Astronomy

For the complete bibliography with references as well as an explanation of the classification scheme go to:
Demonstration Bibliography
The **demonstration name** listed in the bibliography is either the name listed on the reference or, if none is given, a simple descriptive name. In cases where there are several common names for a demonstration, the committee has chosen a preferred name.
The **description** is very brief. It is not intended to be a summary of the reference. One sentence is, in general, sufficient to describe the unique characteristics, if any, of an item. Each source has a unique numbering format. These unique formats are used identify references in the Bibliography.

The formats for the **reference** column and links to the sources are listed below:

Reference	Source
M-1	Sutton
Ma-1	Freier & Anderson
M-1d	Hilton
8-2.8	Meiners
M-108	Dick & Rae
1A 12.01	University of Minnesota Handbook
AJP 52(1),85	American Journal of Physics
TPT 15(5),300	The Physics Teacher
Disc 01-01	The Video Encyclopedia of Physics Demonstrations
PIRA 200	Physics Instructional Resource Association
PIRA 500	PIRA 500
PIRA 1000	PIRA 1000

Each demonstration is listed in only one location, even if it is commonly used to illustrate several concepts.

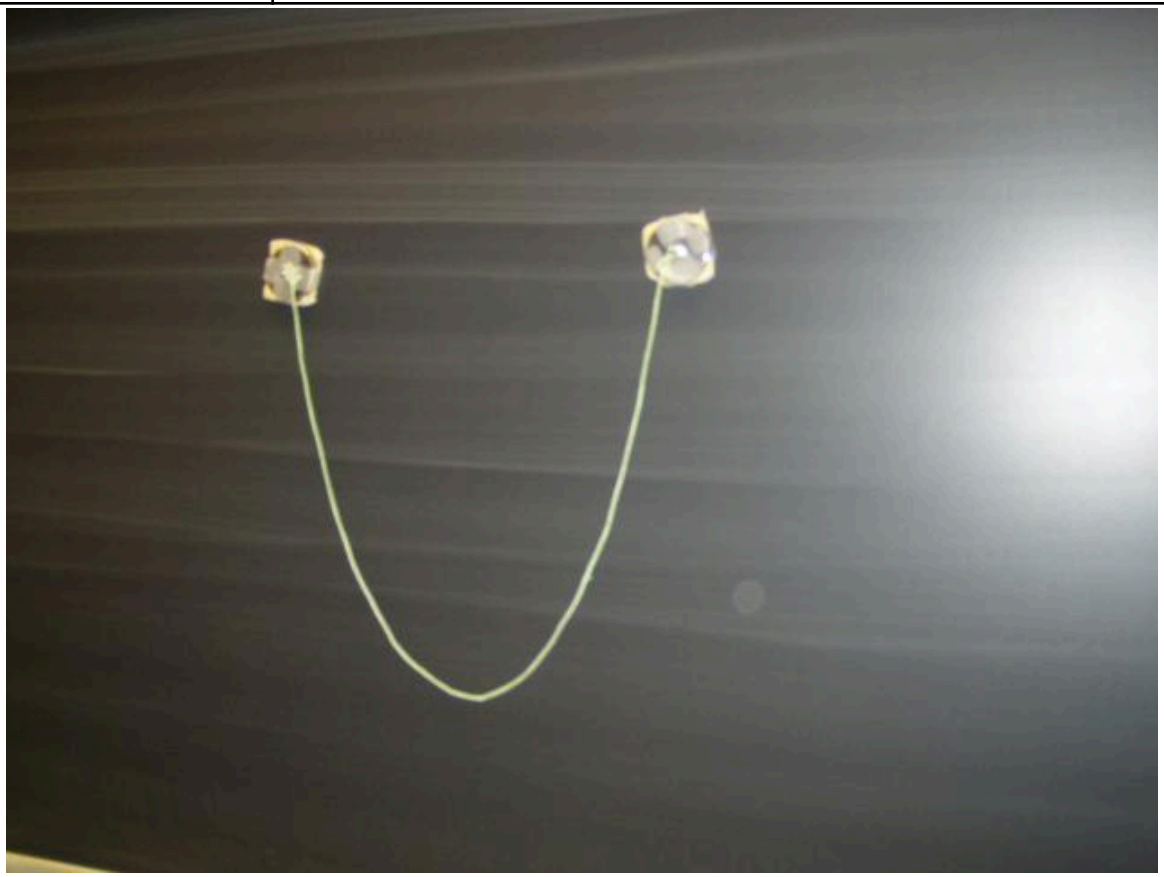
10/20/22

Astronomy

MECHANICS	1E20.10	RELATIVE MOTION
Rotating Reference Frames		
Foucault Pendulum		
	A Foucault Pendulum with a Charron ring drive. Use the machine shop's appliance dolly to move it into the lecture hall.	

