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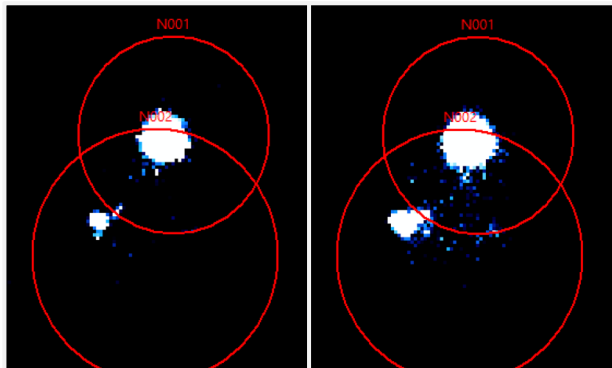
SPS Outreach!

### 2021 Dean’s Scholar – Researcher & Future Teacher

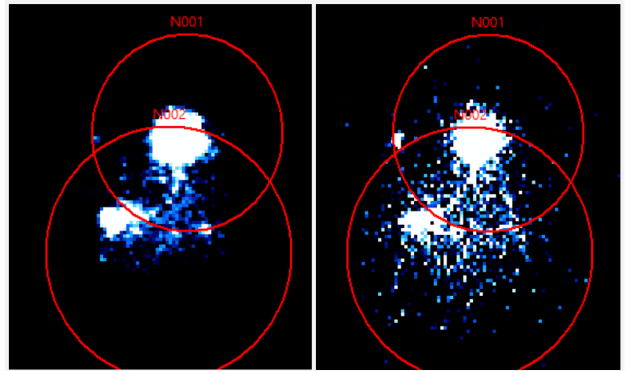


Caitlynn Fischer was named the Physics Department’s 2021 Dean’s Scholar in recognition of her academic performance, research experience, and outreach efforts. Originally from San Antonio, Texas, Caitlynn transferred to Radford University in the Fall of 2019. She has recently earned her B.S. in Physics with a minor in Astronomy and plans to teach physics at the high school level. In addition to excelling in her undergraduate courses, Caitlynn completed graduate level courses through RU’s College of Education and Human Development. Following graduation, Caitlynn is diving right back in – she will be pursuing her M.S. in Curriculum and Instruction through RU’s graduate program in Education (as several of you have done!).

Caitlynn was awarded a Summer Undergraduate Research Fellowship through RU’s Office of Undergraduate Research and Scholarship. During Summer 2020, she worked with Dr. Liss to study the distribution of star forming regions in 104 interacting, low-mass galaxy pairs (208 individual galaxies).



*Images showing pairs of interacting dwarf galaxies.*



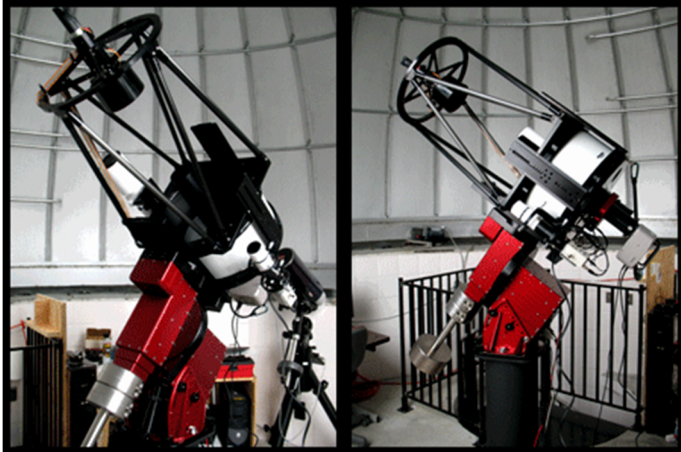
This project required her to generate color maps from the 5-color Sloan Digital Sky Survey optical images, perform a qualitative and quantitative analysis of the age and temperature distributions revealed by these maps, and contextualize the results with other astronomical objects. She presented her results at the Fall 2020 Student Engagement Forum.

Caitlynn also provided invaluable service to both the university and the broader community. She worked as a teaching assistant for introductory physics and astronomy courses and served in a leadership position in RU’s Society of Physics Students. As part of SPS, she co-authored a successful Marsh W. White Award proposal. This competitive award supports projects designed to promote interest in physics among K-12 students and the general public. Along with other members of SPS, she used this award to develop an AM radio-building activity for students and faculty at Radford High School. Caitlynn also served as an instructor in the July 2020 Summer Bridge Women in STEM program, which focused on the science behind both current and future plans to visit Mars. We’re looking forward to having her return to teach in this program in the Summer of 2021!



### Selu Observatory Update

We've been working hard over the last year to get the Selu Observatory up and running, and now we're closer than ever! The 14.5-inch RCOS telescope now has a modern control board, a freshly cleaned primary mirror, and a recoated secondary mirror. We've also been able to purchase two new instruments: an imager and a spectrograph.



