Student-Led Outreach

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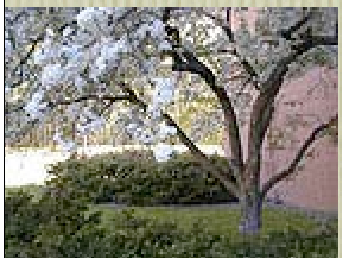
Spartan Science Day

- A student-initiated science outreach program with faculty participation can be a wonderful community service project for an undergraduate student organization.
- This talk discusses a two-year-old program of this kind, that is led by the Briggs Multiracial Alliance at Michigan State University in cooperation with elementary school teachers from Flint, Michigan.

Holmes Hall, home to the Lyman Briggs School of Science at MSU since 1967.

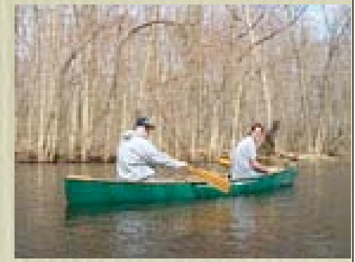






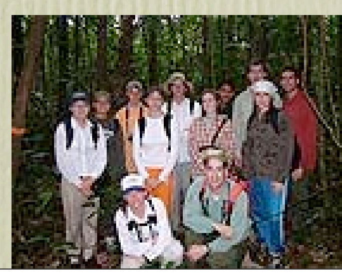
Lyman Briggs School of Science

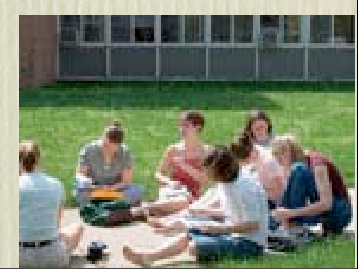
A Residential Learning Community for the Study of Science



Lyman Briggs is an undergraduate, residential learning community at MSU, devoted to studying the natural sciences and their impact on society. Its building houses laboratories, classrooms, and student residential, dining, and recreational facilities. With 1750 students, LBS offers the "best of both worlds": the benefits of a liberal arts college and the resources of a great research university.







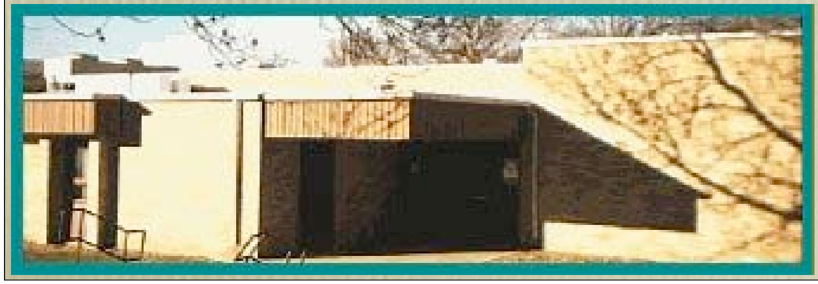
The faculty and staff of Lyman Briggs

LBS graduates, spring 2006.

Flint schools & teachers participating in Spartan Science Day

Brownell Elementary School
Ms. Catanja Harrison

Williams Elementary School
Ms. Karen LaLonde



50 miles apart

5th grade students visiting from Flint, waiting for the program to begin.

Student Organizers from the Briggs Multiracial Alliance (BMA)

Farhan Bhatti
Jaime Murphy
Shaun Wahab
Rome Meeks
Lisa Peterson

These members of the BMA Executive Board conceived of, planned, and executed the program. They made contact with the teachers, arranged transportation and refreshments, recruited faculty & student session leaders and tour guides, and planned the schedules.

SPARTAN SCIENCE DAY 2006

Group 3 Agenda

12:00: Students Arrive

12:00 – 12:25: **Lunch** in West Lower Lounge, Name tag and t-shirt distribution

12:30 – 12:55: **Science Theater** performance in West Lower Lounge. Students sit with their group.

1:00 – 1:35: **Campus Walking Tour**

1:40 – 2:00: Making green-slime with Dr. LaDuca outside of **Chemistry** lab.

2:00 – 2:30: **Microscope Demonstration** with Dr. Smith, Dr. Luckie, and Dr. Urquhart. Bring students to entrance of Sanford Natural Area. Give them a quick explanation of the area using your pamphlet provided in your packet. Allow the students 5 minutes to look for 2 specimens in the natural area (leaves, bugs, etc.) Then back to use the microscopes!

2:30 – 2:50: Dr. Reiheld's **Philosophy of Science** Activity

2:50 – 3:10: Dr Simmons & Dr. Chivukula's **Subatomic Physics** Activity

3:10 – 3:20: Visit a student's dorm room

3:20 – 3:30: Walking tour of Holmes Hall

MSU's student-run Science Theatre performs demonstrations:

... including a Dance of the Sound Vibrations...

… Flint students get in on the act!

Making slime with Dr. LaDuca

Microscopes & Cells with Drs Luckie, Smith & Urquhart

Handouts from Subatomic Physics with Drs. Simmons & Chivukula -- and Honors Student Garrett Warnell.

The Fundamental Building Blocks of Matter

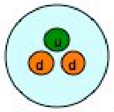
The Electron

Like the quark, the electron is not a combination of any smaller particles. It has considerably less mass than even a quark, and has an overall charge of -1.

Quarks

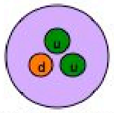
One of the basic particles of matter, quarks combine with other quarks to form structures such as a proton or a neutron. While there are six types of quarks – up, down, charmed, strange, top, and bottom – the most common are up and down quarks. The up quark has a charge of +2/3rds and the down quark has a charge of -1/3.

