

ways of combatting the problem of electrical charges built up on spacecraft surfaces and components at high altitudes.

A key factor for the future, of course, is the success of the space shuttle's orbital trials, since the growing numbers of "space users" — including NASA itself — will have to depend on it for years to come. □

## DSDP shifts gears

As it enters its second decade, the Deep Sea Drilling Project is shifting its objectives. The *Challenger's* most recent voyage, Leg 63, completed the transition, begun by Leg 62 (SN: 11/4/78, p. 309), from hard rock geophysics and tectonics to paleoenvironment — studies of changes in ocean ecology with time as reflected in the sediments.

Microfossils in Leg 63's 330 cores — the largest number of cores yet taken on one DSDP leg — will reconstruct the history of the boundary current — a surface ocean current that stretches along the California coast south to the equator and has a major effect on the southern California climate. Led by Bilal U. Haq of Woods Hole Oceanographic Institution and Robert S. Yeats of Oregon State University, the *Challenger* drilled at seven sites along the Pacific coast from Long Beach, Calif., to Mazatlan, Mexico.

Because different organisms require different climatic conditions for survival, the types and abundance of fossils in the sediments will help researchers map ancient ocean circulation and temperatures. However, according to Dick Poore of the U.S. Geological Survey in Menlo Park, Calif., who accompanied Leg 63, the fossil record is more fragmentary than expected. *Foraminifera*, fossils commonly used for paleoenvironmental studies, are poorly represented, he said, and analysis will depend on other fossils such as diatoms and radiolaria.

Despite its best intentions, the DSDP can't entirely avoid tectonics. Leg 63 also unearthed a little more about the history of the California continental margin.

About 20 million years ago, a deep-sea trench, like the Mariana trench that marks the subduction of the Pacific plate, lay off the California coast. Volcanic rocks recovered in earlier dredge samples were thought to have come from the volcanoes that should form near such a trench. However, the *Challenger* recovered similar volcanic rocks on this voyage and showed that the rocks are too young and lie too near the trench to have resulted from subduction-related volcanic activity. According to Jim Crouch of Scripps Institution of Oceanography, a geophysicist aboard Leg 63, these findings support previous theories that the rocks were formed when the mid-ocean spreading center called the East Pacific Rise, now far to the south, once lay near California. □

## Alcohol metabolism: All in the family

There is growing evidence that alcoholism may "run in the family." Recent studies have shown as much as a fourfold increase in alcoholism among children of alcoholics over children of nonalcoholics. Other studies indicate a 25 to 50 percent lifetime risk for alcoholism in the sons and brothers of severely alcoholic men, and twins of alcoholics have about twice the chance of becoming alcoholics as do two non-twin brothers or sisters.

Such retrospective, epidemiological studies, however, are open to criticism because they deal with statistical probabilities which — no matter how accurate — frequently lack *physical* evidence that should underlie their conclusions. For example, how does one show a physical susceptibility to alcoholism? The answer may be found in the Jan. 5 SCIENCE.

University of Washington researchers report some of the most convincing evidence yet of a metabolic factor in alcoholism among the offspring or siblings of alcoholics. The study indicates that such persons react more intensely to alcohol — apparently by becoming more intoxicated — than do peers with similar backgrounds but from nonalcoholic families.

Marc A. Schuckit and Vidamantas Rayeses of the Alcoholism and Drug Abuse Institute at the University of Washington in Seattle were inspired by indications from several other studies of a genetic factor in alcoholism. They speculated that susceptible individuals might undergo "a possible unique reaction to a single dose of alcohol." They decided to measure the level of blood acetaldehyde produced through metabolism after drinking.

The researchers matched 20 young men (mean age 23) who had an alcoholic parent or sibling against a control group of males of similar age, race (all Caucasian), marital status and drinking history — most of the subjects in both groups reported drinking on one to four occasions per week, with an average intake of two to four drinks.

After fasting overnight, each man was seated in a quiet, temperature-controlled room where his vital signs were monitored and blood drawn. Each participant was given a comparable quantity of liquor (0.5 milliliter per kilogram of body weight) mixed with sugar-free 7-Up and drunk over a five-minute period. Blood samples were taken before drinking, at 15 and 30 minutes after, and every subsequent half hour for the following three hours.