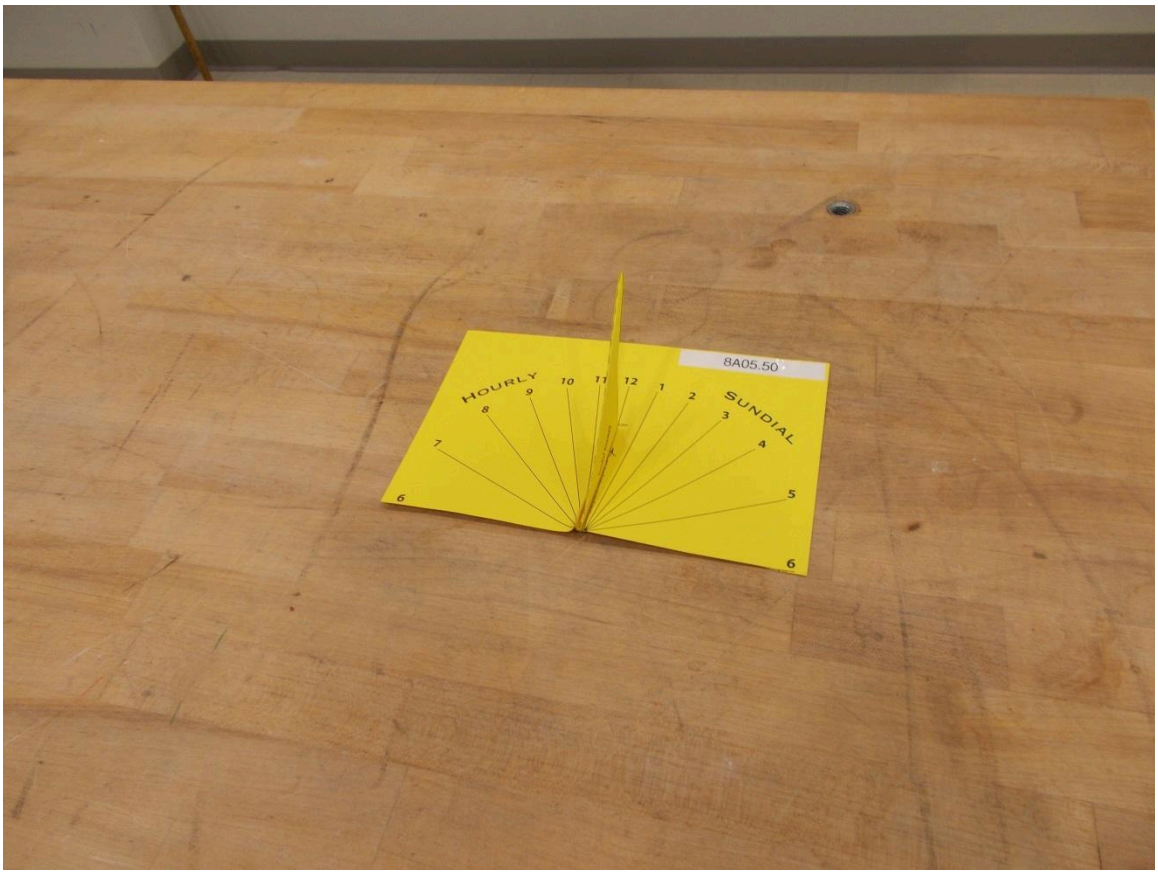
Location: Outside 134A

Mechanics	1L20.50	GRAVITY
Solar System Mechanics		
Ellipse Drawer		
	Magnets hold a string and while the string is pulled taut with a piece of chalk, an ellipse can be drawn.	



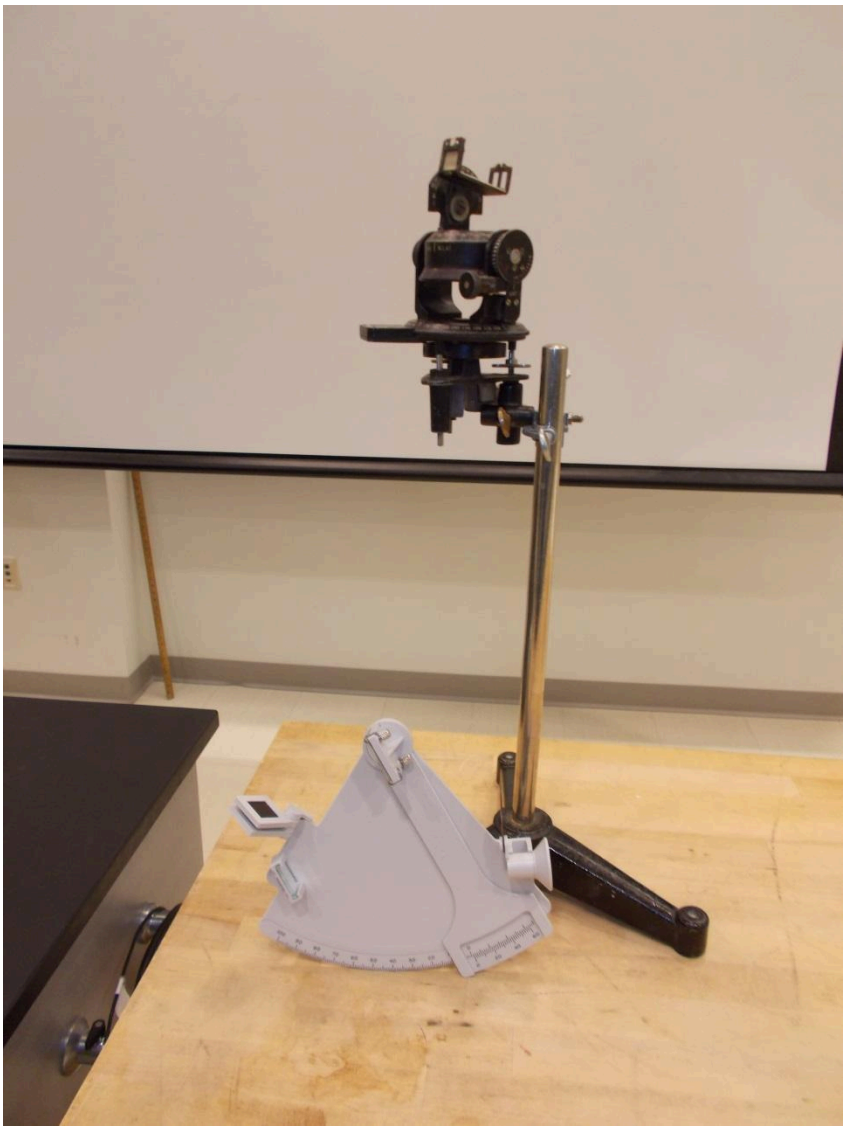
Location: Ca4

ASTRONOMY AND ASTROPHYSICS	8A05.50	PLANETARY ASTRONOMY
Historical Astronomy		
# Sundial		
	A simple sundial made of card stock	



Location:
La3

ASTRONOMY AND ASTROPHYSICS	8A05.70	PLANETARY ASTRONOMY
Historical Astronomy		
Celestial Navigation Instruments		
	A sextant and astro-compass (the astro-compass was used to find true bearings in locations where the deviation of the magnetic compass was too great to use the compass accurately).	

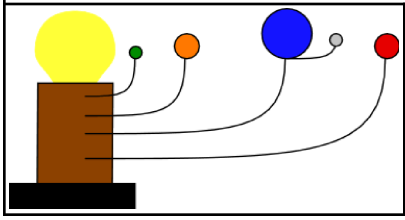


Location: La3

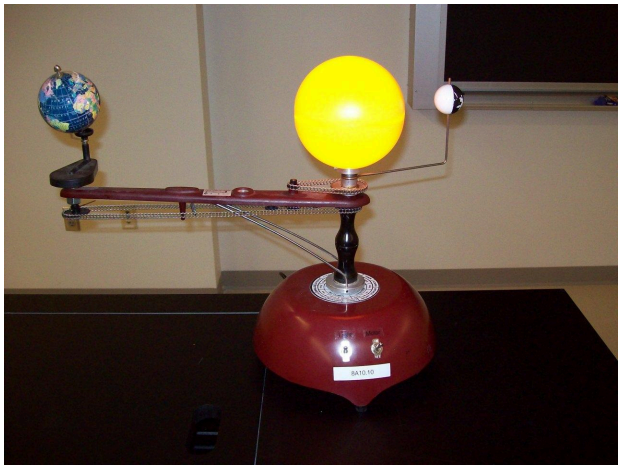
ASTRONOMY AND ASTROPHYSICS	8A10.10	PLANETARY ASTRONOMY

Solar System Mechanics

Orrery



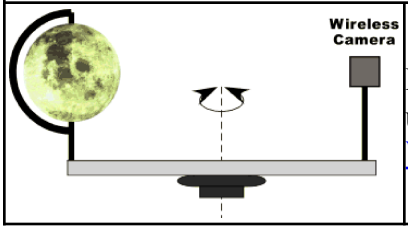
The system is not to scale. The periods of the orbit are scaled. All the planets are on friction clutches and can be positioned by hand.



