May 26, 1973
vol. 103, no. 21, 333-348

science news

SYBIL

16 person-alities in one being

Salvaging Skylab
The energy crisis
New World artifacts

books OF THE WEEK

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ADVANCES IN ENZYMOLOGY and Related Areas of Molecular Biology, Vol. 37—Alton Meister, Ed.—Wiley, 1973, 726 p., diagrams, tables, $24.95. Topics range from structure and function of lactate dehydrogenases to conformational adaptability in enzymes.

THE ANIMAL IN ITS WORLD: Explorations of an Ethologist, 1932-1972—Niko Tinbergen, foreword by Sir Peter Medawar—Harvard U Pr, 1973, 343 p., photographs, drawings, diagrams, tables, $15. Original papers of by now classic field studies comparing the behavior of gulls or tracking the food hoarding by foxes.

CHANGING WOMEN IN A CHANGING SOCIETY—Joan Huber, Ed.—U of Chicago Pr, 1973, 295 p., tables, $7.95; paper, $2.95. Papers and articles discuss the implications of the still prevailing institutional and societal attitudes toward the position of women in employment, family and research.

METHADONE MAINTENANCE: A Technological Fix—Dorothy Nelkin—Braziller, 1973, 164 p., tables, $6.95; paper, $1.95. Study describes the social and individual characteristics of the heroin problem and alternative solutions, considers the development of methadone maintenance on the national level, and focuses its detailed analysis on a specific community, the operation of the program in Syracuse, N.Y.

THE SEARCH FOR MORAG—Elizabeth Montgomery Campbell and David Solomon—Walker & Co, 1973, 192 p., plates, drawings, maps, $6.95. Study explores the evidence of sightings of a sea monster in Scotland's Loch Morar, presents the 1970/1971 investigation team's scientific analysis of the geology and biology of the environment, and charts the analyzed evidence.

SHELLS IN COLOR—R. Tucker Abbott—Viking Pr, 1973, 112 p., 100 color photographs by Kjell B. Sandwed, drawings, $12.95. Photographic essays tell about the growth, form and function of mollusks, and descriptive notes identify the characteristics of each of the exquisite and detailed shell close-ups of the various species.

SYBIL—Flora Rheta Schreiber—Regnery, 1973, 359 p., plates, $8.95. (*See story on p. 344*).

THERMOELECTRICITY IN METALS AND ALLOYS—R. D. Barnard—Halsted Pr, 1973, 270 p., diagrams, $21. This comprehensive account seeks to provide a strong physical basis for the explanation of the thermoelectric effects, in which electron and phonon motion and interactions are particularly stressed.

THE VANISHING TUNGUS: The Story of a Remarkable Reindeer People—Morton Friend—Dial Pr, 1973, 103 p., illus., map, $4.95. Examines the ways of a gentle people and their harmonious primitive culture in the harsh environment of Siberia.

WORLD FISHERIES POLICY: Multidisciplinary Views—Brian J. Rothschild, Ed.—U of Wash Press, 1973, 272 p., diagrams, tables, $9.50. Papers principally concerned with the specifics of policies and institutions which can act widely in the exercise of man's trusteeship of the riches of the sea.

science news®

A Science Service Publication
Vol. 103/May 26, 1973/No. 21
Incorporating Science News Letter

COVER: Sybil, a book published this week, tells the story of a woman with a multiple personality. A painting of trees by one of the personalities is a dramatic representation of the condition. See p. 344. (Art courtesy of Regnery)

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Subscription rate: 1 yr., $10; 2 yrs., $18; 3 yrs., $25. (Add $2 a year for Canada and Mexico, $3 for all other countries.) Change of address: Four to six weeks' notice is required. Please state exactly how magazine is to be addressed. Include zip code.

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 Canadian Patent Offices.

Published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington, D.C. 20036. (202-785-2255). Cable SCIENSERV.

to the editor

The noblest of the arts

My compliments to SCIENCE NEWS, Everly Driscoll and yourself on the outstanding May 5 issue. Everly was up to her usual high performance in the articles on Skylab and astronomy on Skylab.

But your Comment, "The nature of scientific discovery," and the supporting article on the Copernicus celebration was even more eye-catching. The nature of science has long been distorted by friend and foe alike. Science is the noblest and most useful of the arts. When a field progresses to the point that art, i.e. the personal touch and intuition of the scientist, is no longer of value then that field passes into the realm of engineering and technology.

Karl G. Henize
Scientist-astronaut
Johnson Space Center
Houston, Tex.

I found your editorial on "The nature of scientific discovery" (SN: 5/5/73, p. 283), and indeed the entire issue, extremely interesting and well done. Obviously the continuance or interruption of the chain of discovery will have tremendous positive or negative implications both for the nature and character of trade and for the environment.

Richard A. Givens
Regional Director
Federal Trade Commission
New York Regional Office
New York, N.Y.

I enjoyed reading your Comment. Certainly Einstein was right about intuition and Holton about preconception and presupposition being vital to the development of new ideas in science. I guess that science, in growing from alchemy and witchcraft, overreacted and tried to divorce itself from humanity too much. We need to open up more and not hide from the rest of the world that we feel, have exciting fights, and are generally passionately involved with our work and detractors.

Journals, however, still want the record to show only smooth, orderly, emotionless progress in general, but this is slowly changing.

James Edmond
Visiting Assistant
Professor of Physics
Oregon State University
Corvallis, Ore.

Viruses and brain tumors

I was very surprised that the most important fact that the "JC" virus produced malignant brain tumors in hamsters was not mentioned in your article on slow viruses (SN: 4/14/73, p. 245). This finding was announced by Dr. Walker at the symposium. This oncogenic effect of "JC" virus is one of the strongest suggestions that human malignancies might be caused by viruses.

Gabriele ZuRhein
Professor of Pathology
University of Wisconsin
Madison, Wis.

Constructive behavior modification

To Robert J. Trotter:

Congratulations on your series on behavior modification (SN: 4/21/73, p. 260). The dissemination of information on constructive technologies is highly desirable and should form the basis of consumer-oriented legal action, if necessary, to upgrade the quality of mental health service.

Keep up the good work. I retained my subscription to SCIENCE NEWS primarily because of your columns and "Books of the Week."

Robert Schwitzgebel, Ed.D., Ph.D.
Associate Professor
Faculty in Psychology
Claremont Graduate School
Claremont, Calif.

Regarding Robert Trotter's article on behavior modification:

