Teaching Astronomy

K.E.Chilton-Centennial Observatory
93 Currie St.,
Hamilton Ont.,

Astronomy is one of the most difficult sciences to teach as there is very little for the pupil"to reach out and touch" The sizes and distances involved are staggering to the imagination! However most children have some interest. The rest is up to the imagination and initiative of the teacher.

Activities may be divided into three categories:
a.building of equipment
b.observing and recording
c.reading,viewing and reporting

BUILDING OF EQUIPMENT:
1.Make a sunspot viewer. (Directions contained in this booklet.)
2.Make a rotating star-chart.Good for any time any day or night.
3.Build an orrery. (Directions contained in this booklet.)
4.Build a sun-dial.
5.Build a reflecting telescope. (Catalog of optical parts available free of charge from:Optics of Canada
P.O.Box 4
Station C
Hamilton

6.Make a diorama.(Directions contained in this booklet.
7.Make a picture collection of celestial objects.
8.Make a three dimensional wire,mache, and kleenex model of the moon. (or of all the solar system.)
9.Make a three dimensional model of a constellation.(Directions in this book.)

OBSERVING AND RECORDING:
(These activities usually require some sort of optical aid. Binoculars or a small telescope are sufficient for those listed here.Many,of course, need no optical aid at all.)

10.Draw a composite picture of the moon using your own drawings.
11.Record the distance of a morning star or evening star (Mercury or Venus) above the horizon daily.
12.Record the position of a planet relative to a star daily.
13.Record the size and position of sunspots daily.
14.Record the position of Jupiter's satellites nightly.***
15.Watch and time the eclipses and occultations of Jupiter's satellites.***
16.Watch a variable star.***

*** = Predictions for these objects available free by sending a self-addressed stamped envelope to Centennial Observatory or to:Director of Observations
Royal Astronomical Society of Canada
P.O.Box 272
Hamilton,Ont..

17. Measure the length of the shadow of a vertical yard-stick hourly during the day. Make a chart of the results.
18. Record the length of the shadow of a vertical yardstick every day at the same time over 60 days. Record the results on a graph.
19. Record the temperature change between sunny and cloudy intervals on the same day. (An indication of solar radiation.)
20. Record the time of sunrise and sunset daily.
21. Record the time of moonrise and moonset daily.
22. Watch a meteor shower and count the number of meteors seen.

These showers occur yearly at nearly the same dates every year. A self-addressed stamped envelope sent to Centennial Observatory will get you the exact dates and time.

Quadrantids-Jan.4	Orionids-Oct.21
Lyrids-Apr.22	Taurids-Nov.5
Aquarids-July 29	Leonids-Nov.17
Perseids-Aug.12	Geminids-Dec.13
Giacobinids-Oct.9	Ursids-Dec.22

READING, VIEWING, REPORTING:

23. Take a trip to David Dunlap Observatory, Richmond Hill, Ont., Tuesday mornings 10 AM-11 AM
24. Take a trip to McLaughlin Planetarium, Toronto (next to the Royal Ontario Museum)-(Opening in early 1969)
25. Take a trip to the Planetarium at McMaster Univ., Hamilton, (phone university extension department for reservations.)
26. Take a trip to Centennial Observatory-groups up to 10 people-(Write concerning reservations.)
27. Attend a meeting of the Royal Astronomical Society of Canada-1st Thursday of every month October to May-Room 143-Physical Sciences Building-McMaster University-Hamilton, Ont..
28. Have a team from the R.A.S.C. come to your school some evening with a slide talk. Telescopes will be brought to allow some viewing, weather permitting. Write: Director of Public Service,
Royal Astronomical Soc. of Canada.
P.O. Box 272,
Hamilton.

(This service is free in Hamilton and district, but you will have to pay a gasoline allowance for other points.)