ASTRONOMY AND ASTROPHYSICS	8A20.15	PLANETARY ASTRONOMY

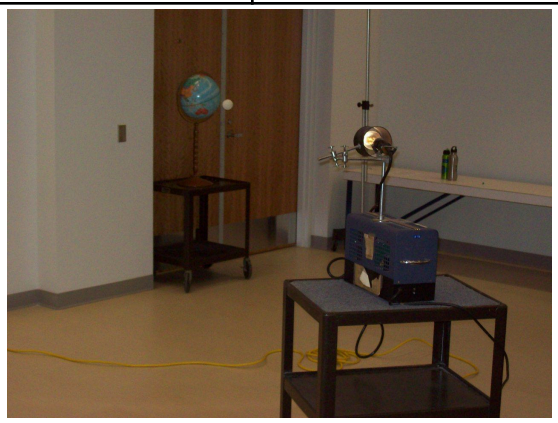
Earth - Moon Mechanics

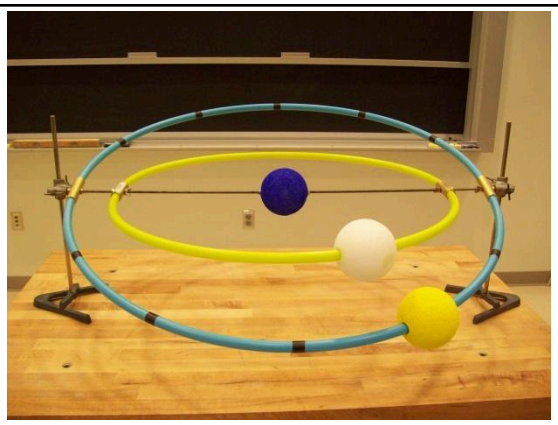
Phases of the Moon



Rotate the camera in a complete circle keeping the softball used as the Moon, in the light.
Workshop Video

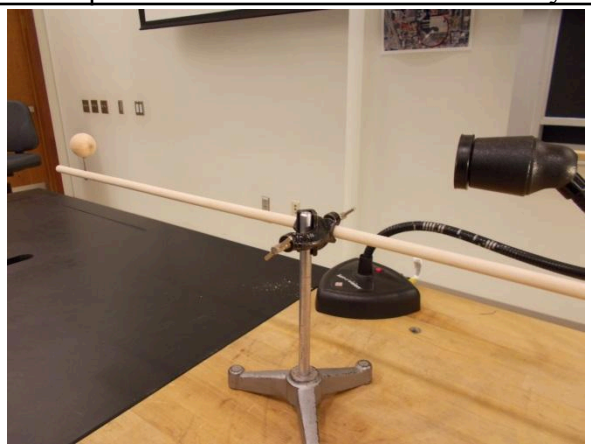
ASTRONOMY AND ASTROPHYSICS	8A20.25	PLANETARY ASTRONOMY
Earth - Moon Mechanics		
Eclipse Model		
	Using a point light source for the sun, a globe for the earth and a hanging ping pong ball for the moon, various eclipses can be modeled. Also shown is a model using a pair of hula hoops and Styrofoam balls.	

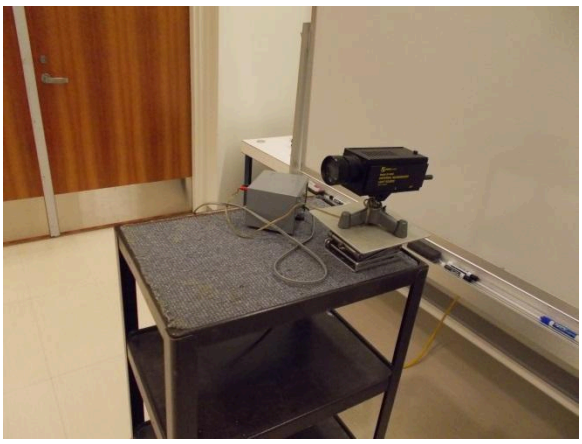




Location: La2, LaT, Id2

ASTRONOMY AND ASTROPHYSICS	8A20.26	PLANETARY ASTRONOMY
Earth - Moon Mechanics		
# Eclipse Stick		
	A Scale model of the Earth-Moon system to illustrate eclipses.	



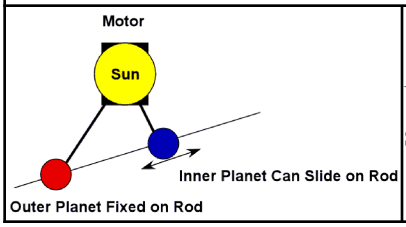


LaT

ASTRONOMY AND ASTROPHYSICS	8A30.30	PLANETARY ASTRONOMY

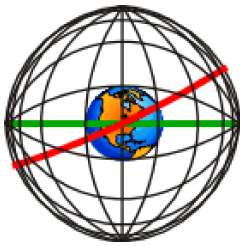
Views from Earth

Retrograde Motion Model



Use the crank on the back to move the two planets around the sun. A sliding rod shows the relative motion of the two planets.

La2

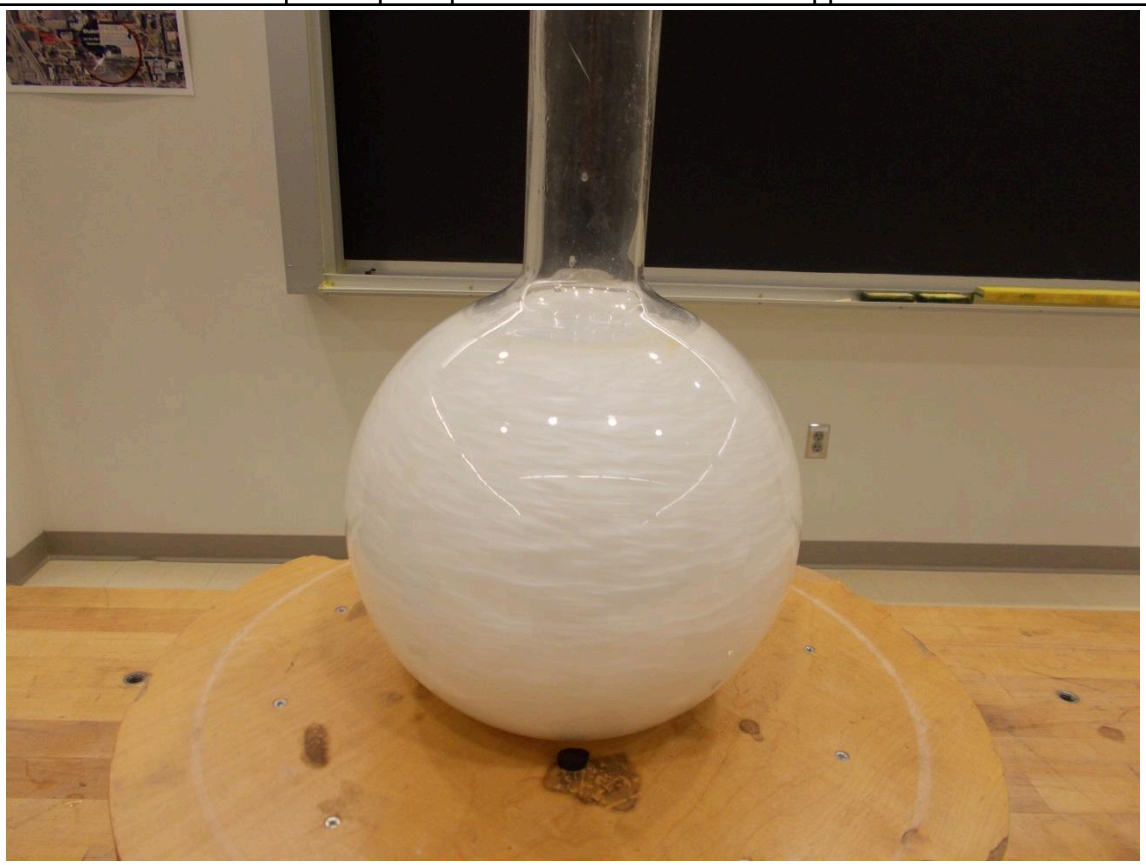
ASTRONOMY AND ASTROPHYSICS	8A35.10	PLANETARY ASTRONOMY
Views from Earth - 2		
Celestial Sphere		
	No instructions	

