

Seals Under Siege: A Heated Warning

Seals have not found the past century a healthy one. Besides facing human predators, who have all but eliminated several regional populations, masses of the fin-footed creatures have succumbed to viral plagues. Most recently, in the summer of 1988, nearly 18,000 dead harbor seals washed up on European shores, victims of a distemper virus (SN: 9/3/88, p.149).

Scientists have speculated that the distemper-resistant harp seal acted as a sort of marine Typhoid Mary in the 1988 outbreak, moving south into the harbor seal's range and passing along the virus. Some blame chemical pollutants known to disarm seal immune systems.

Two biologists now suggest, however, that investigators have overlooked an underlying factor that could explain five of the century's most conspicuous seal die-offs, including the 1988 deaths. Unusually warm weather and crowded seal herds combined to trigger the outbreaks, they propose.

David M. Lavigne of the University of Guelph, Ontario, and Oswald J. Schmitz of the University of British Columbia in Vancouver examined records of regional air temperatures preceding five major seal die-offs. "In each case, the mass mortalities began following three months when mean air temperatures were 1°C to 3°C higher than the preceding 10-year average," they write in the recently released June MARINE POLLUTION BULLETIN.

The researchers suggest that as temperatures rise, seals begin hauling out of the water and gathering in unusually dense herds on shore. If a contagious virus is present it may spread rapidly, like measles racing through a crowded classroom. Lavigne and Schmitz cite a 1973 study showing that a 2°C rise in air temperature coincided with harbor seals hauling out by the hundreds. "What is important is that the local [seal] densities on shore were much higher than densities preceding the [outbreaks]," Lavigne says.

"The act of hauling out does indeed make seals more vulnerable," says John Harwood, head of the Sea Mammal Research Unit in Cambridge, England. "But the problem with this hypothesis is that we really don't know why they haul out. It's unreasonable to think that seals haul out just because the air temperature has gotten warmer." Although Harwood agrees that higher temperatures might in some cases contribute to seal plagues, "its very hard to believe that [temperature] is the sole factor," he says.

Lavigne and Schmitz acknowledge that the hauling out behavior remains poorly understood. Nonetheless, they say, "four of the six documented mass mortalities

in seal populations have occurred in the past 12 years, a period which includes some of the warmest years in the 20th century." Moreover, they suggest warmer weather may have done in other marine creatures. Recent die-offs of dolphins and whales also followed unseasonably warm temperatures, they point out.

Predictions of global temperatures rising by as much as 3°C within the next century (SN: 6/23/90, p.391) carry "profound implications for the future [of pinniped populations]," Lavigne and Schmitz write. "Our data show that a 1°C to 3°C increase in average temperature can trigger very significant ecological events," Lavigne told SCIENCE NEWS. Noting a recent rash of die-offs among seabirds, fish, coral reefs and sea turtles,



One of nearly 18,000 casualties of 1988 distemper plague.

Greenpeace

he adds, "If the record of the past 12 years is anything to go by, we probably have much more to worry about than seal deaths." — W. Stolzenburg

Sweet tooth, rotten kid: A theory gone sour

A new study disputes the notion that overindulgence in sweets predisposes a child to a life of disruptive behavior.

Seeking a link between sugar intake and behavior, researchers compared the consequences of eating either sugar or an artificial sweetener in high school students and juvenile delinquents. Surprisingly, their findings hint that for some delinquents a spoonful of sugar may actually improve behavior.

A substantial body of anecdotal evidence has suggested a causal link between antisocial behavior and heavy consumption of sugary foods. In one of the best-known examples, San Francisco killer Dan White blamed chronic overconsumption of Hostess Twinkies for the loss of judgment that in 1978 led him to gun down the city's mayor, George Moscone, and City Supervisor Harvey Milk. Some correctional facilities have removed their snack machines and de-sweetened their menus in an attempt to minimize behaviors associated with criminality, such as hyperactivity. Yet few well-controlled experiments have directly assessed the purported ties between sugar intake and behavior, and none has proved a link.