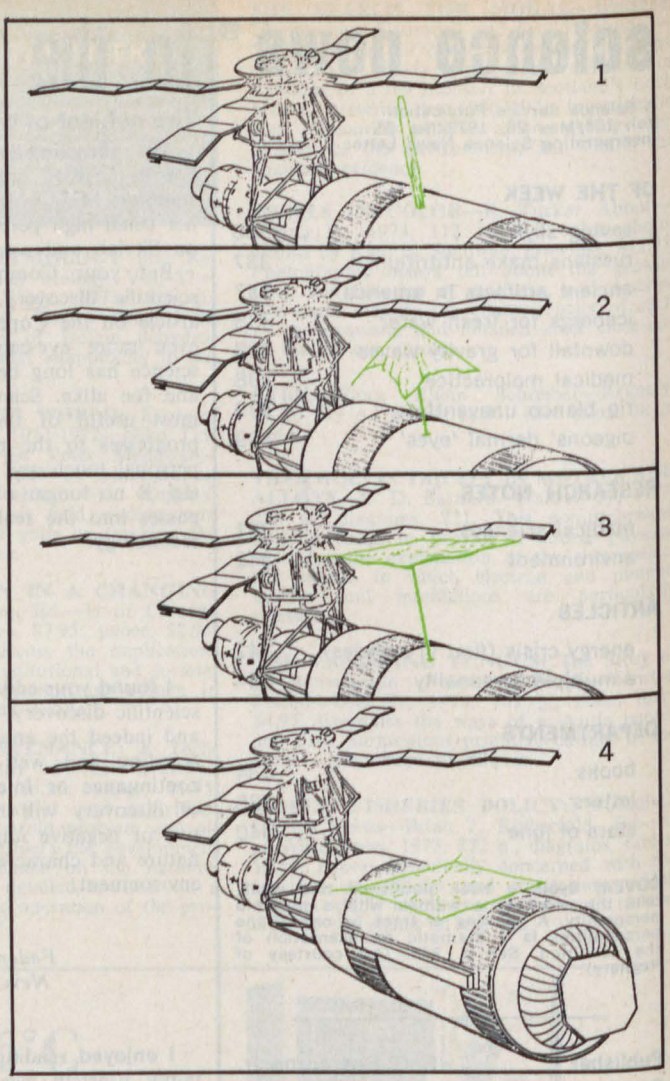
"Lack of motivation" is not a problem, it is a symptom or sign of an imbalance in the inner, personal environment. The first step toward recovery is to give the person warm, loving attention so that their natural self-healing process can begin to function. I would guess that the teaching-parents in Achievement Place offer the young people there much, much more love and aware attention than any of the kids ever received at home. This, I believe, and not the conditioning, is nine-tenths of the reason for the success noted.

A. Hansin Kappelman
Charlottsville, Va.

Address communications to Editor, Science News, 1719 N Street, N.W. Washington, D. C. 20036

Saving a station in space

Engineers, contractors and astronauts joined forces to improvise the plan to save Skylab



A Skylab umbrella extended through one of the scientific airlocks was NASA's primary choice for shading the heated space station.

NASA

Improvisation has been the watchword this week as NASA engineers, aerospace contractors and assorted manufacturing companies across the country joined heads to come up with a means of repairing the over-heated and under-powered Skylab space station (SN: 5/19/73, p. 320).

The astronauts of Skylab 1 will be armed with an improvised tool kit filled with gadgets engineers hope can be used to correct Skylab's problems. What was last week termed "bizarre" shortly after the space station ran into trouble, this week became the most favored device—an umbrella.

To shade the space station from the sun, the men will carry up to earth orbit a parasol, a sail, and possibly an inflatable tube. All were made from material similar to that used inside the lunar surface suits. The crew will also carry modified tree-trimming and electrical lineman tools to clear away debris that might be hanging from the space station as the result of the loss of the meteoroid and thermal shield. Also on board was a shepherd's crook that might be used to yank out one of the undeployed solar panels and some medicine, film and camera equipment.

While astronauts Charles Conrad, Paul Weitz and Joseph Kerwin practiced deploying a sail over the prototype space station in the underwater tank at the Marshall Space Flight Center, flight controllers in Houston were maneuvering the space station by remote commands to keep some parts of it warm enough to prevent freezing of water in the cooling lines and other parts cool enough to prevent more heat damage.

In the middle of this juggling scene, engineers became concerned that with temperatures sometimes above 125 degrees F. in the workshop, the insulation materials inside would emit toxic gases. After heating some of the material on earth, technicians identified the possible gases as carbon monoxide, toluene diisocynate and hydrogen cyanide. All cause varying degrees of illness in humans. Engineers vented the atmosphere inside the workshop in case the gases were present and planned to repressurize and vent the station several more times before the astronauts arrived. As a precaution, the crew members were to carry gas masks and sensors similar to those used inside mines on earth.

Given no more crises, the men were to be launched May 25. Seven and a half hours later they would catch up with the laboratory and fly around it to inspect its condition. The Skylab would then be over ground stations, and television pictures would be relayed to mission control. After the inspection the astronauts were to soft dock the command and service module with the station and eat, rest and discuss the inspection tour with mission controllers in Houston. Their next move would depend on what they saw. John Disher of the Skylab office at NASA headquarters left open the possibility that if it appeared the solar panel could be easily pulled out, the astronauts might then do a stand-up extravehicular activity (EVA) out of the command and service module hatch. This would involve Conrad maneuvering the spacecraft around the Skylab, and Weitz or Kerwin reaching out of the hatch with a long pole to clear away debris or dislodge the solar panel.

Erecting the sun shade would probably be the first major activity.

The astronauts were to have at least two, and possibly three, different sun-shading devices. The most favored at midweek was the parasol or umbrella. "The parasol, which had been a long shot and thought to be too complex, has come on strong now," Disher said. "We are optimistic we can do that."

Erecting the parasol rather than the sails would have several advantages. The main one was that the astronauts could erect the umbrella from inside the Skylab workshop. The plan was to extend the umbrella out through an airlock opening used for scientific in-

struments. The astronauts were to push the shade out with rods. When the poles are about 20 feet above the workshop on the outside, the umbrella collar would be released and a rectangular umbrella, 22 by 24 feet, would pop out.

The sail that was to be carried and deployed in case the parasol didn't work would require the crew to go outside the space station. Twin poles, each about 50 feet long, would be put together to form an A frame with the sail attached. The sail would be unfurled using pulleys and lines much the same way sails are deployed on the masts of sailboats. A third device under consideration was an inflatable shade that would also be put through the airlock from inside the station. The fourth option was a stand-up EVA from the command and service module hatch. This would involve flying over the space station in the command module with one astronaut leaning out of the hatch and attaching the sail with a pole.

If the solar panel could not be pulled out, the crew would then proceed with a mission of 28 days—17 days with power enough to operate at least one experiment at a time and 11 days with substantially reduced power. If the solar panel was successfully activated, NASA was confident of a 28-day mission as originally planned by eliminating experiments that required the most power, such as growing crystals in weightlessness. The decisions to delete experiments would be made, however, after the astronauts finished the repairs. □

Antitritium made in Soviet accelerator

Scientists in the Soviet Union seem to have a penchant for trying to make bigger and more complicated pieces of antimatter. Now they claim antitritium, the antimatter counterpart to the rarest isotope of hydrogen, tritium.

The work, reported this week in Moscow, was done as a collaboration between the Joint Institute of Nuclear Research at Dubna and the Institute of High Energy Physics at Serpukhov. The experimental group was led by Valentin I. Petrukhin and Vladimir I. Rykalin. In the experiment protons from Serpukhov's 70-billion-electron-volt accelerator were driven against an aluminum target to produce the antitritium.

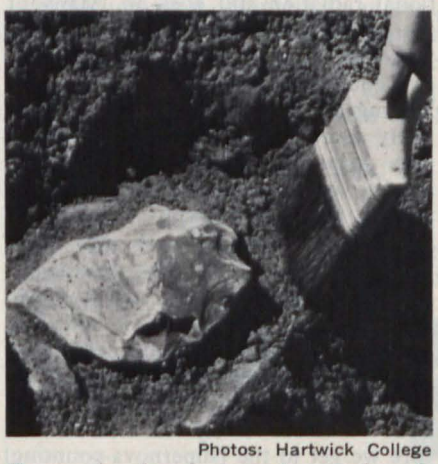
Previously Soviet experimenters had reported the production of antihelium, which though heavier than antitritium, is likely to be more abundant. Presumably now they are going after heavier and rarer species in their continuing search for antimatter nuclei. □

The 70,000-year-old artifacts include projectile points, scrapers and knives.

