

MINNESOTA GEOLOGICAL SURVEY

Matt Walton, Director

Information Circular 15

**EARTH SCIENCE
EDUCATIONAL MATERIALS
FOR
MINNESOTA**



UNIVERSITY OF MINNESOTA

Saint Paul

1979

FOREWORD

The following list of materials was prepared by the Minnesota Geological Survey (MGS) for earth science teachers in Minnesota. The list is by no means definitive. It was intended initially only to determine what materials were already available at low cost, so that any we might prepare would not be on the order of "sending coals to Newcastle."

MGS is a research and service arm of the School of Earth Sciences at the University of Minnesota. Its mission is to investigate the geology of the state and provide information on it to government agencies and the public. The primary program of MGS is directed toward scientific investigation of Minnesota geology, but we feel we should be more active in preparing materials for schools and the general public.

A beginning was made about 12 years ago with A Teacher's Guide for Geologic Field Investigations in Minnesota, prepared jointly by MGS and the Minnesota Department of Education. It is now out of print, but copies were sent to schools, and yours may still have one. The format was 8-1/2" x 11" typeset descriptions (about 10-24 pages) of each of eight regions in a loose-leaf binder with the title printed on both spine and front cover. At the time, it was hoped that more stops (places where features of geologic interest can be seen) would be added, so that eventually all schools would be within a 30-minute ride of at least one stop. We are curious to know whether teachers are using this guide, and whether you have suggestions for additional stops.

General suggestions for field trips, as well as classroom activities, are given in the Geology and Earth Sciences Sourcebook, R.L. Heller, ed., (Holt, Rinehard and Winston, 1st ed. 1962; revised ed. 1970; a third edition is in preparation), that was prepared under the auspices of the American Geological Institute (AGI). It is now out of print, and we were unable to find the 1970 edition in any library. This is unfortunate because the teaching ideas are excellent. We would like to know whether most Minnesota teachers have access to the Sourcebook or not.

Of the materials listed in the following, I strongly recommend that you obtain a U.S. Geological Survey teacher's packet and catalogs of free-loan films. Films for next school year should be reserved SOON. Topographic maps ordered directly from the USGS by early June would arrive in plenty of time for fall classes; they do come somewhat faster if ordered from MGS, but cost more--we must avoid underselling local commercial sources.

Blue-line air photos on the same 1:24,000 scale (1 inch = 2,000 feet) as USGS topographic maps perhaps can be obtained through your county or municipal highway departments from the Minnesota Dept. of Transportation (DOT), according to DOT. However, they cannot accept school purchase orders. The extra dime for the coated version (total cost 35¢) is worth it--they last longer. They must be stored in darkness when not in use--light fades them. If you find a catch-22 problem in getting these, let me know.

The films listed in the following have not been previewed by MGS, but we have indicated those that were included in the Sourcebook or in AGI's Selected Films on Geology. The latter includes many other films in addition to those included here. A new film--by Prof. Charles Matsch of UMD, titled Fire, Water and Ice--deals with Minnesota's geology. It was shown at a meeting of the Minnesota Geological Society, and as one member put it, "we really had to sit up and pay attention." Expansion of the discussion, by the teacher, would probably be necessary for high school classes, although I think even junior high students would find it interesting. It has not yet been assigned a catalog number, but can be ordered from University of Minnesota, Media Resources, 330 - 21st Avenue South, Minneapolis, MN 55454. Tel. (612) 373-4760. Rental charge is \$10.75 per use.

Modern Talking Picture Service distributes EXXON, USGS and other free-loan films from its Minneapolis office (9129 Lyndale Avenue S.), but all scheduling is done from their main office (2323 New Hyde Park Road, New Hyde Park, N.Y. 11040). Scheduled films can be picked up in Minneapolis, or they can be mailed to you. We were sent a list of their films, but it did not include many that I know they have. You may be able to get a more complete list from their main office.

Finally, Lucinda Hruska-Claeys, the student assistant who compiled the list, and I can use all the guidance you can give us. Please return the questionnaire. If nobody responds, we will be terribly discouraged.

If any of you are in the Cities and have time to stop in at the Survey, we would like to meet you. MGS will have a booth at the State Fair this year, which I am not planning to "man," although I do plan to be in the office during the fair.

Nancy H. Balaban
Editor
May 4, 1979

EARTH SCIENCE EDUCATIONAL MATERIALS FOR MINNESOTA

AMERICAN GEOLOGICAL INSTITUTE (AGI)

Dictionary of Geological Terms. Paperback. Cost: \$3.50.
Geology: Science and Profession. Career-guide. Cost: \$1.00.
Selected Films on Geology. 1978. 59 pp. \$3.00.
Publications list. Free. Some items may be of use in the earth
science classroom.
Address: 5205 Leesburg Pike, Falls Church, Virginia 22041,
phone: (703) 379-2480

AMERICAN PETROLEUM INSTITUTE

Films and pamphlets. Catalog "Movies about Oil" describes films
by U.S. Dept. of Energy, U.S. EPA, NSF, oil companies, how to
order, cost or free. Includes sections on Environment,
Exporation, Research.
Address: Film Program, American Petroleum Institute, 2109 "L"
Street, N.W., Washington, D.C. 20037

EXXON COMPANY, USA

Films free for teachers; mainly on energy, oil and economics.
Brochure free. Not in brochure but also available from
Modern Talking Picture Services:
"Bahamas - Where Limestones Grow Today". 1958. 40 min.
Color. (1962 Sourcebook: "Interesting to anyone, but
discussion ... would require expansion by the secondary
school teacher.")
"Galveston Island Barrier Sands". 1958. 36 min. Color.
Demonstration of the formation of Galveston Island.
(Suggested by Exxon. Not in Sourcebook or AGI.)
Address: Public Affairs Department, Exxon Company, P.O. Box 2180,
Houston, Texas 77001

GEOLOGICAL SOCIETY OF MINNESOTA (GSM)

Quarterly newsletter. The organization schedules lectures and
laboratory sessions semi-monthly in fall, winter and spring,
usually at the University of Minnesota, and field trips
during summer. Society is interested in furthering the
understanding of geology by the public with particular empha-
sis on the geology of Minnesota. Yearly dues: \$7.00
(individual); \$10.00 (family); \$2.00 (student).
Depending on the location of your school, it might be possible to
have one of the members talk to classes.
Address: Liaison Officer, Mary Kimball, 1711 Marshall Ave.,
St. Paul, Minnesota 55104

LAKE SUPERIOR INDUSTRIAL BUREAU (Iron Mining Industry of Minnesota)

Pamphlet "Minnesota's Iron Mining Industry" and taconite samples. free. Free-loan film "Minnesota Meets the Challenge", a film strip, other free-loan films. Request order form.
Address: 82 First American National Bank Bldg., Duluth, MN 55802, phone: (218) 722-7724

LILYDALE GEOLOGIC SITE (formerly Twin City Brick Yard)

Booklet "Fossils: A Beach Comber in Minnesota" provides a background on fossils and geologic formations at the site. Reservations are required for field trips, scheduling services of a naturalist.
Address: Mike Ryan, Naturalist, Ramsey County Open Space, 2010 White Bear Ave., Maplewood, MN 55109, phone: (612) 770-1361

MINNEAPOLIS PUBLIC LIBRARY

Environmental Conservation Library. 300 Nicollet Mall, Minneapolis, MN 55401. (612)372-6609. Reference materials, resource librarian.

Minnesota Environmental Organizations: A Directory. Cost: \$2.50 at any branch of the library; \$3.00 by mail.

Planetarium Programs and museum. Admission free. For reservations (612) 372-6543.

MINNESOTA ACADEMY OF SCIENCE

"Journal of the Minnesota Academy of Science." Published quarterly to report research by members. Academy includes geology and science education sections. Semi-annual meetings. Yearly dues: \$15.00 (\$3.00 for graduate students).
Address: Pioneer Building, Rm. 410, St. Paul, Minnesota 55101, phone: (612) 227-6361

Geology Section, Dr. J. Elwell & Dr. R. Melchior,
Geology Department, Bemidji State University, Bemidji, Minnesota 56001, phone: (218) 755-2920

Science Educational Section, Dr. K. Kelsey, A134
Educational Building, St. Cloud State University, St. Cloud, Minnesota 56501

MINNESOTA DEPARTMENT OF ECONOMIC DEVELOPMENT

Pamphlet "Rocks and Minerals in Minnesota." 16 pp. on rock collecting; and tourist pamphlets on resources, scenery and recreation. Free.

Address: Tourism Division, 480 Cedar Street, St. Paul, Minnesota 55101, phone: (612) 296-5029

MINNESOTA DEPARTMENT OF EDUCATION

Teaching guides on Energy. There has been much recent publication in this area.

