from the Physics Department asking the students to perform an energy analysis of a campus building. Groups would have to find the overall energy use of the building they chose. One thing that surprised the students is that there is one person (and has been for years) whose job it is to monitor every KWh of energy used on campus. They also were required to use an instructor-built sensor (yes, Arduino based) and use that to obtain some data that would allow them to determine one aspect of the energy flow into and out of that building. Their final products were posters that they presented at the Artis College of Science and Technology's December 6 Research Forum.



A unique outcome of this inaugural PBL class involved a guest speaker for the class, Mr. Jorge Coartney, Executive Director of Facilities Management for Radford University.

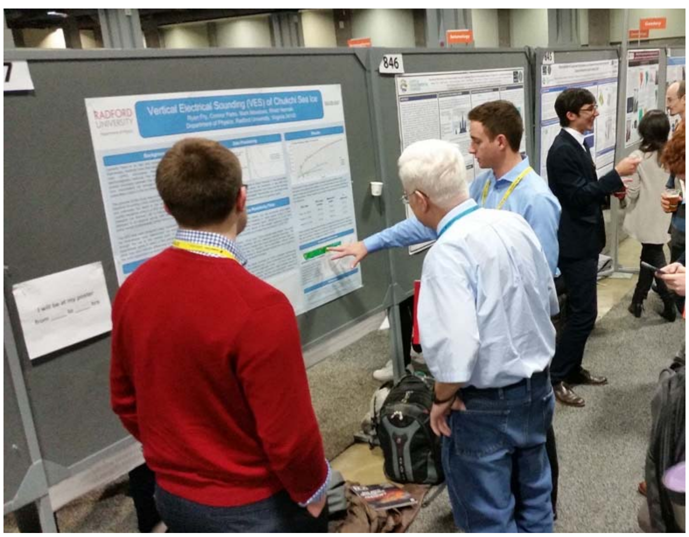
After he talked with the PHYS 330 class, Mr. Coartney and Ms. JoAnn Alger, Mechanical Engineer with Facilities and their Energy Management Controller expressed interest in the students' upcoming December 6 presentations. After seeing the poster and the students' work, they decided that this needed to be expanded to the entire campus for the benefit of the University, with the direct result of cost savings that could be passed down to the students. As of the writing of the newsletter, 5 students from the PHYS 330 class are in the process of being interviewed for a full time (40 hours/week) 3-month summer job doing an energy analysis of all campus buildings.

Due to the success of this pilot of incorporating real Project Based Learning into the classroom, PBL will be employed in multiple classes in the future. Class-appropriate projects will be instituted in PHYS 221 and PHYS 301 (Meteorology) in the fall of 2019 and we look forward to reporting the results to you in future newsletters.

Arctic Research at AGU Fall Meeting

Throughout the fall of 2018, four students worked on the data from the Spring 2018 research trip to Utqiagvik (ne' Barrow), Alaska. Their goal was to get two posters ready to present at the Fall Meeting of the American Geophysical Union in Washington, DC, December 10-14, 2018.

Three students worked on the results of using the OhmMapper capacitively coupled electrical resistivity array in a non-traditional manner in a vertical electrical sounding (VES) of the sea ice. Three trials of this VES method were conducted during the 2 weeks in Alaska. The analysis of the data from each of these yielded ice thicknesses within 4% of that obtained by drilling into the ice. This was consistent with the preliminary results from the 2016 trip.

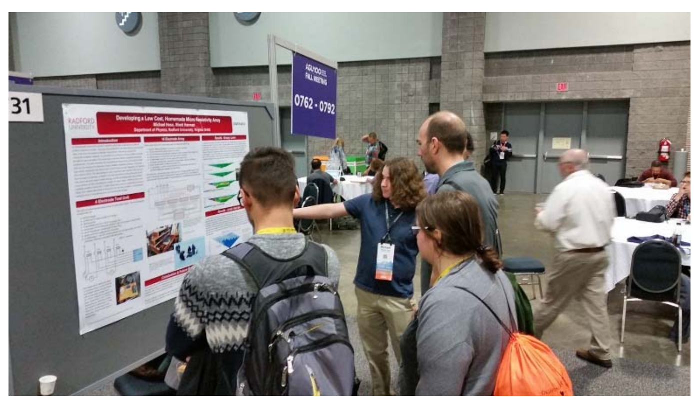


Above: Ryan Fry (left, red sweater) and Mark Meadows (far right, pointing) talk with RU alum Glenn Jolly (, center, currently with the USGS in DC) about the VES method of determining the depth of sea ice. AGU Fall Meeting 2018.

Due to the robust results from these VES surveys, we feel confident that this method will be the most fruitful to pursue on future trips. However, on those future trips we do plan to create our own equipment to perform this VES survey. The results of that equipment development will be reported in future newsletters.

The other poster presented at the AGU meeting concerned some RU-designed and -built equipment that was deployed on the sea ice in its “trial by ‘fire’ ” inaugural run. Michael Hess and Dr. Herman worked for over a year to design and build a version of a professional resistivity array that would cost $30,000. However, this 16-electrode array cost only ~$100!

While it would not be used in a professional setting, their “micro resistivity array” yielded data comparable to a professional array, albeit with less automation than the professional version. In our version the voltage and current data from the array had to be obtained by hand with (very good) multimeters. Since the final version of the array was completed only days prior to leaving for Alaska, it was very tough on all involved to see if the initial deployment would actually work. Fortunately, it did, and it actually worked under conditions where our $30,000 professional array actually failed!



Above: Michael Hess (pointing) explains the workings of the micro resistivity array to just a few of the numerous scientists who came to talk about his project. AGU Fall Meeting 2018.

Our Newest Assistant Professor

We introduced Dr. Sandy Liss in the previous newsletter as a one-year temporary faculty member. However, after a national search in the fall of 2018 for the tenure track version of this previously one-year position, we are pleased to announce that Dr. Liss was the successful applicant in this search. Her background in observational and theoretical astrophysics complements our department well, and we look forward to reporting more of her continued great work in the future. Note that, even in her one-year temporary role, she was mentioned multiple times in just this newsletter for her outstanding research and teaching work with students. We think the picture below from the 2019 Green Bank trip perfectly sums up her infectious, winning attitude!

Reed-Curie Renovations Update

nThe Reed-Curie renovations are on track to be finished during the 2019 fall semester. As many of you know, the shroud – the bane of existence for so many of us! – is now gone, and actual *windows* that see the actual *outside* will be installed soon. In addition, there will be a new 2-story glass-walled atrium between the buildings, the frame of which is in the picture below (taken March 13, 2019). This will certainly lighten up that hallway connecting the two buildings.

We will be moving a few things late in the 2019 fall semester. The final move will happen during the 2019-2020 Winter Break. All classes and labs will be open for the 2020 spring semester.

Contact Us

Let us know how you're doing, what you're doing, and where you're doing it!

Update your information here!
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