



## ***Instructionally Related Activities Report Form***

**SPONSOR: GEOFF DOUGHERTY**

**DEPARTMENT: MATH & APPLIED PHYSICS**

**ACTIVITY TITLE:** Internships on the ATLAS Experiment at the European Organization for Nuclear Research (CERN)

**DATE (S) OF ACTIVITY:** 1<sup>ST</sup> JUNE – 10<sup>TH</sup> AUGUST, 2014

### **SUPPORTING DOCUMENTATION**

Attach:

- 1) Student evaluations or assessments
- 2) A list of attendees complete with each student major and expected graduation date, and
- 3) Images demonstrating student participation (up to 6 images)
- 4) A summary of expenses

E-mail to the IRA Coordinator at [david.daniels@csuci.edu](mailto:david.daniels@csuci.edu) within 30 days after the activity.

***Thank you for your commitment to engaging our students!!***

ANSWER THE FOLLOWING QUESTIONS:

(1) PROVIDE A DESCRIPTION OF THE ACTIVITY;

Our 2 students worked on ATLAS physics and computing projects and attended the famous CERN Summer Student Lecture Series. They tested the ATLAS detector, improved and developed tools to monitor the sub-detectors, and analyzed ATLAS data. They joined separate research groups, and were assigned specific tasks within the groups for a period of 10 weeks under the supervision of a CERN faculty member.

(2) HOW DID THE ACTIVITY RELATE TO A COURSE(S) AND/OR LEARNING OBJECTIVES?

The activities were closely related to the preparatory courses (Phys 497), in which they learned how to program in ROOT and the basics of fundamental particle physics. They reported their experiences in Phys 499 Senior Colloquium

(3) WHAT DO YOU SEE AS THE STRENGTHS OF THE ACTIVITY?



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The internship taught the students how to work collaboratively in a team with top international physicists and engineers, and take the responsibility for a specific part of the team's project. It showed them the level of effort, commitment and performance required to succeed in such an environment.

**(4) WHAT WOULD YOU SAY ARE/WERE THE ACTIVITY'S WEAKNESSES?**

No weaknesses – the activities ran very smoothly. Previously the CERN faculty members generally took a 2-week vacation during the 10 weeks. This year we made sure that a back-up advisor would be available during this period.

**(5) HOW WOULD YOU IMPROVE THIS ACTIVITY FOR NEXT TIME?**

It would be even more useful if we were able to send more students next time. Specific details of each project are now available earlier in the year.

**(6) WHAT DID YOU LEARN FROM THE PROCESS?**

It was very interesting to be exposed to the procedures at CERN, and to see the multi-faceted research approach that has led to so many fascinating discoveries. It was also good to see that our best students are on a par with the best from around the world.



Attachment 1 Student evaluations

Both Gradon and Cameron had a very productive time at CERN. Their local advisors were very happy with their performance and are willing to write them glowing letters of recommendation.

(i) Gradon

“I was able to complete my project and integrate it with the team I was working with. I also ended up giving two presentations to the working group”.

Gradon’s paper on his project “Optimization of Associative Memory” has been accepted for the CSU Student Research Competition (SRC), 2015.

(ii) Cameron

- Worked on existing graphing software to display TTbar data in various ways. Manipulating the data to be displayed in different ways was time consuming because the infrastructure was not very extendable so I had to do a lot of programming to make it so.
  - \* Added lots of features and usability for future extendability.
- Installed and tested generating APPLgrids from different software packages and see these working with our graphing utility.
- We showed APPLgrids from various resources show the same results within appropriate errors in our graphing utility. This adds credibility to the APPLgrid way of doing things and that they generate results that agree with various.
- Gave a talk about the results of the summer work to a working group at CERN (SM PDF Forum).



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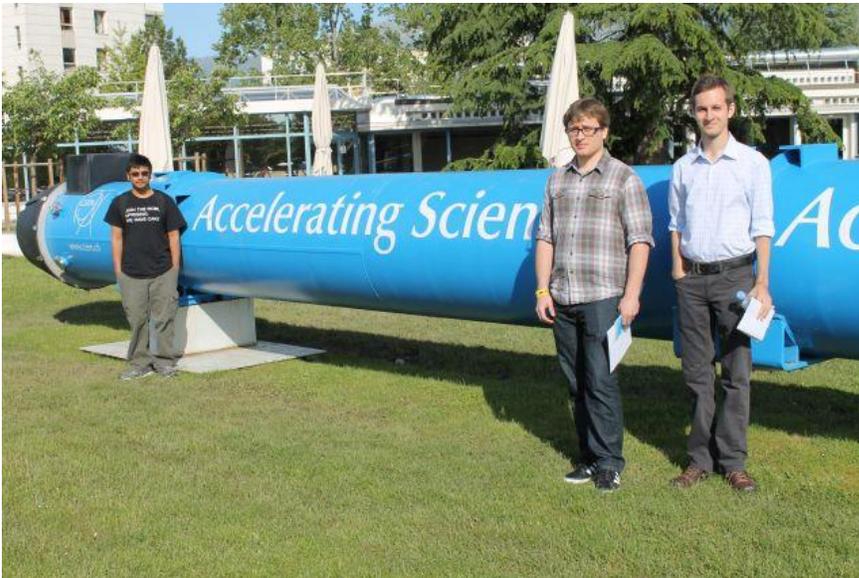
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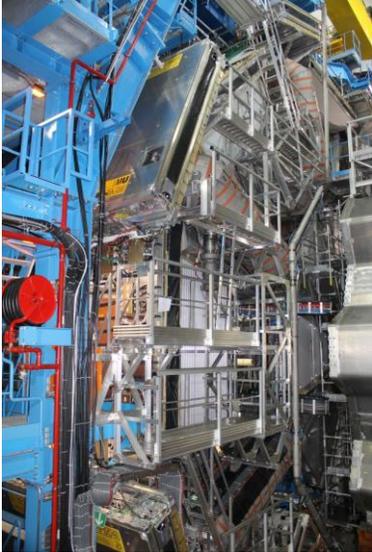
Attachment 2

Gradon Faulkner            Computer Science            Expected graduation date: Spring 2015

Cameron Embree            Computer Science            Expected graduation date: Spring 2015

Attachment 3 Images







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Attachment 4: Summary of expenses

Airfare	3000
Ground transport	200
Faculty travel (Dr. Ivona)	1600
Total	<u>4800</u> (= funding from IRA)