Educational Media-Audio-Visual Division.

Have some films available, including "Minnesota's Future."
Few films on environmental topics. Free film list available.
Phone: (612) 296-6114

Address: Richard Clark, Science Program Coordinator, Science Education Program, 6th Floor, Capitol Square Building, 550 Cedar Street, St. Paul, Minnesota 55101, phone: (612) 296-4071

MINNESOTA DEPARTMENT OF NATURAL RESOURCES (DNR)

"Peat." State map with brief text.

"Conservation Volunteer." Periodical put out 6 times yearly.

For the general public on natural resources and conservation.
Free of charge but there is a waiting list up to 2 years long.

Information and Education Bureau - Film Loan Library. Films on natural resources conservation topics. Catalog upon request.
"The Creek" and "Rise and Fall of the Great Lakes" (see description on attached U of M Audio-Visual film list) can be borrowed from DNR.

Address: 3rd Floor, Centennial Office Bldg., 658 Cedar Street, St. Paul, Minnesota 55155, phone: (612) 296-6157
(Information), 296-3336 (Film loan library)

MINNESOTA DEPARTMENT OF TRANSPORTATION (DOT)

Minnesota Transportation Map. (1979-80 ed.) Now published every other year. Lists state parks and facilities at each. Free to teachers and classes.

Address: Government & Community Relations Div., Office of Communications, Transportation Bldg., Room 410, John Ireland Blvd., St. Paul, Minnesota 55155
phone: (612) 296-3581

MINNESOTA GEOLOGICAL SURVEY

Publications list available upon request. The following selected publications may be ordered by mail. Payment must accompany orders (except for institutions like public schools). Please add 48¢ for postage. Minnesota residents must add 4% sales tax.

Educational Series.

~~ES-1 Guide to Fossil Collecting in Minnesota. Revised edition. R.K. Hogberg, et al. 1967. 38 p. 50¢.~~ Out of print

ES-2 Guide to Mineral Collecting in Minnesota. G.R. Rapp, Jr. & D.T. Wallace. 1966. 42 p. 75¢.

ES-3 Geologic Sketch of the Tower-Soudan State Park. P.K. Sims & G.B. Morey. 1966. 29 p. 50¢.

Environmental Geology of the North Shore. J.C. Green, et al.,

1977. 99 p. \$5.00.

Rocky Roots. By Joan Kain. A walking tour of downtown St. Paul discussing the building stones used. Available at Ramsey County Historical Society or Minnesota Geological Survey. Cost: \$1.00. (Also available at the Minnesota Historical Society).

Maps. Maps of the whole state at 1:500,000 measure 4'2" x 4'8" and can be ordered either flat or folded. Those at 1:3,168,000 are on the right half of a sheet measuring 17" x 11", with explanatory text or cross sections on the left half. All of these in color.

M-24 Geologic Map of Minnesota, Bedrock Geology. 1976. 1:3,168,000. 50¢ per copy; 25-50 copies @ 40¢; 50+ copies, @ 30¢.

S 1 Geologic Map of Minnesota, Quaternary (surficial) Geology. 1:500,000. (in press. Possibly will be available before December)

S 2 Hydrogeologic Map of Minnesota, Bedrock Hydrogeology. 1978. Sheet 1 (map), Sheet 2 (cross sections), and accompanying text. 1:500,000. \$9.00.

S 3 Hydrogeologic Map of Minnesota, Quaternary Hydrogeology. 1:500,000. (in press. Probably available before August, 1979)

S-4 Geologic Map of Minnesota, Quaternary Geology. 1:3,168,000. (in press. Probably available in June, 1979)

S-5 Hydrogeologic Map of Minnesota, Bedrock Hydrogeology. 1:3,168,000. (in prep. Available in November?)

S 6 Hydrogeologic Map of Minnesota, Quaternary Hydrogeology. 1:3,168,000. (in press. May be available in October.)

Bedrock geologic maps in color at 1:250,000 are available for the St. Paul Sheet (@ \$2.00), New Ulm Sheet (\$3.00) and Hibbing Sheet (\$3.00). The Roseau, International Falls and Two Harbors Sheets are in press, as is East-central Minnesota at this scale, and some of them may be available before January, 1980. These maps can also be ordered flat or folded.

Note: At 1:500,000 scale, 1 inch = about 8 miles. At 1:250,000, 1 inch = nearly 4 miles. At 1:3,168,000, 1 inch = 50 miles. 7½-minute quadrangles are at 1:24,000, or 1 inch = 2,000 feet.

Sample kits containing 3 minerals and 3 fossils are free to Minnesota residents upon request. The samples are very small, fitting into lidless boxes 3" x 3-3/4". If you wish a classroom number of these, you might prefer receiving the unglued ingredients--glued to the label, they simply are not attention getters. Possibly the students could share kits in pairs. If you want them to write letters as an exercise, we would appreciate your mailing the letters in one envelope.

Slide programs. Three are in preparation: on glaciers and landforms in the Twin Cities area, on the Mississippi River, and on the Anoka sand plain. They should be available by the start of fall classes.

Minnesota's Rocks and Waters: A Geological Story (revised ed.) (1963) by G.M. Schwartz and G.A. Thiel. 366 pp., 161 figs. This is MGS Bulletin-37, but was written for a lay audience, and is not available from MGS. Send a separate school purchase order to University of Minnesota Press, 2037 University Avenue S.E., Minneapolis, MN 55414. Price is \$8.95.

Field Trip Guidebooks. No. 10, Western Vermilion district, northeastern Minnesota @ \$5.00. No. 11, Keweenawan (Upper Precambrian) North Shore Volcanic Group @ \$4.00. Prepared for university level, but may be useful for teachers.

The Riddle of the Land, the Spring 1979 issue of Roots published by the Minnesota Historical Society, and accompanying teachers' guide can be purchased from MGS, as well as from the Historical Society for \$1.50 per copy. Audience level is grammar school, but it is about Minnesota geology and could be used as supplementary material with 8th graders. I have seen it only briefly, in galley proof, but was really impressed.

Maps by other agencies.

Soil landscapes and geomorphic regions: Twin Cities Metropolitan Area Sheet. 1975. University of Minnesota, Agricultural Experiment Station Misc. Report 130-1975. Scale 1:125,000. \$3.00.

Interpretations of soil landscapes and geomorphic regions: Twin Cities Metropolitan Sheet. 1976. University of Minnesota, Agricultural Extension Service Ext. Bull. 320-1976. Scale 1:250,000. \$5.00.

Minnesota Soil Atlases: Scale 1:125,000. Brainerd Sheet, 1969, \$3.00; Hibbing Sheet, 1971, \$3.00; St. Paul Sheet, 1973, \$4.00; Duluth Sheet, 1977, \$4.00.

Topographic maps (only of Minnesota) @ \$2.00.

Address: Minnesota Geological Survey Map Sales, 1633 Eustis St., St. Paul, MN 55108, phone (612) 373-0223.

MINNESOTA HISTORICAL SOCIETY

Address: Historical Building, 690 Cedar Street, St. Paul, Minnesota 55101, phone: (612) 296-6126 (Information), 296-4694 (Bookstore)

MINNESOTA PETROLEUM COUNCIL

Films: "The Steel Reefs" about drilling platforms in Gulf of Mexico, and two others on fighting and prevention of petroleum fires. American Petroleum Institute catalog available.

Address: Richard Brubacher, Executive Director, 1020 Northern Federal Building, St. Paul, Minnesota 55102
phone: (612) 277-8841

MINNESOTA POLLUTION CONTROL AGENCY (MPCA)

"MPCA Inside Report." Monthly. About current projects and accomplishments of the MPCA. Lists meetings and events. Questions and comments welcomed. Most readily available for agencies and libraries.

Address: Public Information Office, 1935 W. County Road B2,
Roseville, Minnesota 55113

MINNESOTA SCIENCE TEACHERS ASSOCIATION

Quarterly newsletter for science teachers in all disciplines.
Meets in conjunction with Minnesota Academy of Sciences and
the fall teacher convention. Yearly dues: \$5.00.
Address: Minnesota Academy of Science, Pioneer Bldg., Rm 410,
St. Paul, MN 55101. Phone: (612) 227-6361.

MINNESOTA SPELEOLOGICAL SURVEY INC.

The MSS is an independent group "dedicated to the scientific
study, protection, and safe recreational use of caves."
"Minnesota Speleology." Newsletter; contributions to it are soli-
cited. Subscriptions: \$8.00 annually.
Address: Ron Spong, Editor, 1772 Ashland Avenue, St. Paul,
Minnesota 55104

MINNESOTA STATE PLANNING AGENCY

Environmental Planning Division
Environmental Planning Information Series: pamphlets on
topographic maps, soils maps and geologic maps; free.
Overview brochure about Minnesota Land Management Information
System; free.

