Lab Experiments at PAN

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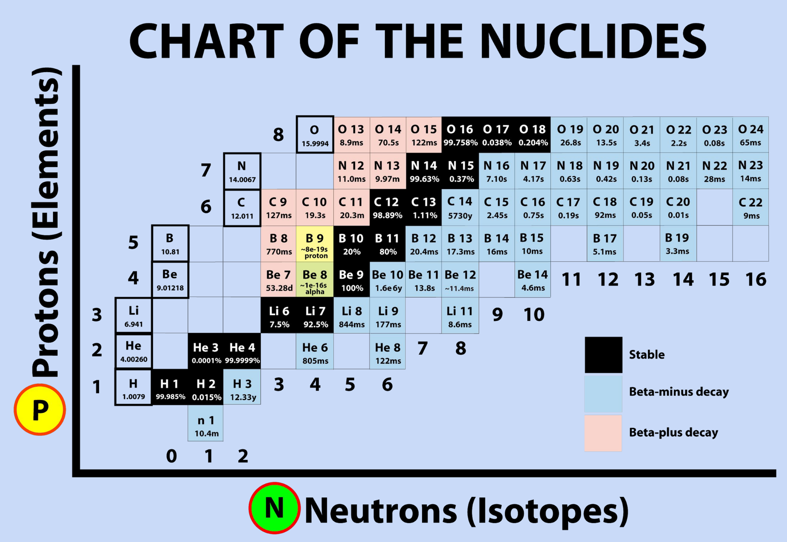
The Higgsinos

JINA-CEE

Gamma Spectroscopy Experiment

Isotope: different versions of the same element with varying numbers of neutrons

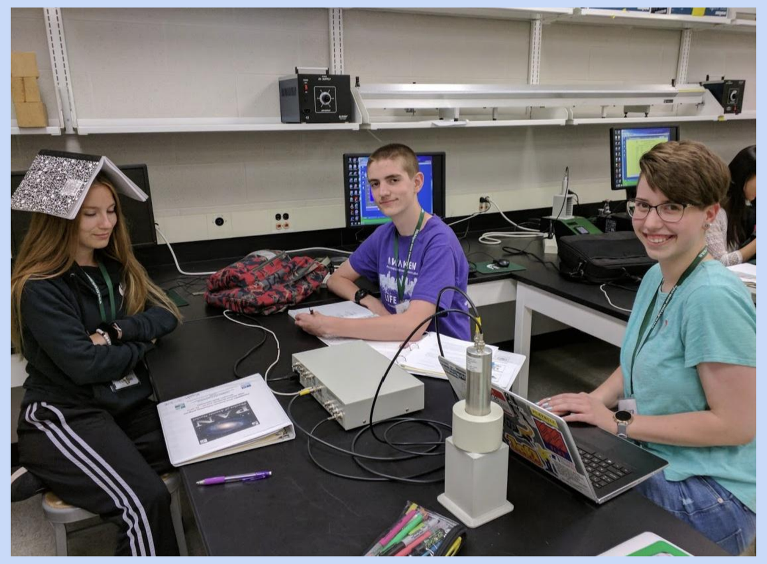


The chart of the nuclides (which is far more useful than the periodic table of elements).

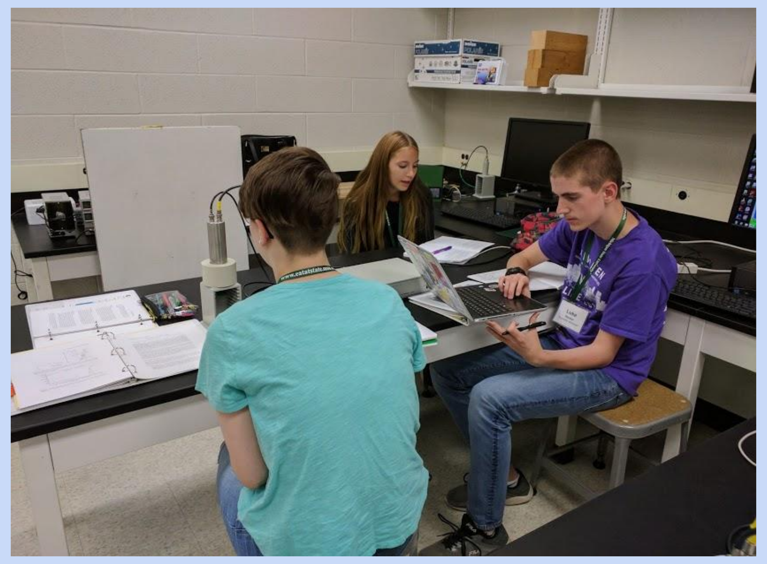
PAN built a portion of the chart of the nuclides out of Legos.

A scintillator is a type of detector that uses a specific medium (Noble Gases, crystals, or hydrocarbons) to turn incoming radiation into a burst of light, which is read as an electric signal by a computer. The device we used picks up gamma rays.

Gamma rays are high energy light that originate from radioactive particles. They can be found coming from stars, supernova explosions, and the decay of radioactive elements like uranium.