Location: La1

ASTRONOMY AND ASTROPHYSICS	8A35.20	Planetary Astronomy
Views from the Earth - 2		
Armillary Sphere		
	Use to show celestial equator, ecliptic etc. A collection of magnetic celestial objects can be added to gradually build up a model of a celestial sphere.	

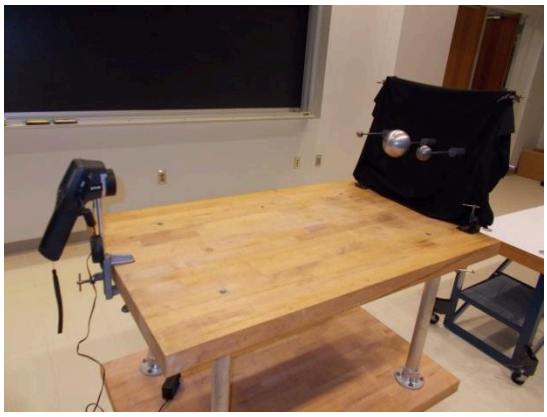
Lb1

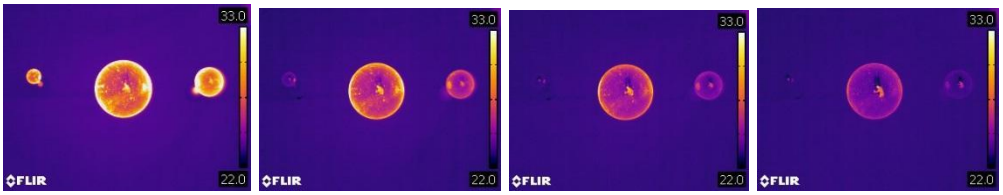
ASTRONOMY AND ASTROPHYSICS	8A70.55	PLANETARY ASTRONOMY
Planetary Characteristics		
Rotational Banding		
	Rheoscopic fluid in a clear plastic ball will show rotational banding when spun up on a turntable and then stopped.	



Location: Bc3, La3

ASTRONOMY AND ASTROPHYSICS	8A70.82	Planetary Astronomy
Planetary Characteristics		
Protoplanet Cooling		
	Three solid aluminum spheres (4, 2 and 1 inch in diameter) are heated in boiling water and then viewed with an IR camera as they cool.	





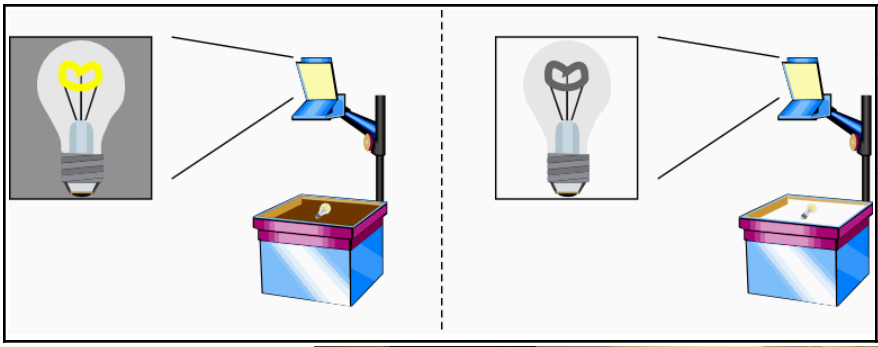
Location: FLIR Shelf, Lb5

ASTRONOMY AND ASTROPHYSICS	8B10.31	STELLAR ASTRONOMY
The Sun		
Solar Convection Cells		

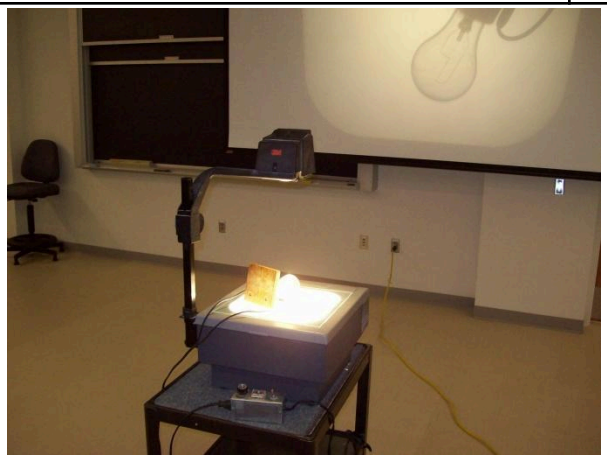
	Place the frying pan on the hot plate. Turn the hot plate to between 350 and 400 on the temperature dial. Pour in the oil/aluminum powder mixture to a depth of about a cm. **CAUTION: The oil does not have to be very hot to give good convection cells. If the temperature is too high the oil may ignite.** Once the cells have formed they will appear very stable. You can use a spoon to disturb the cell structure and watch its reformation.

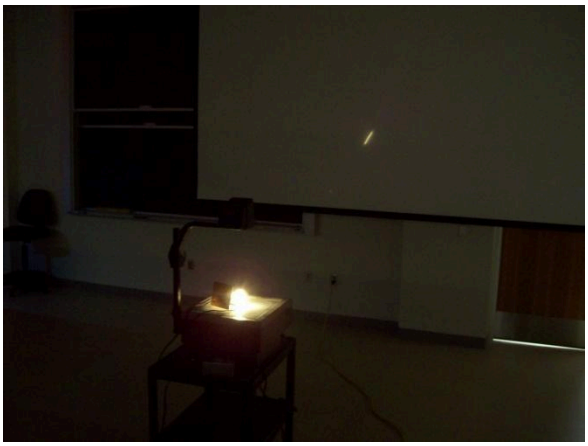
Location: La4

ASTRONOMY AND ASTROPHYSICS	8B10.50	STELLAR ASTRONOMY
The Sun		
Sunspots on the Overhead		



A light bulb on a variac is turned up to visible glow and placed on an overhead projector that is turned off. When the overhead is turned on, the filament appears as a dark spot.

