Resources and Literature Connections

More About Inquiry

National Resource Council (1996) *The National Science Education Standards,* Washington D.C., National Academy Press.

National Resource Council (2000) *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning,* Steve Olson and Susan Loucks-Horsley (eds), Washington D.C., National Academy Press.

Exploratorium Institute for Inquiry at: http://www.exploratorium.edu/IFI/resources/websites.html

Inquire Within: Implementing Inquiry-Based Science Standards by Douglas Llewellyn (Author) Corwin Press (July 2001)

Nurturing Inquiry: Real Science for the Elementary Classroom by Charles R. Pearce (Author) Heinemann; (April 1999)

Science As Inquiry: Active Learning, Project-Based, Web-Assisted, and Active Assessment Strategies to Enhance Student Learning by Jack Hassard, Goodyear Publishing (October 1999)

Weaving Science Inquiry and Continuous Assessment: Using Formative Assessment to Improve Learning by Maura O'Brien Carlson, Gregg E. Humphrey, Karen S. Reinhardt, Corwin Press; (May 2003)

Bonnstetter, Ronald J.: "Inquiry: Learning from the Past with an Eye on the Future" EJSE (*Electronic Journal of Science Education*); volume 3 number 1, September, 1998.

More About Mars

Videos, CDs, and DVDs on Mars

A range of multimedia resources on Mars and the history of exploration of the planet are available from:

The MMI Space Science Corporation
Phone 410-366-1222
Fax 410-366-6311
2950 Wyman Parkway
Baltimore, MD 21211

Mars—Past, Present, and Future—CR190 or DVD8
Available in both VCR and DVD format, this 83-minute video traces the history of human fascination with Mars, from the earliest telescope sightings to the past, present, and future missions to Mars. The DVD includes the NASA film Planet Mars as a bonus.

Mars—Past, Present, and Future—CDR170
An interactive CD-ROM, for PC or Mac, includes a wealth of images along with narration, video, and sound effects.

Pathfinder and the Best of Mars—CDR-168
This CD-ROM includes 150 images of Mars plus 20 3-D pictures with viewing glasses included. Includes images from the Viking, Pathfinder, and Mariner missions, as well as images from the Hubble telescope.

Mars related slides, videos, and CD-ROMs are also available through:
Astronomical Society of the Pacific
390 Ashton Avenue
San Francisco, CA 94112
Phone 415-337-1100
fax 415-337-5205
http://www.astrosociety.org/index.html

NASA Mars Websites

NASA's Mars Exploration program maintains a rich website at **http://mars.jpl.nasa.gov/** which includes areas for "Kids," "Students," and "Educators," and offers images, videos, facts, online activities and games, curriculum units, educator workshops, and lots more.

Other interesting NASA-related Mars websites include:

http://www.nasa.gov/mro

http://nssdc.gsfc.nasa.gov/planetary/mars/marshist.html

http://mars.jpl.nasa.gov/mep/history/

http://mars.jpl.nasa.gov/mep/history/1900.html

http://mars.jpl.nasa.gov/mep/missions/announce2.html

http://nssdc.gsfc.nasa.gov/planetary/planets/marspage.html

http://www.jpl.nasa.gov/pictures/solar/2003rover/

http://photojournal.jpl.nasa.gov/

Books on Mars

Continuing NASA exploration of Mars has led to an explosion of books on the planet, many with great photographs. Here are just a few:

Postcards from Mars: The First Photographer on the Red Planet by Jim Bell, Dutton, 2006. Outstanding photographs from the Mars Rovers.

Magnificent Mars by Ken Crosswell, Free Press, 2003. This splendid book that combines more than 200 pages of photos with current science.

Mars: Uncovering the Secrets of the Red Planet by Paul Raeburn, National Geographic, 1998

A Traveler's Guide to Mars by William K. Hartmann Workman Publishing, New York, 1993

The Pathfinder Mission to Mars (Mission to Mars) by John Hamilton, Abdo & Daughters, 1998

There are a number of books available from NASA on Mars, including:
On Mars: Exploration of the Red Planet, 1958-1978
NASA History Series, Scientific and Technical Information Branch, 1984.

This official history of the Viking Project provides a wealth of information on the background for and realization of the Viking Missions. The book is available for free in pdf format online at the NASA History Office website: http://www.hq.nasa.gov/office/pao/History/SP-4212/on-mars.html

More About the Science of Matter

The Complete Idiot's Guide to Understanding Einstein
by Gary F. Moring
Alpha Books, Macmillan USA, Pearson Education, 2000

Accessible, humorous, and focused on big scientific ideas, older students may find this book enjoyable. There are several parts of the text that describe Einstein's early work on molecular motion that relates to colloidal suspensions.