Reports on agency research and activities; free unless they
have to be duplicated for you.

Environmental Quality Board (EQB)

Pamphlet describing the EQB and its programs; brochures
describing each EQB program in detail; free.

Address: Room 100, Capitol Square Building, 550 Cedar Street,
St. Paul, MN 55101 phone: (612) 296-3985 (Environ.
Planning) 296-2723 (EQB)

Mapping and Remote Sensing Information Center (MARSIC). MARSIC is
not itself a repository of maps, but rather a source of
information on what maps and imagery are available and where.
--quarterly newsletter available. Major catalogs every 5 years.
Address: same address, but Room 15. phone (612) 296-1211

A Directory of Minnesota Maps (catalog; gives prices, how to order).

Address: Documents Section, 140 Centennial Bldg., 658 Cedar St.,
St. Paul, MN 55155, phone: (612) 296-2874. \$1.00 + tax
+ 50¢ postage and handling.

MUSEUMS

James Ford Bell Museum of Natural History

Displays and dioramas of Minnesota wildlife, plants and ecosystems. One of the newest illustrates the geologic history of the state. "Touch and Feel" room where children can handle furs, bones, natural objects. One-hour tours for classes (reservations required). Bookstore.

Address: 10 Church Street S.E., Minneapolis campus of U of M,
phone: (612) 373-2423

Plantarium and museum at Minneapolis Public Library. Admission free, call for reservations.

Address: 300 Nicollet Mall, Minneapolis, MN 55401, phone: (612) 372-6543

Science Museum of Minnesota (formerly St. Paul Science Museum)

Billions of Years in Minnesota. By Edmund Bray for the St. Paul Science Museum. Discusses Minnesota's geological history in a non-technical manner. \$4.25 for paperback, \$6.25 for hard cover. Also available from Minnesota Historical Society.

"Encounters." Monthly newsletter of the Museum. Lists current events and contains articles on activities. Received with annual membership fee of \$15.00.

"Explorer." Quarterly scientific magazine. Received with membership (as above).

"Genesis." A film on the development of the earth and on the geology of plate tectonics. Produced for opening of the Omnitheater in September of 1978, and can be seen there. May later be available as a rental film.

Address: 505 Wabasha Street, St. Paul, Minnesota 55102, phone: (612) 221-9444 (reservations-classes & tours), 221-9409 (membership office), 221-9488 (general information).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

Report to Educators. Quarterly newsletter about current NASA projects. Free.

NASA Educational Publications, and NASA Films. Free brochures. Films can be borrowed. Publications are sold (inexpensive) by U.S. Government Printing Office.

Address: Educational Services Branch, Public Affairs Division (LFG-13), NASA, Washington, D.C. 20546.
Or contact: Alice B. Kohl, Education Office, NASA LEWIS RESEARCH CENTER (MS-11-1), 21000 Brookpark Road, Cleveland, Ohio 44135 phone: (216) 433-4000, ext. 6165.

NASA will conduct aerospace workshops for elementary and secondary teachers at the College of St. Thomas, St. Paul, July 2-6, 1979, and at the University of Minnesota, Minneapolis, July 9-13. According to Dr. Gennaro, the workshop at the U of M will be part of a summer "workshop". Information on tuition and fees from U of M Summer Session Office, 135 Johnson Hall.

We wrote to NASA asking about the education project that was described in the November 1978 Journal of Geological Education. From Ms. Kohl's letters from the Lewis Research Center, it appears that NASA has cut back on school visits for budgetary reasons, although they are still engaged in in-service workshops, college teacher training, and educational TV. They "can present a limited number of lecture/demonstrations and/or classroom visits for students, hopefully in conjunction with these training programs...Two to four hours is the minimum participation time we would consider for an inservice program."

We also asked about the "telephone lectures" described in the article. Ms. Kohl wrote that they do not have these on an on-going basis at Lewis, but that the few they have had were paid for by NASA. (The telephone company can arrange for speaker phone on a one-time basis.) Ms. Kohl said that possible topics could be Energy, Land Satellite, Space Shuttle, Interplanetary exploration. For further information, contact Mr. Calvin W. Weiss, Chief, Educational Services Office, NASA Lewis Research Center. His telephone is (216) 433-4000, Ext. 444. Ms. Kohl did not tell us anything about the slides mentioned in the Journal article, but presumably some of NASA's films would serve the purpose just as well. I gather (although Ms. Kohl did not so state) that a well-briefed class with real, organized questions might confer with a NASA scientist on the telephone, but that the term "lectures" is misleading.

NATIONAL ASSOCIATION OF GEOLOGY TEACHERS (NAGT)

"Journal of Geological Education." Published bimonthly. Ideas and research in geology education for teachers at any level, including college. Yearly membership: \$14.00 (\$5.00 for students). Back issues: \$4.00 each.
Address: Business Office, P.O. Box 368, Lawrence, Kansas 66044

"The Environment Times." Published 9 months a year. Available with membership in NAGT (see above) or annual subscription fee of \$5.00.
Address: The Environment Times, University of Minnesota-Duluth, 2215 E. Fifth Street, Duluth, Minnesota 55812

SHELL OIL COMPANY EDUCATIONAL SERVICE

Pamphlets. "Let's Collect Rocks and Shells" -- 24-page guide to beginning collectors. "Ecolibrium" -- quarterly journal concentrates on environmental topics related to energy. Other educational pamphlets on oil, energy, request listing. Free.
Address: P.O. Box 2463, Room 1535, One Shell Plaza, Houston, Texas 77001

Films. Free of charge upon request. Many on oil and natural resources; request listing from either address. Films on

geology are:

- "The Fossil Story." 1958. 19 min. Color. Layperson's introduction to paleontology with emphasis on the search for oil. (1962 Sourcebook: "Well done!" AGI: Jr. High-Adults.)
- "Story in the Rocks." 1962. 18 min. Color. Introduction to paleontology and historical geology. (AGI: Jr. High-Adult)
- "This Land." 1973. 41 min. Color. Story of the evolution of the North American continent and how geologists have been able to reconstruct events that occurred before human history. (AGI: Jr. High-Adult)

Address: Shell Film Library, 1433 Sadlier Circle, West Drive,
Indianapolis, Indiana 46239

U.S. BUREAU OF LAND MANAGEMENT (BLM)

Materials for elementary classes on ecology and the environment are available, but they contain virtually nothing on geology. A pamphlet, "Making Multiple Use Decisions", could perhaps be useful.

Address: Office of Public Affairs, Eastern States Office, Bureau of Land Management, 7981 Eastern Avenue, Silver Springs, Maryland 20910

A flyer on the BLM in our area is available from their Lake States Office, 125 Federal Bldg., Duluth, MN 55802.

U.S. BUREAU OF MINES

Free-loan library of 16 mm films, on topics such as: Cast Iron--the Biography of a Metal; Copper, the Oldest Modern Metal; Wealth Out of Waste (AGI: all 3 = Jr. High-Adult). Write for catalog:

Address: MOTION PICTURES, Bureau of Mines, 4800 Forbes Ave.,
Pittsburg, PA 15213, Attn: Mary Morofsky.
phone: (412) 621-4500, Ext. 8328

Most publications deal with the mineral industry and are very technical. However, the annual state profile (titled Minerals in the Economy of Minnesota) and the Minerals Yearbook reprints (Minerals Industry of Minnesota) could be useful for teachers and are free from the Twin Cities Liaison Office. A 120-page book (8 pp. on Minnesota) titled Mining and Mineral Operations in the North-Central States: A Visitor Guide, can be ordered from the U.S. Government Printing Office--GPO Stock No. 024-004-01897-6, \$3.25. It is recent (1977), illustrated in color, and readable.

Speakers are available from the Liaison Office on a variety of mineral-related subjects and USBM employment opportunities.

Address: Ronald C. Briggs, Liaison Officer, U.S. Bureau of Mines Liaison Office, P.O. Box 1660, Twin Cities, MN 55111
phone: (612) 725-4535

U.S. GEOLOGICAL SURVEY (USGS)

Teacher's Packet of Geological Materials. Contains: single copies of USGS popular publications with instructions on how to order more (many are free); descriptions of USGS films (sound-color, 16 mm) and how to borrow them; many annotated lists by topic of books and teaching guides; index map to Minnesota topographic maps; descriptions and addresses of seven "preeminent sources of additional information." Focus: grades 7-12.

Selected packet of Geological Materials. Similar to above, but focus is grades 1-6 and packet contains fewer materials.

Free of charge to teachers by request on school stationery.