Now, in the August PEDIATRICS, researchers at the University of Wisconsin-Madison report results from the first study comparing the effects of different sweeteners on criminally delinquent and nondelinquent male adolescents.

Jo-Anne Bachorowski (now at the University of Colorado at Denver), Dian A. Gans (now at the University of Hawaii-Manoa), Joseph P. Newman and their colleagues administered neuropsychological tasks to 115 delinquents and 39 nondelinquents after giving them breakfasts

sweetened with either sucrose or the artificial sweetener aspartame. The tests measured motor endurance, coordination, concentration, short-term memory and hyperactivity. The researchers also rated each individual for 32 mood and behavior variables and administered tests measuring cognitive function and behavioral disturbance. Each individual went through two rounds of testing—one for each kind of breakfast.

The results provide "no support for the contention that sucrose ingestion compromises behavior" among delinquents or nondelinquents, the researchers report. And contrary to popular lore, the most hyperactive, destructive and behaviorally disturbed delinquents "demonstrated better performance after the sucrose than after the no-sucrose breakfast," they say.

The team also tested the controversial claim that aggressive, antisocial behavior can result from a metabolic abnormality called reactive hypoglycemia—a short-term overreaction to sugar consumption, temporarily lowering blood glucose levels.

Oral sucrose-tolerance tests given to 137 delinquent and 41 nondelinquent teenagers show no greater incidence of reactive hypoglycemia among delinquents than among nondelinquents, the researchers report. But the tests do reveal significant differences in the rates at which the two groups metabolize sugar, Newman told SCIENCE NEWS. Citing these findings and unpublished research, Newman proposes that some delinquents suffer from inadequate regulation of blood sugar levels and may benefit from somewhat higher amounts of ingested sugar. He makes the unorthodox sugges-

tion that sweets may represent a behavior-enhancing compensation for a metabolic defect in some delinquents.

Steven Schoenthal, a specialist in nutrition and behavior at California State University at Stanislaus, calls the new work "a valuable contribution," but he also points to some potentially confounding flaws. A longtime proponent of the sugar-behavior link, Schoenthal notes that the sucrose variation between the two test breakfasts was small compared with typical sucrose intakes by U.S. adolescents over an entire day. He suggests that sugar-related behavioral problems might well surface in similar studies involving larger variations in sucrose intake or examining the effects of sucrose in younger children. — R. Weiss

Leaf lenses: A finer focus

Cellular "lenses" on the leaves of some plants allow them to regulate the amount of sunlight reaching their photosynthesis centers, according to two studies described last week.

Raymon A. Donahue and his co-workers at the University of Wyoming in Laramie used scanning electron microscopy and fiber-optic light detectors to track light paths within leaves of the Rocky Mountain weed *Thermopsis montana* in sun and shade. They found that the leaves' transparent, outermost cells become significantly more convex in the shade, thus capturing diffuse light from a broader range of angles and focusing it within a particular, light-sensitive region of the energy-converting machinery within the leaves. From these observations and from metabolic measurements made with a portable gas-exchange system, the researchers conclude that "*T. montana* cells are optically specialized to enhance whole leaf photosynthesis in specific light environments." They presented their findings in Snowbird, Utah, at the annual meeting of the Ecological Society of America.

Biologists have indirect evidence for similar lens effects in more than 40 plant species, adds Wyoming's Greg Martin. But researchers have had difficulty measuring the energy benefits of the lens system. In a study he described at the meeting, Martin used dental latex to make fine-resolution molds of leaf surfaces kept in sun or shade. He then used the molds to create leaf-surface replicas made of agarose gel. From measurements of the refractive properties of these replicas, he concludes that some shaded leaves, compared with sun-drenched leaves, can intensify captured light up to 26 times. He also notes that in intense sun, some plants' leaf surfaces seem to focus light onto a cell layer that absorbs potentially damaging energy excesses. □

Glass shows 'memory' under severe pressure

Molten sand, if cooled quickly enough, will harden before its silicon dioxide molecules realign into an ordered crystalline arrangement. That's one way of making glass.