Einstein for Beginners
by Joseph Schwartz and Michael McGuinness
Pantheon Books, 1990

One of the first titles in this very popular series of documentary comic books, *Einstein for Beginners* offers a fun and accessible introduction to Einstein's life and theories, placing them in the context of the important scientific discoveries that preceded them and contemporary world events.

Matter
by Christopher Cooper, (in the Eyewitness Science series), Dorling Kindersley, New York, 1992.
Grades 4-8

Examines the elements that make up the physical world and the properties and behavior of different kinds of matter.

Website:
http://www.colorado.edu/physics/2000/index.pl

More Matter Activity Books

Adventures with Atoms and Molecules: Chemistry Experiments for Young People
by Robert C. Mebane and Thomas R. Rybolt (in the Adventures with Science series) Enslow, Hillside, New Jersey, 1985.
Grades 6–8

Chemistry experiments for home or school demonstrate the properties and behavior of various kinds of atoms and molecules. Concepts covered include properties of molecules, how temperature affects the behavior of molecules, and how the molecules in different liquids act.

From Glasses to Gases: The Science of Matter
by David Darling, (in the Experiment! Series), Silver Burdett Press, New York, 1992.
Grades 4–8

Text and experiments introduce matter and the various forms it can take under different conditions.

Janice Van Cleave's Molecules
by Janice Van Cleave, (in the Spectacular Science Projects series), John Wiley & Sons, New York, 1993.
Grades 4–8

This collection of science experiments and projects explores the mysteries of molecules.

Lotions, Potions, and Slime: Mudpies and More
by Nancy Blakely
Tricycle Press, 1996

A compendium of simple activities for home, day care, or classroom fun that features various wet and gooey liquids.

Solids, Liquids, and Gases from the Ontario Science Center
by Louise Osborne and Carol Gold, Kids Can Press, Buffalo, New York, 1995.
Grades 2–4

Uses experiments to illustrate concepts such as air pressure, condensation, and changes from liquids to solids and gases.

GEMS Home Science Kits

In partnership with Scientific Explorer, GEMS has developed a line of home-science kits based on GEMS activities, including:

Oobleck: Ooey Gooey Chemistry Slime Science Kit
Adapted from the activities in the Oobleck guide, this home science kit makes fascinating Oobleck activities available for birthdays, science fairs, and family fun.

Literature Connections

Bartholomew and the Oobleck
by Dr. Seuss
Random House, New York. 1949
Grades: K—9

A king orders his royal magicians to cause something new to rain down from the sky. A green rain called "Oobleck" falls onto the kingdom, in too much abundance, and its strange properties cause quite a mess until the ruler learns some humility.

Horrible Harry and the Green Slime
by Suzy Kline
illustrated by Frank Remkiewicz
Viking Penguin, New York. 1989
Grades: 2–4

Four stories about Miss Mackle's second grade

class. In "Demonstrations," Horrible Harry and his assistant Song Lee show how to make green slime from cornstarch, water, and food coloring. It's a big success, ending with the librarian taking it home to her husband who is interested in science. In another story, they celebrate reading *Charlotte's Web* by making cobwebs and hanging them all over the school.

The Quicksand Book
by Tomie dePaola
Holiday House, New York. 1977
Grades: 2—5

A jungle girl learns about the composition of quicksand, how different animals escape it, and how humans can use precautions to avoid getting stuck.

Her "teacher," an overly confident jungle boy, turns out not to be so superior. A variety of graphics and a helpful monkey give visual interest. A recipe for making your own quicksand is included.

The Search For Delicious
by Natalie Babbitt
Farrar, Straus & Giroux, New York. 1969
Grades: 5—8

After an argument between the king and queen over the meaning of the world "delicious," the quest for its meaning begins. Everyone has a different personal definition of the word and war looms. In Activity 2 of the GEMS activities, students in a "scientific convention" often need to define a word, and refine their descriptive language, just as scientists do.

The Slimy Book
by Babette Cole
Red Fox, 2003
Grades: Preschool—4

Lighthearted look at slime of the "sticky, sludgy, slippy, sloppy, ploppy, creepy kind" and where it may be found—around the house, in invertebrate creatures, in foods, and maybe even outer space. Excellent and fun descriptive language of the properties of an intriguing form of matter.