29. Make a biography of a famous astronomer.
30. Learn the legends of the constellations.

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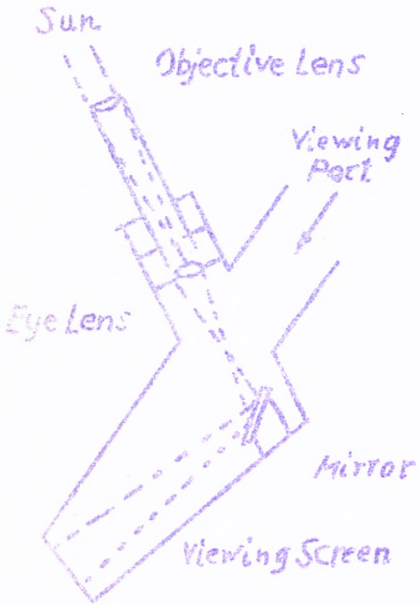
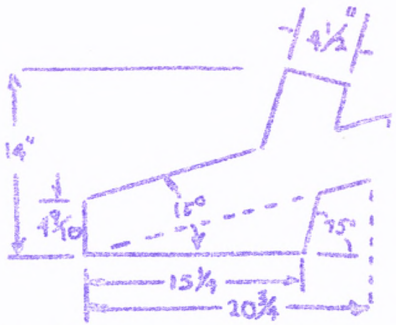
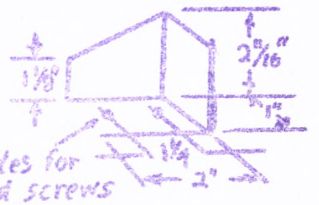
A FINAL NOTE:
The teachers' job in astronomy is one of inspiration!

The joy of viewing the stars at night outshines the problems of the day.

Sunspot Viewer





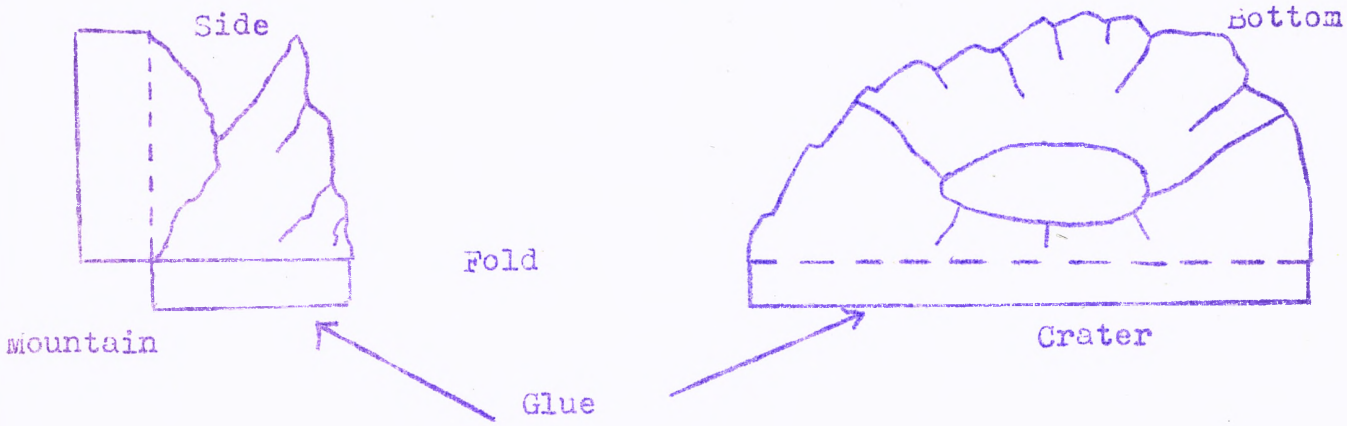


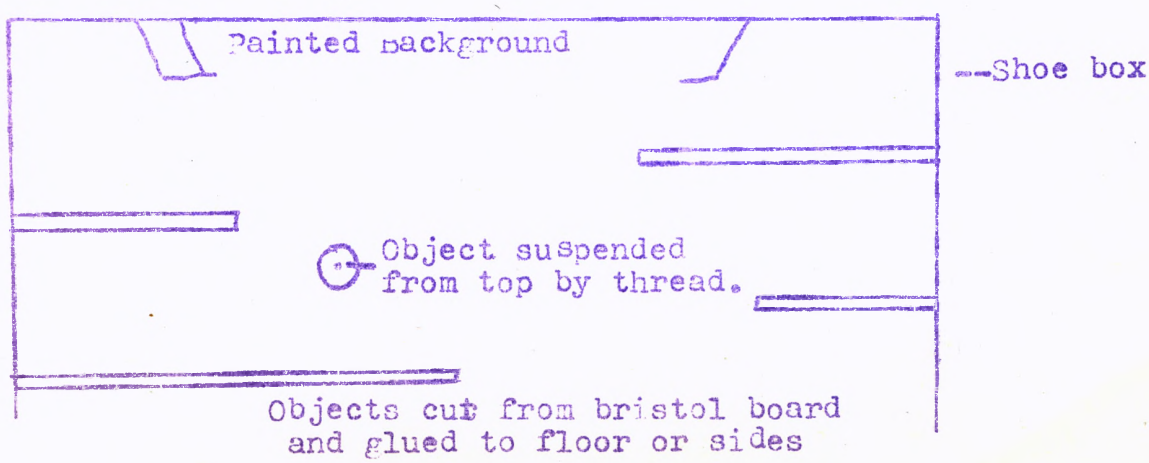
The Diorama

1. Materials needed:
   - one shoe box or equivalent
   - two sheets 5 ply white bristol board 12"x14"
   - glue
   - black thread
   - a variety of colours of tempera paint
   - reference books showing surface of moon or planets
   - transparent cellophane to cover opening of box.
   - scotch tape
   - scissors
   - paint brushes

