



Department of Physics



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Friend

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Dear Friend :

With the academic year coming to an end, it is time to give you the latest update on the Physics Department news.

In addition to the two graduates we had in December, the department had another graduate, Benjamin Sherwood, this spring. Under the supervision of Dr. Keith, Ben has completed his senior research project to build a maglev train. The wooden one-cart model train was presented to the public in May. The cart is capable of levitating above the track due to interaction of electromagnets attached to the track and permanent magnets mounted on the cart and track. The original design proposed for this project has been substantially modified and the geometry of the track and the cart was changed several times to be able to finally lift the cart. After graduation Ben is planning to apply to a graduate program in Mechanical Engineering.

The other senior research project was completed by Arthur Ross. You may recall that under the supervision of Dr. Renfro, Arthur was working on modifying a malfunctioning adsorption spectrophotometer owned by the Chemistry Department to convert it into a modern/digital piece of equipment. Arthur had to replace many of the spectrometer parts and install a new stepper motor to control rotation of the prism from the computer, using LabVIEW programmed software. In the process of working on the spectrometer it was discovered that, along with many other parts, the photoelectron multiplier has failed and would have to be replaced. This was not the part of originally proposed budget and timeline for the project, therefore after Arthur has completed his part Dr. Renfro will continue working on the spectrometer to replace photoelectron multiplier and put the finishing touches before it will be ready to work again. Unfortunately Arthur was transferred to a different Air Force Base at the beginning of May, so he had to put his graduation on hold and will need some additional time to finish with his class work from this semester. We hope that he will graduate in December.

This year's junior, Heath Koop, has started his work on the senior research by completing a proposal of what he is going to be doing next year. According to the proposal, Heath is planning to design and build an induction smelting furnace used in melting and casting metal parts. An induction furnace reaches higher temperatures more quickly and efficiently than the department's current combustion furnace. In this project Heath will construct a small furnace with an insulation canister and electronic controls. Heath will be working under supervision of Dr. Keith. The Science and Math Advisory Board has awarded the "Charles and Lisa Bloomer student research stipend" to Heath to work on this project. This is the fourth award since the stipend was established by SMAB four years ago and the fourth time when the award has been won by a physics student, even though several awards were given out this year, one going to Physics and others to students in the Biology Department. We are very grateful to SMAB for their continued support of the Physics program and congratulations to Heath!

The students in engineering dynamics this spring completed a practical final exam that not only tested their ability to design and build a rotational system as well as follow an engineering format in a report. Students were given the task to design a mechanism that took a form of kinetic energy and turned that energy into an electrical form using a small DC generator. Students chose to use belt and pulley systems. After designing their projects and drafting the parts in SolidWorks 3D CAD, they built their devices. They then used a GoPro3 camera to video their devices in motion. Then using video analysis software they collected data to verify the theoretical calculations they used to decide on their designs. To finish the final exam, they submitted their work in a

standardized lab report format in a Word Document format. Students not only tested their ability to do engineering, but also were tested in their ability to put their results in a reporting document.

We had six freshman students in University Physics course this spring. Most of them will continue on to the sophomore year. Among them are two very bright young men Kent Grimes and Taylor Freehauf. Taylor has been serving as a new physics student worker for the department and did an excellent job not only setting up the lab equipment, but also taking an inventory and cataloging all of our equipment. Taylor has also helped to repair the old model steam engine which was not working for years. Both Kent and Taylor were named outstanding physics freshmen of the year. Starting from their first year, they have been actively participating in the Society of Physics Students. In particular, this year SPS has started the project to rehabilitate the old "Physics Department" neon sign. The sign which was made by physics student(s) in 1976 (as the tag says, but if you know the history behind it, please let us know) has been sitting at the top shelf in the stock room for years and was not used. This year SPS decided to find the right power supply and to construct the suspension system, so that the sign can permanently be mounted on the glass wall in front of the entrance to the department. The group of SPS students has design the suspension system using SolidWorks software and has started building that system. You can see the pictures of some steps of that process on our Facebook page.

Since our freshman enrolment is not clear yet, as always, we are asking you to help us identifying more prospective students. We do need and appreciate your help in that, so If you know of a prospective student who might be interested in pursuing a degree in physics or pre-engineering, please give that person our contact information and/or direct him/her to our web site.

In January together with the West Texas Science Center, AISD, and the other two universities in town the department hosted Dr. David L. Lambert, the current director of McDonald Observatory. Dr. Lambert obtained a B.A. in physics in 1960 and a D. Phil. in solar physics in 1965 from the University of Oxford. His contributions to research in astronomical spectroscopy have been recognized with numerous prestigious awards. Dr. Lambert is one of the most productive and innovative astronomers in the world. In over 35 years of research, Dr. Lambert has over 450 publications. He has established the fields of Cosmochemistry and Galactochemodynamics and continues to lead them. His current research emphasizes precise analyses of the composition of evolved stars to determine how the chemical elements are synthesized by stars, along with studies of the chemical evolution of the Galaxy as revealed by the chemical composition of unevolved stars. Dr. Lambert's lecture in the physics department was open to public and attracted a large number of students and faculty. In this lecture, aimed to general audience, Dr. Lambert discussed production of chemical elements in the course of different stages of stellar evolution.