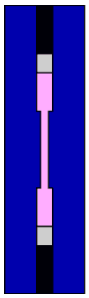


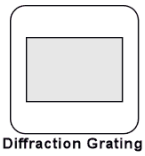


Location: La4

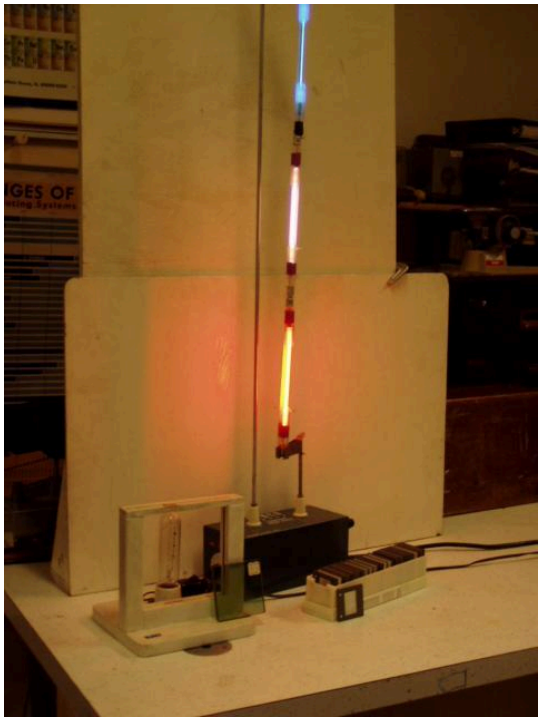
MODERN PHYSICS	7B10.10	ATOMIC PHYSICS
Spectra		

Student Gratings and Line Sources



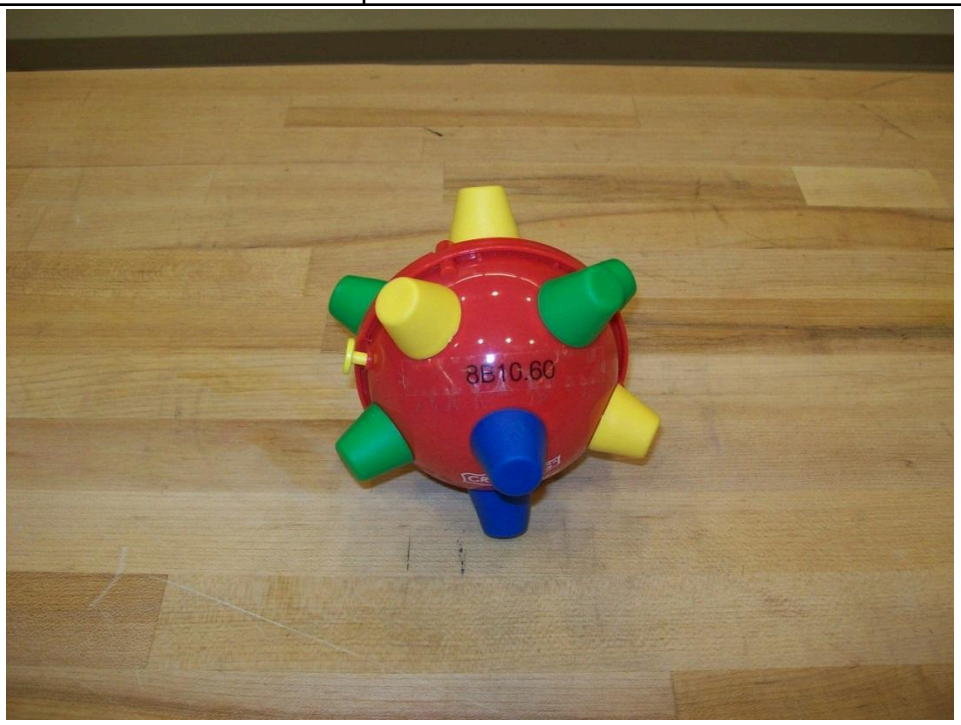


Pass out the 1"x1" gratings to the students. These have 13,400 lines per inch. Turn on one of the light sources. There is a single filament white light source and three discharge tubes, Hg, He, Ne. The Didymium filter can be placed in front of the white light source to show selective absorption. The green carousel has a variety of tubes including H, He, Ne and Hg. The LEDs show individual colors and a white light spectrum.



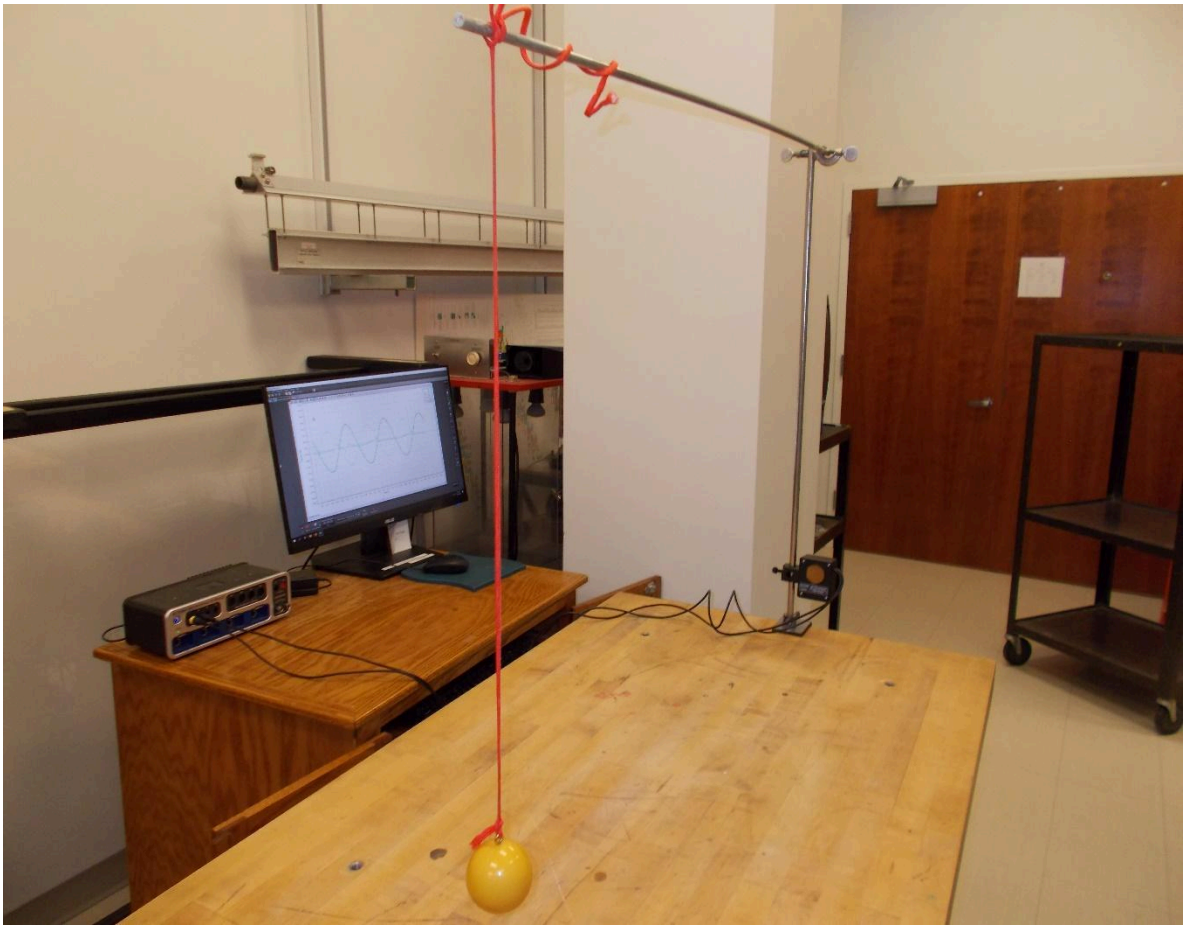
Location: Ja1, Jb2

ASTRONOMY AND ASTROPHYSICS	8B10.60	STELLAR ASTRONOMY
The Sun		
Random Walk		
	Use a Bumble Ball (a common toy) to illustrate the random walk of high energy photons in a star.	