The analyses show that "blood acetaldehyde concentrations were significantly elevated after a moderate ethanol dose" in the 20 men with family histories of alcoholism. The blood alcohol concentrations of the controls were considerably lower, Schuckit (now at the San Diego V.A. Hospital) and Rayeses report. Similar results had been found with recovered alcoholics,

"but our results indicate that young, healthy men with family histories of alcoholism who might be predisposed to alcoholism themselves also demonstrate increased acetaldehyde levels," say the researchers.

The findings — which the scientists say must be replicated in order to be conclusive — may mean that genetically predisposed persons are more easily intoxicated; more vulnerable to organ damage from alcohol metabolism; and more likely to produce morphine-like substances when the alcohol metabolites interact with those of monoamine chemicals in the central nervous system. "These possibilities, as well as others, can now be studied prospectively in healthy relatives of alcoholics and control groups," say the researchers. □

## Feds should push 'passive' solar more

An "unacceptably large number of problems" with solar space- and water-heating systems has convinced a powerful congressional subcommittee that consumers need protection "with all practical speed." The subcommittee backs that assertion with a report that comes down strongly behind advocates of passive solar-energy systems as the least-costly, most cost-effective approach to use of solar energy in the home.

During the recent spurt of solar development, a handful of solar researchers have maintained that passive systems — those that require no mechanical devices to deliver collected heat — have a commercial edge: active systems, which use pumps or fans to deliver heat, require an energy input and maintenance. The subcommittee on oversight and investigations of the House of Representatives Committee on Interstate and Foreign Commerce concludes that "government programs have seriously underemphasized passive and lower cost active solar applications, which are the most cost-effective and least mechanically troublesome of existing, commercially available solar technologies," according to its report.

Under retiring Rep. John E. Moss (D-Calif.), the subcommittee pursued a wide range of investigations, including the one over alleged defects in Firestone tires that ultimately led to their recall. Although not a matter of human safety, as in the tire case, the subcommittee believes the government's imbalanced support favoring active systems threatens to "significantly distort American solar development." And if "problems with solar systems are not sharply reduced, the popularization of solar energy could be set back for years."

Although the subcommittee found too many problems for its liking, the report notes that consumers were not overly dissatisfied. It attributed that to the pioneer spirit in many early solar buyers, but said that continued problems — in design, manufacturing and installation, “particularly in residences” — could end up retarding the fledgling industry.

In a New England experiment, 100 solar water heaters in one year of operation presented 165 problems, including malfunctions in: collectors (23); piping (60); valving (21); tanks, heat exchangers or electric heaters (7); pump or blower motors (20); controllers (33); and “miscellaneous” (1). The second year went better, with researchers estimating that average energy savings will reach 40 percent. The subcommittee notes, however, that improvement followed replacement or “major modifications” of 72 of the systems.

In a Florida survey, 46 percent of solar-system owners reported problems, the report notes. A Department of Energy project with 40 air- or water-heating installations reported similar results: With an undertone of Murphy’s law, it said, “where possible,” 29.5 percent of those systems experienced freezing, 37.7 percent a collector-to-manifold leak, 27.5 percent a controller malfunction and 55 percent a collector malfunction.

Seeing similar results in its own survey, the subcommittee calls for solar-product standards, expanded federal training of solar installers and inspectors, and Federal Trade Commission control of sales claims. Information on problems in the federal-demonstration program should be disseminated quickly to the solar industry and its customers, the subcommittee said. In addition, requirements to qualify for federal solar tax credits should include product warranties, and suppliers should provide customers with operating and maintenance instructions, the subcommittee report said.

What’s more, the subcommittee recommends that federal tax incentives be extended to passive systems. As they are now written, tax credits — 30 percent of an expenditure on a “renewable energy source” up to \$2,000, and 20 percent of the rest up to \$10,000 — can’t be applied to structural work. And structure is central to the five passive systems that the subcommittee thinks are ready for “widespread use.” They include:

- direct gain, or clustering of windows — preferably double-glazed, on a building’s south side,
- a mass storage wall of the type popularized by Felix Trombe, which absorbs heat through a window and delivers it to a room through convection and radiation,
- a “sun-space,” or greenhouse, which can be attached to an existing structure whose facing wall would serve the same purpose as Trombe’s,
- storage of solar energy in containers in a roof for delivery by radiation through the

ceiling in the evening (a “passive” system that must use movable insulation to prevent heat loss to the sky at the time of day it’s collected), and