None of this would have been possible without Steve Conard of the Johns Hopkins University Applied Physics lab, along with Roger Yeager and Jack Gross. These three engineers and astronomy enthusiasts generously donated their time and expertise to allow us to revitalize this facility. Though COVID-19 delayed our original March 2020 plans, visits finally happened in November 2020 and May 2021. These were very productive, and the observatory is now very close to opening.

Once completed, we'll be hosting public observing nights, training students in astronomical techniques, and facilitating student research at the observatory.

Check out the Selu Observatory website for updates: <http://www.radford.edu/observatory>

We will be inviting you all to come visit this amazing eye on the universe that will serve our students and faculty for years to come. This will be especially true for students who are in our Astrophysics Concentration within the Physics major. Look for an announcement in the near future.

### Project Based Learning – A New Way to Learn

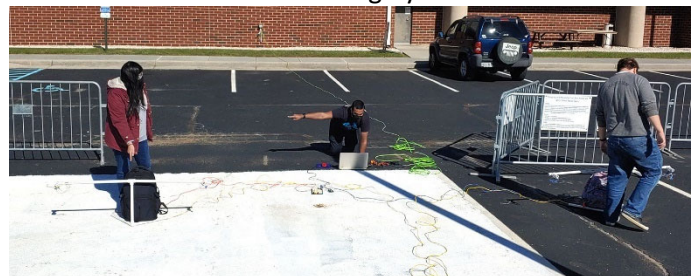
Project Based Learning (PBL) is a new perspective on the old “semester projects.” In the old projects, a topic was given, and then the student's results were reported at the end of the semester.

PBL involves semester long projects that reflect more of what our graduates will encounter in both industry and graduate school. These projects are chosen prior to the semester, with numerous intermediate goals set to guide students towards project completion. They are closely mentored throughout the entire process. These projects are chosen not just for intellectual curiosity, but also for the purpose of inclusion in students' resumes.

Another such PBL initiative was in the 2020 Fall PHYS 330 – Thermodynamics and Statistical Mechanics class. In this project, students were tasked with determining how painting parking spaces white (to increase their albedo) would affect Earth's energy balance. The students planned their own intermediate goals to best advance the project. To go beyond theory, they actually painted 2 parking spaces (at the Facilities building) white!



Once the spaces were painted, they deployed Arduino microcontroller-based sensors to collect data to address the question. They reported their results to the Department – and others – at the end of the semester. Bottom line: Yes, painting parking spaces white would slow Earth's inexorable heating by a small amount.



### Arctic Geophysics – Student Driven Research

Over the years – since that first trip with James Inman in 2006! – many students have participated in the Arctic Geophysics research program. You know that the 2019-2020 “Arctic Cycle” had evolved from the research being faculty-driven to the research being student-driven. One more modification to this program has now been made for the 2021-2022 Arctic Cycle.

In the one-hour PHYS 324 – Arctic Geophysics Preparatory Seminar students will plan their own research, submit proposals for conducting that research, and get started building their equipment. Then they will finish their sensor builds (using your friend and mine, the Arduino!) in the 4-hour PHYS 325 – Arctic Geophysics Field Research, and travel to Utqiagvik, Alaska for one week during February 26-March 12, 2022, to gather their data. More information may be found here: <https://www.radford.edu/alaska>

This new way allowed a full contingent of Arctic researchers to be determined in advance. There are now 11 in-residence RU students plus the upcoming 2 students from the Southwest Virginia Governor’s School. The 11 current RU students include majors (and some double majors) in Physics, Geology, Computer Science, and Biology. Many of them are already thinking about what question they would like to address with their data-gathering, and all are excited to be in this program.

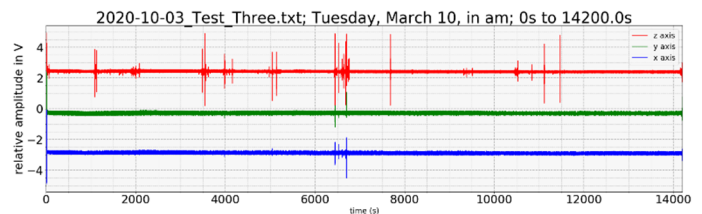
For the first time, students were able to sign up for the 2-course Arctic Geophysics research program in the regular spring class sign-up. They still had to apply and be accepted (and unfortunately not everyone who applied could be accepted due to space limitations). But this now allows students to definitively plan both curricular and financial considerations in advance.



### Arctic Geophysics Researchers at AGU Meeting

Three students from the 2019-2020 Arctic Cycle presented their work with separate posters at the 2020 Fall Meeting of the American Geophysical Union (AGU). Due to the Covid-19 pandemic, the meeting was virtual, but nonetheless just as prestigious and well-attended. This was the first time that 3 separate RU posters were presented.