New World archaeology: A 70,000-year-old site

For the past two summers researchers in New York have been unearthing Stone-Age tools that may demonstrate the existence of a human culture in North America as early as 70,000 years ago. The evidence for such a date first came to light in the spring of 1970 when Joseph Timlin of Worcester, N.Y., interrupted a fishing trip to collect what appeared to be artifacts of an ancient culture. Timlin took the flaked stones to Bruce E. Raemsch of Hartwick College in Oneonta, N.Y., who identified them as human tools. Raemsch and a group of archaeologists excavated the site, near Cobleskill, N.Y., and found hundreds of Stone-Age tools. The silicified limestone, molded clay and quartzite tools appear to be at least 70,000 years old.

This date was arrived at from at least three lines of evidence. The artifacts themselves are similar to 70,000-year-old flaked tools of Old World origin.



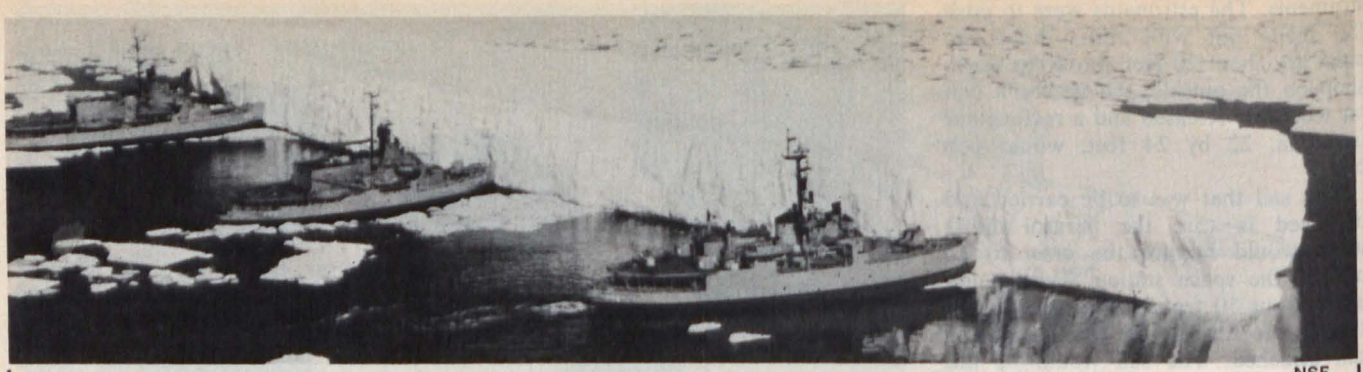
Photos: Hartwick College

Form of a hand ax as it was found.

Raemsch views the Timlin site.

The patina of age and the profile of weathering on the stones agree with this age. And, finally, geological evidence indicates a minimum of 70,000 years. Some of the tools were found in and below a level of soil (gumbotil) that is believed to be at least 70,000 years old.

Previous evidence puts human habitation of the Americas at 15,000 and, possibly, 30,000 years ago (SN: 1/27/73, p. 55). Louis Leakey and Ruth Dee Simpson have even suggested a date of 50,000 to 100,000 years (SN: 2/6/71, p. 99). The Timlin tools—which are much more obviously of human origin than those found by Leakey and Simpson—may confirm this theory and double any previously accepted date. Raemsch will present his evidence this September in Chicago at the Ninth International Congress of Anthropological and Ethnological Sciences. □



NSF

New study indicates that flat Antarctic icebergs could economically be moved to Southern Hemisphere lands.

Icebergs for fresh water: 'Nonsensical' idea seems feasible after all

If the idea of towing icebergs from polar regions as a source of fresh water is not farfetched, it is at least visionary. It's not a new notion, but the logistics of pulling whole "bergs" thousands of miles with ships has kept such schemes in the blue-sky category.

Still, says Wilford F. Weeks of the U.S. Army Cold Regions Research and Engineering Laboratory in Hanover, N.H., "every so often a letter would arrive . . . asking, 'Why doesn't someone tow icebergs?' " Finally, Weeks and William J. Campbell of the U.S. Geological Survey's Ice Dynamics Project at the University of Pudget Sound in Tacoma, Wash., decided to do a study that would show once and for all that the idea was nonsense. "We set out to prove that our intuition was correct," the scientists report in the May SCIENCE AND PUBLIC AFFAIRS. "It wasn't."

"Indeed," they say, "we now believe that the idea is highly attractive when applied to selected locations in the Southern Hemisphere. . . . [It] appears both technologically feasible and economically attractive."

A hypothetical "super-tug" with about two-thirds the power of the nuclear aircraft carrier Enterprise, for example, could deliver an iceberg to Australia or southern South America with enough water to irrigate more than 6,000 square miles of land, Weeks and Campbell estimate. Such a berg could be worth more than $1 billion based on the current estimated production costs of a large-scale desalination plant, about $.19 per cubic meter. Even with freshwater costs lowered to a more practical $.008 per cubic meter, the researchers maintain, the cost of processing the ice could be as much as six times the delivery cost and still be highly competitive.

Engineering, ecological and other problems are considerable—how do you physically tow an iceberg?—but the authors believe that "the potential rewards . . . will prove to be well worth the additional energy expenditure."

The deepening doubt about Weber's waves

On June 15 it will be four years since physicist Joseph Weber of the University of Maryland published a report stating his belief that he had observed gravitational radiation (SN: 6/21/69, p. 593). In the intervening time several observing stations similar to Weber's have gone into operation, but so far none but Weber's have seen what he sees.

With some negative reports already in and more expected imminently, skepticism is growing. It surfaced, with somewhat bitter emotions, at the Texas Symposium on Relativistic Astrophysics in New York last winter. By now it is so strong that NATURE uses the title "Waving Goodbye to Weber's Waves" for a report of a conference held in late April at Oxford. "The conclusion . . . seems inescapable," says NATURE. "Weber has not found pulses of gravitational waves." Americans in the field tend to agree. What Weber records "is not likely to be gravitational radiation of the type that all of us have been thinking it is," says J. A. Tyson of Bell Laboratories.

Tyson and C. G. Maclennan and L. J. Lanzerotti of Bell Labs have tried to determine what Weber is recording if not gravitational waves. In the May 14 PHYSICAL REVIEW LETTERS they report some statistical correlation between the events Weber records and the measure of the intensity of a ring current that circulates in the magnetosphere. More data will be necessary to arouse stronger confidence. Tyson tends to believe that what Weber observes is connected with some, probably important, geophysical effect. "It's a very sensitive experiment," Tyson says.

Meanwhile the search for gravitational radiation still goes on. Many of the physicists now in the field intend to go on in the hope that more sensitive equipment will find what they are looking for. If supernovas are the only likely source of gravitational radiation, then extremely sensitive equipment—able to observe supernovas up to 32 million light-years away—is required. It will take years to reach that stage. Tyson, himself, is not that pessimistic. Perhaps gravity waves are radiated when neutron stars or black holes are formed. Or maybe there are new things out there. "We see new things in astronomy all the time," Tyson points out. "We are likely to find it before we get to the [supernova-counting] stage." □

The malpractice crunch: Impact on U.S. medicine

Millions of Americans are dazzled by television programs depicting medicine as a near-perfect science and physicians as skilled technicians filled with compassion and warmth. But modern medicine is far from a perfect science, and many physicians lack Dr. Welby's bedside manner. The result is a conflict between expectations and actuality.