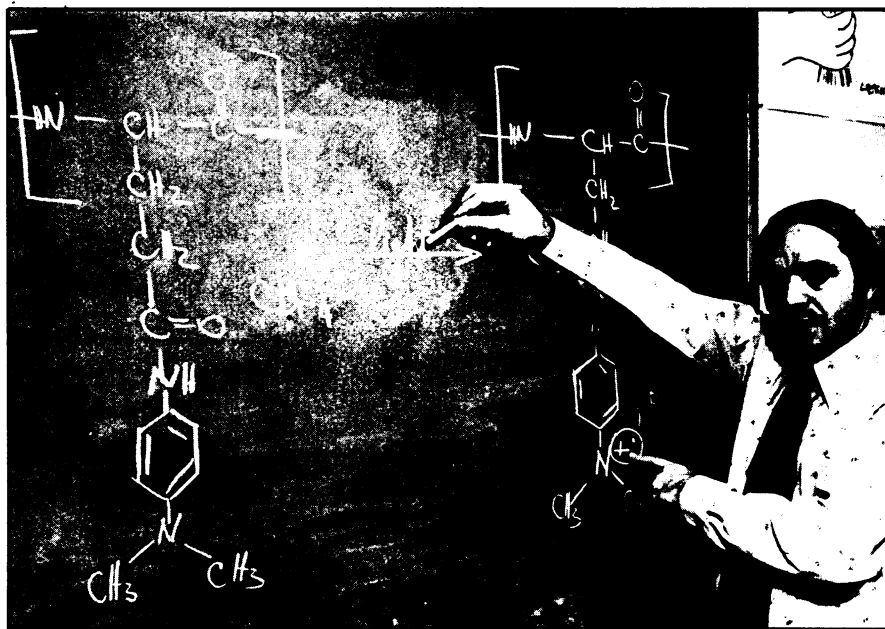
- the “indirect thermosyphon” in which heat-storage mass is placed above collectors to allow heat transfer without mechanical assistance.

While lack of information has confined much passive work to government labs and a few custom-designed houses, there are measures that consumers of active systems can take to protect themselves. The subcommittee report provides a sketchy guide and ample references for

further reading. Appendices detail survey results, serving as guides to the most frequent malfunctions.

Another useful report is a rating of the potential for solar heating in different regions of the country, based on climate. That potential is given as multiples of the potential of the least promising region — around Lake Ontario. The report, authored by Walter Hoecker of the National Oceanic and Atmospheric Administration, permits consumers to gauge how a given solar system — whose performance at any U.S. location is known — will be likely to perform in their neighborhood. □

## New material converts light to expansion



Aviram illustrates how a single segment of the new polymer loses an electron, when exposed to ultraviolet light, allowing more liquid to swell the sponge.

Irradiation with ultraviolet light makes the jelly-like substance slowly swell. In about four minutes, it expands 35 percent in each dimension. This light-sensitive polymer sponge stimulates expectations of a new technology for printing plates, photocopying and light intensity measurement.

Ari Aviram of IBM’s Thomas J. Watson Research Center has synthesized the novel spongy material, which is formally named poly-*p*-(*N,N*-dimethylamino)-*N*- $\gamma$ -D-glutamanilide. He hooked together long chains of the amino acid glutamate and then crosslinked them with dimethylamino groups, making a porous structure.

The light-induced expansion results from interaction of the polymer and appropriate surrounding liquids. When the material is irradiated with ultraviolet light, Aviram has demonstrated that an electron moves from each dimethylamino group to the liquid (such as carbon tetrabromide). That ionization leaves the “holes” in the polymer sponge more receptive to liquid,

and influx of that liquid causes the visible expansion. The total volume change observed is an increase of about 145 percent.

Although other chemists have occasionally observed polymers to change size during light irradiation, this synthesis is the first deliberate creation of a substance that swells dramatically with light.

Future research will attempt to reverse the swelling chemically or electrochemically, to develop materials that expand more quickly and to respond to various parts of the light spectrum. In his current work Aviram wants to understand more completely the new material and the mechanisms that cause it to undergo size transformation.

But Aviram is willing to speculate on applications, because past materials which undergo dimensional change, especially in surface relief, have proved useful in printing and information display: “A substance that swells upon irradiation might allow production of printing plates via a computer-controlled ultraviolet light source without the use of solid type.” □