2. Constructing the diorama:
   - do research to find details of landscape to be reproduced.
   - paint inside of box appropriate colours
   - draw, cut out and paint objects from bristol board. Be sure to leave cardboard flaps for mounting
   - glue objects into box like wings on a stage, with larger parts, or parts of objects nearer to the front to create perspective.
   - use the thread to suspend objects which would appear in the sky.
   - add any titles or labels as desired.
   - cover with clear cellophane

EXAMPLES OF CUT-OUT OBJECTS





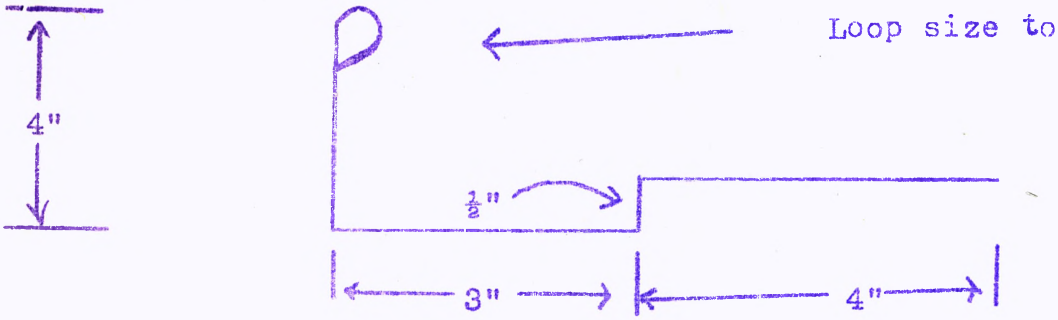
ORRERY* A PLANETARY SYSTEM IN MINIATURE

Materials needed:
-one light bulb (with socket and cord if desired)
-several light weight balls of various diameters ie.ping pong, styrofoam,airfilled
-two or three wire coat hangers
-one ¼"x 1" bolt and nut
-one base board approx. ¼"x12"x12"
-one empty thread spool
-6 metal washers to fit bolt
-one screw 1" longer than spool
-tempera paints-black blue green white
Tools-pliers-to cut and bend wire
-screw driver
-pointed instrument to make holes in balls
-paint brushes

A.CUTTING AND BENDING WIRES

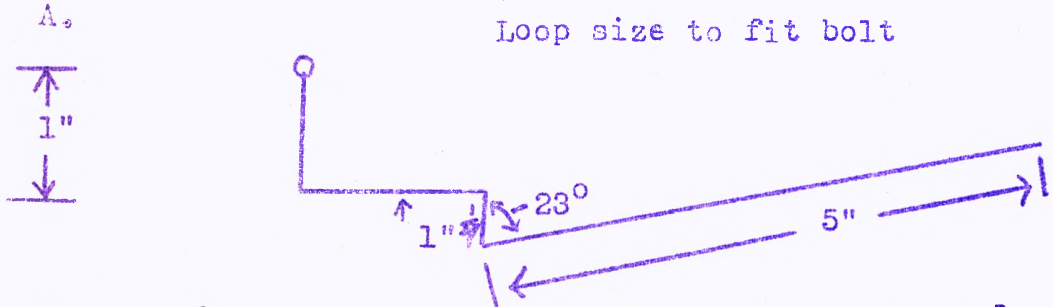
1.For sun (light bulb)

2.For moon (ping pong ball)



3.For earth (larger ball,approx.4" in diameter)

A.