The conflict has been one major cause of an increasing number of malpractice suits in recent years. Some 14,500 malpractice claims were reported in 1970. But television sagas are hardly the only reason. In the spring of 1971, the Secretary of Health, Education and Welfare appointed a commission of lawyers, doctors, consumers and malpractice insurers to pinpoint other causes (SN: 4/8/72, p. 232). The Secretary's Commission on Medical Malpractice has finally reported its findings. Some were expected. Some are surprises.

A major reason for malpractice suits is a breakdown in communication between physician and patient. Thirty-seven percent of 420 physicians who had been sued or threatened with a suit

named "poor communication between physician and patient" as the single most common cause of malpractice suits. "The suit-prone physician," the commission says, is one who cannot admit his own limitations. When he is confronted by a dissatisfied patient, he often neglects the patient by dismissing his complaints as trivial instead of making the patient feel less angry, afraid or depressed.

Another reason for more malpractice suits is Americans' increasing awareness of how they can use the legal process to defend their rights as consumers. In 1970 malpractice insurance carriers judged 46 percent of the claims as meritorious. This indicates, the commission asserts, that "the vast majority of malpractice claims are not entirely baseless, as often alleged."

The commission also probed the effects of malpractice suits on health care. There is no doubt, it says, that a suit destroys the delicate relationship between patient and doctor. Claims have encouraged physicians to practice defensive medicine: to conduct extra tests that are not medically justified or not to conduct tests that might lead to a suit.

The situation also contributes to rising medical costs. "Medical malpractice," the commission says, "has clearly increased the cost of medical care." As malpractice suits have soared, so has the cost of insurance premiums against suits. The premium costs are reflected in physicians' fees.

The commission has brought home other facts. It verified that the use of allied personnel, however valuable in many respects, increases physicians' chances of being sued. It found groundless physicians' reticence to give care at the scene of an accident for fear of being sued. Not one court decision has been officially reported in which a person has sued a physician for such care.

Contrary to physicians' accusations, lawyers do not necessarily make a lot of money handling malpractice claims. Survey data showed that half the attorneys who win a malpractice case on a one-third contingent-fee basis earn less than $1,000 for their work. However, the commission points out, "A significant part of the malpractice problem relates to the costs of processing malpractice claims through the system —and defense counsel fees are a major portion of these costs."

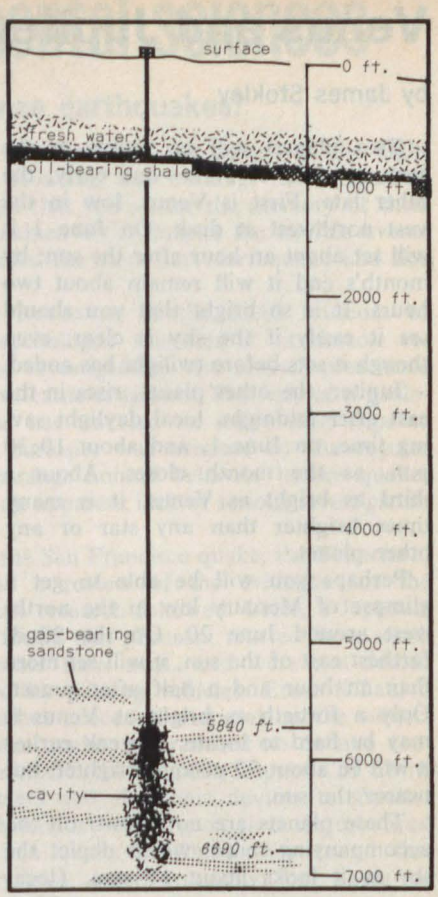
The commission prescribes a variety of remedies for the malpractice problem. It calls for a nationwide organization to collect malpractice information and for better education of physicians in handling procedures that often lead to claims. Hospital patient-grievance mechanisms should be set up. And medical students should be better prepared. □

Rio Blanco blast: An 850-foot cavity

Project Rio Blanco, the detonation of three atomic bombs one mile beneath Colorado's Western Slope to release trapped natural gas, apparently went off without a hitch last week, despite environmentalists' last-minute appeals to halt the blast and their warnings that the explosions could endanger drinking water of 27 million people.

By using three separate atomic devices, stacked one on top of the other, Atomic Energy Commission technicians created a long, cylindrical chamber cutting through a dozen or so pockets of gas-bearing sandstone. (Most news reports incorrectly said the devices were thermonuclear, or "hydrogen" type explosives.) Gas is expected to seep into the 850-foot-by-140-foot chimney for several decades, producing around 20 billion cubic feet of gas over the next 20 years.

A spokesman for Lawrence Livermore Laboratory, which handled engineering for the project, says no environmental damage has apparently resulted from the blast, and only $420 of damage claims have been received, mostly for hairline cracks in plaster of nearby homes. □



Davida Daemon

Pigeons 'see' light through their skin

The eyes, it seems, are not the only organs that can sense light. Electrical responses to light have been recorded in the skin of frogs, guinea pigs, rats, axolotls and black mollies. Marshall S. Harth and Marieta B. Heaton of the North Carolina Department of Mental Health now report that young pigeons apparently sense light through their skin. They were investigating the onset of vision in pigeon embryos when they noticed that the squabs responded to light before there was any evidence of visual function.

The researchers report in the May 18 SCIENCE that a five-second light flash caused young pigeons to raise their heads and shake them from side to side. Wing fluttering, leg extensions and vocalizations were also noted. The investigators covered the eyes of the still blind squabs to ensure that light was not entering the retina (diagram B). The animals continued to respond to the light in the same manner. In additional tests the bodies of the pigeons were covered with an opaque cape (C). The head and eyes were exposed to the light but the squabs did not react. The pigeons were next covered with a clear cape (D) to control for any restraining effect the opaque cape might have had. The squabs again responded to the light. In all conditions the pigeons were insulated from the heat of the 500-watt bulb used.

It is clear, say the researchers, that some form of mechanism in the skin accounts for the phenomenon. The mechanism is not known, but the researchers suggest it might provide prenatal sensory stimulation and be involved in the homing ability of pigeons. Pigeons whose visual input has been impaired are still able to recognize their homes. Perhaps they can see their homes through their skin.

Science

Venus and Jupiter visible in June

by James Stokley

Two planets will be visible in the evening skies of June—one early, the other late. First is Venus, low in the west northwest at dusk. On June 1 it will set about an hour after the sun; by month's end it will remain about two hours. It is so bright that you should see it easily if the sky is clear, even though it sets before twilight has ended.

Jupiter, the other planet, rises in the east after midnight, local daylight saving time, on June 1, and about 10:30 p.m. as the month closes. About a third as bright as Venus, it is many times brighter than any star or any other planet.

Perhaps you will be able to get a glimpse of Mercury low in the northwest around June 20. On the 22nd, farthest east of the sun, it will set more than an hour and a half after sunset. Only a fortieth as bright as Venus it may be hard to locate. A week earlier it will be about 50 percent brighter, but nearer the sun.

These planets are not shown on the accompanying maps, which depict the sky as it looks about 11 p.m. (local DST) on the first and 10 p.m. on the 15th. It would appear the same at 9 p.m. on the 30th, but at that hour in June the sky will not yet be dark.

