1-7-2009

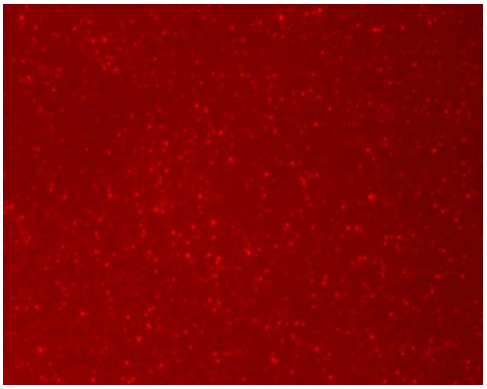
Arkansas Physics Times, January 7, 2009

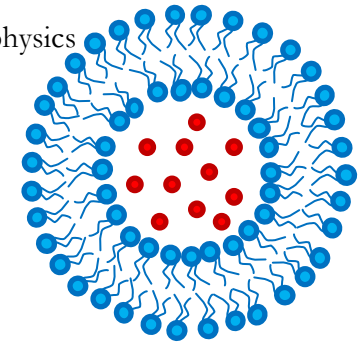
Society of Physics Students (American Institute of Physics)

Arkansas Physics Times
'THE TRUTH SHALL MAKE YE FRET'

Research Experience for Undergraduates and Study Abroad Adventures! Summer 2008

Rachel Lee, Senior: I spent the summer here, continuing research started in August 07. I'm still working on the same project this semester. I am part of the HHMI Drug Delivery team with Dr. Salamo. Our official title is "Developing and Visualizing Nano-Carriers for Cellular Drug Delivery." I work on the carrier part. The project is really fun and I especially enjoy the fact that our work encompasses biology and chemistry as well as physics. I am getting to learn all sorts of biophysics things I would not have found in traditional classes like EM and quantum. When Dr. Salamo first suggested I join this project, I was nervous because I knew very little about anything having to do with drug delivery. It has turned out very well as I have learned many new and exciting things. I would definitely recommend a similar experience to anyone. Pictured above:1 um diameter Liposomes containing Doxorubicin and Nanomagnets. Pictured right: Cartoon of liposomes with materials inside.





Calendar of Events

- Monday Feb. 2, SPS Meeting, 5:30 p.m. Come for officer nominations, t-shirt orders, and pizza!
- Monday Feb. 16, SPS Valentine's Day Game Night, 5:30 p.m.
- Saturday April 4, SPS Ice Cream Social Outreach Event

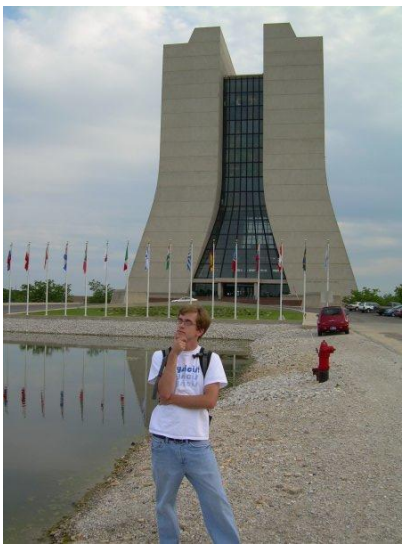
Ashley Stewart, Senior: My research interests are in cosmology and observational astronomy, so I was incredibly excited to spend the summer at Kitt Peak National Observatory in Tucson, Arizona. There I worked on analyzing the effects of scattered light on stellar photometry. After applying to many REU programs in astronomy, I chose Kitt Peak because it's one of the best. I'd say it's the best. My work over the summer provided an interesting new perspective, totally different from what I've been doing at UA. Learning about instrumentation really broadened my range of experience. I would recommend this program to anyone interested in astronomy. Kitt Peak is a great experience and they take excellent care of their students. For the application process, start EARLY! Also, pick programs you're really interested in that are in places where you'd enjoy living for 10-12 weeks. Pictured: Ashley in her green rubber mirror cleaning outfit.