The Three Astronauts
by Umberto Eco; illustrated by Eugenio Carmi
Harcourt Brace Jovanovich, San Diego. 1989
Grades: K—5

An American, a Russian, and a Chinese astronaut take off separately in their own rockets with the goal of being first on Mars. They all land at the same time, immediately distrusting each other. When they encounter a Martian their cultural differences disappear as they unite against him. In a surprise happy ending, they recognize the Martian's kindness toward a baby bird and extend this understanding to differences between all peoples. Younger children may not get the full benefit of the sophisticated illustrations and humor. Unfortunately, the astronauts are all male, with no women characters or references.

The Time Machine and Other Cases: Einstein Anderson, Science Detective
by Seymour Simon
Illustrated by S. D. Schindler
Camelot, 1999
Grades: 4-8

Readers are invited to have fun matching wits with this junior science detective, as he investigates and explains ten mind-boggling mysteries of science--from why his friend's rocket doesn't work to how to speed up slow-moving ketchup. Ketchup is another substance that sometimes acts as a solid and sometimes as a liquid.

The Toothpaste Millionaire
by Jean Merrill; illustrated by Jan Palmer
Houghton Mifflin, Boston. 1972
Grades: 5—8

Incensed by the price of a tube of toothpaste, twelve-year-old Rufus tries making his own from bicarbonate of soda with peppermint or vanilla flavoring. Assisted by his friend Kate and his math class, his company grows to a corporation with stock and bank loans. Beginning on page 47, Rufus designs a machine for filling toothpaste tubes, which is a nice tie-in to the designing spacecraft activities in Activity 3.

The Wise Woman and Her Secret
by Eve Merriam (OUT OF PRINT)
illustrated by Linda Graves
Simon & Schuster, New York. 1991
Grades: K–4/5

A wise woman is sought out by many for her wisdom. They look for the secret of her wisdom in the barn and in her house, but only little Jenny who lags and lingers and loiters and wanders finds it. The wise woman tells her, "The secret of wisdom is to be curious—to take the time to look closely, to use all your senses to see and touch and taste and smell and hear. To keep on wandering and wondering." This book, by a noted woman poet, captures the essence of discovery, student-centered, use-your-senses learning, and, as such, is a good accompaniment to many science and mathematics activities. Although out of print, it may be in school libraries.

Acknowledgments

Key ideas for *Oobleck* activities were contributed by Martha Constantine, Alan Friedman, Alice Spencer, and Dick Spencer. The first published reference to this activity was in "A Laboratory and Discussion Approach to High School Science Teaching" by the original author of this guide, Cary I. Sneider, in *The Physics Teacher,* January, 1971.

The term "Oobleck" is derived from the book *Bartholomew and the Oobleck* by Dr. Seuss. © 1949, Dr. Seuss Enterprises, L.P. The term is used by permission of Dr. Seuss Enterprises, L.P., and Random House, Inc.

The children's drawings that appear in this booklet were made during classes conducted by Margaret Lacrampe at Sleepy Hollow School in Orinda, California. The two drawings were originated by Chris Alonso and Mijo Brinkerhoff, and are reprinted here with permission.

Notes on the New GEMS Revision: Kevin Beals and Lincoln Bergman updated and revised this GEMS classic, in consultation with Cary I. Sneider, the original author, and as part of an overall update of the series. Special thanks to Lynn Barakos for allowing us to adapt her work on classroom inquiry for the Full Investigations activity, to John Erickson for assistance with background information on non-Newtonian fluids and other matters, to Alan Gould, who provided his astronomical expertise in the updating of information on Mars missions, to Carolyn Willard for her careful consideration of changes in light of her respect and appreciation for the educational essence and pedagogical elegance of the original *Oobleck* unit, and to Jacqueline Barber, Steven Dunphy, Kimi Hosoume, and Nicole Parizeau.

Bruce Birkett, former Professor of Physics at U.C. Berkeley, was kind enough to provide us with his scientific review of the New GEMS edition. We are indebted to him for both his scientific expertise and educational acumen. Any errors or misstatements, however, reside with GEMS and will be corrected in future editions! ■

As Oobleck once more goes to press
We wanted to again express
Our thankfulness to Dr. Seusss
Modern-day rhymester Father Goose
For his stories of wild imagination
Gentle but righteous indignation
As if such accomplishments weren't enough
He gave us a word for green, gooey stuff
We borrowed it, with all due respect
Thanks, Dr. Seuss, for naming "Oobleck!"

Original *Oobleck* author Cary I. Sneider dances on Oobleck.