

science □ news

April 24, 1971 **25c**
vol. 99, no. 17, pp. 273-292



Sewage and soil fertility

A Science Service Publication
Vol. 99/April 24, 1971/ No. 17
Incorporating Science News Letter

Watson Davis, 1896-1967

Publisher: E. G. Sherburne Jr.

Managing Editor: Kendrick Frazier

DEPARTMENTS

Aerospace: Everly Driscoll

Behavioral Sciences: Robert J. Trotter

Earth Sciences: Louise Purrett

Environmental Sciences: Richard H. Gilluly

Physical Sciences: Dietrick E. Thomsen

Copy Editor: Nadine Clement

Production: E. Cherry Doyle

Production Assistant: Esther Gilgoff

Books: Margit Friedrich

Advertising: Scherago Associates, Inc.

Circulation: Gustave T. Wescott

Copyright © 1971 by Science Service, Inc.,
1719 N Street, N.W., Washington, D.C. 20036.
Republication of any portion of SCIENCE NEWS
is strictly prohibited.

SUBSCRIPTION DEPARTMENT
231 WEST CENTER STREET
MARION, OHIO 43302

Subscription rate: 1 yr., \$7.50; 2 yrs., \$13.50;
3 yrs., \$19.50. Special trial offer: 39 weeks,
\$3.97. Single copy, 25 cents. \$1.00 per year for
foreign postage. Change of address: Four to
six weeks' notice is required. Please state
exactly how magazine is to be addressed. In-
clude zip codes.

Printed in U.S.A. Second class postage paid at
Washington, D.C. Established as Science News
Letter® in mimeograph form March 13, 1922.
Title registered as trademark U.S. and Cana-
dian Patent Offices. Indexed in last Science
News of June and December, in Reader's Guide
to Periodical Literature, Abridged Guide and
the Engineering Index. Member of Audit Bu-
reau of Circulation. UNSOLICITED MANU-
SCRIPTS will not be returned unless accom-
panied by a stamped, self-addressed envelope.

Published every Saturday by SCIENCE SER-
VICE, Inc., 1719 N St., N.W., Washington, D.C.
20036. NORth 7-2255. Cable Address: SCIEN-
SERV.

ADVERTISING STAFF
Director: EARL J. SCHERAGO
Advertising Sales Manager:
RICHARD L. CHARLES
Production Manager:
BONNIE F. SEMEL

Address all advertising to Scherago Associates,
11 W. 42nd St., New York, N.Y. 10036.

Sales: New York, N.Y. 10036: Herbert L. Burk-
lund, 11 W. 42 St. (212-PE-6-1858); Scotch
Plains, N.J. 07076: C. Richard Callis, 12 Unami
Lane (201-889-4873); Medfield, Mass. 02052:
Richard M. Ezequille, 4 Rolling Lane (617-444-
1439); Chicago, Ill. 60611: John P. Cahill, Room
2107, 919 N. Michigan Ave. (312-DE-7-4973);
Beverly Hills, Calif. 90211: Winn Nance, 111 N.
La Cienega Blvd. (213-657-2772).

OF THE WEEK

- 277 A new battle over pot
- 278 Soviets start on a space station
Growth of mouse embryos
Quasars and the speed of light
- 279 Origin of the Panamanian Isthmus
- 280 Automakers invoke confidentiality clause
Amounts of airborne mercury
Geophysics prize winners
- 274 Earth Sciences: Sea-floor spreading complications; Healing the Ethio-
pian rift; Aerosols and global climate; Galapagos triple junction;
Iceland's formation

IN SCIENCE FIELDS

- 286 Environment: Sewage as crop fertilizer
- 289 Astronomy: Jupiter brilliant

-
- 276 Letters to the Editor
 - 288 New Products
 - 290 Books of the Week
 - 291 Films of the Week



Experiments at Pennsylvania State University show that sewage effluent is valuable in stimulating plant growth and that trickling it through the soil is efficient in cleansing it. Muskegon County, Mich., will try these techniques on a large scale. Here, cuttings of hybrid poplar are beginning to sprout under the influence of sewage effluent irrigation. See p. 286. (Photo: Pennsylvania State University)

SCIENCE SERVICE

Institution for the Popularization of Science founded 1921; a non-profit corporation