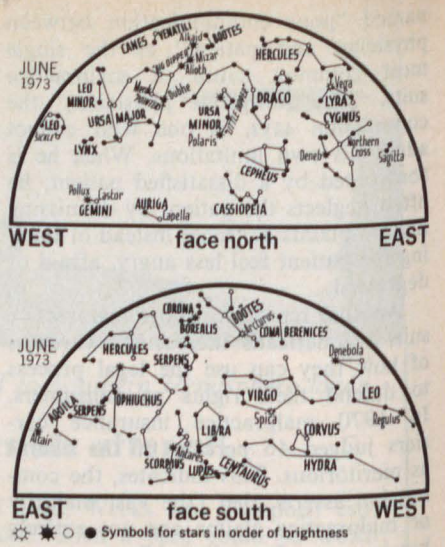
The highlight of June will come at the end of the month with a total eclipse of the sun. A total eclipse of the sun occurs when the moon passes in front of it. Not only is it a magnificent spectacle; it also affords an opportunity for important scientific investigations. That is why many professional and amateur astronomers, as well as interested laymen, will travel to Africa this month to see one. Every few years there is an eclipse worth going a long distance to watch. But this one is far more rare. It is one of a series of three which are the longest total eclipses between 1099 and 2149. At the point in the Sahara where duration is greatest, the sun will be hidden for seven minutes, four seconds.

A Princeton University astronomer, Dr. Edward S. Light, reported recently to the Royal Astronomical Society of Canada on long solar eclipses. Between 3000 B.C. and 5000 A.D., he finds, there are 5,920 solar eclipses in which the sun is completely hidden. In 62 (1.1 percent) the sun was or will be obscured for at least seven minutes.

This is an average of one every 129 years. However, they do not occur at regular intervals but in bunches—as many as five about 18 years apart. The current series began on June 8, 1937 when one lasted seven minutes four seconds. Next came one with seven minutes eight seconds on June 20, 1955.

Before 1937 the last seven-minute eclipse was on July 1, 1098, with seven minutes seven seconds, visible in the South Atlantic Ocean. This was the last of a series of four in 1044 (seven minutes ten seconds), 1062 (seven minutes nineteen seconds) and 1080 (seven minutes seventeen seconds).

After this year the next will come June 25, 2150, with seven minutes fourteen seconds, visible over the North Pacific Ocean, first of a series of five. The third, on July 16, 2186, will be the longest known. The total eclipse, visible in the South Atlantic area, will last seven minutes twenty-nine seconds, two seconds less than the longest now theoretically possible. □



CELESTIAL TIMETABLE

June	EDT	
1	12:34 am	New moon
	10:00 am	Moon nearest, distance 222,200 miles
7	5:11 pm	Moon in first quarter
15	5:00 am	Saturn behind sun
	1:00 pm	Moon farthest, distance 252,400 miles
	4:35 pm	Full moon
19	5:00 pm	Moon passes north of Jupiter
21	9:01 am	Sun farthest north, summer commences in Northern Hemisphere
22	1:00 pm	Mercury farthest east of sun
23	3:45 pm	Moon in last quarter
	10:00 pm	Moon passes north of Mars
29	8:00 pm	Moon nearest, distance 222,300 miles
30	7:39 am	New moon, total eclipse of sun visible in South America and Africa

medical sciences

ATP and DNA replication

ATP is one of the most important energy-releasing molecules in bacteria and mammalian cells. There have been some suggestions that ATP might also assist in the replication of DNA, the genetic material of the cell, but its specific role is unknown. Now in the May 4 NATURE, Chirabrata Majumdar and Fred P. Frankel of the University of Pennsylvania report details of ATP's role in DNA replication.

Since a bacterium does not have a nucleus, DNA is replicated in the membrane surrounding it. (In the mammalian cell, DNA replication may take place in the nucleus. Scientists aren't sure.) So the Philadelphia microbiologists studied the action of ATP on DNA replication in bacteria membranes. They found that ATP diverts the use of deoxynucleoside triphosphates, the building blocks of DNA, from DNA repair into DNA replication. Phosphate in the ATP molecule is held together by two kinds of bonds—an alpha-beta bond and a beta-gamma bond. The alpha-beta bond, the researchers found, is altered during DNA replication. "The energy required for the replication process is most probably derived from the alpha-beta bond of ATP," says Majumdar.

The researchers are not sure whether ATP acts directly on the building blocks used for DNA replication, on an enzyme necessary for DNA replication or on some chemical that primes replication. The only protein or enzyme known to be required for DNA replication is DNA polymerase, but other proteins or enzymes may be required as well.

Sperm banks for elephants

Sperm banks and artificial insemination for livestock have been used successfully for some time now. Sperm banks and artificial insemination for humans are becoming more prevalent. Now efforts are being made to build sperm banks for, and to apply artificial insemination to, elephants. Elephants rarely breed naturally in zoos. Sperm banks and artificial insemination may also help save the Asiatic elephant, which is threatened with extinction.

R. C. Jones, formerly of the Zoological Society of London and now at the University of Newcastle in New South Wales, looked into the collection and storage of elephant semen. He removed some sperm from elephants and found them to be immotile (incapable of movement). So he tested various methods of inducing motility. He found that a saline solution mixed with potassium chloride and fructose worked best. He also carried out several experiments to determine a suitable method for freezing sperm. He found dimethyl sulphoxide plus glycerol to be fairly effective. Jones concludes in the May 4 NATURE, ". . . with one exception, elephant spermatozoa survived freezing and thawing as well as the deep-frozen cattle semen used at present for artificial insemination."

Home dialysis vs. kidney transplant?

Recipients of kidney transplants from living, related donors enjoy significantly better survival than recipients of cadaver grafts. Home dialysis patients have about the same survival rates as recipients of transplants from living, related donors, but show significantly superior survival to recipients of cadaver grafts. Edmund G. Lowrie and his physician team at Harvard Medical School report these findings in the NEW ENGLAND JOURNAL OF MEDICINE.

Age is not a limiting factor in either transplants or dialysis. The only requirement for dialysis is that a patient has the right equipment and a family member who is capable of applying it.

environmental sciences

Can animals sense earthquakes?

The dogs of San Francisco did not sleep well the night of April 17, 1906. Howling and barking, they disturbed weary citizens enough that years later the memory of their eerie restlessness remained vivid, despite the terrible events that followed. At dawn the next day, earthquake and fire destroyed the city.

Reporting in the BULLETIN of the Field Museum of Natural History, psychologist Caroline J. Anderson recounts the course of investigations into animal prescience of earthquakes and volcanic eruptions. The wife of a geologist, with whom she has traveled on many field trips to volcanic areas, her curiosity was aroused by the regular occurrence of this strange animal behavior before quakes or eruptions and by an apparent lack of serious investigation into its causes.

Three years after the San Francisco quake, the SCIENTIFIC AMERICAN published a review of the evidence for the phenomenon, but little research followed. Later, a Japanese scientist, F. Omori, found that pheasant reacted more sensitively to earth tremors than man, and were not fooled by rumblings caused by passing vehicles. Ernst Kilian, a German, tried to gather anecdotal material on the subject after the 1960 Chilean quake, but reached no definite conclusion. Beginning in 1966, the People's Republic of China used peasant volunteers and electronic devices to monitor anomalous animal behavior before geological disturbances. Before the large 1966 quake in China they found that animals, particularly rats, acted strangely, but again no definite pattern emerged.

Some scientists suggest the animals notice faint foreshocks before the main quake. Others propose reactions to air pressure changes or high-frequency sounds from cracking rocks. But given no persistent research, Anderson says, the mystery of the nervous animals remains unsolved.

Airborne global monitoring by jetliner

Now that the "jumbo jets" are equipped with automatic navigation systems that provide digital readout of latitude, longitude and altitude, they could be used to gather valuable data on atmospheric pollution and meteorological processes, NASA official Robert Steinberg suggests in a recent issue of SCIENCE.