In April all physics faculty and a group physics students, including Taylor Freehauf, Kent Grimes, and Nicholas Conklin, traveled to the Texas Section of the American Physical Society (APS), American Association of Physics Teachers (AAPT) and Society of Physics Students (SPS) joint meeting at Tarleton State University in Stephenville, Texas. For the students it was the first professional meeting they have ever attended. So, even though it was too early for them to present, they have gained some valuable experience on what a professional presentation should look like and what to do and not to do during such presentations. Some of the notable talks during the meeting were the ones given by the national experts in their respective fields.

Dr. Wolfgang Christian of Davidson College is the nationally recognized leader in using computer simulations for teaching physics. He was talking about "Building a national library for computational physics education at all levels". Dr. Christian's physics java applets, also known as "Physlets", have been successfully used in physics education during the last decade in many universities around the country including McMurry University. The theme being set by Dr. Christian's talk has been further exploited in other presentations, including Dr. Bykov's talk devoted to "Integrating computational physics problems into upper division physics curriculum" at McMurry. Dr. Bykov emphasized that learning computational physics methods in the context of typical physics problem enhances understanding of both numerical and programming aspects. He also gave examples of the types of computational physics problems being considered in Classical Mechanics, Thermodynamics and Electricity & Magnetism courses to illustrate the main numerical methods used in physics. It was pleasant to see that our physics department is doing things very similar to the ones done by the leaders in the field of Physics Educations, such as Davidson College, Baylor and Angelo State University.

Another interesting talk was by Dr. Joseph Nagyvary from Texas A&M University, who studied power spectra of vowels in Old Italian violins, including those of Guarneri and Stradivari, and compared these spectra to the spectrum of human voice in operatic singing. Dr. Nagyvary was inspired to start studying physics of string instruments back in the 1950s, when he had a chance to play and study the violin which originally belonged to Albert Einstein.

This semester we have continued the active use of the renovated machine shop. Some of the new equipment in the shop was used for the projects mentioned above. In addition to that the department has started collection of used aluminum cans in an effort to use recycled aluminum in physics student projects. Dr. Timothy Renfro built a small smelting kiln using a 5 gallon metal bucket, furnace cement, K-wool, and a flame tube made in the machine shop. About 20 gallons of aluminum cans were melted



down to create the ingots pictured below. The heap of material in the paint bucket is slag, a byproduct consisting of a mix of metal oxides and foreign materials that separates from the aluminum during the process. The ingots were cast using a steel muffin pan. You can view the whole process on our Facebook page. Future smelting runs will also involve recycled copper, brass, and steel. Students will not only be learning how to recycle metal, but later will be using sand and lost-wax casting to fabricate parts for their own projects. The machine shop is getting busy! The department would like to thank the students and faculty that have been donating cans as well as Dr. Walker-Millar in the art department for supplying the K-wool.

**WARNING.** If you attempt to do this on your own for some reason, please take appropriate safety precautions. Molten metal will cause 3<sup>rd</sup> degree burns on contact with the skin. And person handling molten metals should be covered from head to toe with protective clothing.

In late May, after 11 years of service, Dr. John Russell has announced his decision to retire as President of McMurry University effective June 1st. It is difficult to overestimate Dr. Russell's contributions serving McMurry, but to the physics program his contribution was even more important. Many of you had Dr. Russell as an instructor in Engineering Statics and Engineering Dynamics courses. Some of you received valuable advice from him working on your senior research projects. Dr. Russell is also a member of the McMurry Chapter of Sigma Pi Sigma, National Physics Honor Society. The physics department would like to thank Dr. Russell for his support of our program and his service to our students during his years as McM president. The fact that Dr. Russell was able to find time out of his busy schedule to teach for the department and to work with the students meant a lot to us. We wish him a very happy retirement and to remain active and creative in his service to the global academic community.

Congratulations to Dr. Keith on the birth of his second daughter, Ella, in March! We are glad to see the entire Keith family at our SPS meetings every week. The physics community is growing.

We always like to welcome our alumni back and would like to see more of you coming here, giving talks and meeting with the students. We have not had a chance to host anybody this spring, so if you happen to pass through Abilene, please do let us know about your visit. One of the best occasions to visit is during the Homecoming weekend. This year it will take place on October 4<sup>th</sup>-6<sup>th</sup>. You will receive a special invitation to the Science Homecoming Reception in the fall. This year will also mark the 55<sup>th</sup> anniversary of the Physics Department.

These were just some of the very many news we had during this spring. You can always keep track of our current events by visiting us on Facebook. Look for the McMurry Society of Physics Students group page.

If you have been recently added to our database and never received this letter before and/or by some reason want to be removed from the list and/or prefer to update your contact information and/or prefer to receive an electronic instead of a paper copy of this letter, please do not hesitate to contact me at the address above or by email at [tbykov@mcm.edu](mailto:tbykov@mcm.edu).

Tikhon Bykov - Wayne Keith - Timothy Renfro, The McMurry Physics Department