Astronomy Education Workshop 15 -- Breakout Session & Workshop Descriptions

10:30 am

Baseball's Distant Road Games
Brian Thomas, Washburn University
I will discuss a student-initiated project to answer the question "What would it be like to play baseball on other planets?" The project uses baseball to illustrate how the acceleration due to gravity at the surface planets varies with their mass and size. We will look briefly at the physics involved, discuss the project and its results and discuss how teachers might use something similar in physics or astronomy classes. Finally, I hope this will serve as a springboard to stimulate discussion about how sports can be used to illustrate physics principles in introductory courses.

Targeting the Reasoning Processes behind Students' Misconceptions
Marilyne Stains, UNL
Common sense reasoning has been shown to underlie many of students' misconceptions in the sciences. Knowledge of these reasoning processes can be a powerful instructional tool that will enable one to predict and understand students' struggles. In this session, we will learn about some of the dominant reasoning strategies that students use when thinking about concepts in science.

Surveying Astronomy Simulations
Kevin Lee, UNL
This presentation will demonstrate many of the simulations (Flash and Java) that I have found useful in teaching introductory astronomy. It is interesting that many of these are very straightforward simple simulations. Participants will be provided with a list of URLs and involved in a discussion of what makes the simulations powerful.

11:00 am

Outreach with Squishy Circuits
Marina Bradaric, UNL & Steve Wignall, Seward HS
Use the universal excitement of playing with PlayDough to teach students how an electronic circuit works using tools such as LEDs and motors. The material can be made simple enough for little kids or quite advanced for more mature students. Electronics made simple!

New Lecture Tutorials on Cosmology
Lee Powell, UNK
A new edition of Lecture Tutorials for Introductory Astronomy will be available sometime soon. There are a few editions to the new edition, including some tutorials on cosmology that were developed by Colin Wallace (who is now a post-doc with the Center for Astronomy Education) while he was a doctoral student at the University of Colorado. We will work through two of these new tutorials in this session: "Hubble's Law" and "Dark Matter".

Discussion: Teaching the Higgs Boson
Dan Claes, UNL
Through group responses to a series of leading concept questions, a few fundamental physics principles will be reviewed allowing a discussion on "What is a boson?", "Why do we NEED a Higgs' Boson?", "How do we FIND fundamental particles?" (which, after all, are subatomic) and "How can we infer ANYTHING about them once they've been identified?"

11:30 am

Frames of Reference and the Foucault Pendulum
Cliff Bettis, UNL
I will show several demonstrations illustrating inertial and non-inertial frames of reference, including the Foucault Pendulum.

Star Clusters as Astrophysical Laboratories
Jeff Wilkerson, Professor of Physics, Luther College
Color-magnitude diagrams of star clusters help us understand how stars evolve and they can be these used to determine distances to the clusters, ages of the clusters and the distribution of interstellar dust. We will look at how these diagrams are constructed and practice determining ages and distances. We will also see how the distribution of clusters on the sky maps the major visible components of our galaxy.

Discussion: An Educator's Refresher on Faster-Than-Light Travel
Adam Davis, Wayne State College
Astronomy students are sometimes intrigued by the idea of humanity actually going to the stars and so it is a question that pops up from time to time. In this discussion we review some of the physics constraints on interstellar travel and possible some of the speculation about "tricks" to get around those constraints. We'll also go beyond just the facts and have a discussion about how to talk to students informatively and accurately, especially for students who don't have a background in relativity. So come, refresh, discuss, and share!

1:45 pm Workshops

Sweet Labs in Chemistry, Physics and Optics with Candy Glass
Dr. Michael Nydegger, Dr. Todd Leif Cloud County CC
Glass is seldom discussed in our study of matter, yet it is one of the most ubiquitous materials in our everyday life and provides numerous applications in optics, devices and materials. In this workshop/lab lecture demonstration we provide an introduction to glass science for the teacher through a series of low cost experiments with candy glass, a.k.a. hard candy. Experiments will include the making of candy glass, preparing optical fibers, measuring refractive index, exploring polarization and crystallization - all with commonly available materials and minimal cost. The experiments can be tailored for use in the classroom demonstration or student labs from middle school through high school or even college labs.

Self-Assembly of Nanostructures
Dr. Axel Enders
How is a virus or a seashell built? Self-assembly is a process by which materials build themselves. The principles of self-assembly explain how specific binding events occur in nature and help scientists and engineers design materials that build themselves. This new era in materials science has resulted in "nanomaterials" that have many interesting applications in computing, drug delivery and tissue engineering to name a few areas which we will explore.