ACU Engineering and Physics Weekly Research Newsletter

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DANGO

(DOINGS AND GOINGS ON)

UPDATES FROM THE STUDENTS

From Tyler Hague:
"Dear DANGO,
This summer I am in Livermore, California working at Lawrence Livermore National Laboratory. I think this is going to be a rather interesting summer since I am now on NIFFTE instead of SeaQuest. I'm doing my best to learn as much as I can about the experiment and be productive at the same time. A post-doc here, Brandon Seilhan, sat me down and ran me through a talk he is giving soon to help me out. I think the plan is to run me through a couple other talks at some point to help me understand as well.

As of Tuesday, I finally have all of my required training done. It was mostly just a bunch of basic safety courses that I took online. Since I am now "allowed" to work, I have been setting up thermistors. There are a number of them on the TPC which Mike Heffner attached and I am making cables for. I have also placed some thermistors around the TPC Lab to be part of a different system that monitors the lab temperature. The air conditioning in the lab is finicky and we hope to convince someone to work on it sooner than was estimated with the data. Currently, there is a decently large and noticeable temperature gradient from one end of the room to the other. While it isn't anything that bothers us, it can effect how the TPC runs to have as much temperature flux as there is. My goal is to have this system up and running by the end of the day on Monday, as it is nearly complete.

It is kind of odd not having anyone else ACU affiliated out here, but it is working out. There are some cool guys in the lab that I work with. I am living with a family from church, so I hang out with them in the evenings. The mother in the family is an ACU alum and was rather excited when she found out that I came from there as well. The church here is really awesome. It is full of a bunch of really nice people that are helping me get involved with the "young adults" group.

Anyway, it's probably time for me to get to work on the thermistors again. Let me know if there are any online DOTA or LoL games going on in the evenings, as I would love to join :).

- Tyler Hague"

From Walker Nikoaus:
"I arrived last Saturday after an 11 hour drive by myself from Denton, OH. Upon arrival I met up with my fellow conspirators and we headed out for our beginning of summer, ceremonial pizza eating at Carlo's Pizzeria. It was excellent. After claiming a room for myself, I went to bed. Sunday morning we went to church at Patchogue Church of Christ. It was good to see people and Ramsey and I helped with communion. We proceeded to Mediterranean Kitchen to appease our appetites with gyros. Delicious. Leaving there full and satisfied we went to Shop and Spend to obtain food for the week. On Monday, we completed our training. I was surprised to find out that for training this year I had to pass a test that I had taken last year only this time I did not get the two hour lecture that preceded it. Nbd. Shift started on Tuesday. I have shift in the evening, while everyone else has morning shift so I see my barracks mates for about 15 minutes each day at the shift change. I sleep till 11in the mornings, drink tea with my brown, sugar cinnamon pop tarts, play some guitar, do some chin ups, watch some tv, eat a turkey-swiss-italian dressing sandwich, and leave for shift. That is my week.

- Walker Nikoaus"

From Mathew Solomon:
"Hello,
So last Saturday we got onto the Brookhaven lab and got all settled in. Monday me and Aric went through and got our training done for using the collider and we also did our PHENIX shift training. Tuesday we began out shifts and my position is Shift Assistant, this entails learning the duties of the other positions so if one of the other people didn't show up or died I would take there spot and fulfill their duties. So far everything is going well and it's pretty cool to be in an environment such as this.
- Mathew Solomon"

From Ramsey Towell:
"Sup People,
Me and my posse showed up to BNL last Saturday afternoon. We arrived a little later than we thought we would, because our stupid GPS told us to drive right through the middle of New York City for some reason, instead of taking us around the outskirts of it. But we finally made it and we're all settled in, and we started shifts for running the detector on Tuesday. Dr. Daugherity, Mat, Aric, and I are all on the 8am-4pm shift, but unfortunately, Walker is all by himself on the 4pm-midnight shift. So we haven't really seen Walker this week because we wake up before him and are at work all day, then by the time he gets home, we are already in bed. It's been a fantastic Walker-free past few days. Nothing too exciting has happened up here yet, except that I get to turn on and off a $100 million detector a few times a day, but it's no big deal. We will still be on shift up until next Tuesday so my life will probably be about the same up until the middle of next week.
Peace,
Ramsey"