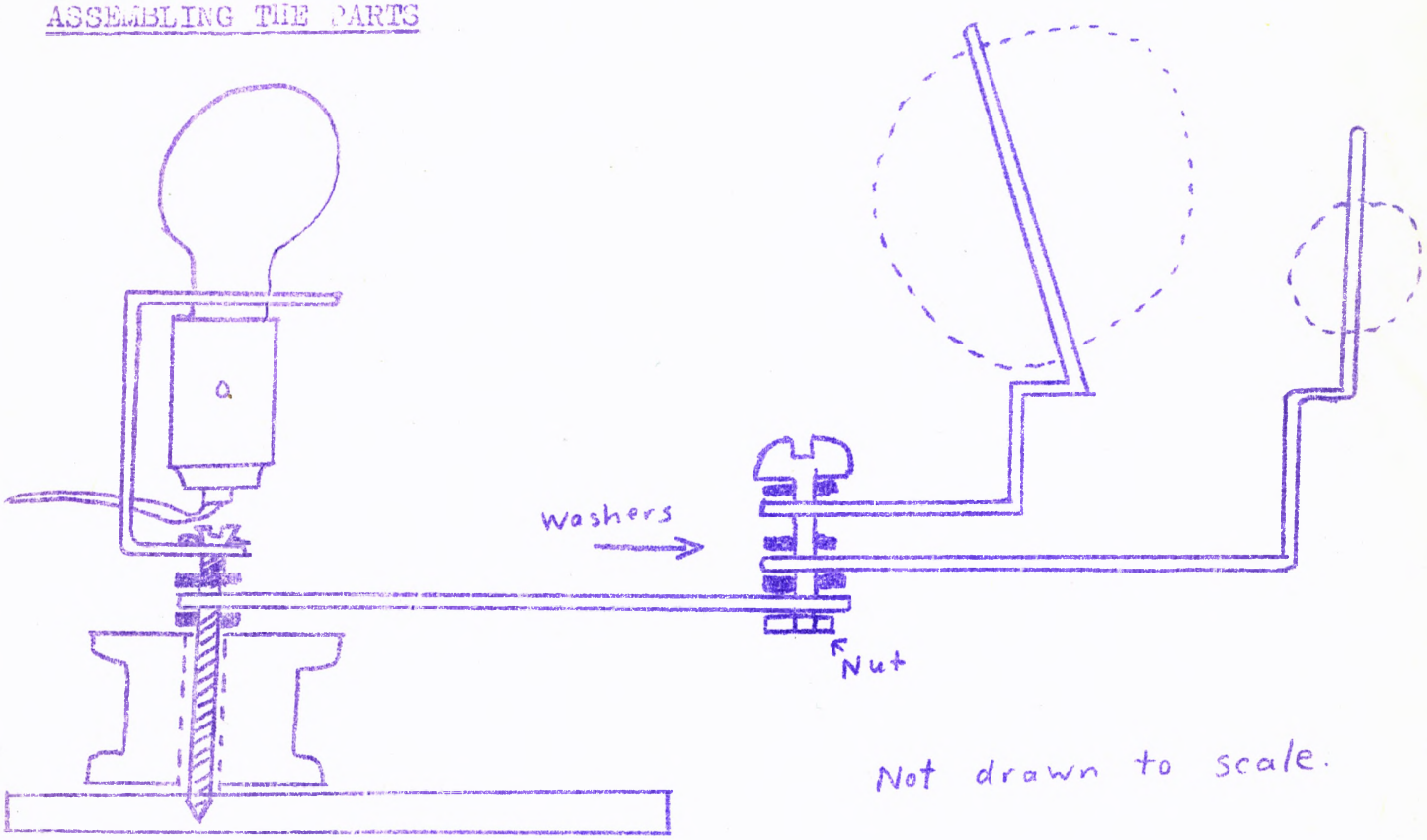
B.

Loop sizes to fit bolt and screw.

Note: Other wires of various lengths with balls of various diameters could be added to the screw to simulate other planets.

The Orrery (contd.)

ASSEMBLING THE PARTS



Some uses of the Orrery

1. To show the relative movements of the earth and sun.
2. To show the relative movements of the earth and moon.
3. To show the causes of the seasons.
4. To show the causes of eclipses.

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All pupils are interested in Bodes Law-an easy way to learn the distances of the planets from the sun.

Write down the following series of numbers

0 3 6 12 24 48 96 192 384

Now add 4 to each

4 7 10 16 28 52 100 196 388

Divide by 10

.4 .7 1.0 1.6 2.8 5.2 10.0 19.6 38.8

The resultant series of numbers represents the distances from the sun of the planets, in astronomical units. 1 Ast.Unit=93 million miles, ie. the distance from the earth to the sun.

Example: the Earth is 1.0 A.U. from the sun. Mars is 1.6 A.U.

