Resource Appendix
Resource Appendix

Vendors

Arbor Scientific
P.O. Box 2750
Ann Arbor, MI 48106-2750
1-800-367-6695
Fax (313) 913-6201

Cline Glass
1135 S.W. Grand Ave.
Portland, OR 97214
1-800-547-8417
(Catalog is $5)

DFC Ceramic
P.O. Box 110
Cannon City, CO 81212
1-800-284-9498

Edmund Scientific Co.
101 East Gloucester Pike
Barrington, NJ 08007-1380
(609) 573-6295
Fax (609) 573-6295

Fisher - EMD
Educational Materials Division
485 Frontage
Burr Ridge, IL 60521
1-800-955-1177

Flinn Scientific Inc.
P.O. Box 219
131 Flinn Street
Batavia, IL 60510
1-800-452-1261

Frei and Borel
126 2nd St.
Oakland, CA 91607
1-800-772-3456

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• Vendors
• Printed Materials
• Business Resources
• Videos
• Ordering the Space Shuttle Tile
• Innovative Materials, Processes, and Products Developed by Battelle Memorial Institute
Resource Appendix

Frey Scientific
905 Hickory Lane
P.O. Box 8101
Mansfield, OH 44901-8101
1-800-225-3739

Gesswein
1540 West Glen Oaks Blvd.
Suite 104
Glendale, CA 91201
1-800-232-2311

IASCO
5724 West 36th Street
Minneapolis, MN 55416-2594
1-800-328-4827
Fax (612) 920-2947

Jensen Tools Inc.
7815 South 46th Street
Phoenix, Arizona 85044-5399
(602) 968-6231
(Source for scissors for cutting Kevlar)

Lab Safety Supply Co.
P.O. Box 1368
Janesville, WI 53547-1368
1-800-356-0783
(Suppliers of safety equipment and laboratory supplies)

Lindberg
275 Aikens Road
Asheville, NC 28804
1-800-438-4851
(Replacement furnace parts only)

Rex-Roto
5600 East Grand River
Fowlerville, Michigan 48836
(517) 223-3787
(Source of GH board for furnace—minimum order $100)

Rio Grande
6901 Washington N.E.
Albuquerque, NM 87109
1-800-545-6566
Sargent-Welch
911 Commerce Court
Buffalo Grove, IL 60089
1-800-727-4368
Fax 1-800-676-2540

Schnee-Morehead, Inc.
111 N. Nursery
Irving, Texas 75060
(214) 438-9111
(Supplier of Tacky tape – minimum order $250)

Science Kit & Boreal Labs
P.O. Box 5059
San Luis Obispo, CA 93403-5059
1-800-828-777

Spectrum Glass Co., Inc.
P.O. Box 646
Woodinville, WA 98072-0646
(206) 483-6699
1-800-426-3120 (out of state only)

Swest
26017 Huntington Lane #F
Olencia, CA 91355
1-800-527-5057

Vesuvius-McDaniel Company
P.O. Box 560
Beaver Falls, PA 15010
(412) 843-8300
(Source of alumina rod—minimum order $150)

Vigor
Habsons Jewelry Supply
1424 Fourth Ave., Suite 303, Fourth & Pike Bldg.
Seattle, WA 98101
1-800-678-7759

Western Industrial Ceramics
10725 S.W. Tualatin-Sherwood Rd.
Tualatin, OR 97062
1-800-727-9424
(Suppliers of ceramic board – trade name Fiber Frax—minimum order $100)
Supplies from Hardware Stores

- Propane torch kit ($15)
- Leather gloves
- Hammers
- Tin snips
- Triangular file
- Glass cutters
- Pliers
- Steel wool
- Tongs
- Plaster of paris
- Epoxy resin - in small amounts
- Wire cutters
- Screw drivers
- Wire - copper and iron

Supplies from Grocery Stores

- Ammonium alum
- Twenty Mule Team Borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10 \text{H}_2\text{O}$), sodium borate
- Cornstarch
- Vinegar
- Cups (paper and plastic)
- Plastic bags
- Paper bags
- Marbles
- Silly putty
- Washing soda ($\text{Na}_2\text{CO}_3$), sodium carbonate

Supplies from Lumber Yards

- Wood
- Portland cement
- Gravel (rock aggregate)
- Sand

Note:

A. Silica may be picked up cheaply at local art supply stores

B. Materials for vacuum bagging are not readily available. One possible source is Molen Co., Inc., 22651 83rd Ave. S. Kent, WA, (206) 872-6877

