

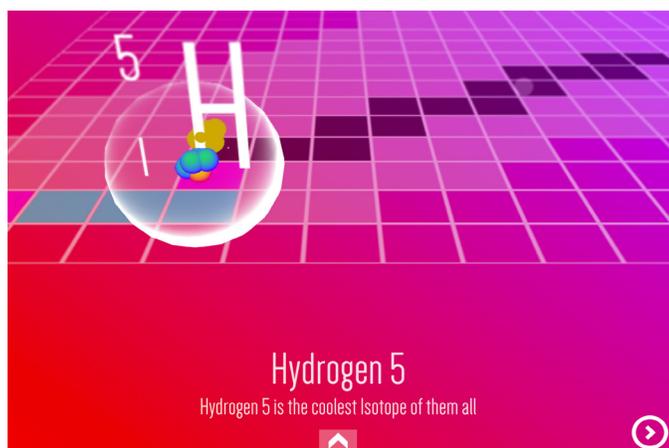
PLAY THE NEW RARE ISOTOPE GAME

Contributed by: Zach Constan

Over the past year a collaboration between the Games for Entertainment and Learning (GEL) Lab in the MSU College of Communications and Arts, and the Laboratory Outreach Committee have worked on the creation of a tablet game about the process of discovering rare isotopes. In the game, players accelerate isotopes, collide them with targets and assemble new isotopes from the fragments in an effort to create and complete the table of isotopes in a playful process inspired what goes on in the real fragmentation process.

For each isotope that is created, basic data and some interesting facts will be displayed. Many facts can still be added, so if you wish to contribute, please [have a look at the current table](#) and contact Zach Constan for information to be added. Zach will also have a beta version of the game in his office between 18-20 August, so if you are interested to have a look, drop by. A full playable version of the game is scheduled for completion in the Fall.

The creation of the game is supported by a grant from the American Physical Society and generous contributions from the MSU Offices of the Vice President for Research and Graduate Studies, the Provost for University Outreach and Engagement, and of the Dean of the College of Communications and Arts, MSU's Chief Information Officer, the Department of Physics of Astronomy, JINA and the Laboratory.



Players try to guide their rare isotope down the beam where it is fragmented, in an attempt to produce an isotope.

PRECISION MEASUREMENTS OF ISOSPIN DIFFUSION

Contributed by: Jack Winkelbauer

To extend our knowledge from measurements of finite nuclei to nuclear matter we need to understand how the energy that binds protons and neutrons together changes when the number of neutrons and protons are not equal. The energy term that varies with changing proton and neutron numbers is called the symmetry energy and depends on the density of the nuclear matter. We would like to know how the symmetry energy changes when the density of nuclear matter is below (dilute nuclear matter) and above (dense nuclear matter) the density of the core of a lead nucleus. Such understanding is important to model neutron stars, extremely dense astrophysical objects that are very rich in neutrons. One way to gain information about the symmetry energy is to study heavy-ion collisions.

The tendency for neutrons to drift from a neutron-rich region to a neutron-deficient region during a peripheral collision of heavy nuclei is known as "isospin diffusion" and is strongly related to the symmetry energy. At NSCL, isospin diffusion has been measured indirectly. This was used successfully to study the symmetry energy in dilute nuclear matter created in the neck formed by two colliding nuclei as they move apart. Experimentally, it is not possible to measure isospin diffusion directly. Instead scientists can compare the yield ratios of light charged isotopes emitted from colliding heavy nuclear systems for different choices of target and projectile isotopes.

Instead of investigating the light charged isotopes, one can also investigate the residues of the projectiles, which are more directly related to isospin diffusion. This latter method was the topic of Jack Winkelbauer's thesis experiments. Yields of projectile fragmentation with beams of $^{112,118,124}\text{Sn}$ at 70 MeV/u on targets of $^{112,118,124}\text{Sn}$ were measured with the S800 Spectrograph. The results from this experiment can give a more precise measurement of isospin diffusion and detailed information about the symmetry energy. At present, theoretical calculations using supercomputers at the Texas Advanced Computing Center at the University of Texas (Austin) are performed to compare with the data and to better interpret the results.

