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Feather Spectrum

Thomas Campbell
Capital High School

D. Louis Finsand
Malcolm Price Laboratory School

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FEATHER SPECTRUM

*Thomas Campbell
SPICA Agent
Planetarium Director
Capital High School
Boise, Idaho 83703*

*D. Louis Finsand
SPICA Agent
Professor of Teaching
and Science Education
Malcolm Price Laboratory School
University of Northern Iowa
Cedar Falls, Iowa 50613-3593*

The activity explained in this article was developed at the Harvard-Smithsonian Center for Astrophysics by the authors for SPICA Activities. SPICA is the acronym for the Support Program for Instructional Competency in Astronomy and is funded by the National Science Foundation. Thirty-three astronomy and science educators were selected from throughout the United States to be involved in the three-week SPICA astronomy education workshop during August 1989. They developed over 60 astronomy education activities for use in grades K-12. SPICA activities were selected to address ideas that were frequently misunderstood, not understood and/or seldom taught (other than as facts). Each activity was designed to provide a learning experience that (1) was hands-on activity based, (2) developed conceptual understanding and (3) used varied learning strategies. The activities were edited by SPICA staff and are currently being field tested in schools across the country.

Each workshop participant is now a SPICA agent for his/her area and is obligated to serve as an astronomy resource person, conduct local astronomy workshops and field test the activities. If your district has specific astronomy education needs, contact one of the authors. A workshop may be organized and your needs will be forwarded to the SPICA director in Cambridge.

If you use this activity in your class, SPICA would appreciate your evaluation, feedback and/or suggestions. Send feedback to your nearest SPICA agent.

Feather Spectrum

Suggested Grade Level
K-4

Curriculum Connections/ Correlated Topics

Art

Biology

Light

Objectives

Students will: Explore a feather.
Observe light through a feather and see a spectrum.
Identify the sequence of the colors in a spectrum.
Identify variables that affect the size, brightness
and orientation of a spectrum.
Understand that a rainbow is a spectrum.

Processes Illustrated

Observing

Inferring

Controlling Variables

Questioning

Designing Experiments

Identifying Variables

Class of Activity Exploration

Materials Needed

Feathers of various colors and sizes
Bright light source
Paper and pencil for recording observations

Procedures

Messing around -- Each student will be given several feathers and told to list the things that he/she can discover about those feathers. A list of "discovered feather characteristics" will be written on the black-board.

Teacher directed -- A light will be turned on in the room. The students will be told to list the things that he/she can discover about the feather and the light. After several minutes, the teacher will suggest that the students look at the light through the feather. Each student will record his/her description of what he/she sees while looking at the light through a feather. The teacher should suggest that the students note what colors are visible, the order of those colors and what part of the feather gives the best colors. These results will be listed on the board.

Lecture -- The "rainbow" of light seen through the feather is a spectrum. A spectrum is white light being separated into its component colors. The light passing through the feather is bent (diffracted) by the feather. Different colors are bent different amounts, resulting in the separation of the light. A rainbow is the result of the Sun's light being bent by drops of moisture in the Earth's atmosphere. The production of a spectrum by raindrops or a prism results from a process fundamentally different than that of the feather. These materials produce a spectrum as a result of refraction, but the end result is the same: white light is separated into its fundamental component colors.

Extensions

1. Demonstrate white light from a projector or the sun passing through a prism to form a spectrum.
2. Other spectra can be created by passing light through various media (e.g. water, cut glass, magnifying glasses, optical glasses, diffraction gratings, Mr. Rainbow Glasses [see "Special Notes" below], etc.)
3. An out-of-focus overhead projector can be used to project a spectrum onto a screen. This same projector will project a beautiful rainbow onto a planetarium dome for very little cost.
4. This idea can be incorporated into a "spiral curriculum" sequence usable at all grade levels.

Special Notes

Mr. Rainbow Glasses are highly recommended for all grade levels. They can be obtained by contacting Mr. Rainbow Glasses, P.O. Box 27056 E, Philadelphia, PA 19118. Cost is approximately \$1 per pair.

Some concern has been expressed for the potential transmission of disease from handling the feathers of wild birds. Be certain that the feathers being used are clean and disease-free.

Subject Bibliography

DeBruin, Jerry. 1980. *Creative, Hands-on Science Experiences, Using Free and Inexpensive Materials*. Good Apple, Inc., Carthage, IL.

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Dr. Darrel Hoff, Associate Director

Harvard-Smithsonian Center for Astrophysics

Cambridge, Massachusetts 02138