C. Stainless steel molds are not very common, but local metal working shops are possible. A source is Alaskan Copper & Brass, 3223 6th Ave. S, Seattle, WA 98134 (206) 623-5800. They have

- 1 in. square stainless bar in 12 ft sections (41 lb) at $3.06/lb
- 1/4 in. round rod in 12 ft sections (2 lbs) at $3.28/lb
- 1/2 in. stainless plate at 22 lb/ft² for $1.70/lb plus cutting (minimum cutting charge is $18)
# Materials/Equipment Price List

This list is only a sample, and PNL does not recommend or endorse the vendors listed. Note that prices are not guaranteed by the vendors; make sure you get a quote first. Several vendors are West Coast companies, and shipping could be expensive. It would be better to use the items list and research local vendors for prices. One-time-expense items are noted in the last column with an “A.” Those items that will have to be replaced are noted by “B.” Some items will need to be replaced annually, others less frequently.

<table>
<thead>
<tr>
<th>Qnty</th>
<th>Unit</th>
<th>Description</th>
<th>Order #</th>
<th>Vendor</th>
<th>Cost</th>
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Printed Materials

Possible Texts


Classroom Resource Books


Shakashiri, B.Z. Chemical Demonstrations. Volumes 1 and 3, University of Wisconsin Press, Madison, Wisconsin.

Journals

Advanced Composites. 7500 Old Oak Blvd., Cleveland, Ohio.

Aerospace America. 370 L’Enfant Promenade, S.W., Washington D.C.

Aviation Week. P.O. Box 503 Hightstown, New Jersey.

Compressed Air. 253 E. Washington Avenue, Washington, New Jersey.

Discover. Newsstand Publication.


High Technology. P.O. Box 2808, Boulder, Colorado.


“NASA SPINOFF” Technology Utilization Division, Office of Commercial Programs, P.O. Box 8757, Baltimore-Washington International Airport, Baltimore, Maryland.

NASA Technology Briefs. Washington, D.C.

National Geographic. P.O. Box 2895, Washington, D.C.


Metal Alloys - Booklets, Brochures and Articles


Resource Appendix


Glass/Ceramics - Booklets, Brochures and Articles


Corning Glass Works. *This is Glass*. Corning, New York.


Schott Glass Technologies Inc. “Glass the Incredible Liquid.” Duryea, Pennsylvania.


**Note**: Numerous books exist on all levels of stained glass expertise, too many to list. Your local stained glass supply outlet will have a good selection or resources. Select patterns and/or project books your students will enjoy working with.

Polymers/Composites - Booklets, Brochures, and Articles


Additional Resources


Journal Writing Resources


Kanare, H. 1885. "Writing the Laboratory Notebook." *American Chemical Society*.


Business Resources

The following businesses have supported the MST program with free information.

ALCOA
Spokane, Washington
(509) 663-9278
Publication: Company Brochures

Bethlehem Steel
(215) 694-5906
Publication: Company Brochures

Cab-o-Sil
Cabot Corporation
Tuscola, Illinois
(800) 222-6745
Publication: Company Brochure
Product: Cab-o-sil

Corning Incorporated
Corning, New York
(607) 974-8271
Publication: Glass Brochures

Compressed Air
A Division of Ingersoll-Rand Co.
Washington, New Jersey 07882
(908) 850-7817
Publication: Compressed Air Magazine

Dow-Corning
Midland, Michigan
1-800-248-2481
Publication: Materials News

Battelle, Pacific Northwest Laboratories
Richland, Washington
(509) 375-2584
Publication: Profile

Schott Glass Technologies, Inc.
Duryea, Pennsylvania
(717) 457-7485
Publication: Company Brochures
Videos

This brief list of videos have been used in the MST classroom. Many other excellent videos may be available from your school media center, local libraries, and local industries.

Bureau of Mines, Audiovisual Library, Cochrans Mill Road P.O. Box 18070, Pittsburgh, Pennsylvania 15236, (412) 892-6400

Celebration of Light, The Making of Waterford Glass, Waterford Crystal, Inc., Waterford Wedgewood, USA, Belmar, New Jersey, (201) 938-5900

Steuben Glass, Corning Glass, Corning New York, 1-800-235-2357.

Superconductors, Public Broadcasting Network, New York.


Miracle by Design, Dubs Inc., 1220 N. Highland Ave., Hollywood, California 90038, Facsimile (213) 466-7406.