Address: Geologic Inquiries Group, U.S. Geological Survey, 907 National Center, Reston, Virginia 22092

Topographic Maps @ \$1.25/quadrangle.

Address: Branch of Distribution, 1200 South Eads Street, Arlington, Virginia 22202

U.S. GOVERNMENT PRINTING OFFICE

"Nature to be Commanded..." Earth-science Maps Applied to Land and Water Management, G.D. Robinson and Andrew M. Spieker, editors: U.S. Geological Survey Professional Paper 950. 1978. 95 pp., \$6.25 The pages are 12" x 16" and lavishly illustrated. Intended for a lay audience, to encourage wider use of earth science and earth scientists at all levels of urban planning. Should not be too difficult for bright 8th graders interested in the subject. You might want to encourage the local public library to acquire it.

"Selected U.S. Government Publications." Monthly catalog. Free. May contain geological publications.

Address: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

UNIVERSITY OF MINNESOTA -- AGRICULTURAL EXTENSION SERVICE

Publications. List of publications is free; most publications also are free. They range from quite technical Bulletins to four-page Environmental Education Activity Sheets for Teachers. The Special Reports titled "Minnesota Natural Resources, Elementary Teaching Guide", and "Guide to Environmental Education Resources in the Twin Cities Area" could be quite useful. The emphasis is soils, environment in general, water; the Soils Atlases and the two Twin Cities publications also available (same price) from the Minnesota Geological Survey do include some geology.

Address: Bulletin Room, 3 Coffee Hall, University of Minnesota, St. Paul, MN 55108, phone (612) 373-1615.

4-H Club project manuals. Topics include water, landforms, geology. Activity/experiment approach. Only enough copies were printed for 4-H because funds were limited, but copies could be borrowed, e.g., from County Extension Offices. Specialists who can answer questions are Prof. Halsey (soil testing lab; 373-1060) and Profs. Smith and Vogt (forestry; 373-0720).

UNIVERSITY OF WISCONSIN, SEA GRANT COLLEGE PROGRAM

Educators' Guide to Great Lakes Materials. Evaluations of books, films, maps and pamphlets for classroom use, 6th through 9th grades. Some earth science materials. Very well done. Should be passed along to Social Studies and English teachers. 25¢. Address: 1800 University Avenue, Madison, WI 53706.

UNIVERSITY OF MINNESOTA

Audio Visual Library Service
Continuing Education and Extension
3300 University Avenue S.E.
Minneapolis, MN 55414

(612) 373-3810

Films available to schools and individuals; catalogs and order forms upon request.

The following are recent (1963-1978) films that have (or appear to have) earth science topics. The descriptions were clipped from their catalog. Rental prices are in bold, upper right corner of each entry. Audience-level code is at end of descriptions:

- p - primary (grades 1 - 3)
- i - intermediate (grades 4 - 6)
- j - junior high (grades 7 - 9)
- s - senior high (grades 10 - 12)
- c - college
- a - adult

Notation in ink AGI indicates film is listed in American Geological Institute Selected Films on Geology. AGI audience levels are indicated only where very different from the catalog.

Entries are grouped here as follows:

- Astronomy, solar system
- Conservation of natural resources
- Continental drift
- Deserts
- Earth's crust and interior
- Earthquakes
- Erosion
- Estuaries and coasts
- Glaciers
- Meteorology and weather
- Minerals
- Mountains and mountain building
- Paleontology and fossils
- Rocks (see also Minerals)
- Rotation and orbit of the earth
- Volcanoes
- Water - Lakes and ground water
- Water - Oceanography
- Water - Rivers and streams

*Orders by letter or purchase orders are acceptable if typed, double spaced and include call number and complete title as printed in catalog. Give date desired for use and alternate dates and/or titles; often a shift of a few days or weeks may make a film available.

TOPIC: ASTRONOMY, SOLAR SYSTEM

***BIRTH AND DEATH OF A STAR** 13.00
7P0820 color 35 min.
 Including a thorough discussion of the controversial black holes, "Birth and Death of a Star" is a tour-de-force of the stellar life cycle. Prominent astronomers are interviewed in their observatories from Princeton to the University of California, as they present lucid explanations of the phases of the formation, development, and death of stars. ijsca (2449/1090)

***CRAB NEBULA** 20.25
 SERIES: NOVA
1P0821 color 56 min.
 Describes the current theories on the origin of the Crab nebula, first observed on earth in the year 1054. Explores the characteristics of its radiation, and the scientific supposition that its core contains a neutron star, or pulsar. sca (1089/1090) AGI 1972

OTHER PLANETS--NO PLACE LIKE EARTH 12.95
 SERIES: THE LIFE AROUND US
7N1157 color guide 30 min.
 From the earliest times, man has studied the sky. Through the use of old drawings and diagrams and film footage of modern exploratory operations, this film documents the progress of astronomy from the time of the Greeks to the present. Similarities and differences between Earth and the other planets are discussed. A summary of knowledge gathered about the eight other planets is given, covering such topics as the seasonal changes on Mars, the atmosphere of Venus, the motion of Jupiter, the rings of Saturn, and the discoveries of Neptune and Pluto. The findings of the various Mariner missions are presented and the plans for future space probes delineated. Through computer animation, viewers are taken on a grand tour of the outer planets, simulating a trip actually planned for an unmanned space-ship in the late 1970's. Highlighted by special effect photography. Based on the Life Science Library--"Planets" jsca (1090/1090) 1971

THE PLANETS 25.00
 SERIES: NOVA
1P0846 color guide 52 min.
 The planets of the solar system may each represent a different stage in the history of the earth. Scientists think that Mercury is very similar to the way the earth was 4 aeons (billion years) ago. The larger planets, Jupiter and Saturn, represent even earlier stages. They are still condensing. This documentary takes a close look at America's space program. It discusses the objectives of NASA and the results of recent space flights. The program explains many of the important techniques utilized: space photography, communication and radiometric dating. THE PLANETS also provides detailed accounts of the geologic history of the moon and the planning that went into the U.S. Viking mission. Using animation and charts as well as space photography and film, THE PLANETS is the viewer's key to the complexities of the space program and the intricacy of the solar system whose mysteries man has just begun to unravel. sca (2429/1090) 1976

SKY IS FALLING 10.30
 SERIES: SMITHSONIAN
7G0732 color 24 min.
 The film presents basic knowledge about meteors and meteorites and demonstrates some techniques through which scientific information is obtained. ijsca (1080/1011) 1967

TOPIC: CONSERVATION OF NATURAL RESOURCES

PROBLEMS OF CONSERVATION: OUR NATURAL RESOURCES 6.30
 SERIES: PROBLEMS OF CONSERVATION
5N1010 color 11 min.
 Man relies heavily on natural resources and simultaneously misuses his resource supply. Water pollution and food distribution are established as two of our most crucial conservation problems. Current efforts to solve such problems are surveyed. The effects of conservation efforts will determine if we keep the earth habitable. jsa (1007/1007) 1970

SURVIVAL ON THE PRAIRIES 19.00
1G0774 color 52 min.
 The "American grasslands" can survive any storm, however severe, but may not be able to survive the intrusion of man. Part I of this film traces the geological history of the grasslands, climatic conditions, varieties of insect and plant life, and the marvelous balance that may well teach man much about his own survival. Part II shows the effects of rain on the prairie, the relationship between various forms of animal life, and shows man as the most effective killer of all animals. The history of the area is traced from teepee and buffalo trails to the Homestead Act to technological farming success of today, showing some modern agricultural problems, and the importance of the grass itself as the binding force of the prairie. jsca (1080/1080) 1970

THE 3RD POLLUTION 9.00
7D0367 color 23 min.
 This film is a comprehensive and orderly treatment of the subject of solid waste management. Burning refuse contributes to air pollution and dumping it contaminates ground water supplies. The collection and disposal of solid wastes is expensive and technically challenging. This film was made specifically to inform the general public and outline the various alternatives available to communities. jsca (1379/1379) 1966

TOPIC: EARTHQUAKES

***CITY THAT WAITS TO DIE - SAN FRANCISCO** 19.00
1G0843 color 47 min.
 An alert from scientists concerned with a catastrophic fate for San Francisco based on earthquake conditions presented by the San Andreas fault. Includes scenes of earthquakes and describes some of the radical experiments being conducted in starting and stopping earthquakes. sca (1089/1090) *AGI* 1971

TOPIC: CONTINENTAL DRIFT

***DRAFTING OF THE CONTINENTS** 20.25
1G0842 color 50 min.
 Surveys recent discoveries in the earth sciences which explain the movement of the continents and disclose other facts about the earth. sca (1089/1090) 1971 *AGI*