"We urgently need an economical way to measure mid-tropospheric wind velocities in the tropics," Steinberg says, since these winds provide the energy that drives the major weather systems in the rest of the world. Little is known, also, about the life cycle of pollutants such a sulfur dioxide, aerosols, pesticides and gases that reduce atmospheric ozone.

By using instruments now under development in the Department of Transporation and the Environmental Protection Agency, in conjunction with existing on-board navigational aids, Steinberg says, jumbo jets on regular international flights could offer the least expensive way to learn vital missing information about the atmosphere, and what is being done to it.

As dirty as new fallen snow . . .

Meteorologist Rosa Pena, reporting in ONLY ONE EARTH, says snowflakes collect particles of pollution many times more efficiently than rain. With ten to one hundred times the surface area, greater electrical charge and a rate of fall one-tenth to one-sixth that of rain, snowflakes effectively "scavenge" the particles, reducing air pollution but bringing the pollutants down to earth . . . and people.

Fuel Shortages in America:

by John H. Douglas

This is the first article in a series on the energy crisis. In the series, Science and Society Editor John H. Douglas will explore the extent and the causes of the crisis, new technological advances that promise relief, and the conflict of environmental concerns with the seemingly insatiable energy requirements of an industrialized society.

ARCO

Oil companies want more offshore drilling, Alaska pipeline to meet shortages.

The energy crisis has come home. Across the nation hundreds of neighborhood gasoline stations have closed, schools have had to suspend classes during cold waves for lack of heat, shortages to farmers threaten a new round of rising food prices and millions of Americans have begun to wonder whether their summer vacation plans will be curtailed by fuel rationing. They have also begun asking troublesome questions: Why did the crisis get this far? Why did it come first in petroleum products? Is anybody doing anything about it?

The answers rest on an understanding of two very different, but equally grave, problems—long-range ecology and short-range economics.

The long-range problem is the more easily stated: An end is in sight for America's reserves of oil and gas, but the nation continues acting as if they would continue forever. Half the country's original oil has been burned; a third has not been pumped but is known to exist, a fifth has not been discovered but is presumed to exist from geological considerations.

Oil supplies about half the nation's energy needs and demand is expected to double in the next 12 years. If it does, and if domestic production increases as expected, by 1985 the United States may have to import as much as 60 percent of its petroleum. The price of this imported oil, and the resulting cost of powering the country, would be many times higher than at present.

The soaring demand for oil stems from several factors. Shortages of natural gas have forced industries and utilities in some areas to switch to oil. (Low cost and lack of new wells have combined to bring natural gas—the cleanest conventional fuel—into critical shortage, with projections of rising demand and import needs roughly equivalent to those for oil). Environmental pressure has forced industries that once depended on coal to use oil or gas, and at the same time, has slowed the installation of nuclear reactors that could potentially ease the fuel shortage. New refineries and deep-water ports for supertankers have also been blocked. Electric companies increasingly use diesel turbines for power generation. More immediately, the worst winter in decades for many regions severely depleted existing stockpiles. Something had to give.

What gave were the "mom and pop" independent filling stations. Almost entirely dependent on surplus gasoline of "brand name" distributors, the independents suddenly found themselves cut off from supplies as the major petroleum companies moved to protect their own dealers. By last week, 600 private-brand stations had closed, hundreds of others had shortened their hours, and the nation, especially Congress, had begun to awaken to the growing problem.

A series of hearings before a Congressional subcommittee quickly revealed a situation more encompassing and more serious than most people yet realized. Darrell M. Trent, acting director of the Office of Emergency Preparedness, told the committee acute problems were only "temporary and localized," and that gasoline rationing was unlikely. If that were so, asked Rep. Paul Cronin (R-Mass.), why couldn't Boston find a bidder for its municipal fuel contract? Rep. J. J. Pickle (D-Tex.) demanded to know why Austin, Texas, should experience over a dozen instances of fuel shortages this winter though it lies in the middle of a fuel-producing region.

Trent's assurances aside, rationing has already begun, depending on one's definition of the term. Demand for gasoline is expected to exceed supply by two to five percent this summer, and prices have already begun to rise for big users. Cleveland, Ohio, has just promised to pay 35 percent more for gasoline to run its buses. The Massachusetts Turnpike Authority has had to pay 49 percent more for this year's fuel contract. Iowa plans to reduce the speed limit on its highways to conserve gasoline, should the pinch worsen. Ten-gallon limits on individual "fill-ups" are becoming more and more common. One major oil company has recently started "voluntary" nationwide rationing and lowering of octane to conserve fuel.

Trent suggested to the Congressional committee that states should begin allocating fuels within their boundaries and "jawbone" the oil industry to make sure fuel is spread evenly around the country. "*That*," grumbled Congressman Pickle, "doesn't help much." The situation will only get worse as the country has to depend on foreign suppliers for oil, added Rep. Bob Bergland (D-Minn.). "Those folks won't take green stamps—they want cash!"

Indeed. America paid $2.1 billion a year for oil imports in 1970; now it imports $7 billion worth of oil a year, and some industry projections antici-

The Energy Crisis Comes Home

pate the need for $30 billion worth of imported petroleum annually by 1980.

However, long before that figure is paid, say some experts, the country will either have to find its energy elsewhere, or do without. "The projections are fantasies," says J. T. Claiborne Jr., head of an appraisal firm. "Such import needs would bankrupt America, eliminating us as a customer." Already, evidence has surfaced indicating the danger of too heavy reliance on Middle Eastern oil and pointing up the complex role short-term economic pressures have played in creating a growing emergency.

Some economists, like MIT's M. A. Adelman, believe that the energy crisis, at least in the short-range, has been artificially created. "The world 'energy crisis' or 'energy shortage' is a fiction," he says. "It makes people accept higher oil prices as imposed by nature, when they are really fixed by collusion." American oil companies, he charged in a Wall Street Journal article, have acted as "tax collectors" for the oil sheiks, acceding to ever higher demands by Middle Eastern exporters in hopes of driving up the worldwide price of oil.

Between now and 1985, the world will probably burn more oil than has been consumed so far throughout history, sending perhaps a half trillion dollars into the Middle East.

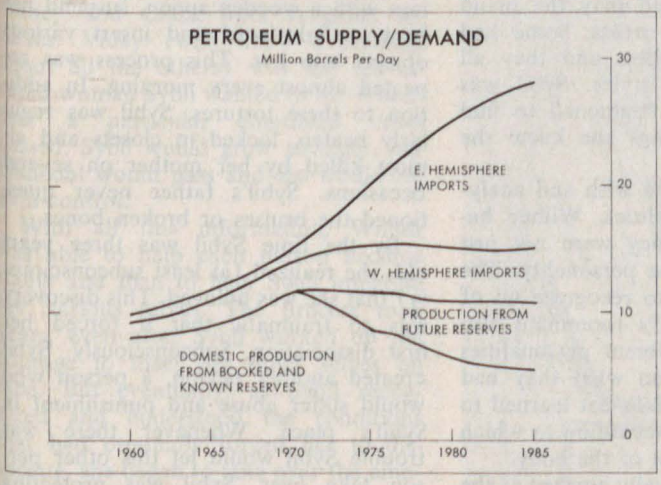
Some of the smaller oil-producing countries have been raking in money almost twice as fast as they can spend it, leading them to make speculative ventures with American dollars. Such speculation is now blamed, in part, for precipitating the latest dollar devaluation. The emerging villain, from the American point of view, is the Organization of Petroleum Exporting Countries (OPEC). The organization's latest move is a demand for hundreds of millions of dollars added to existing oil contracts to counterbalance devaluation. The member countries—which produce 85 percent of the world's oil—have scheduled an extraordinary meeting in Vienna later this month to decide how to enforce their demands, since Western oil companies, they say, "continue to adopt a negative attitude." That, in the euphemistic parlance of international finance, amounts to making them an "offer they cannot refuse."