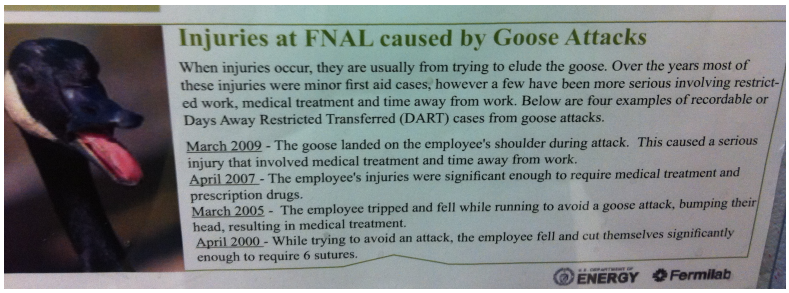
From Aric Tate:
"I have been doing shifts (8am-4pm) since Tuesday. I am Data Monitor so I make sure all 25ish subsystems are working properly (primarily that they are not overheating, no bad packets and other events) and alert the daq operator (Dr. Daugherty) if they need attention. This requires that I memorize roughly 40 root plots, graphs, histograms… and recognize what is wrong in a very timely manner. He will either stop the run and feed them and continue the run or I will continue to monitor the subsystem and make a note to feed it after the run finishes. I also have listed under my job title Gas Checker which means every 4 hours I go and check 50ish gas readouts, pressure meters, blah blah… and then record them in a database. Since mat's job isn't too strenuous we usually divide and conquer this monotonous task (though it is good to get out and walk some). I second everything Ramsey has mentioned expect that I only have the responsibility of finding all the errors of a 100 million dollar detector before something bad happens."

From Spenser Lynn:
"Hello and greetings from Los Alamos! I am finishing up my second week at the lab so here is a rundown of what has been happening since my travels began. To start, let me say that driving through west Texas and New Mexico alone is a truly unique experience. Who would have thought that you could go for long stretches of time with nothing but cotton fields, Spanish radio stations, and the occasional tractor hauling a device which threatened to transform my car into a convertible with a road-wide plowing device? Overall, the drive was fine and after a brief stop in Abilene to eat deer steaks with Kyle Gainey, I made it into town. I moved into the room I'm renting, and the house is owned by a wonderful first grade teacher who bakes homemade cornbread every Saturday morning and other delicious things like cookies and brownies. Needless to say, I won't be starving this summer. My roommate Ke (pronounced "key") had already moved in and there is another student moving into the third bedroom on June 24th. To top it all off, there is a fantastic trail which runs right behind the house so I can head out the door and be on it in less than two minutes. There is one thing I was not expecting about Los Alamos which turned out to be a pleasant surprise: There are a ton of summer students! There were twenty-seven of us in my orientation session and what seems like at least three times that number outside of my session. The point I'm trying to make here is that LANL summer camp is awesome! Fun events so far have been Summer Fest, the weekly concert at Ashley Pond, Wednesday student BBQ's, and just spending time with the other summer students. On the work related side of things, I am done with my training! The glovebox project is underway, and I began my tests on it today. Hopefully within a couple weeks I'll have a good idea of how to achieve a clean enough environment so the TPC can be placed in there. I hope everyone else is off to a great start this summer!"

From Noah Kitts:

"For work Dr. Isenhower has been giving us lectures on electronics at the start of each day. I have been working with finding cables that will run from the control room down to the experiment. The apartment we stay in is nice, and we have been watching a lot of movies since the start of summer.

