

Building a Refracting Telescope

A Science Lab for Grade 6 – Exploring Space Unit

Written and Submitted by Ron Waldron – June 2004

Background Information

Although many people still mistakenly refer to the Italian scientist Galileo as the inventor of the telescope, Hans Lippershey, a Dutch spectacle maker in 1608, most likely invented it. There is a legend that Lippershey's children actually discovered the telescope while playing with flawed lenses in their father's shop but this has never been verified.

Students are still thrilled with the story of how it happened. Now you in your classroom can retell the story and have your students follow up with the actual construction and presentation of a working telescope.

The Story

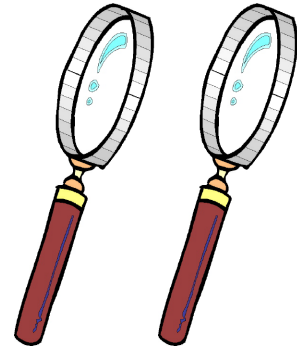
Sometime around the end of the 16th century, a Dutch spectacle maker, Hans Lippershey was making spectacles when he accidentally held two lenses, one in each hand apart from each other. To his surprise, he noticed that when he looked through the first lens into the second lens that a church steeple off in the distance was greatly enlarged. Years later, in October of 1608, Lippershey applied for a patent on a device for "seeing faraway things as though nearby." The patent was refused, but news of the gadget had already spread in Europe.



Galileo, another scientist in Venice Italy, heard of the invention and started experimenting on his own. He built several and pointed them at the one place no one else, it seemed, had thought of – the heavens. Galileo went on to become famous for the discovery of the craters on the moon and four moons around Jupiter. The second discovery ultimately led to humankind's realization that the sun, not the earth was the centre of the solar system.

Materials

- Magnifying glasses of varying sizes (at least one per student)
- Cardboard tubing from (the kind used in toilet paper, paper towel, or shipping tubes)
- Masking and Scotch tape
- Materials suitable for decorating the finished telescopes, i.e. tin foil, construction paper, adhesive stars, etc.



Procedure

PART ONE

1. Tell the story of the discovery of the telescope using two magnifying glasses to illustrate.
2. Following the story, allow students to experience the invention firsthand by allowing the two magnifying glasses to circulate around the classroom.
3. Invite the students to work with a partner and build their own telescope. Allow each pair of students to select two magnifying glasses with which to build the telescope. If the lenses can be removed from the magnifiers then the teacher prior to the lab should do this.
4. Challenge each student pair to come up with a way to hold the lenses in a cardboard tube in either a fixed or movable fashion. If they are choosing to mount them in a fixed position, remind them that the distance between the two lenses must be correct so that distant objects are in focus.

PART TWO

1. Now that they have a working telescope, challenge each student pair to come up with a way to present and "sell" their new telescope. They should decorate their telescope and arrive at a suitable name to be used in promoting it.
2. Give each student pair five minutes to present their finished product. Consider allowing the telescopes to circulate following each presentation.



Evaluation

The students will need to dismantle each of their telescopes in order that you can return the lenses to the magnifying glass holder. Prior to dismantling, use the following rating scale to grade each presentation and product.

Telescope Design (fixed or movable focus, durability, appeal)									
1	2	3	4	5	6	7	8	9	10
Telescope Presentation (organization, clarity, catchy name, identification of superior qualities)									
1	2	3	4	5	6	7	8	9	10

Extensions

1. Students could research the types of telescopes and how each one works (refractor, reflector, radio, infrared, etc.)
2. Students could find out why all astronomical telescopes show things upside down and why this is corrected only in terrestrial (land telescopes)
3. Students could find out why Galileo went blind and why he got in serious trouble for what he believed after viewing the heavens through his telescopes.
4. You might give the students the opportunity to view through an actual astronomical telescope. Contacting local astronomical organizations or universities with observatories can achieve this.