Whether viewed as the machinations of an international cartel or simply the inevitable pinch that comes with dwindling supplies, the shortages of fuel are real and all the suggested remedies seem both unpleasant and very expensive. Intense pressure is mounting to relax atmospheric-pollution standards enough to reintroduce coal—cheap and abundant—as a primary source of energy. Likewise, offshore drilling, the Alaska pipeline and deep-water ports for supertankers, which environmentalists have so far successfully blocked, will gain new impetus. Oil companies say capital investment for new refineries, new pipelines, new drilling and new tankers could run to the astronomical figure of half a trillion dollars by 1985, and they have already begun approaching the Government for help.

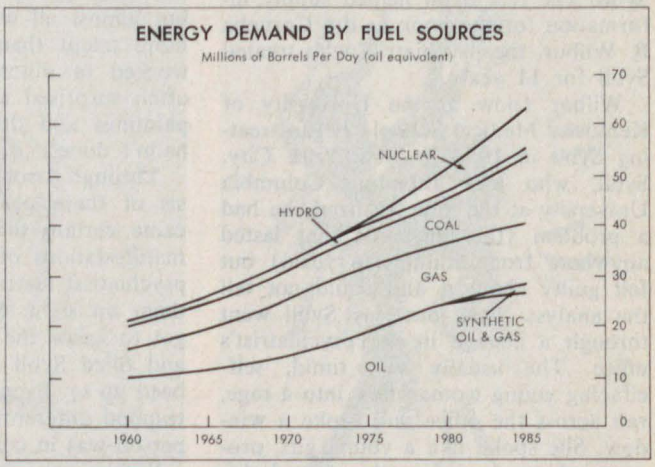
Ultimately, the consumer must pay. OEP Director Trent expects gasoline prices to rise this summer by about a nickel a gallon. Congressman Cronin predicts prices of 50 to 80 cents a gallon by summer's end, but he quotes the president of one oil company as saying the price could be $1.25 a gallon "soon." Meanwhile, the Federal Trade Commission is studying possible antitrust action against the nation's major oil companies, claiming their control of refinery capacity seems to have "contributed in a major way" to the current fuel shortage.

Oil cannot long remain the principal source of energy for the United States, much less for the world. At *present* rates of consumption, currently proven Free World reserves of oil could last only about 35 years, with new discoveries possibly extending that time by a factor of two or three. By taking into account the continued rapid expansion of industrialized countries and the technological development of Third World nations, the figure reduces sharply. The expected rise of imports, following the recent lifting of all quotas, will probably ease the current pinch. Alaskan oil may someday provide 20 percent of the country's needs, particularly if new technology assures its safe transport (SN: 5/19/73, p. 325). Oil now locked in shale, and thus not counted as "reserves," might someday be freed by nuclear explosions, but thousands of such explosions would be required to make a significant impact.

Ultimately other energy sources must be exploited. Environmentalists and industrialists alike must make hard choices as to what the sources will be. The transition to new sources can be made smoothly only if pursued with foresight and compromise, not the amateurism and intrigue that have led, in part, to the present crisis. □



Even with the Alaska pipeline and increased offshore drilling, America must soon import much oil from Middle East.



Graphs: Exxon

Though more energy is expected to come from nuclear reactors and coal, demands for petroleum will continue to rise.

SYBIL

The case history of a woman divided among herself

by Robert J. Trotter

Sybil was perplexed. She sat there in what she knew to be the fifth-grade classroom but couldn't understand why she was there instead of in the third grade where she belonged. When the teacher asked Sybil to work a multiplication problem, she was at a loss. She had learned to add and subtract in the third grade but knew nothing of multiplication. Another thing Sybil knew nothing of was her own multiple personality.

The last thing Sybil remembered was being in the third grade and attending her grandmother's funeral. But gradually, as she looked around and recognized her classmates, it dawned on her that she must have been having another one of her time lapses or memory blackouts. What she didn't realize was that these seeming losses of memory were much more than that. While Sybil was gone or blacked out for two years several totally different personalities had been doing things and learning things and had been in complete control of her mind and body.

Sybil is a real person and this is only one of the many bizarre incidents that make her story—the story of a woman with 16 complete and totally different personalities—one of the most fascinating and informative case histories to come out of a psychiatrist's office in many years. The story was published this week by Regnery (see p. 334) and is called *Sybil*. The 359-page book, written by Flora Rheta Schreiber of the City University of New York, reads like a novel and definitely like fiction. But the only facts that have been changed, says Schreiber, are those that would identify the woman she calls Sybil. The real Sybil helped supply information for the book as did Cornelia B. Wilbur, the psychiatrist who treated Sybil for 11 years.

Wilbur (now at the University of Kentucky Medical School) began treating Sybil in 1954 in New York City. Sybil, who was attending Columbia University at the time, realized she had a problem (the blackouts that lasted anywhere from minutes to years) but felt guilty about it and could not tell the analyst. Then one day Sybil went through a change in the psychiatrist's office. The usually shy, timid, self-effacing young woman flew into a rage, ran across the office and broke a window. She spoke like a young girl, pronounced words differently, moved differently and called herself Peggy. A few minutes later she returned to her chair, seemed to calm down and asked about the broken window. Sybil had returned and knew nothing of what Peggy had been up to. She did not even know that Peggy existed. But under questioning, Sybil admitted that she had been experiencing time lapses for as long as she could remember.

This was Wilbur's first indication of what Sybil's problem might be. She thought that perhaps Sybil was a dual personality. Before the psychiatrist could confront Sybil with this fact, however, she was shocked to meet a third and completely different person in Sybil's body. This woman, calling herself Vicky, was sophisticated, warm and friendly. She knew all about Sybil and Peggy and was willing to talk to the analyst about them. After this first meeting Vicky said, "It seems strange for me to be coming to a psychoanalyst. The others are neurotic, but I'm not." The others she mentioned were not just Sybil and Peggy. With the help of Vicky, during the next several years of analysis, Wilbur met and got to know all of the personalities who were taking turns using Sybil's body. There were 16 of them.

Each self, when in control of the body, was a whole (if neurotic) person. They came in various ages (young infants, adolescent boys and mature women). Each had a distinct voice and vocabulary. Each carried herself (or himself) in a recognizable manner and had a different body perception. Some saw themselves as thin, others as plump. Some were tall, others short, some were blond and others brunette. Each had a personal philosophy and life-style but all shared a rather strict morality. Only one (not Sybil) could play the piano but almost all were artists. Some had more talent than others and they all worked in different styles. Sybil was often surprised and frightened to find paintings and drawings she knew she hadn't done.

Through association with and analysis of these personalities, Wilbur became certain that they were not just manifestations of one personality. The psychiatrist learned to recognize all of them on sight. Sybil's roommate also got to know the different personalities and filled Sybil in on what they had been up to. Even Sybil's cat learned to respond differently, according to which person was in control of the body.

