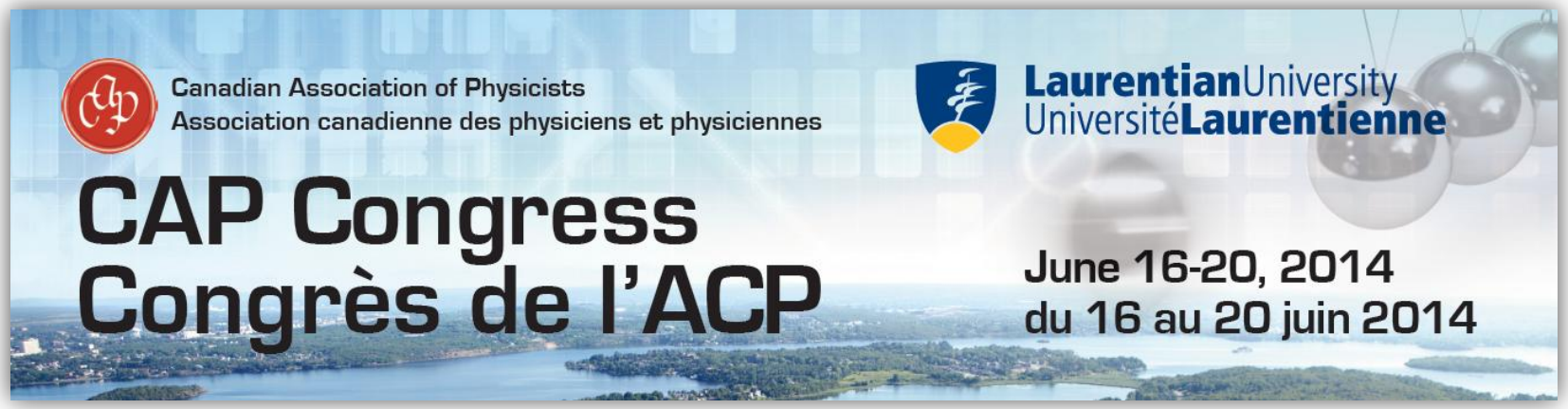
Who should be conducting scientific outreach in high schools?

Matthew BLUTEAU, University of Strathclyde

Svetlana BARKANOVA, Acadia University



Introduction

The importance of scientific outreach in our science and technology based society cannot be over emphasized; however, questions about who in the scientific community should be conducting such outreach remain largely unanswered and little discussed.

Promoting the involvement of students from graduate and advanced undergraduate levels in such outreach could avoid placing another time commitment on faculty, improve the communication skills for the next generation of physicists, and possibly improve the efficacy of the outreach by lessening the age gap between the presenter and audience.

Physics students with some research experience, especially students granted the IPP/CERN Summer Student Fellowship, are in a particularly advantageous position to get involved in this movement and promote the world of modern science.

In the Maritime Provinces, significantly more grade 7 boys than girls (49% versus 36%) rated General Science as their favourite subject.

Students in urban area schools rated General Science subject higher than those in rural areas.

Only 60% of students in the public school sample had engaged in some kind of STEM activity over the past 12 months. Grade 7 students in rural areas were less likely to have participated than students from urban area schools, but 40% of those who had not participated said they would if they had the opportunity.

T. Franz-Odendaal et al., Executive report for the WISEatlantic study, “Career Choices and Influencers in Science, Technology, Engineering and Math: An analysis in the Maritime Provinces” (2014)

"… a scientifically literate population is an advantage for any nation, and … as the world becomes more inextricably tied to technology and the science behind it, the need for aggressive, systematic outreach becomes imperative."