EARTHQUAKE 6.70
5G0366 color 14 min.
 Through the use of animation, this film demonstrates how an earthquake takes place. The effects of earthquakes on land forms and on man-made structures are shown. Aerial photographs are used in the explanation of fault lines. How scientists study vibrations produced by earthquakes to learn the location and direction of earthquakes and also to learn about the inside of the earth is presented. ijs (1029/1030) *AGI* 1966

THE NOT-SO-SOLID EARTH 12.95
 SERIES: THE LIFE AROUND US
7N1155 color guide 30 min.
 The discovery of continental drift was one of the most revolutionary findings of this century. This film describes the history and geological character of continental drift, including the theories formulated to explain the configuration of the earth's continents, and the new technological developments which enable scientists to understand the processes of continental drift. Based on the Life Nature Library--"The Earth." jsca (1090/1090) 1971 *AGI*

IN SEARCH OF EARTHQUAKES 12.00
 SERIES: IN SEARCH OF...
7G0864 color 24 min.
 This film examines the causes and results of some of the world's major earthquakes. The last several decades have been a period of relatively low seismic activity, but all current indications point to the fact that we are moving into a more active period. Scientists are developing techniques for predicting earthquakes, including using the radio signals from stars millions of light years away to plot movements in the earth's surface. Some day we may be able to use this information to prevent the disasters caused by earthquakes. Narrated by Leonard Nimoy. Winner of the CINE Golden Eagle Award. "In Search Of..." is a series of films that probe unsolved mysteries. sca (2829/1014) 1976

TOPIC: DESERTS

AMERICAN DESERT 6.60
5G0691 color 16 min.
 The deserts of North America are lands of contrasts and extremes. This film considers the geologic history and formation of these areas and shows how plants and animals adapt. Man is gradually changing the desert by bringing to it the one most important resource: water. ij (1264/1264) 1966

THE PREDICTABLE DISASTER 15.00
 SERIES: NOVA
7G0860 color guide 32 min.
 In recent years scientists have been maintaining careful records of when and where earthquakes occur. What has emerged from this documentation is one of the most exciting discoveries of modern science. A graph on a world map which plots all the earthquakes of the last 50 years shows that earthquakes concentrate in narrow bands. These bands indicate the boundaries of what scientists think are huge lithospheric plates which move along the surface of the earth. The theory developed from this research is called "plate tectonics," and it dominates the field of geological science. As a result of the plate tectonic theory, scientists have developed an increased ability to predict earthquakes. As the plates move they release energy, but if there is no movement energy is stored up and may be released as earthquakes. Through the use of tilt-meters and magnetometers, scientists have begun to keep careful records of plate movements. sca (2504/1090) 1976

***SAND: THE DESERT IN MOTION** 6.20
5P0729 color 11 min.
 The film examines the source of desert sand; pictures deserts of many regions; explains the effects of water, wind and sharp edges of sand on rocky and sun-baked areas. ij (1214/1030) *AGI* 1969

THE SAN ANDREAS FAULT 8.70
 SERIES: EARTH SCIENCE
5G0862 color 21 min.
 Nowhere are the geologic forces that shape the earth more evident than at California's San Andreas Fault. Dramatic aerial photography and startling geologic evidence document the awesome forces that come into play in the fault zone. The film shows what the fault trace looks like, what it has done to the landscape and to the rocks of California, and how it is being monitored and studied with creep meters, tiltmeters, strain gages and seismometers. The use of computers to forecast seismic activity is described. Produced in collaboration with the American Geological Institute. jsca (1007/1007) *AGI* 1974

TOPIC: EARTH'S CRUST AND INTERIOR

THE INTERIOR OF THE EARTH 6.70
 SERIES: GENERAL SCIENCE
5G0381 color 14 min.
 This film illustrates that knowledge about areas man cannot reach directly can be acquired by instruments, in this case the seismograph. The first part of the film shows the cause of earthquakes and how they are detected by a seismograph. A moving model explains how a seismograph works. The second part demonstrates why seismic waves are transmitted through the mantle and core at different speeds due to differences of density. Why there is a shadow zone is illustrated by a light beam passing through two liquids of different densities. This and the fact that transverse waves do not pass through liquids suggests that the outer core has the characteristics of a liquid. Further demonstrations give evidence that there is possibly an inner core which has the characteristics of a solid. js (1011/1011) 1963

TREMBLING EARTH 9.65
9P0786 color 29 min.
 Lamont Geological Observatory at Columbia University featured. Seismometer shows formation of earthquakes. California's San Andreas fault and Alaskan earthquake included. jsca (1076/1010) *AGI* 1968 *jsca*

STRATA: THE EARTH'S CHANGING CRUST 5.00
3G0405 color 11 min.
 The formation of sedimentary rocks is explained. Development of faults and folds is traced. The effect of pressure applied slowly to rocks is illustrated. ij (1029/1030) 1966

TOPIC: EROSION

***EROSION** 6.30
5P0724 color 10 min.
 Photography of the Colorado plateau in the Southwest U.S. shows weathering, erosion of material by wind and water, the carving out of canyons and the remaining "capstones" of rock. ij (1214/1030) 1968

EROSION—LEVELING THE LAND 6.70
 SERIES: EARTH SCIENCE
5G0368 color 14 min.
 This film uses laboratory demonstrations and natural photography to investigate the processes of weathering, erosion and deposition of rock materials. It shows how the constant movement of rock debris from high places toward the seas levels the land and explains how scientists find evidence of the leveling process. Produced in collaboration with the American Geological Institute. ijs (1007/1007) *AGI*
 1964

MUD 8.70
7N0920 color 20 min.
 Development and conservation of soil can be compatible if construction firms, land developers, and highway construction workers will work with conservationists toward better methods of erosion and sedimentation control. ca (1379/1379) *sc AGI*
 1968

PROBLEMS OF CONSERVATION: SOIL 6.95
 SERIES: PROBLEMS OF CONSERVATION
5N1014 color 14 min.
 A discussion of the shift from an agricultural to an industrial economy is presented. Present conservation practices protect our soil. Plants sustained by soil are a key to soil's conservation. Man's soil handling practices are exposed as soil destroyers. The film ends declaring conservation of soil as more important than ever with larger populations. jsa (1007/1007)
 1969

TOPIC: ESTUARIES AND COASTS

THE BEACH—A RIVER OF SAND 9.00
 SERIES: EARTH SCIENCE
7G0001 color 20 min.
 The film presents some of the answers to the question, "Where does sand come from; where does it go?" From an elementary analysis of the currents produced by waves and the calculations of the accumulation and depletion of sand, the discovery is made that the most pronounced movement of sand on a beach is usually along the shore. The beach is a moving river of sand between the land and the water. Some of the effects of longshore transport of sand along the coastline of North America are studied. Produced in collaboration with The American Geological Institute. js (1007/1007) *sc AGI*
 1965

INSIDE THE GOLDEN GATE 25.00
 SERIES: NOVA
1N1253 color guide 59 min.
 San Francisco Bay teems with plant and animal life. Its tremendous productivity is linked to the fact that it is an estuary. An estuary is a meeting place for both ocean and river water, characterized by a complicated flow pattern. The null zone, one feature of this flow pattern, is extremely productive. As a result, San Francisco Bay has a complicated food chain. But there has been much tampering with the bay. As a result of this tampering, life in the bay has been severely altered. A once-flourishing clam and oyster industry is all but dead and we have yet to identify other consequences. Sewage processing plants have helped to cope with the problem, but the bay still relies heavily on the flow of river water to flush it out. Once new irrigation canals and pumps are completed, however, it is doubtful that farming interests would allow the river water to be used to clean out the bay when it might be used to boost harvests. This sobering documentary takes us aboard the POLARIS, a U.S. Geological Survey vessel, and introduces us to the scientists who are trying to understand and protect the bay. jsca (2504/1090)
 1974

IT'S YOUR COAST 5.50
7G0859 color 28 min.
 Through the Coastal Zone Management Act, Congress encourages cooperation among federal, state, and local agencies. The film visits Naples, Florida; Portland, Maine; Chicago, Illinois; and Seattle, Washington to discuss coastal zone problems with people interested in the coast and coastal zone management. Subjects discussed include land development, oil pollution, and beach erosion. The commentary stresses the importance of the coast and the fact that anyone can express a viewpoint during the planning for coastal management. sca (1175/1175)
 1976

