

## Northfield ACC partakes in flux study cosmic ray experiment

QuarkNet gives freshmen the opportunity to use advanced detector

by Millie Winter

Students at the Northfield freshman campus had the opportunity to operate and upload data from a cosmic ray detector, using it to measure the occurrence of muons (a particle similar to an electron).

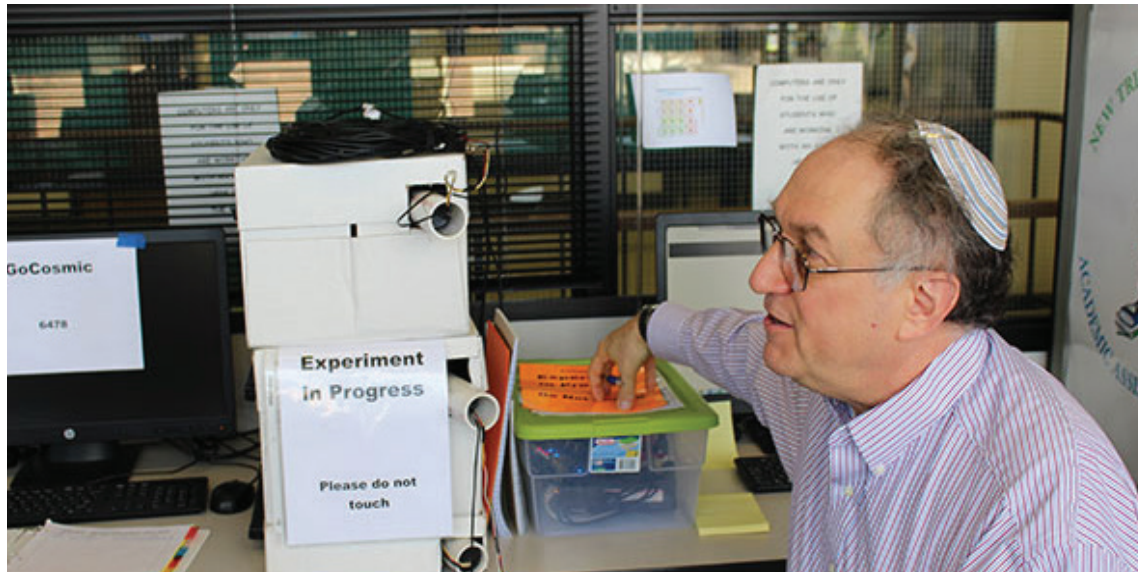
The cosmic ray detector was available for students from Mar. 19 to Apr. 15, and located it in the AAC.

The target of this machine was for students interested in performing high energy physics research regarding the presence of the many cosmic rays that hit earth about every second.

Cosmic rays mainly originating outside the solar system, but secondary rays can hit earth's surface. They have a very high-energy radiation.

QuarkNet (from Fermilab) allows for schools to be provided with a cosmic ray detector, but trained teachers must be present in order to use it. Physics and geoscience tutor, Nate Unterman, provided assistance with his expertise of in using this detector.

"There is no charge for students



Nate Unterman shows students how to use the QuarkNet Cosmic Ray Detector on the Northfield campus | New Trier

to be able to use the detector, but students must regularly be uploading data," said Unterman, "I am a QuarkNet fellow, and I suggested if there was student interest in the cosmic ray detector."

Students get a unique experience to collect a lot of data on the occurrence of cosmic ray particles within our atmosphere.

"This is an opportunity to do high energy physics research. This is both for practice in using a muon detector, or original experiments," added Unterman.

The experiments they are able to conduct allow them to collect the

data they need to upload regularly in order to be able to use the detector. When studying the occurrence of the muons within the cosmic rays, there are many experiments students can perform.

**'This is an opportunity to do high energy physics research'**

One such experiment is a flux study, with looks at the number of muons recorded per unit area per minute. Flux studies are done comparing muon occurrence with

different directions, time of day, or differences in solar activity.

"Nearly all muons being measured come from the cosmic rays," said Unterman. The data that students can collect on such minuscule particles from cosmic rays are precise with the detector.

Shower studies are another experiment that test the details of the muons the detector records. Shower studies detect the muons and determine the direction of the muon's origin.

Along with these main experiments, there are many other experiments that can be performed by students including the speed of

the muon, altitude, flux, weather, and lifetime.

These are extremely unique experiments that many students will not have the opportunity to perform in their high school experience. This opportunity is something New Trier does not take for granted and is a great way for freshmen, especially those interested in science fields, to use a tool.

The detector itself is something anyone can use; it isn't a high tech machine with numerous confusing buttons. According to Unterman, "If you can use the web, you can operate the detector and upload data."

This is another reason for freshmen to get their hands on the detector. It is easy to use while obtaining detailed data.

During the process of using the detector, the data is analyzed. The analyzing stage is done by using a grid computing system. After the computations are made, the results are returned to the student.

From these results, analyzing can be done to collect a wide range of data. Students are able to take these results and interpret their graphs.

Currently, the Northfield campus plans to keep the detector until Apr. 15. However, Unterman explained that "If there is enough interest, we will be able to get a detector kit, where we will be able to build our own detector, and have it on a semi-permanent basis."

