

Undergraduate Research Center Newsletter

!!!IMPORTANT!!!

As you all (hopefully) know your top of the pops, the cherry on your sundaes, the time for the fireworks, i.e. the research conference, is going to be on August 1st. It is crucial that everyone sends us the following information by Friday, July 20th:

ARE YOU MAKING A POSTER OR GIVING A PRESENTATION?
WHAT IS YOUR TITLE?

Another requirement for the participants in the summer research program is the *submission of an abstract*. You must do this at http://departments.oxy.edu/urc/students/submissions_links/abstract_submission.htm

Also, for those funded directly by the URC, you will need to submit *a final report*. This should be five to ten pages and should be submitted as an email attachment. If you are preparing a report for your mentor, you can submit a copy of that report.

You should review your award letter from the URC to determine exactly what is expected of you at the end of the summer.

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RESEARCH ETHICS PANEL- July 18th, noon Lower Herrick

Research ethics is one of the most important facets of the summer research program. At the panel you will have the opportunity to ask questions and take part in a responsible scholarship discussion, so please come prepared to raise any concerns that you may have.

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Time to Say Goodbye/ Don't You Cry Tonight

A nice opportunity to share memories from the past summer with your friends, a URC-sponsored dinner at *Meals by Genet: European and Ethiopian Fine Dining*, will take place on August 2nd. The food is said to be fantastic, and the restaurant looks cozy, sweet, exotic- you name it. First 30 people to e-mail igeorgieva@oxy.edu will go for free. You don't want to miss it.

One Week to Go

**July 18, 2007
12:00 noon**

**Research Ethics Panel
Lower Herrick, includes lunch**

**July 25, 2007
12:00 noon**

**Joseph Schulz, Biology Dept.
Samuelson Pavilion, includes lunch**



A Raging Saturday

It was Saturday, last Saturday, but not an ordinary one, let me tell you. Because it was time for Raging Waters! Not surprisingly, the water park, which is the third biggest in the US, was full of children, their parents, and a substantial number of adventurous couples.

We had three vans, and since they all started at different times, it was impossible to locate the other groups once we got there. However, this did not prevent us from having fun. Neither did the monstrous lines in front of the most popular rides! The rides were rated with a number from 1 to 4, depending on how scary they were. Undoubtedly, the most challenging one was the Drop Out- a high vertical "ride"



(do you call this thing a ride? It was dreaming-of-a-suicide type of thing). To our group's shame, no one gathered the courage to go on it, but the group from Mike Adams' van did (with two exceptions, and one ☺ extreme experience. Here is the moment to say thank you for the bribes, I am not disclosing your identities AND extreme experiences, you-know-who). However, we went in the small kids' section, and I can assure you that this rocked to no end. A tiny problem arose when my highness and Mr. David Bergner got too excited and decided to try one of the slides there. Apart from the fact that we were tripping over babies on our way to the coveted slide, we also got scolded by the personnel. And I thought it is important to preserve the child in oneself... Alas!

A BIG thanks to everyone who came! Next time we must go on Monday evening, though, no crowds will be involved, and we will slide, and slide, and slide forever.

Students' Corner

Jonathan Beck

Fiducialization of events in the DRIFT Dark Matter Detector



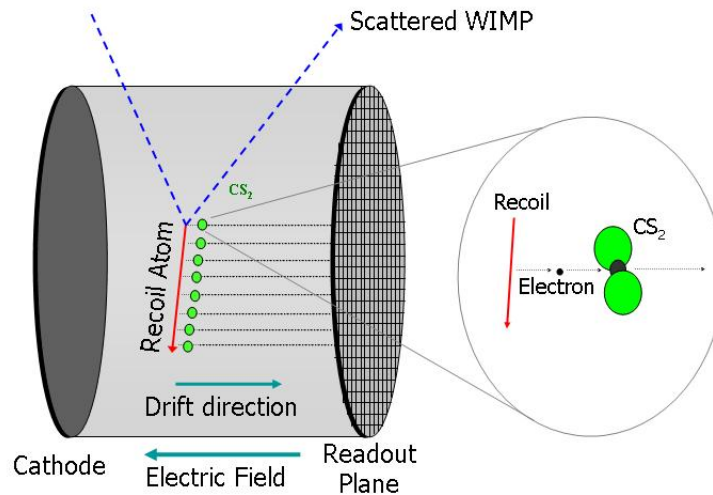
1. As far as I understand you work under the mentorship of and with Professor Snowden-Ifft. Last week, he gave an interesting; though a little mystifying to an unscientific person like me, talk on WIMPs. I was wondering how you- the students involved in the project- would explain it to the broad public.