J. Matlock and G. Dick, "Mission: Outreach - The Why and the How of It", *Physics in Canada*, 66(2), 130-134 (2010).

"… we suggest that the who question could be just as critical: who should be conducting scientific outreach in high schools? "

M. Bluteau and S. Barkanova, "From CERN to High Schools: An Argument for Greater Involvement of Postsecondary Physics Students in High School Outreach", *Physics in Canada,* 70(2) (2014)

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http://www.ipp.ca/

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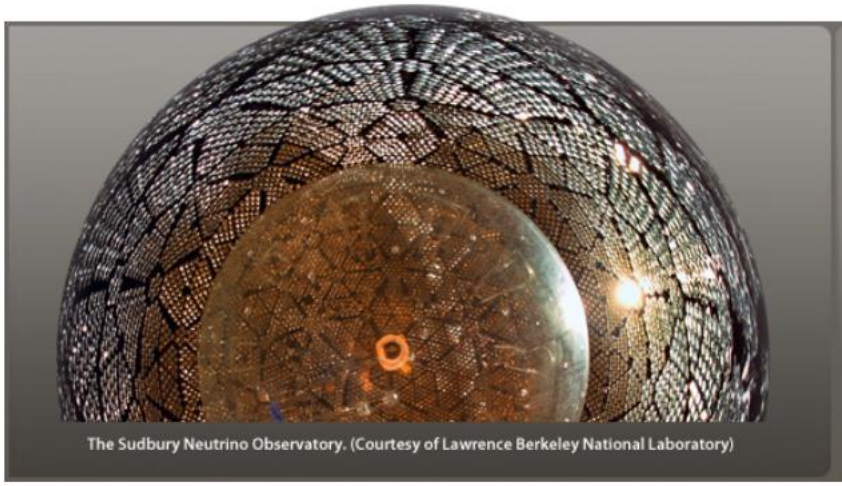
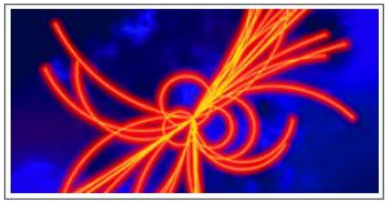


The Sudbury Neutrino Observatory. (Courtesy of Lawrence Berkeley National Laboratory)

The Institute of Particle Physics promotes Canadian excellence in particle physics research and advanced education.



Physics Programme

While the IPP broadly supports particle physics research in Canada, we maintain a set of "IPP projects" that constitute our core programme. **more**

Research Scientists

The IPP employs eight faculty-equivalent research scientists who lead the Canadian efforts in major particle physics experiments around the world. **more**

Englert and Higgs awarded 2013 Nobel Prize

"for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider"

Background on Canadian and IPP's role in the Higgs boson discovery

CERN Summer Students

The Institute of Particle Physics provides support for Canadian citizens to participate in the CERN summer student programme. **more**

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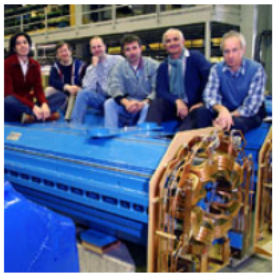
IPP Sponsored CERN Summer Students-past recipients



LHC cleaning insertion quadrupoles produced in Canada (Copyright TRIUMF)

IPP CERN Summer Student 2007

Jason Rabinovitch

IPP CERN Summer Students 2008

Stefan Guindon

Nikolina Ilic

Andrew Louca

Tom McCarthy

IPP CERN Summer Students 2009

Ossama Abouzeid

Grace Dupuis

Ilya Feige (poster)

Robert Keyes

Catherine LaFlamme (poster)

Matthew Low

IPP CERN Summer Students 2010

Karol Krizka

Matthew LeBlanc

Ian Moult

Kate Pachal

Sebastien Picard

IPP CERN Summer Students 2011

Terry Buck

Nigel Burke

Charles Collins-Fekete

Allison MacDonald

Stephen Portillo

IPP CERN Summer Students 2012

Aysha Abdel-Aziz

Matthew Bluteau

Kyle Boone

Martin Friedl

Ryan Killick

IPP CERN Summer Students 2013

Syed Haider Abidi

Natascha Hedrich

David Layden

Sébastien Rettie

Olivia Wasalski

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Acadia undergraduate student and IPP prize recipient, Matthew Bluteau in front of the CERN Globe with an old, decorated dipole magnet from the LHC.

