



SHENANDOAH ASTRONOMICAL SOCIETY

October 2010

April, Pulsar Hunter



ADVENTURES OF THE HEDGESVILLE HIGH SCHOOL PULSAR SEARCH COLLABORATORY TEAM IN THE 2009-2010 SCHOOL YEAR

as told by their teacher/adviser Betty
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This adventure began when I read in [Sky and Telescope](#) that the educator at the National Radio Astronomy Observatory, (NRAO) in Green Bank, WV had written an NSF grant for high school students to uncover unknown pulsars in the sky. I knew somehow that I had to get involved in the program, especially since it allowed students to get up to 6 college credit hours in from West Virginia University while attending Hedgesville High School.

In May of 2008, after being selected to attend a summer workshop to learn how the program worked, I was told that I could bring with me at least two students who might be interested in attending the

workshop. I pitched the offer to students who would be taking my astronomy class in the fall and the freshmen, April, mentioned that she would be interested in attending the workshop. Thus began an adventure which continues to today.

At one time, the Robert C. Byrd Green Bank Radio Telescope, (fondly called the GBT for short), the largest steerable radio telescope in the world, was "up on blocks" so to speak, being refurbished, and could only steer up and down in altitude. The observatory was afraid that astronomers would not be able to use the telescope at this time. Not so, with pulsar astronomers. They could still use the telescope while the earth rotated, doing a survey of the sky to gather data in a way to possibly discover unknown pulsars. A pulsar is the left over core of a star much more massive than the sun. It has used up its fuel and went supernova, blowing off its outer layers and leaving behind a core that does not have enough mass to collapse into a black hole. It instead forms a neutron star that is only about as big as a city on Earth, yet has a very strong magnetic field. As some of these stars rotate, they send a beam of radio radiation toward Earth that can be picked up with a radio telescope. These stars rotate very fast and the signals we pick up from them look like a pulse in the data.

When the GBT gathered data, it got over 20 terabytes of data. This is way too much to look through by the few astronomers at WVU, so that is where the high school students came in. April became my team leader and she helped me recruit more students to look through data and form a team. The students use an on-line database to access and keep track of the data they look through. In addition they can take an on-line class on pulsars and astronomy in general and if they find something that

looks good, they can alert the pulsar astronomers and if they concur, they can do follow up observations on the GBT from their home computer with the help of one of the pulsar astronomers.

At the end of the first school year, I had six students do a poster paper on their research and presented it at what is called the “Capstone” event at the end of the school year at West Virginia University where the students get to stay in the dorms and tour the science areas of the campus.

During the 2009-2010 school year the astronomers ran a couple of data analysis marathons where the students try to look at as much data as possible during a fixed amount of time, such as a week or a weekend. My students came in first place in both data analysis marathons and won NRAO book bags and tee-shirts. The team has grown to many students, actively searching the database. At the Capstone Event this year I had six students attend and seven students contribute to three poster papers and we won first place in the poster paper competition beating out over 65 students from seven states. Also my student, April, our team leader received recognition for finding the most potential pulsar candidates and getting the most follow up time on the GBT. I received a certificate for my participation in the on-line class. Also there was a film crew that filmed the Capstone event for a documentary on the pulsar program and interviewed my students.

One Hedgesville High student, Josh spent one week at the National Radio Astronomy Observatory this summer, training to be a better pulsar searcher.

Although as of yet, none of my students have discovered a pulsar, two other students from other schools in West Virginia have made discoveries. Shay discovered a new pulsar. Lucas discovered a weird object called a RRAT which stands

for a Rotating Radio Transient which is an object we think might be an aged pulsar that takes time to store up energy and no longer gives off radiation at a regular rate. These are hard to identify, since they do not give off regular radio radiation. This discovery allowed Lucas to attend the star party on the White House lawn last October.

When I was in elementary school, I remember reading about the discovery of pulsars in my Current Science magazine. Little did I know that I would grow up to train high school students to locate pulsars along with NRAO astronomers.

Find out more about our program at: <http://www.pulsarsearchcollaboratory.com/>



Program for October 13

LFCC 7:00 PM

We will see a video from “The Universe” series entitled “Wildest Weather in the Cosmos.” Our meeting will be in the Board Room in sight of the front desk so come in the front and check with the desk clerk or look for a sign.

Observing:

- 1) Andy Guest State Park on Rte 340 south of Front royal 8 miles – October 9
- 2) Shenandoah Park on Rte 11 at the edge of Maurertown - October 16