The Neutron



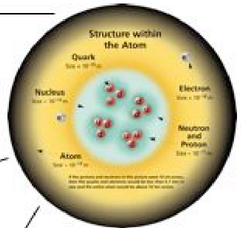
The neutron is very similar to the proton in that it is also composed of three quarks. However, the neutron contains two down quarks and only one up quark. This accounts for the difference in charge between the neutron and the proton – the neutron has no charge.

The Proton



You may have already learned that the proton is a particle that appears in the nucleus of atoms and has a charge of +1. However, the proton itself is composed of three quarks – two up quarks and one down quark.

Atom



All of the particles to the left come together to form an atom. This one contains two neutrons, two protons, and two electrons.

Notice the number of protons is equal to the number of electrons. This is so their charges will cancel (-2 +2 = 0), and as a result the atom itself will have no charge.

Large collections of atoms make up the substances you see every day. For example, the above atom is Helium, the gas that makes balloons float away.

Isotopes

An **isotope** is a "version" of the same atom that has more or less neutrons than normal. For example, one isotope of hydrogen is deuterium. While the common hydrogen only has a proton and an electron, the isotope deuterium has an electron, a proton, and a neutron.

When describing atoms and their isotopes, there are a few numbers that you should know:

Z = The number of protons in the atom
N = The number of neutrons
A = The sum of protons and neutrons

So, under this system, the deuterium isotope described above has the following numbers:

Z=1
N=1
A=2

The number of electrons is always equal to the number of protons, or Z.

Keeping this in mind, the following is a table of some atoms and isotopes:

Isotope Name	Z	N	A
Hydrogen	1	0	1
Deuterium (Hydrogen-2)	1	1	2
Tritium (Hydrogen-3)	1	2	3
Helium	2	2	4
Carbon	6	6	12
Carbon – 14	6	8	14

How to Build an Atom

The materials below represent the different elementary particles of matter:

Up Quark

Down Quark

Electron

To group quarks into protons and neutrons, place them in a small Tupperware container. To add the protons and neutrons into an atom, place their small Tupperware containers in a larger one. To add electrons, simply screw the lid of a big container on over the string connected to the ping pong balls so the end with the ball is hanging out.

Remember
Protons = 2 up quarks and 1 down quark
Neutrons = 2 down quarks and 1 up quark

Here's an example to get you started:

Deuterium

1 proton:

1 neutron:

1 electron:

You can see the deuterium atom set up on the table

• Helium is the gas that is commonly put into balloons to make them float. Try to build a model of Helium using the displays (keep in mind that the number of electrons is equal to the number of protons!)

Challenge

• Carbon-14 is a well known isotope of Carbon that is used in radioactive dating of things such as fossils. Using the materials available and the table on this page, construct a model of Carbon-14.

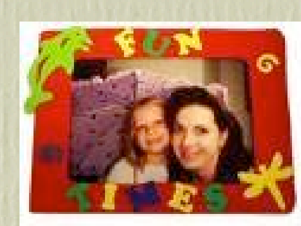
Quark Transformation

Though they usually stay in their current state, it is possible for some quarks to transform into others! Ask one of the presenters for an explanation and demonstration of this process.

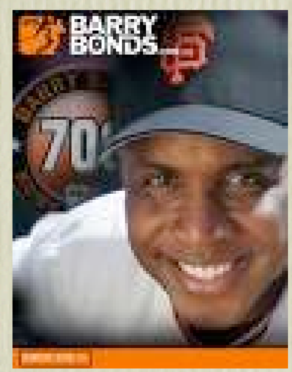
Philosophy of Science with Ms. Alison Reiheld

- What is a technology ? (a skill or thing that uses what we know to solve human problems)






- What uses are acceptable ... and what factors matter? (fairness? harm to self?)

Perspective from Flint teachers

- **Many of my students come from homes where no one has ever gotten past high school.**
- **When I talk to my students about college and career plans they say "My mom says poor kids can't go to college…." This trip helps counter what they're hearing at home.**
- **Many students didn't know what a college was before this day and had never set foot in one before… they left the program saying "I want to go there!"**
- **The MSU students were awesome with the kids, even with those who usually present behavior problems. There was a spirit of camaraderie.**
- **One of the best field trips EVER!**

Perspective from MSU faculty

- … the [document] projector itself blew them away, incidentally; in all groups, most kids did not know such a thing existed and in some groups none did….
- [P]eople tend to underestimate the capacity of primary and secondary school students to think critically or philosophically with any kind of rigor….All they need is a concrete place to start and some open-ended guidance.
- Most of the kids got pretty involved with the hands-on activities and a few asked lots and lots of enthusiastic questions.

Perspective from Student Organizers

- **[T]he kids we were targeting are among the least privileged kids in the entire state - some coming from families that earn less than $8000 per year. Many of those kids have no idea what it means to go to college .... I am hopeful that as they grow up, they'll remember the fun they had at MSU and will see college as a realistic goal, not as an unrealistic dream.**

- **At the end of the day, just before the kids left, we asked how many of the kids would like to go to college someday. And when almost every single one of them raised their hand, that gave me all the satisfaction and reward that I needed for all the work that was put into it.**

- **Getting ten and eleven year old kids excited about science experiments, physics demonstrations and the use of technology could be paramount to their desire for education.**

- **I know I gained a greater sense of appreciation for my education, and those that have guided me along the way, i.e. parents and teachers.**

End of the Program

(Can you spot the physics handout?)

New Friends...