- Noah Kitts"



From Drew Boles:

"I just started work this week, but I've helped find cables that we will run from the control room down to the experiment. I also worked with Ryan on figuring out the length of wire that we need to run. I also completed my rad training yesterday. Outside of work, Noah, Ryan and I will be seeing Prometheus tonight at IMAX 3D! Super excited.

- Drew Boles"

From Ryan Castillo:

"Hell-o Dango,

My first couple of weeks here in Chicagoland has been quite refreshing. By far the most enjoyable aspect of working at Fermilab is Mrs. I's fantabulous cooking. In the first three days I'm quite certain I gained approximately five pounds. Work has been good and quite challenging to my eyeballs. I have mostly been squinting at PMT bases and deciphering circuit boards, as well as untangling 42,000 miles of cables. Which I'm told was leftover from an experiment that ran in the 70's. Luckily, no one in our party has fallen victim to Chicagoland's 75th most dangerous animal. See picture for more details.

Best,

Ryan"

UPDATES FROM THE PROFESSORS

From Dr. Rusty Towell:

"Hello Dango,

I hope everyone is enjoying your summer work so far. If so, then I expect you will really enjoy things in the coming weeks when the real work picks up and the number of training classes fade away. My family and I arrived at BNL on Monday. Since our apartment wasn't ready for us, we had to move into the "Brookhaven Energy House". They say now that repairs to our apartment will be finished "some time next week" and then we will be allowed to move into it.

Another space not ready to move into is the ACU office cubicle. Over the past year renovations to the building our cubicle is in required several other offices to be cleared out. I guess our office was selected as the dumping ground. (See the attached picture.) With all of us working at it, we moved everything that wasn't ours out pretty quick. Now if we could just find a use for that old Mac...

Much of this week I've spent meeting with others to line up a few good summer tasks for those of us at BNL. As always, after spending a couple of days asking where we can help, it looks like we are now in a position to start saying no to anything new. We've been asked to help with several analysis tasks related to the data we took this year with the completed RPC system and to help with simulations needed for the next major upgrade to PHENIX called sPHENIX.

This weekend, I'm at a conference at the APS headquarters near Washington DC for physics department chairs. The first keynote speaker referred to us as "masters of the universe". I kind of like that title. I might have to get my business cards reprinted. :)

Grace and Peace,

Rusty"