TOPIC: GLACIERS

EVIDENCE FOR THE ICE AGE 9.00
 SERIES: EARTH SCIENCE
5G0004 color 19 min.
 Today, glaciers are found in only a few areas of North America. How did scientists discover that much of the continent was once covered with glacial ice? Using the inductive approach, this film examines many features of today's landscapes which cannot be explained by processes at work around them. Observation of the work of modern glaciers establishes that these anomalies could have been caused by a massive sheet of moving ice. The hypothesis is proposed that glacial ice moved south at least four times in geologic history, and that its shape and size correspond approximately with the distribution of glacial features. Produced in collaboration with The American Geological Institute. ijs (1007/1007)
 1965 *AGI*

GLACIERS MAKE NEW LAND AND STONES THAT GROW 6.85
3P0819 color 12 min.
 Glacial ice invasions have extensively affected large land areas of the Northern Hemisphere. Animation combines with field photography to reveal the effects of three such invasions in central North America. Erosion in the present Minnesota River Valley has been influenced by the formation of Lake Agassiz, larger than all the Great Lakes combined. The diverting of the Mississippi River in east central Minnesota resulted in the very extensive sand deposits known as the Anoka Sand Plains. Lastly, the succession of soils deposited by the last two glacial invasions near Minneapolis-St. Paul have resulted in the formation of calcium carbonate concretions—stones that have grown in the soil to form many strange and interesting shapes. sca (2473/1020)

TOPIC: METEOROLOGY AND WEATHER

ABOVE THE HORIZON 7.15
 SERIES: AMERICAN METEOROLOGICAL SOCIETY
5P0660 color 21 min.
 This film gives a bird's-eye view of the field of meteorology emphasizing air circulation, numerical forecasting, hurricane reconnaissance, satellite meteorology, and weather modification. js (2022/1034) *AGI*
 1967

WHAT MAKES CLOUDS? 9.00
 SERIES: EARTH SCIENCE
5G0015 color 19 min.
 In this film, experiments and observation of natural phenomena provide data for an investigation of conditions which cause clouds to form in the atmosphere. Evaporation and transpiration are found to be the source of invisible water which condenses on tiny particles in the air to form the trillions of water droplets in a cloud. Time-lapse photography is used to provide visual evidence for condensation by revealing how clouds appear to "materialize" in a clear sky. Produced in collaboration with The American Geological Institute. ijs (1007/1007) *AGI*
 1965

WHAT MAKES THE WIND BLOW? 9.00
 SERIES: EARTH SCIENCE
5G0412 color 17 min.
 This film is a search for the cause of a typical on shore sea breeze at the beach. Conditions related to the breeze are observed, possible explanations proposed, experiments in laboratory models made, and the results are checked in nature. In this way, pressure differences are found to be associated with the normal day time air movement. The security of these discoveries is shaken by the reversal of the wind direction during a wind storm that blows offshore. Principles established earlier are used to find the cause for the storm, and to discover that the local beach conditions have been overwhelmed by larger and stronger air movements. Produced in collaboration with the American Geological Institute. ijs (1007/1007) *AGI*
 1965

TOPIC: MINERALS

CONSERVING OUR MINERAL RESOURCES TODAY 5.00
3P0677 color 11 min.
 As our industrial society consumes more mineral resources, the decreasing supply of irreplaceable coal, oil, stone, and other materials, make conservation a major problem. This film illustrates conservation methods such as more efficient mining, and new sources of power. ij (1006/1006) *AGI*
 1966

PROBLEMS OF CONSERVATION: MINERALS 7.80
 SERIES: PROBLEMS OF CONSERVATION
5N1013 color 16 min
 A variety of mineral resources are introduced. A description of the non-renewable feature of minerals is made. Many scenes from current efforts to conserve minerals are presented. Questions about diminishing world mineral supplies closes the subject. jsa (1007 1007)
 1969 *AGI*

"THERE'S COAL IN THEM THAR' HILLS" STRIP MINING: PROS AND CONS, NO. 7 8.00
 SERIES: 60 MINUTES
5S1319 color 20 min
 In Montana, surface and mineral rights can be sold separately for the same piece of land. Ranchers have been ruined by large coal companies strip mining their land, but by law they can do nothing about it. Given today's energy crisis and the plight of the food producers, which use of the land is more important? sca (1750 1090)
 1976 *AGI*

TOPIC: MOUNTAINS AND MOUNTAIN BUILDING

GLACIER PARK STUDIES, THIRD EDITION 6.70
5Z0097 color 15 min
 Following a map orientation, a series of geological diagrams explain how this area developed. The film continues with a trip through the park that shows its scenic attractions, plant life and animal life. Glacier Park is compared with other mountain areas of the world. The film concludes with views of the park in the winter season. jsa (1047)
 1965

LANDFORMS AND HUMAN USE 5.00
3G0559 color 11 min.
 The purpose of this film is to show characteristics of four major landforms of the earth, how they influence man's ways of living, and how he has modified them to improve his living conditions. Shown are mountains, hills, plateaus and plains; human use of these landforms; and how man overcomes natural limitations. ijs (1006/1006)
 1965

WHY DO WE STILL HAVE MOUNTAINS? 9.00
 SERIES: EARTH SCIENCE
5G0413 color 20 min.
 This film presents students with a fresh look at the land they live on by considering the seeming paradox that erosion should long ago have carried away all the land above sea-level down into the oceans. The film explores several methods how mountains are formed and examines the evidence associated with the uplift of the earth's crust. Produced in collaboration with the American Geological Institute. ijs (1007 1007) *AGI*
 1964

TOPIC: PALEONTOLOGY AND FOSSILS

DEAD DRY BONES 12.25
 SERIES: SMITHSONIAN
7S0061 color 24 min.
 The film shows how Smithsonian research teams use clues, supplied by prehistoric bones found at a typical excavation, to recreate the environment in which an ancient animal lived. jsca (1080 1011)
 1966

"THE DINOSAUR HUNTERS 13.50
7H0717 color 50 min.
 This unusual film asks: How did dinosaurs function? What did they eat? How did they reproduce? How did they defend themselves? And how and why did they become extinct? During a "dinosaur hunt," we see the moon-like badlands of Utah, where eroding cliffs and rocks are continually exposing fossils buried over a hundred million years ago. Utah's deep canyons also reveal sediments deposited by the oceans long before animal life appeared. Other landscapes show unique evidence of the 120-million-year period when dinosaurs dominated the earth. sca (1089 1090) *AGI*
 1972

DISCOVERY AT HELL CREEK 16.45
7S0185 color 28 min.
 This film was produced by the St. Paul Science Museum to tell the story of the large reptiles of the past. The techniques of the scientific discovery of the fossil remains of Triceratops (the three horned dinosaur) the procedures used by the paleontologist in the exacting work of removing a large dinosaur skeleton and moving the remains to the museum is traced in the film story. The importance of every fossil discovery in piecing together the many fragments of knowledge of the history of the earth is emphasized in this film. jsca (2053 1117) *AGI*
 1964

EXTINCTION; A LESSON FROM THE PAST 6.70
5N1018 color 13 min
 The various layers of the earth's surface reveal many extinct life forms. Paleontologists study fossil remains and the rocks surrounding them to determine the geologic age, as well as the physical characteristics and life style of species living then. The film briefly discusses the evolution of creatures 500, 325, and 70 million years ago. The factors probably contributing to the death or extinction of many amphibians, reptiles, and mammals are noted. The question is asked: Can man continue to survive? Perhaps he can by learning from the lessons of the past. ij (1810 1041) *AGI*
 1971

HISTORY: LAYER BY LAYER 8.00
 SERIES: MARINE SCIENCE
7N0918 color 23 min
 This film describes how a core sample of the sea bottom is taken, prepared and studied in order to obtain a record of the evolution of life and of the planet earth. jsca (1947 1011) *AGI*
 1967

THE HISTORY OF LIVING THINGS 6.20
5N0809 color 13 min.
 Studying differences in fossil shape, size, and structure reveals how plants and animals have developed and changed over millions of years. The development of the major life forms known today is traced and the effects of mutation are noted. i (1006 1006)
 1967

HOW OLD IS OLD? 12.95
 SERIES: THE LIFE AROUND US
7N1159 color guide 30 min
 For a long time, man had to guess the dates relating to his past. The further back, the more inaccurate were his estimates. Tree-ring dating, nuclear clocks and modern technology have made it possible to be much more precise. Current methods for dating pre-historic findings are explained using film footage of archeologists, dendrochronologists, geologists and oceanographers with descriptions of the techniques used by each. Illustrations and diagrams are provided to explain evolutionary process or clarify methods of scientific procedure in measuring age. Presents the findings of modern research and the significant discoveries of recent years. Based on the Life Science Library--"Time" jsca (1090 1090)
 1971 *AGI*

MESSAGE FROM A DINOSAUR 5.00
 SERIES: BASIC LIFE SCIENCE
 SUBSERIES: STREAM OF LIFE
3N0434 color 11 min.
 Shown is how life of the past is reconstructed from fossil remains, how paleontologists use inductive reasoning to hypothesize about prehistoric life forms, and how new forms of life evolved from environmental changes. i (1007 1007)
 1965