Acadia Outreach Program, 2013 Pilot Project

As part of his summer employment in 2013 with Acadia University, Matt visited high schools in mainland Nova Scotia to give a presentation about particle physics with specific focus on the Higgs boson.

Goal 1 – Educate: A large part of the presentation was dedicated to a brief introduction to the Standard Model of Particle Physics and the work conducted at CERN.

Goal 2 – Motivate: Matt talked about physics as a major in university, his own experiences at Acadia, and possible careers in physics.

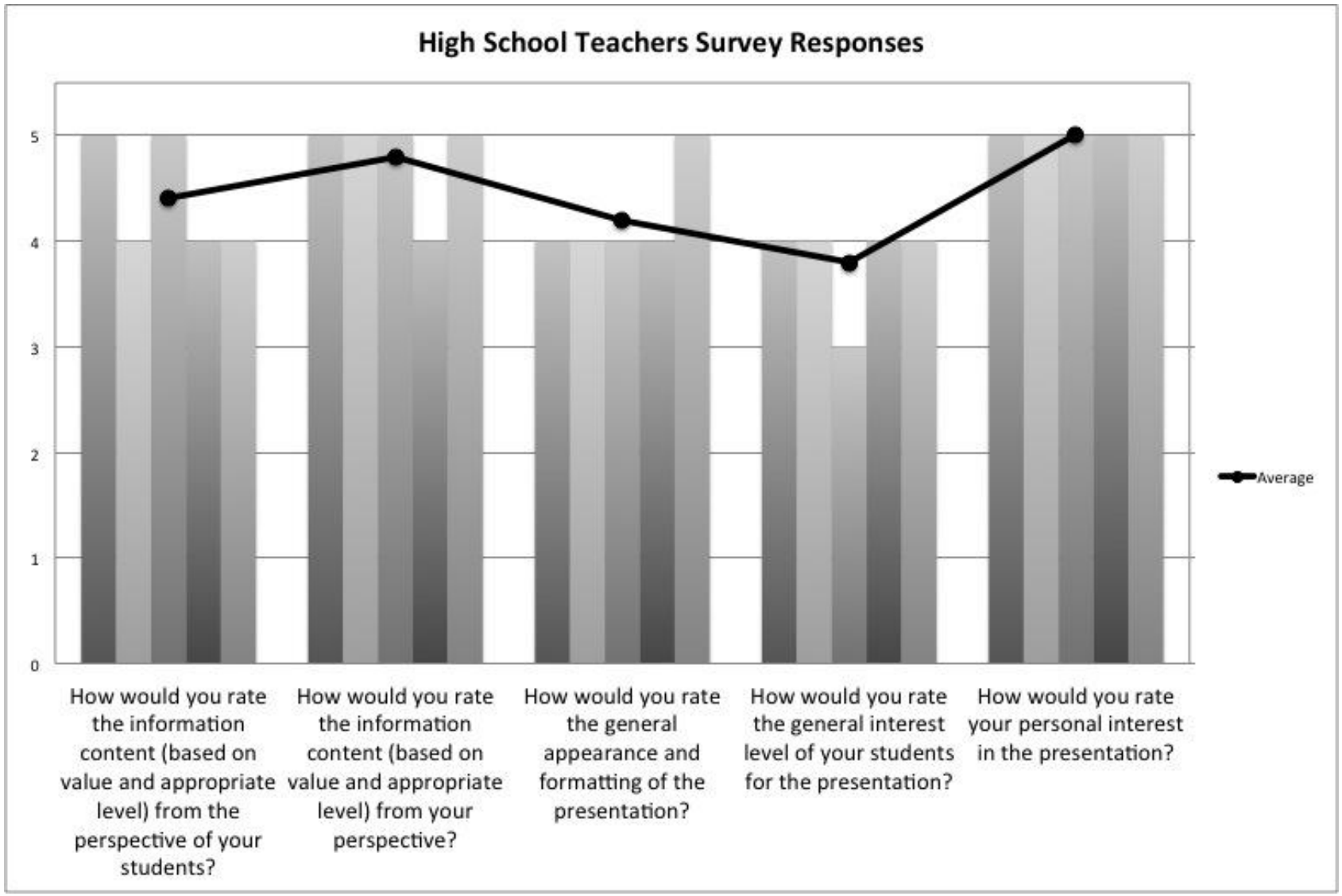
A key feature of 2013 pilot project: Matt got all high school contacts from his own network, and did all communication and scheduling.