## Flagship ensembles take the Big Apple by storm

NT ensembles seize the chance to play at Carnegie Hall

by Molly George

An orchestra trip to Carnegie Hall in New York over spring break included musicians from Concert Wind Ensemble, Symphonic Wind Ensemble, and Symphony Orchestra.

The New Trier Wind Symphony, a combination of the two wind ensembles, also collaborated with the Symphony Orchestra for their big performance on Sunday, Apr. 1 at Carnegie Hall.

"Carnegie hall is known worldwide as having one of the best acoustics for a performance hall," orchestra director Peter Rosheger said. "Our ensembles were so inspired to perform in this space. From the late 1800's to today, the most important musicians have performed in this space."

The Carnegie Hall performance was the main event of the trip, according to many of the participants. Senior and violin player Rachel Chiao said, "The trip was a once in a lifetime experience, and I'm so glad I was able to participate. You hear so much about Carnegie Hall in movies and books, but you would never believe that you would be able to actually experience it."

"It was really cool and a little bit surreal to perform in Carnegie Hall," said senior violinist Ella Torres.

Senior violinist Linda Chiu was also impressed by the venues where the orchestra played. "We rehearsed in the recording studio where many Broadway soundtracks are made."

"The acoustics were insane. After we finished a piece the last note would ring. Carnegie was the coolest place we've played, and it was neat because it was the ensemble's first time playing there," added Chiu.

Symphony Orchestra performed



New Trier Symphony Orchestra's french horn section posing for a selfie at New York's Carnegie Hall | Williamson

three pieces, including Franz Liszt's third symphonic poem, "Les Préludes." Wind Symphony played five pieces, opening with Leonard Bernstein's "Slava!"

The group prepared with plenty of practice, including long rehearsals in Winnetka, New York City, clinics in Manhattan, concerts at Northwestern University and a high school in New Jersey.

With all the preparation, junior violinist Rachel Hsu said, "I thought it was the best performance we'd played of each piece, and it was quite amazing when we got a standing ovation which I never expected."

"The students were definitely in the moment. They were excited but focused and played beautifully. It was the best performance of their music all around," said band director Matthew Temple.

Torres agreed and said, "It was definitely one of our better if not our best performance."

The performance included

the New Trier orchestra and wind ensembles as well as two festival choirs. According to Torres, "A lot of high school groups perform in Carnegie Hall because they need to keep the space filled."

According to junior viola player Jasmine Wu, while it is not uncommon to see high schoolers performing in renowned concert halls, it was a great opportunity. "The New York trip was a fun and exciting experience. Rarely do you get to travel and perform at a high level with your friends, and we were fortunate enough to do it this spring break," said Wu.

In addition to creating musical opportunities for students, the trip helped the musicians bond within their ensembles.

"What I really like about orchestra is all the relationships that can develop and the interconnectedness. This trip did just that and created more bonds," Hsu said. "Everyone has to work together to make great music, and New Trier

has one of the few high school orchestras that is actually able to play music at a fairly high level."

"It's a very meaningful experience to bond with other students through music. Music connects us and moves us in ways that can't easily be explained. To share that bond on the stage of Carnegie Hall was priceless," elaborated Temple.

Rosheger said that the orchestra performed at Carnegie Hall in 2006 as well. "Trips are similar in that the ensembles develop a bond and an esprit de corps. But every trip is different because each group of students brings a unique or different character to the experience."

In addition to the performance in Carnegie Hall, students had fun sightseeing around New York. "We were able to explore multiple parts of New York City. We went to MoMA, the 9/11 Museum and Memorial, Times Square, Rockefeller Center, an opera at the MET, and a Broadway musical in three days," said Chiao.

## Lollapalooza lineup

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"Melancholy" will be kicking off Saturday. Known for his incredible vocals, The Weekend will be coming off his performance at Coachella when he makes his appearance in Chicago.

New York City based act Vampire Weekend is also performing Saturday. The band is very popular within the Indie Pop genre with hits including "A-Punk" and "Unbelievers."

Rappers Logic, LL Cool J, and Lil Pump are scheduled for Saturday. While the day is scheduled to feature many hip-hop acts, the different styles of each artist will make the day anything but boring.

Logic has one of the fastest flows, LL Cool J's East Coast, 90's sound on tracks like "Mama Said Knock You Out" is legendary, while Lil Pump is known for the chart-topping "Gucci Gang."

The final day's big performer is Jack White, solo act and half of the rock group The White Stripes. White just released his third solo album, "Boarding House Reach," on Mar. 23, and is expected to showcase various songs from the record.

Other notables from Sunday are the EDM duo Odesza, music often made better at outdoor festivals, and Lil Uzi Vert, performing at Lollapalooza for his second consecutive year.

The day will also include many smaller acts worth seeing: Gucci Mane, experiencing a resurgence since being released from prison in 2016, Playboi Carti, a member of ASAP Rocky's label, Quinn XCII, and last but not least, Rainbow Kitten Surprise.

As a whole, this year's event will have something for fans of all genres and has once again delivered a solid lineup of exciting musicians.