Board of Trustees—Nominated by the American Association for the Advancement of Science: **Athelstan F. Spilhaus**, West Palm Beach, Fla.; **Wallace R. Brode** (Treasurer), American Chemical Society, Washington, D. C.; **Bowen C. Dees**, Franklin Institute, Philadelphia, Pa. Nominated by the National Academy of Sciences: **Henry Allen Moe**, The Clark Foundation; **Harlow Shapley**, Cambridge, Mass.; **Allen V. Astin**, Bethesda, Md. Nominated by the National Research Council: **Glenn T. Seaborg** (President), U.S. Atomic Energy Commission; **Leonard Carmichael**, National Geographic Society. Nominated by the Journalistic Profession: **O. W. Riegel** (Secretary), Washington and Lee University; **Gordon B. Fister**, Call-Chronical Newspapers. Nominated by the Edward W. Scripps Trust: **John Troan**, Pittsburgh Press; **Edward W. Scripps II** (Vice President), Edward W. Scripps Trust.

Director: E. G. Sherburne Jr.; Assistant Director: Dorothy Schriver; Staff, Youth Division, Howard Weisbrod; Things of Science, Ruby Yoshioka.

**TO OBTAIN MORE
INFORMATION ABOUT THE
PRODUCTS ADVERTISED IN
THIS ISSUE USE THIS HANDY
READER SERVICE CARD.**

Just circle the number corresponding to the advertisement of interest and drop in the mail. No postage is necessary. In a few days, you will receive the requested information. Students must make inquiries through their Science Teachers.

SCIENCE NEWS

Room 1740
11 West 42nd Street
New York, N.Y. 10036

Readers' Service Card

24 April 1971 (Expires 26 June 1971)

Print name and address
on front of card

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132
133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180

For more information about ads in this issue, circle Key No. and return above card.

All student inquiries must be made through science teachers. Direct inquiries from students will not be processed.

Please print and include title

Name

Field Title

Employer

Address

City State Zip

Are you building a new science facility? Yes..... No.....

Are you a subscriber? Yes..... No.....

Are you a science teacher? Yes..... No.....

SCIENCE NEWS
 Room 1740, Readers' Service
 11 West 42 Street
 New York, N.Y. 10036

**BUSINESS
 REPLY MAIL**
 No postage stamps necessary
 if mailed in the United States
 Postage will be paid by

FIRST CLASS
 PERMIT NO. 12711
 NEW YORK, N.Y.



Share the Thrills of Exploring Outer Space!



\$249.95

All DYNASCOPES, including this superb RV-6, 6-inch available on easy terms!

Now it's easy to join the thousands of serious amateurs who have discovered the excitement of exploring our mysterious universe. Your enjoyment begins right from the start, yet the challenges and rewards go on for years! And it's a hobby that can be shared at modest cost.

Choose from a Full Range Of DYNASCOPES® 4" Starting at \$49.95

Picking a telescope to fit your needs and your pocketbook is simple when you select a DYNASCOPE — the same instruments used by more than 150 schools, colleges and observatories. Prices begin as low as \$49.95, and your satisfaction is guaranteed by a full-refund warranty.

**FASCINATING GUIDE
YOURS FREE!**



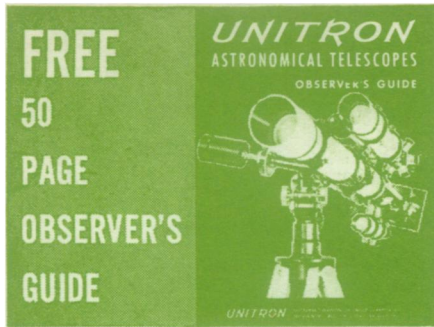
Read these valuable facts before buying any telescope. Mail coupon or postcard for your complimentary copy of this helpful guide.

Criterion Manufacturing Co.
 331 Church St., Hartford, Conn. 06101
 © TM Registered U.S. Pat. Office

CRITERION MANUFACTURING CO., Dept. NL-76
 331 Church St., Hartford, Conn. 06101
 Please send your free Telescope Guide.