Can one-time interaction be effective?

"*When it came to course selection in grade eleven, I still had not decided what career path I wanted to take; I wanted to keep all doors open. I remembered that Svetlana had stated that physics can lead to any profession, whether it be music, medicine, or astronomy. This really impacted my decision. I decided that since physics was so versatile I would give it a try and enroll in the class. To my surprise, I was very good at problem solving and the strange way of thinking that physics entails. I did not know that one simple quote from someone I had just met could turn them into a role model for both my high school decisions and my commitment to a physics related career, radiology technology.*"

Dominque Zwicker, New Germany Regional High School, a Techsploration graduate, March 2014

About Techsploration: http://techsploration.ca/

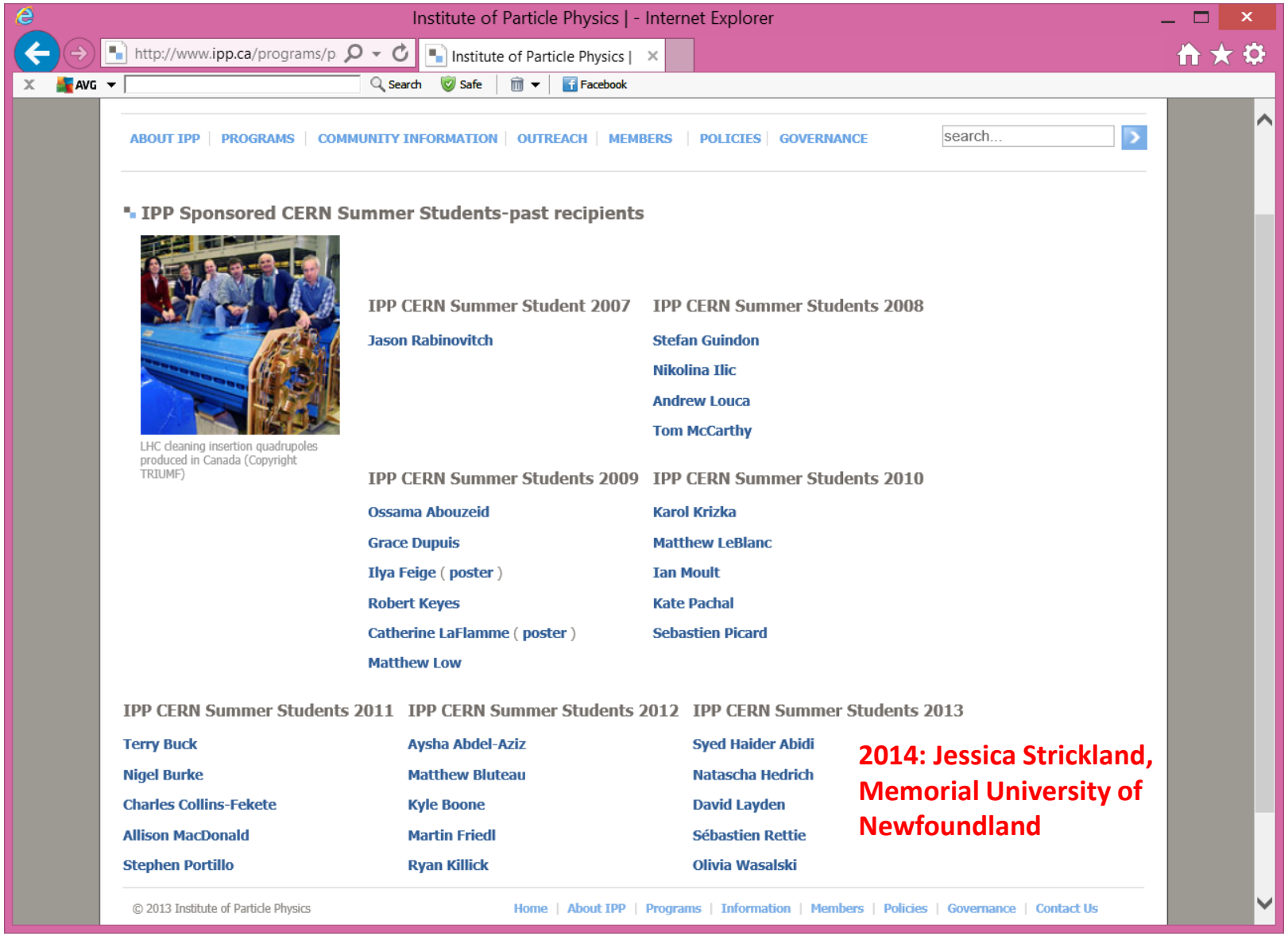

High School Teachers Survey Responses
5
4
3
2
1
0
How would you rate the information content (based on value and appropriate level) from the perspective of your students?
How would you rate the information content (based on value and appropriate level) from your perspective?
How would you rate the general appearance and formatting of the presentation?
How would you rate the general interest level of your students for the presentation?