The Higgsinos pose for their close up



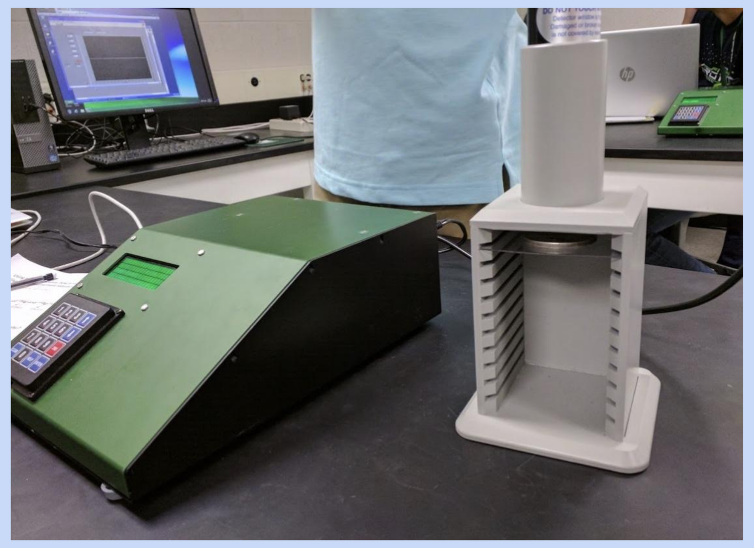
The Higgsinos work to calibrate the spectroscope using elements with gamma rays of known energies

At the BPS (Biomedical and Physical Sciences) building, we performed an experiment which required us to use a gamma ray spectroscope to identify a mystery radioactive element. We were able to practice the skills that nuclear physicists use in actual labs at MSU and elsewhere.

We determined the properties of the mystery element using an image produced by the spectroscope called a *spectrogram*. These properties allowed us to correctly identify the sample as Manganese-54.

Half-Life Experiment

Decay: When a nucleus loses energy, causing an internal conversion. There are 3 common types: alpha, beta, and gamma. Alpha and beta both release particles, whereas gamma only releases high energy light.



A GM Tube (right) sitting on a stand beside a . The radioactive sample (a silver coin) can be seen on the clear plastic shelf in the stand.

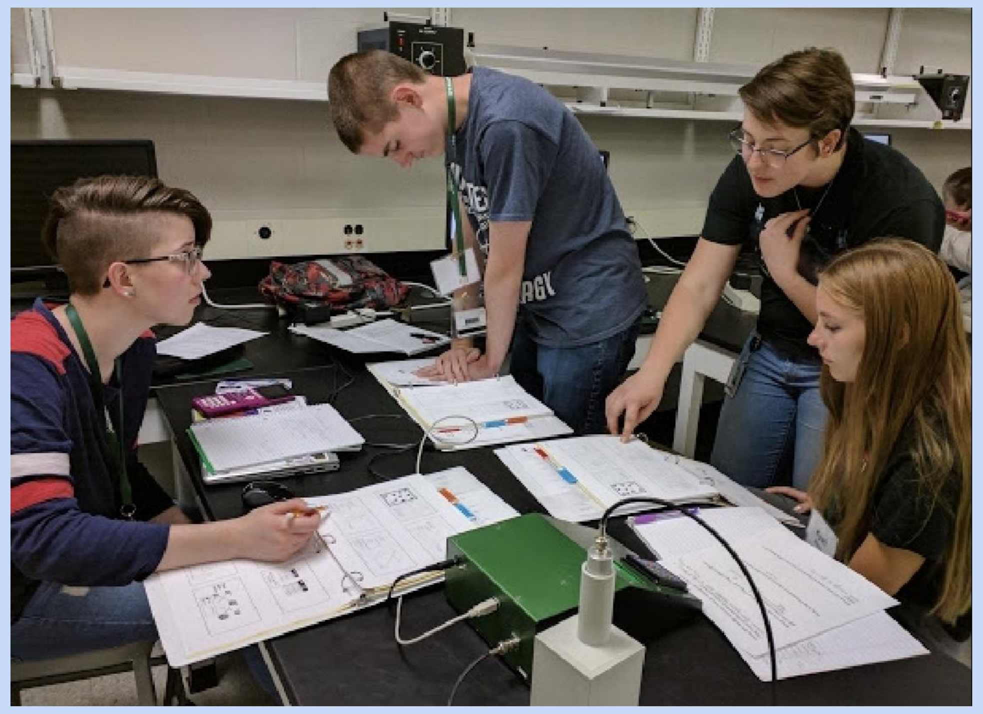
PAN takes a trip to the museum!

Half-life is the rate at which a radioactive isotope decays.

A device that can help us determine half-life is the Geiger-Mueller (GM) Tube. The GM Tube is filled with an inert gas and contains a charged electrode which collects ions of the gas created by the radiation passing through it. The charge collected is read by a computer as an amount of radiation present.

Notice how spread out the dots are; this means that this particular reading has a high level of error. The first 200 seconds are more consistent, therefore easier to analyze than the readings that follow.

This scatterplot shows "counts" per 10 seconds over a span of 24 minutes. Each count represents the detection of one gamma ray.



The Higgsinos at work

In this experiment, our objective was to measure the half lives of Silver-108 and Silver-110. Our team used a GM Tube to detect beta-decay in an irradiated silver coin, which contained the Silver isotopes.

After collecting data, we graphed and analyzed the it to determine the value of the half lives of the isotopes. We found the value of Silver-110 to be 37.067 seconds, compared to the accepted value of 24.6 seconds. For Silver-108, we calculated a value of 2.818 minutes, while the accepted half life is 2.4 minutes. The error is so large because we struggled to get a strong signal from the decaying coin.

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