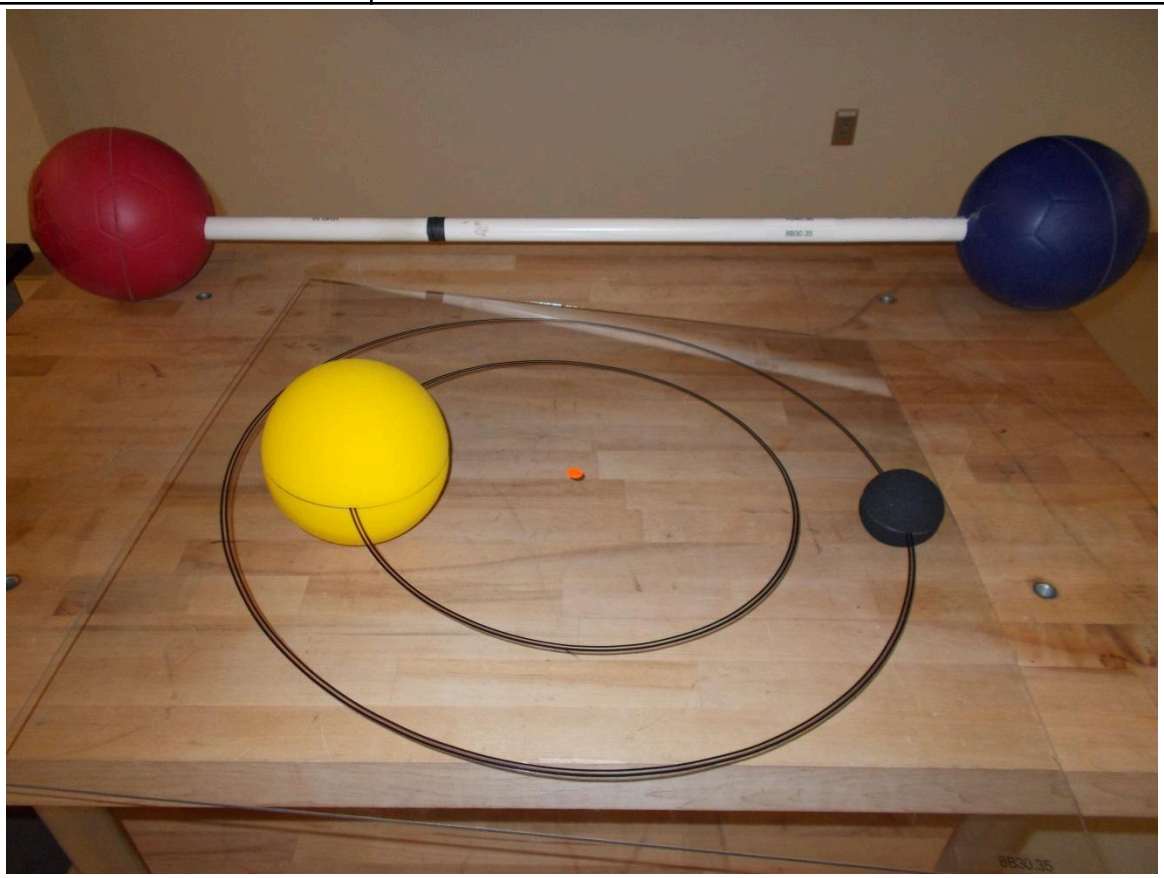
Location: La4

ASTRONOMY AND ASTROPHYSICS	8B20.35	STELLAR ASTRONOMY
Stellar Spectra		
Radial Velocity		
	A conical pendulum is used with a sonic ranger to display velocity along the line of sight. Capstone file: Radial Velocity.cap.	



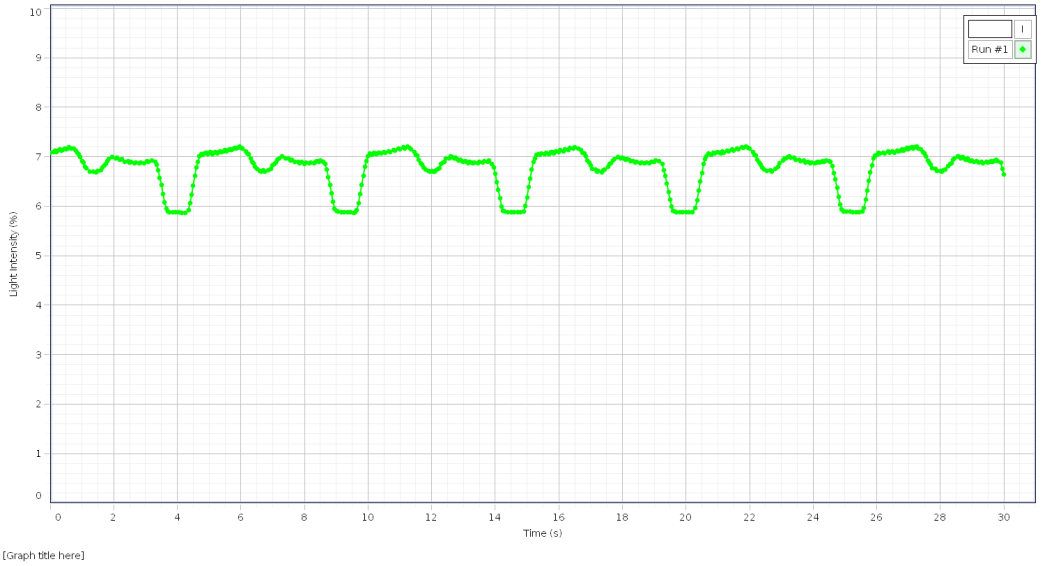
Location: Science Workshop, Ca2

ASTRONOMY AND ASTROPHYSICS	8B30.35	STELLAR ASTRONOMY
Stellar Evolution		
Binary Star Models		
	Balls at the end of a rod with the barycenter marked are used to illustrate a binary system. Also, a couple of balls on a plastic sheet with orbits and the barycenter marked can be used to illustrate orbital inclination.	