How would you rate your personal interest in the presentation?
Average

Qualitative questions:

When asked the question, *Did you see a spark of interest in any of your students for physics/science?*, all teachers replied in the affirmative, and one teacher noted, “I had a student tell me after the presentation that they were [sic.] going to focus on physics in university.”

Similarly positive responses were received for the question, *Was there any impact of the presentation on any of your taught units?*, with one particularly shining example: “I was currently teaching the unit on Nuclear Physics, [and] … Several times, they [my students] mentioned that they better understood the concepts because of Matt's presentation.”

Our Plans for 2014-2015



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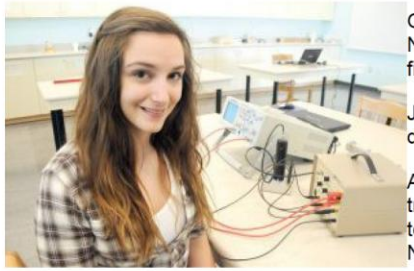
Grenfell student to work on Large Hadron Collider

Diane Crocker
Published on February 10, 2014



© Geraldine Brophy
Corner Brook resident Jessica Strickland will be travelling to Geneva, Switzerland this summer to work at the European Organization for Nuclear Research (CERN).

Grenfell Campus, Memorial University of Newfoundland promotes itself as the place to find your corner.

Jessica Strickland found hers in the physics department.