Name _____
 Address _____
 City _____ State _____

Circle No. 123 on Readers' Service Card



With artificial satellites already launched and space travel almost a reality, astronomy has become today's fastest growing hobby. Exploring the skies with a telescope is a relaxing diversion for father and son alike. UNITRON's handbook contains full-page illustrated articles on astronomy, observing, telescopes and accessories. It is of interest to both beginners and advanced amateurs.

CONTENTS INCLUDE:

Observing the sun, moon, planets and wonders of the sky • Constellation map • Hints for observers • Glossary of telescope terms • How to choose a telescope • Astrophotography

UNITRON
 INSTRUMENT COMPANY • TELESCOPE SALES DIV.
 66 NEEDHAM ST., NEWTON HIGHLANDS 61, MASS.

Please rush to me, FREE of charge,
 UNITRON'S OBSERVER'S GUIDE and TELESCOPE
 CATALOG #E-5

Name _____
 Street _____
 City _____ State _____

Circle No. 126 on Readers' Service Card

**IT'S EASY . . . to order
 a subscription to
 SCIENCE NEWS
 simply fill out and mail
 this coupon**

Your Name

Occupation

Address

City State Zip

Check here to begin your subscrip-
 tion.

Check here to extend your current
 subscription.

1 year \$7.50 2 years \$13.50
 3 years \$19.50

Check here to send a gift subscrip-
 tion to:

Gift to

Address

Occupation

City State Zip

S-09

**BUSINESS
REPLY MAIL**
No postage stamps necessary
if mailed in the United States

Postage will be paid by

SCIENCE NEWS
Subscription Department
231 West Center Street
Marion, Ohio 43302

FIRST CLASS
PERMIT NO. 12711
NEW YORK, N.Y.



SLIDE RECORD—
for the efficiency-minded executive. Controls up to 106 accounts, salesmen, projects, etc., using contrasting, superposed celluloid bands running freely in plexiglass channels. Show target, attainment, difference figures. Striking performance picture — an asset to any operation.

ULTRADEX Box 615
Washington C. H., Ohio 43160

BIND and SAVE your copies of science news

Keep your copies of SCIENCE NEWS always available for quick, easy reference in this attractive, practical binder. Simply snap the magazine in or out in a few seconds—no punching or mutilating. It opens FLAT—for easy reference and readability. Sturdily constructed, this buff-colored buckram binder stamped in gold leaf will make a fine addition to your library.

SCIENCE NEWS binders hold one six-month volume of SCIENCE NEWS. Each of the 26 issues snaps into the cover with a metal strip. \$5.00 each, 2 for \$9.00. Postage-paid.

Order Now, From

science news

Dept. 222

1719 N St. N.W.

Washington, D.C. 20036

Just Published!

The Smithsonian Institution CENTER FOR SHORT-LIVED PHENOMENA

300 page Annual Report. This report contains a comprehensive account of the activities of the Center as well as descriptions of each of the 113 short-lived events that the Center participated in during 1970. The events are listed by discipline and include photographic documentation, information source contacts, field expedition information, archive locations, in some cases preliminary results of field research, and bibliographies on published scientific papers and reports.

THE SHORT-LIVED EVENTS OF 1970

Documentation includes information on 49 earth science events: 22 volcanic eruptions in Guatemala, New Guinea, Indonesia, Japan, the U.S.S.R., Hawaii, El Salvador, the Philippine Islands, Nicaragua, Iceland, Iran, Costa Rica, and Antarctica; 19 major earthquakes in China, Peru, Ecuador, Philippine Islands, Guatemala, Turkey, Canada, Colombia, U.S.S.R., New Guinea, Iran, India, Australia, and Alaska; other earth science events such as landslides, landrises, fissuring, storm surges and tsunamis; 47 ecological events including 20 animal irruptions, migrations, colonizations, and mortalities, 16 major oil spills and pollution events; 15 astrophysical events including 9 major fireball events in India, Mozambique, Sweden, Germany, Austria, and the United States, and 6 meteorite falls in Ethiopia, Sudan, Swaziland, Venezuela, Mauritania, and the United States, and their recovery; and, 1 urgent anthropological events, a new tribe discovery (in Paraguay).