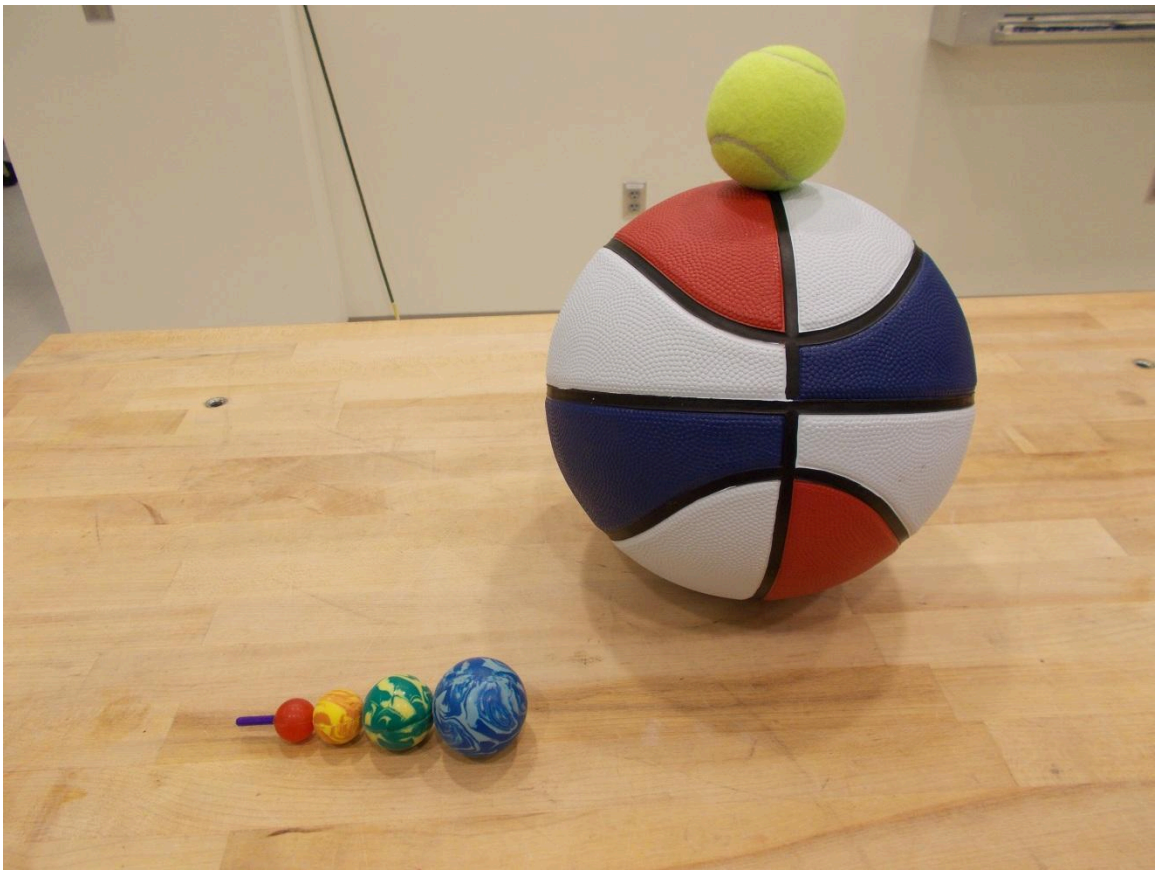
Location: La5

ASTRONOMY AND ASTROPHYSICS	8B30.35a	STELLAR ASTRONOMY
Stellar Evolution		
Eclipsing Binary Light Curve		
	Two battery-powered light bulbs on a rotating platform are used with a photometer and the Capstone software (Eclipsing Binary.cap) to model an eclipsing binary light curve.	



Location: La5, Jb1, Hb2, Hb3, Bc3

ASTRONOMY AND ASTROPHYSICS	8B30.50	STELLAR ASTRONOMY
Stellar Evolution		
Supernova Core Bounce		
	Use the double ball bounce to illustrate supernova core bounce.	



Location: La5, Cd3

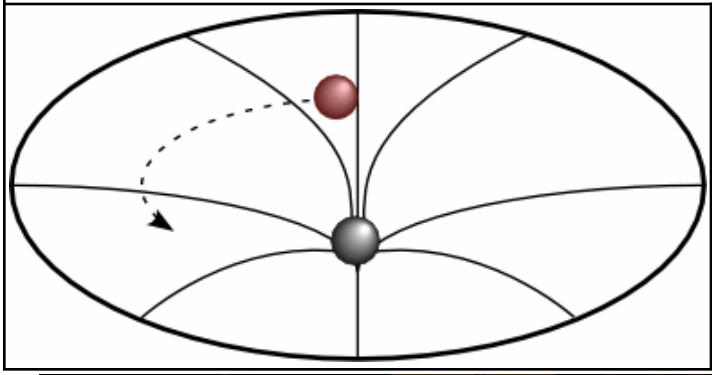
ASTRONOMY AND ASTROPHYSICS	8B40.20	STELLAR ASTRONOMY
Black Holes		
Gravity Well		
	Use this demonstration when discussing black holes and gravity wells.	

Location: OaT

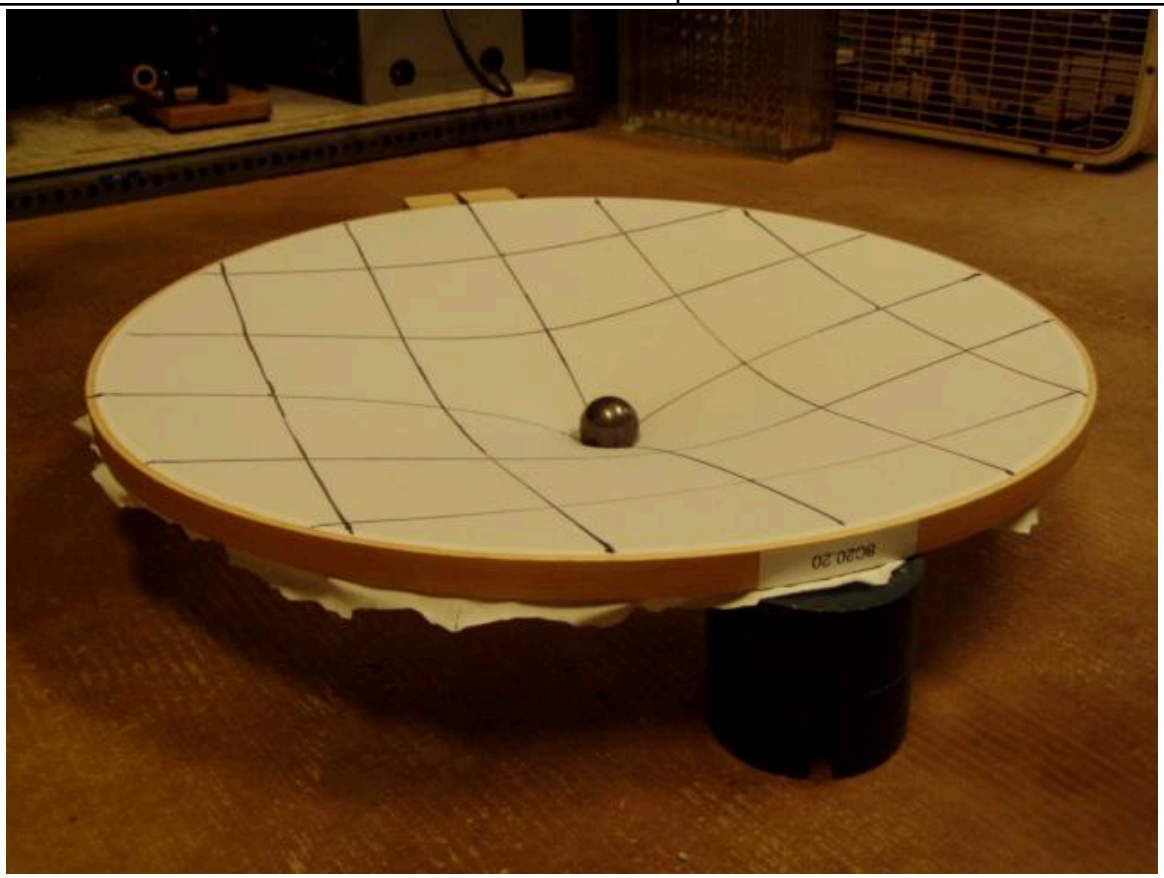
ASTRONOMY AND ASTROPHYSICS	8B40.30	STELLAR ASTRONOMY

Black Holes

Membrane Table / Black Hole



Swimsuit fabric stretched over a wood frame is deformed with a weight and balls are rolled around.