SHUTDOWN UPDATE

During the shakedown period last week, a problem with the vacuum in the K1200 was encountered. That was traced back to the stripper foil mechanism. During the cap raising to address the stripper foil issue, there was a mechanical failure that required a large repair effort. Material was ordered and parts were machined to replace the damaged parts. Thanks in large part to Craig Snow in Mechanical Design, Jay Pline and John Santana in the Machine Shop and Jason VanAken the welding shop, the needed repairs were made in time to meet the start of the experimental schedule.

Beam for the first experiment was developed in the K500 Tuesday and tuned through the K1200 Wednesday after the repairs were complete. Secondary beam tuning started Thursday morning at 8:00am; we presently have two independent experiments running.

LADDER SAFETY

A ladder is an essential workplace tool for anyone working above ground level. However, each year there are over 100,000 ladder related injuries reported in the United States. Work-related falls from ladders result in fatalities as well as serious injuries. Not all these incidents are due to defective ladders; however that can certainly be one of the factors. It is important that ladders are inspected regularly. MIOSHA regulations require frequent inspection of all ladders and those which have developed defects must be withdrawn from service for repair or destruction.

Unfortunately frequently is a very subjective word. Truly each ladder must be evaluated on its use and exposure to damaging influences prior to starting the task.

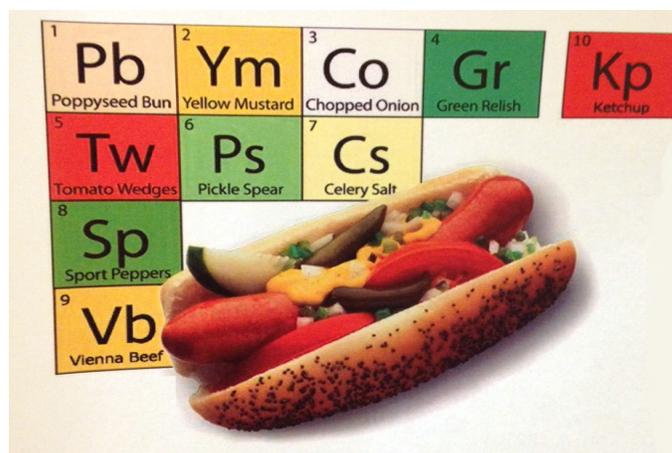
Remember these ladder safety tips:

- Select the correct ladder. Why waver near the top of a stepladder when you can use an extension ladder;
- Check the ladder for unsafe footing, broken steps, bent legs, bent supports, cracks, worn or slippery step treads, and worn or missing rubber feet;
- Use ladders only for their designed purpose; do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity;
- Use ladders only on stable and level surfaces unless secured to prevent accidental movement;
- Face the ladder when moving up or down;

- Follow the belt buckle rule when using a stepladder, making sure your belt buckle goes no higher than the top step of the ladder;
- Use both hands when climbing; do not carry objects or loads that could cause loss of balance and falling;
- Keep areas clear around the top and bottom of ladders;
- Do not move, shift or extend ladders while in use;
- Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment.

HOT DOG BAR-B-QUE

The Social Events Committee is pleased to announce the last cook-out of the season will be next **Wednesday, August 19th** starting around 11:30am in the Atrium. We will feature Koegel Vienna Frankfurters with poppy-seed buns, (Morningstar Veggie-dog option too) with all the fixings including chili and cheese and Chicago style, plus sides such as coleslaw, macaroni salad, potato salad, tortilla chips and salsa, fruit salad, deserts and drinks, for only \$5!



PEOPLE AT THE LAB

- Michael Larmann joined the lab this week. Aftab Huessein is his line manager.
- A group of Graduate Students joined the lab this week. They are: Sara Ayoub, Jasper Hill, Aaron Magilligan and Didi Luo.
- Zoe Waldbuesser is a student employee who joined the lab this week. Jennifer Gilbert is her line manager.

[THE ARCHIVE FOR PREVIOUS GREENSHEETS IS AVAILABLE HERE](#)

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