Not Your Usual Field Trips (Plastics), Society of Plastic Engineers, 14 Fairfield Dr, Brookfield, CT 06805-0403, Phone: (203) 775-0471; Fax (203) 775-8490.
Resource Appendix


Owens Corning Fiberglass, Corporate Production, Inc., 4516 Mariota Avenue, Toluca Lake, California 91602.

Manufactured Fibers, American Manufacturers Association Inc., 1150 17th St NW, Washington D.C., 20036.

Lost Wax Casting with Kerr, order no. 260-3210 ($57.25), Gesswein, 10031 South Pioneer, Santa Fe Springs, California 90670, 1-800-949-5480, Facsimile (310) 942-7308.
Ordering the Space Shuttle Tile

The ceramic space shuttle tile used by NASA to shield the space shuttle from the atmosphere’s fierce re-entry heat is available to schools for the cost of shipping the tile (about $10.00, cash on delivery). The tile must be used for educational purposes only.

To order the space shuttle tile send a letter, like the sample below

Lyndon B. Johnson Space Center
Attn: Eileen Bellmyer
Mail Code JF34
Houston, TX 77058

Dear Ms. Bellmyer:

I understand that our school can receive space shuttle tiles from your office for educational purposes. I am sure these items would instill an interest in science and the space program in our students. If these are available please send them to the address below.

Lincoln Community High School
Attn: Mary Allen
320 South Lane
Learned, IL ZIP007
(509) 555-1212

Thank You,

Lynn B. Jones
Principal
Lincoln Community High School

The tile will be shipped Federal Express collect unless otherwise notified; therefore, make sure the correct street address of the school where someone (school office perhaps) will be present during the working day to pay for the shipping costs.

Before NASA will ship the space shuttle tile, they will call your school principal to ensure the request is legitimate. The tile will become school property and be used for school functions only. It generally takes 6 to 8 weeks for the entire process to be completed. If you encounter problems or need some questions answered call Eileen Bellmyer at (713) 483-7965.
Innovative Materials, Processes, and Products Developed by Battelle Memorial Institute*

Advanced materials and innovative chemical processes are often required to help solve environmental, energy, and industrial problems. First known for its materials research and development, Battelle has been involved in developing innovative new products, processes, and technologies for more than 60 years. Battelle scientists, engineers, and technologists have worked with metals and their alloys, polymers, ceramics, and composites to create new and improved materials and develop cost efficient processes for forming and fabricating materials. Battelle continues to be a leader in this field. A sampling of Battelle’s materials-related project achievements are highlighted below.

• an antimagnetic and rustproof alloy for watch springs, later found to be of value in a mechanical heart valve (1935)
• production of zirconium, titanium, and other reactive metals in pure form through an iodide method (1940)
• a study leading to U.S. Mint production of sandwich coins—coins from a copper core with copper-nickel cladding (1965)
• preparation of ceramic teeth to be implanted in human jaws (1970)
• coating for Titleist golf ball that keeps it from splitting (1976)
• a concrete joint that can withstand the stress of a severe earthquake (1978)
• a device to measure and evaluate the impact resistance of laminated glass (1978)
• an instrument that uses laser-produced X-rays to determine quickly the chemical structures of a variety of metals and other materials, some that could not be easily determined by other methods (1980)
• a general purpose, fire-retardant paint for submarines that doesn’t emit harmful vapors while drying (1981)
• hot-corrosion and erosion-resistant coatings that reduce corrosion problems in gas turbines and diesel engines caused by alternative fuels (1984)
• a clear scratch- and abrasion-resistant coating to protect automobile surfaces (1985)

*Battelle Memorial Institute operates Pacific Northwest National Laboratory for the U.S. Department of Energy.
• a hydrothermal processing technique that produces paint pigments with greatly improved properties (1987)
• biodegradable packages that are clear, strong, and inexpensive (1988)
• materials for magnets to power a superconducting supercollider (1989)
• ceramic space fabrics comparable in strength to steel and aluminum that weigh only one-tenth as much (1990)
• anti-static packaging materials for shipping computers (1991)
• optical digital recording (1991)
• biodegradable plastic made from chemically modified natural products such as wood cellulose or cotton fibers (1991)
• aerogel, a lightweight insulator that looks like frozen smoke and doesn’t produce CFCs that will be used in refrigerators (1992)
• coating technology for Dow Chemical Company’s “smart” windows, which control solar radiation coming into buildings (1993).
Sample Experiments/Demonstrations