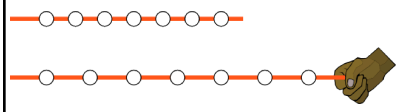


Location: Lb3

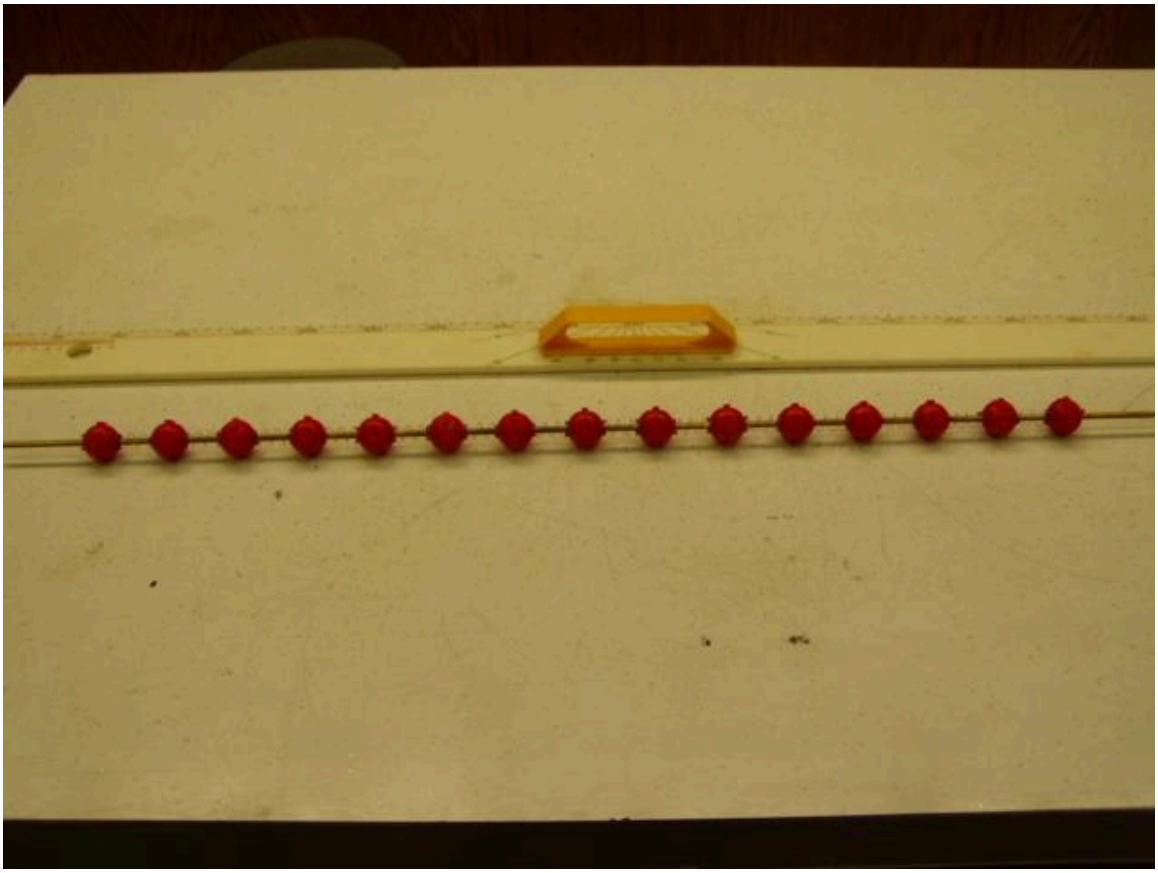
ASTRONOMY AND ASTROPHYSICS	8C10.30	COSMOLOGY

Models of the Universe

Expanding Universe



Fifteen plastic balls are threaded onto a rod and connected by springs with equal intervals. Pull on the ends and watch the expanding intervals.

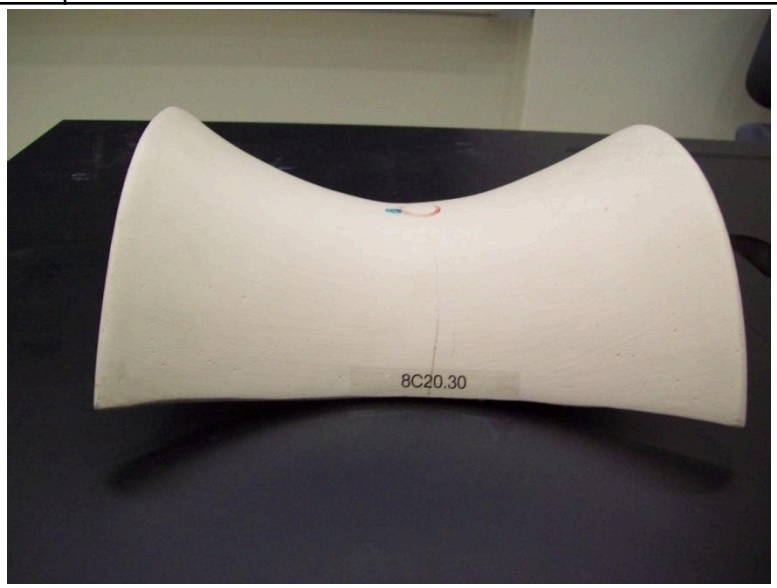


Location: Lb2

ASTRONOMY AND ASTROPHYSICS	8C20.10	Cosmology
Gravitational Effects		
Klein Bottle		
	All surface and no volume.	

Location: Lb4

ASTRONOMY AND ASTROPHYSICS	8C20.30	Cosmology
Gravitational Effects		
Saddle Shape/Paul Trap Model		
	A model of a negatively curved two-dimensional space. Also shown is a rotating saddle Paul trap model. A ping pong ball is not stable when placed on a saddle shape. The ball becomes stable (trapped) when the saddle is rotated.	



Location: Lb4

ASTRONOMY AND ASTROPHYSICS	8C20.40	Cosmology
Gravitational Effects		
Gravitational Lens		
	The bottom of a wine glass is used as a gravitational lens and a small ball is used as a distant galaxy. Depending on where the ball is placed you can see a ring, an arc or two arcs.	

Location: LB4