Joseph Snow, **Junior**: This last summer, myself, six other students at the UoA, and a professor took a trip to Japan and stayed there for roughly 3 weeks. We visited mainly two places: Shimane and Tokyo. Tokyo is a very modern metropolis, while Shimane is a more laid back and rural place with numerous and well-preserved historical sights and sites. The trip itself was great fun. We visited Shimane University and Kanto Gakuin University, met some official folk, and went out at night with students from the universities who had volunteered to show a few foreigners a good time. Most notably, language skills are not a pre-requisite for the Unfamiliar Japan program, and most of the students we met were majoring in something like English and could understand our English far better than we could understand their Japanese. Since this program doesn't focus on beefing up your language skills (although brushing shoulders with native speakers is helpful), its primary focus was to show Japan to folks who knew very little about Japan. We were practically tourists 24/7, and there are so many reasons you should want to go. If you're interested, check out <http://studyabroad.uark.edu/1414.htm> or feel free to seek out and talk to Tatsuya Fukushima, the UA professor in charge of the program. The program title is Unfamiliar Japan.

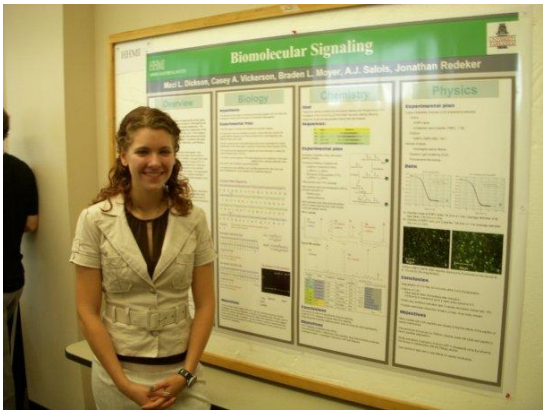
Marshall Scott, Junior: I had an amazing experience at the REU last summer. Since the REU was here in Fayetteville, I got an opportunity to talk and become acquainted with many of the physics faculty, learn more about their research and the types of projects going on in the physics department, and see the many labs and equipment we have here. I also met many new people and developed a network of friends from other colleges around the country.

What I enjoyed the most about the REU was the research. Theoretical physics is my passion and I got an enormous opportunity to do some research last summer with Dr. Bellaiche. Officially, my research was in computational condensed matter physics, which just another way of saying that I worked with computational simulations of crystals under the influence of varying electric fields. So I spent the greater part of my summer working on a supercomputer and reading about physics…time well spent. Pictured: Supercomputer!

Josiah Walton, Senior: I am interested in experimental and theoretical high energy physics, particle astrophysics, atmospheric physics, and geophysics. This summer, I participated in an REU at Fermi National Accelerator Laboratory (Fermilab). There I worked at the D0 detector, as part of the single top quark group, searching for weak signal of single top quark production at the Tevatron. I was originally attracted to this project by the chance to work at one of the leading, if not the leading, particle accelerators in the world, alongside physicists at the forefront of high energy physics research. Before my summer internship at Fermilab, I was very fascinated by high energy physics but I didn't know definitely if high energy was the path I wanted to pursue. The summer internship gave me the opportunity to get a "taste" of the field and immerse myself in the dynamic environment unique to particle physics. It was an invaluable experience. I would absolutely recommend a similar experience to other students. For others considering summer research with its potentially daunting application process, I advise being completely honest and fully displaying your enthusiasm for science. You need to express yourself in a mature, scientific manner and demonstrate that you are capable of scientific research. You should also have interests in particular fields, although they need not be specific or binding. Reviewers are looking for people who have done their homework on possible careers and who excel in research and academic ability. They don't want people who have no clue what they want to do. Coming from a smaller school, use this fact to your advantage in your essays; summer programs in these exciting areas were developed specifically for people like us at the UA. Pictured above: Josiah at Fermilab Headquarters



AJ Salois, Sophomore: This past summer I continued working with the Howard Hughes Medical Institute Biomolecular Signaling Research Team. My team and I are studying a protein sequence (dLipin) found in the DNA of a fruit fly, which shares similar qualities with the peptide Lactoferricin, an antimicrobial agent that interacts with membranes. We want to see if dLipin does similar things. Our team is composed of students and professors from the Chemistry, Biology, and Physics Departments.



For my part of the project I make vesicles, or model membranes, using peptides and the lipid DMPC. Using Dynamic Light scattering and Fluorescent Microscopy I am hoping to find out how these peptides interact with the model membranes. Dynamic Light Scattering uses a laser to scatter light off of the very small particles, this light is then captured by a Photomultiplier tube and the signal gives me a correlation curve which can then be used to find the particle's radius. These vesicles are so small that they approach the diffraction limit and Dynamic Light Scatterings provides an accurate way to measure them. My next goal is to make sure that the laser is not interacting with the sample and causing them to degrade. I use a fluorescent microscope to look at vesicles I have made with a larger radius. This confirms that the vesicles have been picking up the fluorescently labeled peptides. Soon I will be making vesicles with a much larger radius so that I can see the membrane itself. Then I can find out how the peptide is attaching to the membrane.