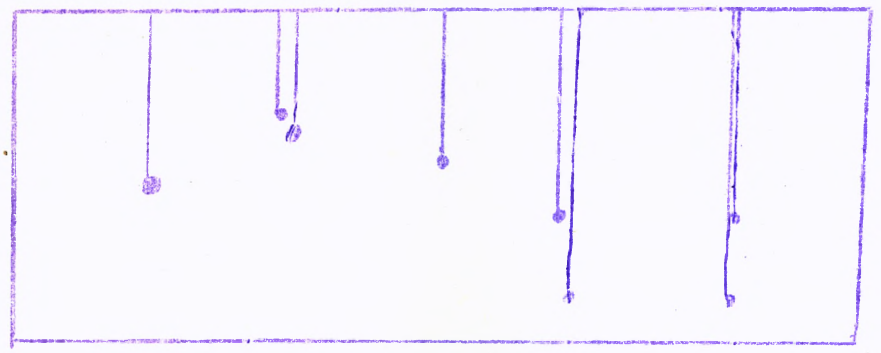
Please note that the 2.8 represents the asteroid belt between Mars and Jupiter. Sorry-this doesn't work for Pluto as it was not discovered when Bode made this little mathematical discovery.

THREE DIMENSIONAL CONSTELLATION VIEWER

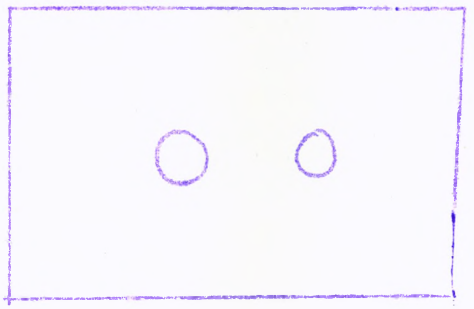
Materials needed:-shoe box
-black paint
-ping pong balls
-black thread

Paint inside of box black and suspend ping pong balls from top by black thread.

Example:
The Big
Dipper

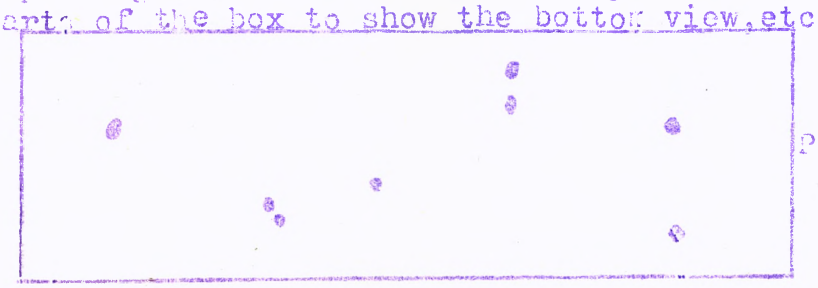


Not all balls are hung the same distance from the front. This is because, in reality, all of the stars in a constellation are at different distances from us. Approximately correct distances from the front of the box may be had by sending a self-addressed stamped envelope to Centennial Observatory. (Unfortunately some constellations cannot be represented in this manner, but most can.)



Cut peep-holes in side of box to view constellation from another angle.

Enterprising teachers will find a way to cut peepholes in various parts of the box to show the bottom view, etc...



Possible layout for Big Dipper as viewed from the top

BOOKS, MAGAZINES, CHARTS, PERIODICALS, ETC. ETC.

Sky and Telescope:
A monthly magazine for advanced amateurs. Subscription is $8 per year. Sky Publishing Corp. 49 Bay State Rd., Cambridge, Mass. USA, 02138.

Planetarium:
A quarterly publication for the layman. 2 shillings 6 pence per copy (about 30¢) The Planetarium, Armagh, Northern Ireland.

Orbit:
5 times per year. At present free of charge. A newsletter published by the Hamilton Centre of the Royal Astronomical Society of Canada. A self-addressed stamped envelope should be sent to: Orbit-R.A.S.C., P.O. Box 272 Hamilton, Ont.

National Aeronautics and Space Administration (NASA) Publications are available from the Superintendent of Documents
U.S. Government Printing Office
Washington 25, D.C.

Catalog of Publications:
Sky Publishing Corp.
49 Bay State Rd.
Cambridge, Mass.
USA
02138

Books you may want for your class:

Barlow-"A Child's Book of Stars"- Ryerson Press
Freeman-"Fun With Astronomy"- Random House
Hood- "Let's Look At The Stars"- Houghton Miflin
Moore-"Amateur Astronomer's Glossary" Lutterworth Press
Moore- "Exploring the Planetarium"-Odham's
Moore-Exploring the Moon"-Odham's
Moore & Brinton-"Exploring Other Planets"-Odham's
Olcott-Field Book of the Stars-Putnam's Sons
Zim-"The Sun"- McLeod
Zim & Baker-"Stars"-Moyer