Wilbur was continually amazed as the cast of characters grew. Multiple personality (known clinically as *Grande Hystérie*) is a rare condition but not unknown. The case of the woman described in *The Three Faces of Eve*, for instance, was known at the time of Sybil's analysis. What made Sybil's case exceptional, however, was the number of personalities involved. Also, Sybil was the first multiple personality to undergo analysis.

After diagnosing the problem, Wilbur's next step was to find a way to solve it. She had to find out where all the people came from and why they existed. The analytic technique was helpful but it was not powerful enough to get all of the personalities to open up. This resistance was overcome for a while by the calming effects of sodium pentothal, but Sybil became emotionally addicted to the drug and had to be taken off it. Withdrawal caused suicidal depressions in several of the less stable personalities and shock treatments had to be used for a short time. Finally Wilbur decided to use hypnotism.

Using hypnosis Wilbur was able to speak to all of Sybil's selves at will, and the full extent of the disorder became clear. The conversations while Sybil was under hypnosis were extraordinary. Two, three or more of Sybil's selves would emerge to talk with the analyst and with each other. The details of their conversations revealed what had happened to Sybil.

Sybil's mother was a schizophrenic, sometimes catatonic but almost always sadistic, individual. Sybil's father was a strict fundamentalist who kept himself emotionally distant from Sybil. When Sybil was very young she was a battered child. Her mother, when the father was absent, would spread Sybil's legs with a wooden spoon, suspend her from a light cord and insert various objects into her. This process was repeated almost every morning. In addition to these tortures, Sybil was regularly beaten, locked in closets and almost killed by her mother on several occasions. Sybil's father never questioned the bruises or broken bones.

By the time Sybil was three years old, she realized (at least subconsciously) that she was unloved. This discovery was so traumatic that it forced her first dissociation. Subconsciously, Sybil created another person, a person who would suffer abuse and punishment in Sybil's place. Whenever there was trouble Sybil would let this other person take over. Sybil was protecting herself from her parents.

The tactic worked so well that Sybil's

A self-portrait by Sid when Sybil was 10 years old.

Photos: Regnery

Self-portrait by Peggy showing "lips like a Negro."

subconscious used it again and again as a defense mechanism. In this way the 16 personalities were born. Under hypnosis each told what trauma was responsible for his or her existence. Each was the instrument for coping with a specific emotion while Sybil herself remained free of all emotions.

Peggy, for instance, was assertive and enthusiastic. She came out whenever Sybil was angry and needed those characteristics. Mary was contemplative and home-loving. Sid and Mike, patterned after Sybil's father and grandfather, were carpenters and handymen. Nancy and Clara were religious fanatics. Vicky (who knew everything about all the others) was the self-assured woman Sybil wanted to be. Whenever a particular emotional crisis passed, Sybil would grow stronger, her blackout would pass and she would regain control.

With all this information, Wilbur was able to help each person become stable and then to help Sybil integrate her various selves. The process took years, even after Sybil worked up the courage to meet her other selves on tape. But eventually, as Sybil recognized and understood the conditions that had originally forced her to dissociate, she began to take over the emotions and personalities of her various selves. Finally, after 2,354 office sessions, Sybil became a 17th personality —a complete new Sybil with all the emotions, memories and feelings of her former selves. She remembers the cruelty of her mother, the multiplication tables someone else learned and the piano lessons someone else took. Sybil is a whole person and has had no time lapses since her final integration. She is now a respected artist and teacher at a Midwestern university.

Sybil's case is more than the story of a successful analysis. It is a vivid explanation of a mental condition that may be more common than generally believed. Wilbur and Schreiber suggest that some incidents of amnesia may actually be cases of multiple personality. Sybil's story is also a detailed description of how psychoanalysis and various other types of psychotherapy work. And, finally, it is a story of sexual and physical child abuse and how the mind develops mechanisms for coping with such cruelty. □

Sybil's catatonic mother by Peggy.

'Blue is the color of love' by Sybil.

new products

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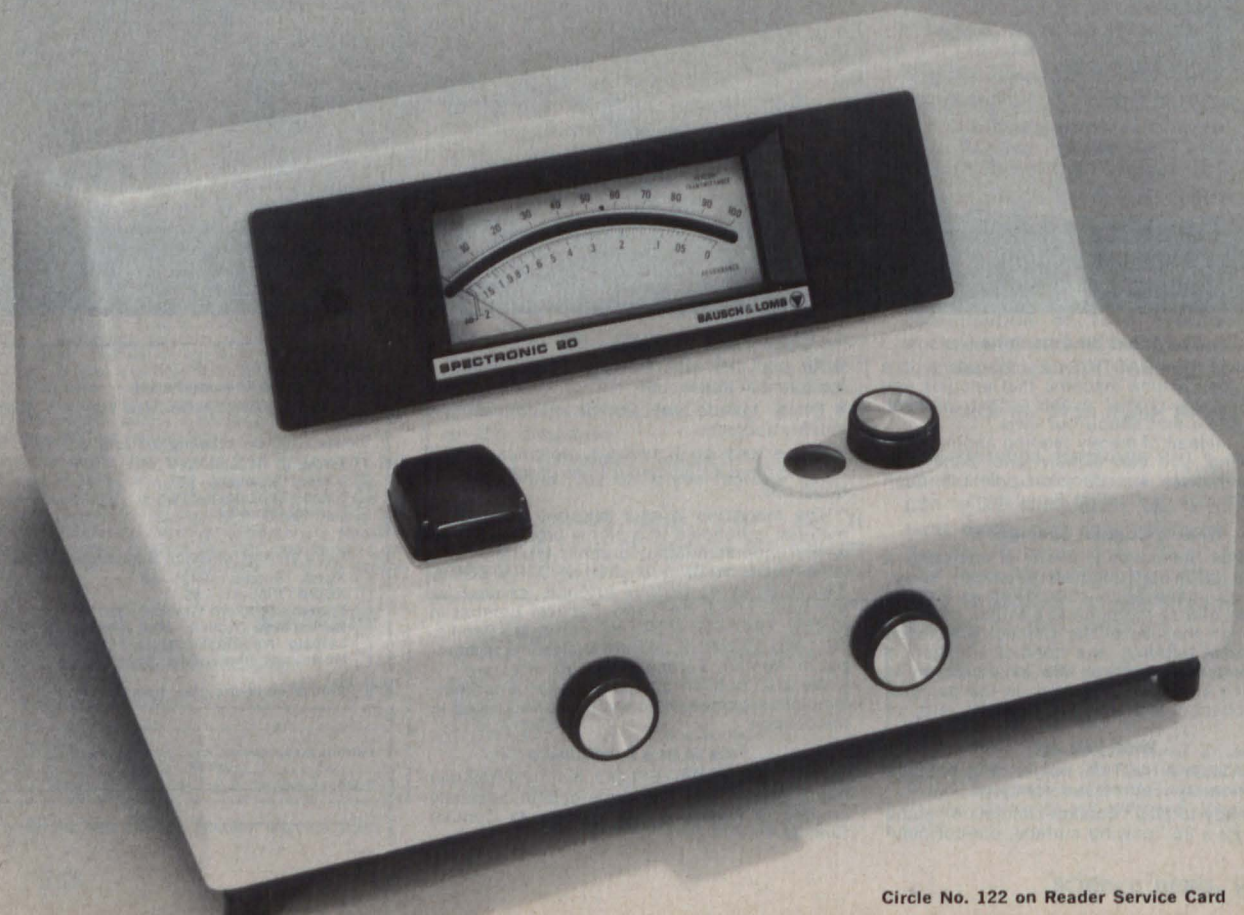

Circle No. 122 on Reader Service Card