Doing research with Dr. Oliver for this project has been one of the most beneficial and educational experiences I have had at college so far. I look forward to working with him and the rest of my team for the rest of this year, and next year I will to start on my honors thesis research which will be another exciting adventure. Being in this program has really made me believe that everyone who has the slightest interest in research should talk to their professors about getting started as soon as they can, it is very exciting. If you would like more information about the program on this campus visit the website http://hhmiinfo.uark.edu/

Adam Barito, Junior: Over the summer, I participated in a National Science Foundation REU at the University of Arkansas. Under Dr. Gordon in the mechanical engineering department, I worked to optimize the crystal structure of aluminum oxide films deposited by physical vapor deposition in a plasma environment. Most of my work was done in the Engineering Research Center where I worked with an inverted cylindrical magnetron sputtering system. The system is composed of two cylindrical aluminum targets located on the outside of a cylindrical chamber. Each aluminum target is connected to a mid-frequency power supply. For the alumina deposition process, I first pumped argon gas into the chamber. Then, I created a plasma (a sea of flowing electrons and ions) by initially pulsing high power through the aluminum targets. The plasma was then sustained by alternating the top and bottom as anode and cathode many times a second. Charged particles were attracted to the oppositely charged targets at high speeds and bombarded the surfaces, sputtering off aluminum particles. An axial magnetic field was also used to trap the electrons in close proximity to the aluminum targets. Oxygen gas was pumped into the chamber and allowed to react with the aluminum particles. The oxygen-aluminum mixture (aluminum oxide) then settled onto a number of substrates placed at the bottom of the chamber. Most of my research involved systematically studying the crystal structure of the deposited alumina films as a function of target power, chamber pressure, oxygen partial pressure, and substrate voltage. Specifically, I tried to determine the combination of system variables most conducive to producing the alpha-phase crystal structure of aluminum oxide. I conducted 39 experiments designed to demonstrate the full capabilities of our magnetron system and then began to characterize and analyze the deposited films through X-ray diffraction and scanning electron microscopy. I have continued my work into the fall semester with more rigorous analysis of all 39 films. My hope is to work with my research group to finish the detailed study by the end of the semester. From there, we will decide how best to proceed in achieving alpha-alumina films.

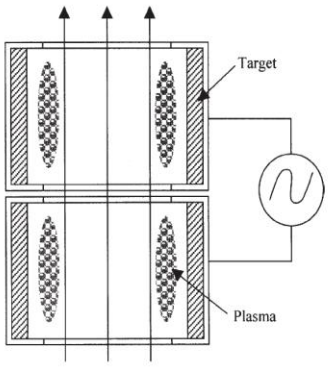


Figure 1. Cross-Section of Inverted Cylindrical Magnetron

Despite Less than Stellar Record, SPS Soccer Season Filled with Brilliant Plays

The prowess of many graduated or otherwise unavailable physics students and Elaine's mad soccer skills in particular were sorely missed this season. The SPS team went 0-3 against formidable opposition. This was a downright depressing showing compared with the tournament bid achieved two seasons ago. Scheduling conflicts resulted in Newton's 2nd Law of Funk playing short for the first two games, which set a negative tone for the season. Hopefully the team will have better luck, and perhaps convince Dr. Bellaiche to play with them, next year.

SPS Soccer Team Fall 2009: Colin Paul, Holly Jackson, AJ Salois, David Lachut, Nestor Figueroa, Shawn Ballard, Josiah Walton, William Lewis

The most valuable player for Newton's was easily our goalie, David. Despite the added challenges that came with a short team, David defended the goal like a champion, making countless saves and keeping the team from soul-destroying losses.

Graciously supplementing the underrepresented female members of the team, AJ Salois joined Newton's for the final and most exciting game of the season. Valiantly defending the backfield, AJ made the three best plays of the game. First two hand balls in short succession, followed by a gravity defying block. Blocking the goal with her stomach, AJ was blasted clear off the ground by the ball.