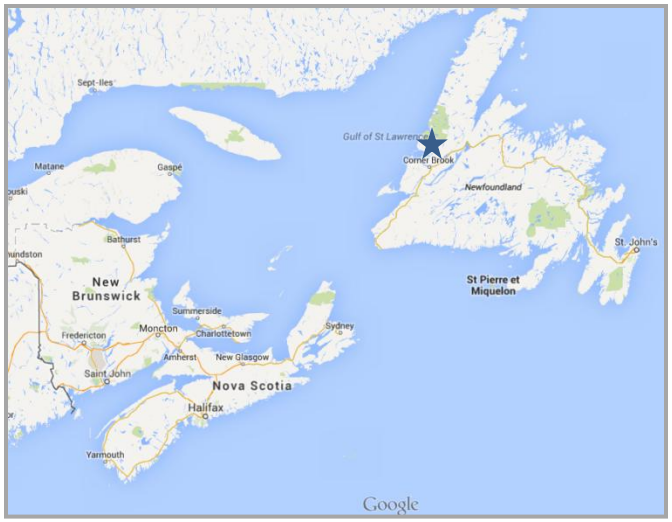
And now the Corner Brook resident will be travelling to Geneva, Switzerland this summer to work at the European Organization for Nuclear Research (CERN).

Strickland, 21, is currently in the third year of the physics program at the university.

"When I first came to Grenfell I really wanted to go into education, but then I realized how much I loved academia itself. And I really like physics and geography," said Strickland.

"I guess the fact that it's kind of everything. It's literally the world. It's like understanding the world around you and just figuring out how it all works, or trying to anyway," she said, the passion for the field coming through her voice.

Last summer Strickland received a research award that allowed her to get more experience in the field. She worked with Aleksandrs Aleksejevs, one of her professors at Grenfell, on the properties of dark matter.



Next for Jessica:

- Working on her thesis

- Visiting schools in and near Corner Brook, staring fall 2014

- Funded by Memorial U

Acadia outreach program 2014-2015:

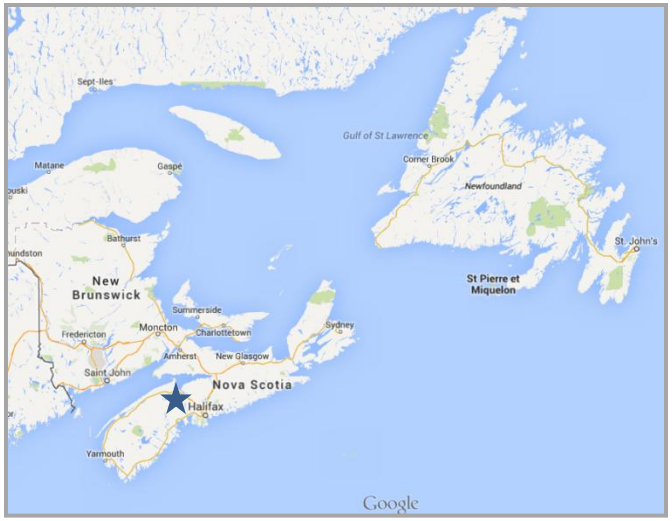
3rd year Acadia physics student, Kyle Marshall, is visiting schools in Nova Scotia with his own presentation about particle physics.

The teachers will be polled with the same questions online (same way as before).

We did not poll students directly yet, but would like to do that next year. The students will be asked to fill multiple-choice sheets to rate their interest level in the presentation, science in general, careers in sciences, and add optional comments.

We are still working on questions for studetns.

Collaborators are welcome!



Next for Kyle:

- Visiting schools in Nova Scotia, staring spring 2014

- Funded by Acadia U

- Working on his thesis

Conclusions

The systematic science outreach in high schools is absolutely imperative, especially in remote, underserved areas.

There are many benefits for increasing the role of postsecondary students in outreach, such as a smaller age gap and better familiarity with the local high school audiences.

The students with research experience, especially students granted the IPP/CERN Summer Student Fellowship or similar high-profile awards are in a particularly good position to do physics outreach.

The project piloted at Acadia University in 2013 where a physics honour student visited schools was well-received by teachers and provided great educational experience for the student.

Acknowledgements

Many thanks to T. Antimirova, M. Milner-Bolotin and A. Sarty for useful discussions. We are grateful to the Acadia University Faculty of Science and Physics Department for providing us with the unique privilege of conducting this pilot program, and to the IPP and NSERC for enabling M. Bluteau to conduct his honours summer research at CERN.