The report is now available at a cost of \$5.00 per copy including airmail postage. If you desire to receive the Smithsonian Institution Center For Short-Lived Phenomena 1970 Annual Report, please send a check, money order, or purchase order to: Smithsonian Institution, Center For Short-Lived Phenomena, 60 Garden Street, Cambridge, Mass. 02138. Please make checks payable to the "Smithsonian Institution."

Circle No. 125 on Reader Service Card

SCIENCE EXPLORING AT SPRUCE MOUNTAIN CAMP FOR BOYS

BRYANT POND, MAINE

New knowledge, new skills, new challenges in 3 major areas—Science Exploring, Outdoor Exploring and Lifetime Sports. Boys 10-15. Field, mountain, canoe trips. Outpost at Mt. Katahdin. Ham radio, photography, plants, animals, weather, geology, ecology, astronomy. Staff inquiries invited. Catalog: William T. Hartly
12 Highland St., W. Medway, Mass. 02053

IS THERE A CHEMIST IN THE HOUSE???

Only \$4.00 Plus \$1.50 p.p.

Will bring 49 "PLUS" individual, assorted, items of standard quality laboratory apparatus: glassware, porcelain, rubber, plastic, etc., etc. Value? 2 to 3 times our offer. None dangerous. No junk. Surprise items. Pyrex Advanced Student Assort. @ \$10 plus \$2.50 p.p.

HARRY ROSS

Scientific & Lab. Projects
61-L Reade St. N.Y. 10007



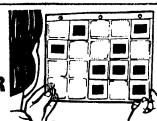
ORGANIZE YOUR SLIDES PROTECT YOUR SLIDES SEE YOUR SLIDES

SLIDE HOLDER VIEWER

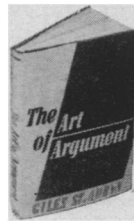
Holds 20 cardboard mount 2" X 2" slides safe from damage or dust, in flexible vinyl pockets. No. 49910 package of 25 - holds 500 slides \$8.75. plus postage

Forestry Suppliers, Inc.

BOX 8397/JACKSON, MISSISSIPPI 39204



How to Argue and Win!



Here is a clear simply written basic guide to logical thinking, showing how to spot the fallacies, the prejudices and emotionalism, the inappropriate analogies, etc., in the other fellow's argument and how to watch for and avoid the irrational in your own judgments. The author makes plain not only *how* but also *why* people resist facing the truth.

A tool for clear thinking as well as convincing others.

ORDER NOW:
THE ART OF ARGUMENT, By Giles St. Aubyn
\$4.95, plus 25¢ handling 10-Day Money-Back Guar.
EMERSON BOOKS, Inc., Dept. 279-T
251 West 19 Street, New York, N.Y. 10011

Break the Hate Habit.

Hate Blacks! Hate Whites! Hate Jews! Hate Gentiles! What sane person needs any of that noise? So how do you turn it off? With love. And all the caring, kindness and consideration that love means. Start today, lover.



**Break the hate habit:
love your neighbor.**

Advertising contributed for the public good



Folds for easy carrying
and storage.

MULTI-PURPOSE Porta Desk

ONLY
\$798



This remarkable, versatile, portable desk probably has more than a thousand lives. You (the whole family) will use it at home, or wherever you go! Immediately converts bed, chair, car, train, lap into functional work area.

Looks like fine walnut furniture. Is actually tough, high-density plastic — you can't burn it — you can't break it! You can tote it, pack it with ease. Its sturdy legs tuck flat. It weighs a mere 3 pounds. A must for students, teachers, salesmen, writers, sick-a-beds, homemakers. Generous sized 13½" x 19½".

Tuck a desk under your arm for only \$7.98.

JAY NORRIS CORP.

31 Hanse Ave., Dept. JB-54
Freeport, N.Y. 11520

BUY WITH CONFIDENCE 30-DAY MONEY BACK GUARANTEE

JAY NORRIS CORP., 31 Hanse Ave.
Dept. JB-54 Freeport, N.Y. 11520

Please rush me the following:

- 2 Porta-Desks for \$15.00 + \$1.50 postage & handling.
 1 Porta-Desk for \$7.98 + \$1.00 postage & handling.

Enclosed is check money order.
(N.Y. residents add sales tax.)

Name (Print) _____

Address _____

City _____

State _____ Zip _____