But two researchers find that an alternative method yields glasses that retain a "memory" of their original crystal structure and can actually revert to it. Geophysicist Raymond Jeanloz of the University of California, Berkeley, and graduate student Michael B. Kruger introduce their "memory glass" in the Aug. 10 SCIENCE.

The team's pressure-based technique involves a diamond-anvil cell that can subject materials to pressures thousands or even millions of times greater than external atmospheric pressures. First, Jeanloz and Kruger surround their crystals with a fluid to ensure even pressure distribution around the samples, in this case the berlinite form of aluminum phosphate.

When the pressure in the diamond-anvil cell reaches at least 150,000 atmospheres — corresponding to the pressure about 250 miles below the Earth's surface — the aluminum and phosphate ions edge away from their crystalline sites into an amorphous arrangement. At these pressures, the X-ray diffraction pattern indicative of crystalline order disappears. Changes in the way the material absorbs

infrared radiation also suggest a crystal-to-glass transition, the researchers report.

But to their surprise, the ions snap back into their original crystalline places when the pressure in the cell falls below 500 atmospheres.

Jeanloz conjectures that the memory effect of aluminum phosphate, and of several other crystals tested, depends on the experiment's room-temperature conditions, which probably prevent the squeezed ions from wandering more than a smidgen from their original sites. So when the pressure goes down, the ions simply pop back into their thermodynamically favored places. The high temperatures used in conventional glass-making send the crystal's ions or molecules too far out of line to "remember" where they started, he says.

"The recrystallization of an amorphous phase upon decompression is very intriguing," remarks Russell J. Hemley of the Carnegie Institution of Washington (D.C.). Such studies may uncover mechanisms of molecular reorganization, he says. And that knowledge could enable engineers to tailor a variety of glasses from the same starting material for applications ranging from specialty windows to new semiconductor materials, Jeanloz says. — I. Amato

Ulcerative colitis gets emotional shake-up

A research review casts doubt on the popular assumption that ulcerative colitis stems largely from emotional disorders and traumas. Methodological flaws have marred most investigations of the emotional link, and the few studies that do withstand scrutiny suggest that ulcerative colitis is in fact not a "psychosomatic" disorder, according to a report in the August AMERICAN JOURNAL OF PSYCHIATRY.

"We may locate a psychosomatic association for ulcerative colitis in the future, but the best studies so far don't find one," says psychiatrist and project director Carol S. North of Washington University School of Medicine in St. Louis.

She and her colleagues reviewed all known English-language studies of links between emotional factors and ulcerative colitis, a severe, recurring inflammation of the large intestine and rectum. Among a total of 138 investigations dating back to the 1930s, only seven used "reasonably adequate" research methods, the St. Louis scientists maintain. Flaws included small, nonrandom samples, lack of control groups or comparisons with other chronic medical conditions, and absence of reliable psychiatric diagnoses.

The seven methodologically sound studies — conducted between 1973 and

1987 — revealed that psychiatric problems and traumatic losses, such as divorce or death of a loved one, occurred no more often among ulcerative colitis patients than among healthy individuals or people with other gastrointestinal illnesses. Only one of the four studies evaluating enduring personality features, such as anxiety or irritability, suggested a link to ulcerative colitis.

Researchers have yet to conduct a prospective study of traumatic events among ulcerative colitis patients, North says.

She notes that medical patients frequently suffer from psychiatric disorders — particularly depression — as a result of their physical conditions. Gastroenterologist Ray E. Clouse, who coauthored the new report, says the review indicates "psychiatric factors may play a role in the course, not the causation, of ulcerative colitis." The specific physiological causes of ulcerative colitis remain unknown, he adds.

Some psychosomatic theories, such as the view that ulcerative colitis reflects repressed rage, elude verification with scientific methods, North says. For now, she concludes, proposed psychological causes of the illness find no systematic support. — B. Bower