From Dr. Donald Isenhower:
“Dear Dangoites,
OK, you really want me to tell you all I've done so far this summer? Let me try to start to count the ways.
1. Found a place to stay, got furniture in it and got students into it (as well as my wife and myself).
2. Reviewed hodoscope issues during past run. Problems discovered were that station 1 cannot handle the rates we had, much less the ones we will be having. While station 1 & 2 are not ACU's responsibility, I'm the experiments hodoscope expert, so working on this has to involve me. I had Ryan draw out the circuit, and after some corrections we now have it and can see that as it stands it will have to have major modifications. I'm in the middle of discussions on this with Naomi Makins (who ultimately is responsible for them), Sten Hansen, Dave Christian, Chuck Brown, and others as to what we will do.
3. Related to #2 I had Ryan draw out the circuit of the Hamamatsu E934 bases as a normal diagram that will complement the diagrams done by Kristin of the layout of every component inside the bases. This is needed for diagnosing and repair.
4. We've found that a group of the hodoscope signals from station 4 seem to be about 5-6 ns off from the others. Students have been shown how to measure these, so I will have them check every 234 of them to verify their lengths to a ns or so.
5. While working on #4 it dawned on me that while doing the cabling we did not attempt to deal with the difference in what is called the "Total Transit Time" (TTT) for the Hamamatsu vs Thorne (DESY) phototubes. There is a 7 ns time difference. So we may be getting to add in 7 ns delays for the PMTs with the longer transit times. Although as the readout goes to an FPGA it isn't certain if the timing needs to be changed or if it can just be done in software.
6. I am deciding exactly how we will modify the three scintillation counters that were monitoring beam intensity by viewing a location where the beam goes through what is known as a SWIC, which is also used to monitor beam current.
7. I will be designing a Cherenkov detector, with input from Paul Reimer and Dave Christian to put in the beam to do pulse by pulse monitoring. Right now I am planning on quartz and a very fast PMT; however we haven't settled how badly quartz is damaged by the beam passing through it, which will mean switching to a He radiator and some type of mirror. I attempted one of these before for E789 at Fermilab and the flash Analog to Digital digitizer for the special PMT never did work right, so I will have to come up with a better solution based on my previous experience. I've been building Cherenkov detectors since 1988 so I should be able to figure something out. Of course to do it right takes a much higher quality PMT since they have to be fast, but also sensitive to single photons, which runs into problems in that those two items are not really compatible. I'm also looking at seeing what would happen if we used a quartz fiber in the beam. I think the fiber core would be okay with the radiation levels, but am uncertain about the fiber cladding. So all parts of this will take some study.
8. I am also deciding the best way to put in a hodoscope array that will view the target from upstream, as going downstream will give way too high rates for normal scintillators, PMTs, and bases. You need bases with transistors and other such active electronics, which are all sensitive to radiation damage.
9. I am still going to be trying to install some type of small counter downstream of the target related to the tiny 3 mm x 3 mm x 10 mm scintillators epoxied to optical fiber I tried for the last run. Those definitely had problems, but I have ideas on how to get around these.
10. I have been assigning the typical non-fun, but critical tasks to the students, such as reversing the signs of entropy that were present downstairs. They have done a great job of cleaning up, so now we have a place to work on the PMTs and bases that need repair or replacing.
11. I've been giving lectures almost every day to the students as the things they are working on are almost all new to them. So we have had detailed lectures on scintillators, PMTs, base designs, signal propagation, impedance matching, using impedance mis-matching to measure cable length, drift chamber design, basic electronics used for drift chambers, details on capacitors and why the different choices are made for the bases, drift chambers, and wire chambers they will be working on, gas mixtures for chambers, oscillation of amplifiers, and other such subjects. How much of each topic they've really learned so far is unknown as of yet, but some they definitely must have learned somehow or they couldn't have finished their tasks.
12. Showed the students how various NIM modules worked so that they could take the stack of modules we had at SeaQuest and identify any problems. These included discriminators, fan in/fan out modules (both logical and

linear), logic modules, and various others. They completed these tests with exceptional speed for not having ever seen most of these type devices before.
13. We have helped with the assembly with the frame for the new station 3 drift chamber that the Japanese are installing. They do not have sufficient man power to do the assembly and wiring of the chamber, so we will be helping with it for the duration of our stay. For those of you who don't think this is all that much of a task, the chamber has 5,000 wires, which means 10,000 connectors, which all have to have to be cleaned and then special connectors for the wires inserted and glued in place. Each wire must be threaded through the connectors individually before being tensioned properly before soldering. The total length of the wire is 18 km (yes, kilometers) and cost $70k. So they will get to see an awful lot of wire before the end of the summer.
14. I am helping arrange the disposal of many of the KTeV magnetic tapes that are stored in the SeaQuest area. That will be another task that the ACU students will wind up doing a lot of the work. The problem is that there are tapes that must be kept because the type data on them are required by law for DOE to keep. Picking these out of the 100,000 or so tapes that are in the area is not going to be real easy. We are still in the process of figuring out how to get the tapes that can be trashed disposed of. Due to some of the materials they are made of it turns out make it difficult to get someone to take them. I've suggested sponsoring a gigantic kite flying contest in Chicago and using the tapes for string, but the idea doesn't seem to have caught on.
15. We all get to participate in weekly meetings for those working onsite, plus two weekly analysis meetings (I have to be involved and hopefully I will be able to get a couple of the students involved), plus biweekly collaboration meetings.
16. I've herded all the students through most of the training they needed. That took more work than normal since there weren't any who had gone through it all before at Fermilab. So Kyle and Noah got the job of helping Ryan get through it (who I luckily convinced the lab that since he had done rad-worker at LANL last year that he could just take the challenge exam rather than attend the 9 a.m to 3 p.m. class).
17. I don't know if the students will mention it, but I hope that they do include a picture of the special safety issue and how to respond posted at the SeaQuest area. If they don't this week, I won't spoil it for next week.
18. I have found out which tasks the students and I will get to work on beyond those listed so far. They include helping Kaz, a University of Maryland Postdoc, and Grass, a postdoc from Taiwan, Dave Christian from Fermilab on whatever tasks he needs students (his projects are usually interesting even if they are difficult).
19. I have been enquiring who the students will need to go to for training to work with the low-end shop equipment in Lab 6 where we work on wire chambers and some of the scintillator work. I looked at enrolling them in the shop safety course, but as it cost $100 each for the course, and they weren't going to be permitted to use the shops where this really applied, I decided to save the money.
20. I've been having discussions with Hamamatsu on the delivery of the 21 new R329-02 PMTs and 11 new bases we ordered from them. They are to be shipped Tuesday, and hopefully they will come to me directly at Fermilab.