TOPIC: ROCKS

EARTH SCIENCE: MINERALS AND ROCKS 8.30
5P0350 color 18 min.
 This film surveys three types of rocks—sedimentary, igneous, and metamorphic—and the characteristics of various minerals, and shows how order in internal composition gives rise to order in external form. js (1010/1010) *AGI*
 1968

GEOLOGICAL HISTORY OF GRAND CANYON COUNTRY 5.00
3G0375 color 11 min.
 The purposes of this film are to interpret the rock layers of this region in terms of the ancient landscapes they represent and stimulate an awareness of the land on which we live. The Grand Canyon country tells us about the past history of our earth. The many sedimentary rock layers of this region represent the five eras of geologic history. The Grand Canyon contains rock layers of the three oldest eras—most are from the third era. The kind of rock, patterns of deposition, and fossils of each layer record a story of ancient oceans, river valleys and floodplains, and the wind blown sand dunes. On the plateau surrounding the Grand Canyon, petrified logs, fossil dinosaur tracks, and sandstone cliffs tell of an ancient coastal plain and a great arid desert that were parts of the fourth era. Bryce Canyon records the presence of fresh water lakes and streams in the fifth era. This era is still in progress and as the forces of erosion continue to carve the land, we wonder what will happen in the millions of years to come. Animated drawings indicate the successive rock layers and show their relationship to geologic history. ij (1026 1026) *AGI*
 1965

HOW SOLID IS ROCK? 9.95
7P0734 color 22 min.
 Rock is a symbol of permanence, but how permanent is it? This film asks questions, and gives evidence that rock once did flow and bend. A laboratory experiment duplicates heat and pressure beneath the earth's surface, and compares the resulting internal structure with a control sample. js (1007 1007) *AGI*
 1968

IGNEOUS ROCKS 9.00
5G0379 color 20 min.
 This film provides an introduction to the study of igneous rocks. Minerals and rocks are defined and illustrated. The occurrence of magma in the earth's crust and the formation of igneous rock are shown. A system for the classification of igneous rocks is described and illustrated with specimens. Significant exposures of igneous rocks in the Sierra Nevada Mountains, Yosemite Valley, Columbia Plateau, Hawaiian Islands and Yellowstone Park are described as they are viewed. ijs (1523/1012)
 1965

ROCKS FOR BEGINNERS 6.70
5G0394 color 16 min.
 This film is designed to present the fundamentals of rock classification, and to explain the origin and characteristics of the different classes of rocks. The film will assist students in understanding the nature and significance of large rock formations and in relating rock samples to such formations. It provides a meaningful foundation for rock identification. ij (1523/1012)
 1968

ROCKS THAT FORM ON THE EARTH'S SURFACE 9.00
 SERIES: EARTH SCIENCE
5G0396 color 16 min.
 This film is designed to help students investigate sedimentary rocks—to discover where they come from, what they are made of, and how they are formed. With selected visual examples and demonstrations, the film explores some of the ways in which sediments are produced, transported, accumulated, and hardened into sedimentary rock by processes which can be observed on land and in shallow water. Produced in collaboration with the American Geological Institute. ijs (1007/1007) *sc per AGI*
 1964

ROCKS THAT ORIGINATE UNDERGROUND 12.25
 SERIES: EARTH SCIENCE
7G0397 color 23 min.
 This film explores the origin of igneous and metamorphic rocks, rocks formed inside the earth's crust. Geological conditions inside the crust are reconstructed by the use of indirect evidence. Requirements for growing the type of crystal-intergrown crystalline mineral grains—found in igneous and metamorphic rocks are investigated and these requirements, combined with observations from nature, form the basis for studying the conditions which give birth to underground rocks. ijs (1007/1007) *sc per AGI*
 1966

ROCKS: WHERE THEY COME FROM 4.50
2G0008 B&W 11 min.
 The purposes of this film are to illustrate the different types of rocks about us, and to explain how they vary in characteristics and how they were formed. At a granite quarry, a sandstone cliff and in a museum, Don sees many interesting kinds of rocks. He learns that some are made by heat, some are made by water, and that others are made over from other rocks by pressure. Simple demonstrations help him actually see the effects of water, heat and pressure in the formation of rocks. pi (1006/1006)
 1963

TOPIC: ROTATION AND ORBIT OF THE EARTH

THE EARTH IN MOTION 4.50
 SERIES: OUR EARTH AND UNIVERSE
2P0189 B&W 11 min.
 This film presents realistically the dynamic aspects of the earth as a planet. The earth's sphericity is demonstrated, while rotation is established by star trails and the Foucault pendulum. Proof of the earth's revolution about the sun is presented by motion of the sun in respect to stars and by the annual parallax of stars. The film concludes with phenomena associated with this revolution, such as characteristics of orbit, aphelion and perihelion, law of areas, inclination of axis, and seasons. ijs (1278/1278) *AGI*
 1963

THE EARTH'S MOVEMENTS 5.00
3P0676 color 11 min.
 Through animation, models, and live action the film shows four movements of the earth, and how concepts such as rotation affect time differences and changing seasons. The equinoxes and galactic rotation are explained. ij (1006/1006) *AGI*
 1967

SOLAR RADIATION: SUN AND EARTH'S RAYS 6.85
 SERIES: AMERICAN METEOROLOGICAL SOCIETY
5P0664 color 18 min.
 The film is concerned with the idea that the earth must balance the energy received from the sun. Step-by-step explanations are given of the roles played by rotation of the earth, tilt of the earth's axis, etc. js (2022/1034)
 1967

TOPIC: VOLCANOES

***CASE HISTORY OF A VOLCANO** 7.55
 SERIES: EXPERIMENT
7P0669 color 30 min.
 This film describes the need for and the development of better seismographs and tiltmeters to measure and record the geophysical events that precede a volcanic eruption in Hawaii. Shows the volcano Kilavee Iki erupting. jsca (1886/1010) *AGI*
 1966

FIRE UNDER THE SEA: THE OCEAN OF PILLOW LAVA 9.80
5G0856 color 20 min.
 The film dramatically documents man's first observations of red-hot lava flowing underwater. It provides new insight into the formation of pillow lava—the most common volcanic rock on earth. The film follows a lava flow from a new vent of Kilauea Volcano in Hawaii down to the shoreline and then to 100 ft. beneath the surface of the sea. The actual undersea sounds of molten lava—including both implosions and explosions—add realism and excitement of the colorful undersea lava flows. By providing the first actual look at the formation of pillow lava, the film combines basic scientific discovery and high adventure. Scientific consultant: Dr. James G. Moore. jsca (2496/2495) *AGI*
 ACQ. 1976

***HEARTBEAT OF A VOLCANO** 10.40
 SERIES: EARTH SCIENCE
5P0804 color 20 min
 A filming of one of the earth's most powerful land building processes a volcano eruption. Shows the two-week buildup and awesome nine-hour eruption of Kilauea in Hawaii. Rare views of "degassing" and cessation of the eruption add to the film. js (1007/1007) *AGI*
 1970

***VOLCANOES: EXPLORING THE RESTLESS EARTH** 10.90
5P0213 color 18 min.
 On-location photography and animated drawings illustrate volcanic phenomena in Hawaii, Mexico, Italy and Iceland. The film distinguishes shield, cinder cone and strato-volcano by showing how each type of volcano is formed and how each erupts. Lava flows are contrasted in scenes showing ropy pahoehoe and rough, blocky aa lava. Before-and-after footage of the 1973 destruction of Helgafjell on Iceland's Heimaey Island vividly documents the effects of volcanic eruptions on man and his environment. ij (1007/1007) *sc per AGI*
 1973

VOLCANO SURTSEY 9.65
7P0791 color 27 min.
 Volcano formation off south coast of Iceland; follows growth from submarine volcano to a one-mile-square island. ca (2035/2035) *jsca per AGI*

TOPIC: WATER— LAKES AND GROUND WATER

AGING OF LAKES 7.15
 SERIES: EARTH SCIENCE
5N0996 color 14 min.
 The geological and ecological factors of normal "aging" of lakes are surveyed in contrast with the ways man is speeding up this natural process. Indiscriminate disposal of fertilizers, sewage, and industrial waste is choking lakes. Suggested methods of preventing and stopping lake pollution are made with emphasis on the fact that each lake has its own ecology. The solution to the problem of each lake must be treated separately. Produced in cooperation with the American Geological Institute. jsa (1007/1007)
 1971