Above: David directing a defensive player

Above: AJ planning her brilliant plays

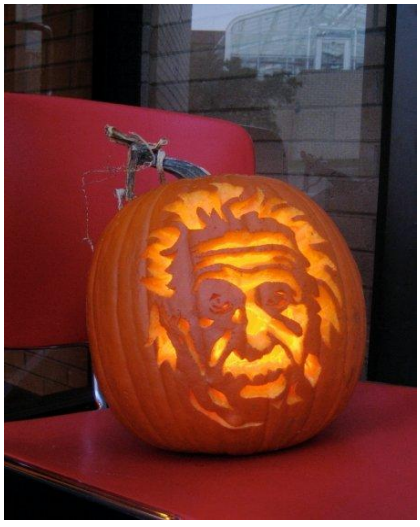
Special thanks to Events Coordinator Holly Jackson for organizing intramural soccer this year.

Right: Going for a goal!

Haunted Lab 2008

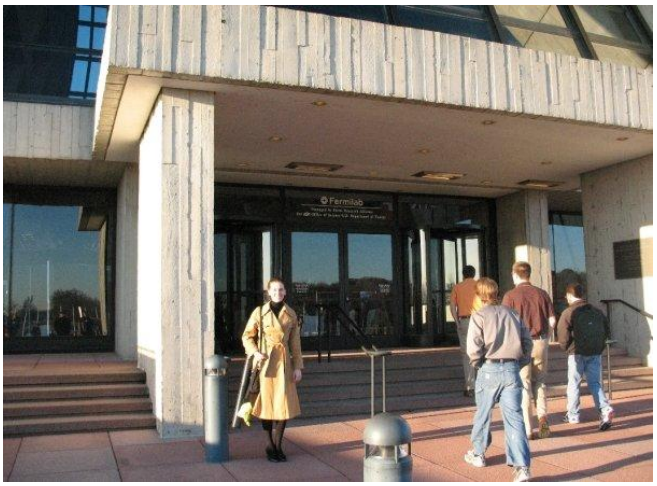
The annual Haunted Lab Halloween outreach project was a fantastic success this year. Haunted Lab 2008 had more kids, more nitrogen, and more fun. SPS thanks everyone who participated and looks forward to an even greater production next year.

Joseph Snow, Angela Hendrickson (above) and Rachel Lee (right) having fun with the Van de Graaff



Clockwise from top left: Dr. Stewart and guests discussing Van de Graaff; Cat Woman, Shawn Ballard, and Bar Wench enjoying the demos; Pion, Matt McKnight, and Batman digging into liquid nitrogen ice cream; and Einstein pumpkin.

This November a group of SPS members traveled to Fermilab to participate in the 2008 Quadrennial Congress of Sigma Pi Sigma. Several students presented posters, and all benefitted from the interaction and exchange of ideas with other SPS members and scientists from around the country. Holding the conference at Fermilab meant the added bonus of getting to tour the facility. Though the conference featured several scientific talks, there was a larger focus on being a scientific citizen. Talks focused on things like what SPS can do to help science education or how to get involved in everything from local to national politics.



Above: AJ Salois outside Fermilab. Above right: Rachel Lee presenting her poster. Right: Nathan Willems, Dr. Stewart, AJ Salois, and Matt McKnight.

Above left: Max Gutierrez, Nathan Willems, AJ Salois, and Rachel Lee at lunch with a Fermilab scientist. Above and above right: AJ Salois, Josh Bacon, Dr. Stewart, Matt McKnight, Max Gutierrez, Rachel Lee, and Nathan Willems enjoy breakfast at Einstein Bros.

Monster Sudoku

Instructions: Each row, column, and box must contain the numbers 0-9 and the letters A, B,C.

	8	D	1		2	4		3				0		A	
9			3				1		8				2		D
	6	2		3				D		7			E		5
			C				6					3		F	
			9		5	0			D	A			B		
0				9			A	5	3					1	E
			A	6	D	3			E	1	B				9
E	B				F		C			4	0		6	2	
	9	6		5	C			1		2				B	0
B				8	7	F			A	D	9	2			
7	1					2	9	6			C				F
		4			B	6			0	5		C			
	F		4					E				5			
2		B			9		3				1		D	4	
8		0				C		9				1			B
	D		6				0		2	B		9	A	7	

Monster Daily Sudoku: Wed 7-Jan-2009 medium

Good luck!

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