Hunter Witt presented his results from two high-precision 3-axis seismometers of his own design. This work will certainly continue with the next trip.



Deanna Perales (left) presented her results from the high-precision ocean pressure sensor that she built and deployed under the sea ice. Deanna will return to further this work in the upcoming Arctic Cycle.

Katelyn Collett (right) presented her work identifying microorganism distributions throughout the sea ice.



### Faculty Changes

Dr. Michael Freed decided to leave academia after the 2020 fall semester. He took a position with the Prairie Island Nuclear Generating Plant in Minnesota. This was a natural fit for him since the same principles of nuclear power for our sun – the subject of his doctoral and ongoing research – apply to the generation of nuclear energy. We all wish his well in this endeavor.

We were fortunately told that we would be allowed to replace Dr. Freed. We completed a national search, and our newest physicist is Dr. Riddhi Mehta. Dr. Mehta just received her PhD in high energy astrophysics from Purdue University. Her thesis is titled *Physical mechanisms to understand high energy emissions from Magnetars*. Dr. Mehta states, “The purpose of my research is to gain a theoretical understanding of the physical mechanisms that cause some of the most energetic emissions in the universe, namely, giant flares from magnetars. As a graduate research assistant, I accomplish this through building analytical models and running high resolution simulations in C using the PLUTO code to predict and reproduce astrophysical observations as closely as possible.” We are looking forward to Dr. Mehta joining the Physics Department and bringing her strong teaching and research abilities.

### Arctic Geophysics & Crowdsourcing

There will be another crowdsourcing campaign this summer to support the Arctic Geophysics students. As many of you know, this experience does require travel to, and living in a beautiful but *expensive* location – Utqiagvik, Alaska. The total estimated cost per student for this one-week research trip is approx. \$2,800. This includes both the ~\$1,400 plane ticket and then another ~\$1,400 for all expenses for the week in Alaska.

This campaign will officially begin at 8am (yes, a time that often doesn’t exist for physicists!) on **Monday, June 21**, and will continue for at least one week (but perhaps 2 weeks). We are working with University Relations to put the finishing touches on the campaign’s website, which will have a quick donation link. Previously, we had raised a total of \$4,500 to help these students! You will receive an email right before June 21 with the link to that web page. We hope that you will donate as you are able for the next generation of students.

### SPS – “Electrifying Electronics” Outreach

In the late fall of 2019, the SPS submitted a successful proposal -authored by some of you! – for a Marsh White Award grant from the National SPS office to fund an outreach effort. The funds from this were to purchase the components for local K-12 students to build their own unpowered radios. Well, COVID struck, and the implementation was delayed. However, the current SPS students did not one, but two such outreach events, both via Zoom. The SPS put bags together with all of the parts, and delivered them to the two schools in time for the students to pick them up.

The first event was with two physics classes at Radford High School. A total of 20 RHS students plus their teacher joined the Zoom session on a clear Wednesday afternoon, the kind of weather that’s not good for AM radio. Four SPS students led individual Zoom breakout rooms to give more personal instruction. Things went at least OK, with a couple of the RHS students saying that they “thought” they heard a signal. However, the RHS students enjoyed the idea of building things, and learning about some basic circuitry. And, they really took pride in learning to use real breadboards.



We learned several things from this event. First, we learned that our breakout room leaders should not be in the same room! The cross talk was pretty intense. We also learned that we needed to send them the crystal earphones that work with really weak signals – we had them use their own earbuds, which we discovered (too late!) assumed some type of amplifier circuit.

We also learned that our students should work in pairs, with one person being the “primary instructor” while the other monitored the high school students in the breakout rooms for signs of confusion, or simply to pick up questions that the “primary” missed.

The second of these outreach efforts happened in mid-April of 2021 with physics students from the Southwest Virginia Governor’s School. We incorporated all of the lessons learned from the first time, and things went much better. This time, we had our SPS teams in separate rooms and that cut out the cross talk.



Having two team members working together allowed them to catch more questions and better troubleshoot things. When the first radio signal was heard by one of the high school students – even on yet *another* clear afternoon! – everyone was very excited. The SPS learned even more lessons from this event and will continue to improve this outreach for future events.



## Support RU Physics and Our Students!

Here are the links for supporting us with your comments, news, and information (and perhaps a donation ☺ ).

<http://www.radford.edu/physics>  
<https://www.radford.edu/alaska>  
<https://planetarium.radford.edu/>  
<https://www.facebook.com/Radford-University-Physics-252289272464/>

To donate **directly** to the Physics Department, or one of the funds supporting the department, click the following link:

<https://connect.radford.edu/give>

After filling in your donation amount, go to the pull-down list and select “Other (please specify).” Then type any of the following into the box:

RU Physics Department  
Arctic Geophysics  
Physics Faculty/Alumni Scholarship  
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