***THE BIG LAKE** 12.40
7G0841 color 26 min.
 Re-creates the awesome beauty of Lake Superior as recorded in the journal of John Johnston, young Irish fur trader, as he travelled the south shore in 1792 on his way to LaPointe in the Apostle Islands. The film shows how Superior has changed since the first white man, Etienne Brule, set eyes on it in 1610. Contemporary developments with historical remains and geological phenomena found in Michigan, Wisconsin, Minnesota and Ontario are contrasted. Segments on the Sault St. Marie locks, Taconite Harbor in Minnesota, Tahquamenon Falls, Kakabeka Falls, Quimet Canyon, Lake of the Clouds, Grand Sable Dunes and the Pictured Rocks are included. pijsca (1713/1305)
 1974

LAKES: AGING AND POLLUTION 7.85
 SERIES: BASIC ECOLOGY
5N0988 color 15 min.
 Lakes differ in many ways including size, shape, depth, and age. Organisms living in young lakes are quite different from those living in old lakes. Lakes provide natural habitats at different levels. Plants live at or near the surface while animals live at every level. The aging process and its effect are illustrated as a normal cycle. Man hastens this cycle by allowing pollutants (minerals and poisons) into lakes. jsca (1004/1004)
 1971

PROBLEMS OF CONSERVATION: WATER 7.80
 SERIES: PROBLEMS OF CONSERVATION
5N1012 color 16 min.
 This film shows how pollution, decomposition and algae growth can lead to loss of water life, various solutions—dam projects, desalination of seawater, and purification projects. jsca (1007 1007)
 1969

RISE AND FALL OF THE GREAT LAKES 8.05
5P0722 color 17 min.
 Folk songs accompany this story of a man transported from a canoe back to the glacial age. We see traces of glaciers as the ages progress, changes in water levels and soil, and finally the lone paddler is brought to the present and dumped in a river filled with detergent and oil—evidence of the changes wrought by man. ijsca (1082 1014) AGI
 1969

TOPIC: WATER - OCEANOGRAPHY

THE EARTH BENEATH THE SEA 8.50
 SERIES: MARINE SCIENCE
7N0780 color 22 min.
 This film explains the process of mapping the ocean floor. Some of the methods currently being used by scientists in order to obtain information about the bottom of the sea are photographing it with a specially designed camera, bouncing echoes off the bottom, using a piston corer to take samples of soft sediment, and using a deep-sea dredge to sample hard sediment. jsca (1947/1011) AGI
 1967

HOW LEVEL IS SEA LEVEL? 8.20
5P0805 color 13 min.
 Waves and tides create constant changes, even mean sea level is not the same for all the oceans. After viewing this film, students should be able to define mean sea level and explain how it is determined; describe factors that influence sea level at various locations; demonstrate comprehension of concepts presented in the film by analyzing the problems of creating a sea level canal in Central America. ijs (1007) AGI
 1970

OCEANOGRAPHY: THE STUDY OF OCEANS 7.90
5P0733 color 17 min.
 This film emphasizes the worth of specializing in one phase of study of the oceans—meteorology, physics, chemistry, biology, or geology. It studies information on core samples, currents, ocean floors, and ocean life, pertaining to the different fields. ijs (1810/1041) AGI
 1970

SECOND CHANCE: SEA 6.85
3N1220 color 11 min.
 The global message of the need for marine conservation is easily transmitted in this creatively-animated film. A history of the state of the oceans from the beginning of time to the present, the film features the music of Dizzy Gillespie along with the seldom heard natural sounds of whales and porpoises. Designed to evoke an optimistic attitude toward the "planet ocean," the film is an excellent starting point for an analysis of whether man has learned to use his environment to his further advantage. A film by Faith Hubley. sca (1014 1014)
 1976

SHOULD OCEANS MEET? 12.95
 SERIES: THE LIFE AROUND US
7N1161 color guide 30 min.
 Scientists discuss the potential ecological damage that may result from the excessive building of canals and dams. Should we build a sea-level canal—joining the Atlantic and Pacific—across the Isthmus of Panama? The film stresses the fact that man's prior tampering with water on a large scale (Aswan Dam, the Welland Canal) has brought about many unforeseen disastrous aftereffects. In this film, scientists at the Smithsonian Tropical Research Institute point out that vastly different tides, currents, temperatures and animals have evolved in the two oceans—separated for millions of years. Is there a chance of an ecological upheaval? Could commercial fishing be destroyed by new predators? Based on the Life Nature Library—"Ecology" and "Fishes." jsca (1090 1090) AGI
 1971

WAVES ON WATER 9.00
 SERIES: EARTH SCIENCE
5G0410 color 16 min.
 In this film, principles discovered in the laboratory are the basis for interpreting the characteristics of waves and wave motion on the sea surface. Wind is identified as the most common source of a wave's energy, and the observation of waves in a tank reveal that the particles in a wave describe circular orbits of a size inversely related to depth. Waves are also shown to be caused by applying energy to the water's container, as it happens when an under water earthquake alters the ocean floor, producing giant "seismic waves." Produced in collaboration with the American Geological Institute. ijs (1007 1007) AGI
 1965

TOPIC: WATER - RIVERS AND STREAMS

THE CREEK 7.60
 SERIES: MAN AND HIS NATURAL ENVIRONMENT
7N1007 color 26 min.
 This environmental action film is concerned with the ecological considerations of man and his environment, specifically as they apply to the creek. It shows how to measure the quality of a creek, how to locate sources of pollution and then, most importantly, it goes on to show what the average citizen can do to improve his environment. The film specifically focuses on the Twin Cities' Nine Mile Creek as an example. jsca (1969/1081)
 1971

FORT SNELLING: THE LONELY SENTINEL 4.60
7H0628 color 24 min.
 Farmers & Mechanics Savings Bank of Minneapolis in cooperation with the Minnesota Historical Society produced this new film as part of the observance of the 150th anniversary of the establishment of Fort Snelling. Scenes of the reconstructed fort, artifacts and drawings are blended to form a background as the story of Fort Snelling is told. In addition to presenting detail of the design and construction, the film traces its changing function during the growth of the Upper Mississippi Valley. Original music of the era is included. jsca (1751 1751)
 1970
 Mostly history, not earth sci.

***RIVERS, FLOODS & PEOPLE** 6.65
5G0839 color 11 min.
 Showing how men have built upon the flood plains that parallel large rivers, the film traces a combination of meteorological circumstances that periodically produce a flow of water greater than average. The exhausting, extensive and expensive efforts made to keep the river from the flood plain are seen to be largely futile. In the aftermath of heavy flooding, students learn how fighting the flood has minimized losses, but more importantly, how the flood plain can serve both man and its natural purpose. ijs (1078 1078)
 1973

RIVER VALLEY 5.00
3G0390 color 11 min.
 This film tells the story of a river that begins high in the western mountains, flows down steep slopes to a valley and then on to the sea. How a river valley is formed, how parts of the valley are related, and how people depend on the river for water, food, minerals, power and transportation are explained. ij (1007 1007)
 1964

THE STREAM 6.70
5G0009 color 15 min.
 The two basic types of stream environments, the erosional and depositional habitats, are examined through seasonal changes and along the course of a flowing water system. Examples of channel cutting at the headwaters and pond-like stretches, where the stream gradient lessens, are shown in detail. Life forms especially adapted to running water are presented in close-up view: typical organisms of erosional habitats, such as the stonefly nymph and the sculpin, are examined in the light of their adaptive structures. Similarly, a great many slow-water species are pictured and discussed. In addition, the positions and interrelationships of the aquatic plants and animals in the numerous food chains are described. jsc (1032/1032)
 1963

WHERE DID THE COLORADO GO? 25.00
 SERIES: NOVA
1G0861 color guide 59 min.
 The Colorado was once a mighty, uncontrollable river stretching from the Rockies to the Pacific. Now, it has been so diverted, damned, and controlled that there is virtually no stretch of water it can call its own. Today, the Colorado barely flows as far as Mexico, bringing with it cold, saline water, useless for irrigation. Each of the three main dams on the river acts as a container for a large lake. At Lake Powell, a result of Glen Canyon Dam, Gordon Jacobi, a hydrologist, has discovered a serious problem. He reports that the bottom and banks of Lake Powell are so porous that water is being absorbed and lost at the rate 1.5 million acre feet per year. Jacobi says it is "like building a dam on a sponge." In an attempt to solve these problems, engineers have come up with several suggestions which include reversing the flow of some Canadian rivers to feed U.S. rivers, seed-farming of clouds to manage rainfall. The application of such solutions betrays a misunderstanding of the problem. Man must learn that in trying to correct the mistakes by further artificial modification of nature, he only makes matters worse. The program further examines alternate solutions offered by conservation-minded scientists. sca (2504 1090)
 1974