OK, the list could go on, but I'll stop here. The above should at least show that since we started work on May 21, we have been quite busy and have gotten a lot of work done already, while the rest of you have been waiting to get started! But don't worry, Dr. Towell and Dr. Daugherity will soon take any feeling of not having done much yet move to deeply stored memory as the number of things they should have listed for you to do will grow to an appropriate level for an ACU student, which should be a minimum of twice as much as any other universities' students can do, and all work done by ACU will show up to clearly be superior to others work as well!

-Dr. I.

P.S. During this time I also had by first grandson born on the day after I arrived at Fermilab. His name is Liam Davis Isenhower, so there are now three Isenhower's with LDI as initials. If my son, Larry, and I are successful in influencing him he will become the 3rd Isenhower the world who is a physicists. SInce Larry did better than me, as Physics Today was interviewing his group the week after he published his quantum computing research, and nobody made any big deal with my glueball data were published, maybe I will have a grandson who can become famous! But he is a cute baby and we got to go up over Memorial Day weekend to visit and had a brief visit of this past weekend when they were visiting Chicago where his wife's parents live."

IN OTHER NEWS…

CEU PROGRAM
Newport Beach 2012

APPLICATION DEADLINE: 1 August 2012

What: Conference Experience for Undergraduates (CEU) – Fifteenth Annual
Where: 2012 DNP Meeting, Newport Beach, CA
When: 24-27 October, 2012
Sponsored by: NSF, DOE, DNP

All undergraduate students who have participated in nuclear physics research are invited to apply! Students will present research posters and participate in several CEU and conference related events. Travel and lodging awards will be granted to a number of the top qualifying students. Please refer to the CEU website for more detailed information, updates, and application information:

http://physics.westmont.edu/ceu/

PROGRAM
CEU12 will include the following highlights: student research poster session, undergraduate nuclear physics seminars, graduate school information faire, social reception, and regular DNP conference events, including attendance at invited and contributed talks.

QUALIFICATION AND APPLICATION
Students (fall 2012 returning undergraduates) who have participated in experimental or theoretical nuclear physics research are invited to apply. The online application (found on the link above) consists of a research abstract and a brief summary of the student's individual contribution to the larger group effort. Application deadline is 1 August 2012. Applications will be reviewed and travel and lodging award decisions will be based on the quality of the research, and the imagination and creativity reflected in the student's contribution.

QUESTIONS
Contact Warren Rogers <ceu@westmont.edu>

ALL UNDERGRADUATE STUDENTS WHO HAVE PARTICIPATED IN NUCLEAR PHYSICS RESEARCH ARE ENCOURAGED TO APPLY!

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