In his presentation, Professor Snowden-Ifft went over some of the basic reasons why we believe that dark matter exists. The reason I keep in my mind most is about the spiral rotation of the universe. We believe that the universe rotates but according to the way it behaves, there seems to be something missing. All the mass we consider normal (planets, normal matter) isn't enough. There is a lot more out there that we consider dark matter - about 22% of the universe.

The next part is finding out what dark matter really is - what particles that might have to be discovered that compose dark matter. There are various theories about what makes up dark matter. Lots of different theories have been tested but those have been cut down to a handful that includes WIMPs (weakly interacting massive particles). Again, various groups are working to detect WIMPs. The detector that our collaboration has built and upgraded over the past few years is our contribution to the search.

2. What does fiducialization of events in the detector refer to? Give us a background on your responsibilities and expectations.

Fiducialization simply means locating. We have many things going on inside our detector and we need to distinguish the background noise and 'bad' events to 'good' events (which should be WIMPs). This problem is increased by the radon problem, which is many radon particles decaying and producing alpha particles and electrons. If we can somehow take into account the radon (which is undesired noise) we can focus in on the good data. My project has changed a bit since the beginning. I have spent a large amount of my time this summer working on a replacement for the central cathode of the DRIFT detector. This device will allow us to see alpha particles, which is a step in the direction of fiducializing events in the detector. Towards the beginning of the summer I was running computer models on alpha particle and photon penetration into various targets and building some data analysis programs. Eventually we moved on to implementing some of our ideas. I have been testing different configurations of our radiation detection equipment. Gradually this should build into a complete prototype which we can test on some of Professor's prototype mini-DRIFT devices.



3. To put it shortly, why Xenon? What makes this gas appropriate for dark matter detection? What made you interested in undertaking this exact part of the project?

The DRIFT detector is run in a vacuum chamber that has had the air pumped out and replaced with gas. Currently the detector runs with carbon disulfide. We want particles to enter our detector and have collisions with these gas particles. It is favorable to maximize the number of collisions so we can try to see more WIMPs. Xenon is a heavier gas that should give us many more collisions.

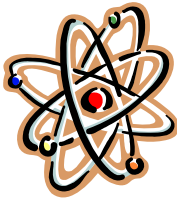
4. The unexpected problem with radon came about most unexpectedly. Was there a way that the interference of the gas with the results of the observations could have been determined? Is there a lot of frustration involved when such a surprising issue comes about?

Radon is certainly a problem that we have to deal with. You can find materials that are low in radon but it is always present. This has been an issue for our project for the past couple years I believe. I explained it a little above, but the radon will decay and release radioactive particles. The half life of radon-222 is about four days so we can get many decays. My little project is one that works towards the handling of the radon problem.

5. What are the future developments on the DRIFT dark matter detector project going to be?

Keeping the detector up and running is sometimes difficult. Its location in a mine makes it hard to access, which can compound problems. There can be many different problems that can knock it out for a couple days. The future for it should be eventually using Xenon (we aren't there yet) and replacing the central cathode (should the trials behave well). Assuming both of these go well they should be Oxy contributions to changes. Beyond that, I'm sure there are many things being considered by the collaboration but I'm not aware of them. I've been focusing on my project and not the big picture unfortunately.

I want to thank Jonathan for responding to me promptly. He works with Maureen Dwyer and Professor Daniel Snowden-Ifft. The two of them are presently in Britain (if you remember from Professor Ifft's presentation, the detector was shipped there and located in an underground mine, a necessity for precise results) working on the detector.



See classes offered by the Physics department at
<http://departments.oxy.edu/registrar/catalog/phys.html>