

Saccharin ban: A sour reception

On March 9, the U.S. Food and Drug Administration proposed a ban on the sale of the only artificial sweetener on the American market—saccharin—to start later this year. Its decision was based primarily on a Canadian rat experiment that showed that saccharin could cause bladder tumors. The FDA had no choice but to propose a ban under the Delaney clause in the 1958 food additives amendments to the U.S. Food, Drug and Cosmetic Act. The clause prohibits the use of chemicals in American-produced foods that have caused cancer in either animals or people, and it requires banning from the market any food additive that has triggered cancer in animals or people.

The pending ban has created a furor among many Americans. It is having a major impact on artificial-sweetener, soft-drink and other manufacturers who use saccharin, and it is putting some people temporarily out of work. It also raises some poignant questions about the science and law under which the FDA operates and whether Americans' individual rights are being infringed upon by government.

The major experiment on which the FDA has based its decision was performed by the Health Protection Branch of the Canadian government. Saccharin was fed to 100 rats as 7 percent of their diet (comparable to a human consuming 800 cans of diet drink daily). Of these animals, three developed bladder tumors. Of their offspring, exposed before birth, 14 percent incurred bladder cancer. This study, as well as several others conducted by the FDA itself, led it to invoke, on March 9, the Delaney clause.

Since then Americans have been bombarding the FDA with calls of protest; some of them have been in tears. They are also hoarding sugar-free soft drinks and artificial sweeteners. A spokesman for the American Diabetes Association has warned that the nonavailability of sugar substitutes could have "very grave effects" on America's 10 million diabetics. The Calorie Control Council, representing the diet-food industry, has run a two-page ad in various newspapers, explaining "why the proposed ban on saccharin is leaving a bad taste in lots of people's mouths," accusing the ban of being "another example of the arbitrary nature of big government" and encouraging readers to protest to their congressmen.

As for the impact of the proposed ban on industry, Coca-Cola Co. and Pepsico, Inc., will be changing their low-calorie drinks so that they have a higher calorie content. Abbott Laboratories, the maker of Sucaryl, a saccharin sweetener, may fight the ban. The Cumberland Packing Corp., the manufacturer of Sweet 'n Low,

a saccharin sweetener, has halted production for the time being, putting 500 workers in Brooklyn, 100 in Miami and 100 in Los Angeles on vacation. Blammo, America's most advertised sugar-free gum, will go on without saccharin.

Is there any scientific rationale to the FDA's decision? Scientists close to the chemical carcinogenesis scene point out that there is. Substances like saccharin cannot be properly tested on humans. For one reason, it would take up to half a person's lifetime for many cancer-causing chemicals to produce tumors. Second, one would then have to kill the human subjects after a set time to look for tumors during autopsy. Therefore researchers usually use short-lived small mammals for chemical carcinogenesis experiments. Yet even here there are some difficulties. Cancer-causing chemicals, at realistic levels of exposure, may produce tumors in only a small percentage of animals. Thus researchers would have to use many such animals to indict a chemical carcinogen. Investigators generally compromise by testing a small number of such animals by dosing them with a suspected chemical in far greater amounts than they, or humans, would ordinarily be exposed to. This way, they believe, they can get an idea of what the chemical would do in lesser amounts to more animals. They also assume that large doses of a cancer-causing chemical reflect what the chemical would do at lower levels over a period of time. And contrary to common belief, most chemicals do *not* trigger cancer, no matter how high the dose.

On the other hand, in its 80 years of use in the United States, saccharin has never been demonstrated to trigger bladder cancer in people. Nor has it produced cancer in primates massively dosed with saccharin over a period of years. What's more, banning the only available noncaloric sweetener on the market is bound to encourage Americans to eat more refined sugar, which also carries its own health risks—dental caries, enhancement of a hereditary predisposition to diabetes and obesity, which in turn may encourage heart disease or cancer of the bowels.

With no definite proof that saccharin causes cancer in humans, then, the question arises of whether people should be able to eat what they like. Critics of the action point out that people are allowed to smoke cigarettes, and cigarettes, unlike saccharin, have been indicted as human cancer-causers. On the other hand, it was Congress that legislated the Delaney clause, and if Americans are not happy with it, it is up to them to encourage their congressmen to change the law.

The probable outcome of the proposed ban is not clear. The Delaney clause may be changed. Or saccharin may be reclassified as a drug, since drugs are not covered by the clause. Or perhaps a new sweetener will be approved for marketing; some are already waiting in the wings. □

Research dives probe the Galapagos Rift

An exciting and significant field of scientific exploration in the last four years has been a series of expeditions taking researchers down in submersibles to witness firsthand the centers of seafloor spreading where giant crustal plates, on which the continents and oceans ride, are slowly growing. Such observations were made on the Mid-Atlantic Ridge in 1974 and the Cayman Trough near Cuba in early 1976.

Now the first half of a near-identical series of dives has been completed to the Galapagos Rift in the Pacific Ocean west of northern South America. A record 11 dives in 11 days were made in the 23-foot submersible *Alvin*. Further observations were made by a camera sled towed by the surface vessel *Knorr*.

Scientists from Woods Hole Oceanographic Institution and other institutions diving to the Galapagos Rift in the *Alvin* report that they examined in detail several hot water vents on the deep ocean floor. The Mid-Atlantic Ridge, the Cayman Trough and the Galapagos Rift are all areas of spreading, where new volcanic material wells up from the earth's interior, and bulbous "pillow" structures some 30 centimeters across, plus relatively flat flows of lava, are typical. But according to Woods Hole, the Galapagos work represents the first observations of active hot water vents emerging from holes in pillow lava. The holes are "about the size of a cereal bowl."

Richard Von Herzen, just returned to Woods Hole after serving as chief scientist on board the *Knorr* during the first half of the expedition, says he believes the ease of finding the vents may be due to the relatively flat topography of the area. On the Mid-Atlantic Ridge there were mountains two kilometers high, but the highest elevation in the Galapagos is about 200 meters.

The current hypothesis for the vents, which were first spotted last summer in photographs taken during survey work by the Scripps Institution of Oceanography research vessel *Melville*, is that there are large convection currents that move sea water down through sediment and rock layers, perhaps several kilometers into the ocean floor. There it is heated, and then it rises by percolating back up through the rock and sediment layers. The scientists have also found higher temperatures in a series of curious 20-meter-high mounds that occur in straight lines about 20 kilometers south of the rift. These mounds, says Von Herzen, are also believed to be related to such hydrothermal circulation.

Leading the observers to the hot water vents was the unusual presence—for these 2,700-meter depths—of large groups of

animals clustered around them, apparently thriving in the 9°C-warmer-than-usual water. Though well-known in shallow water, this is the first known occurrence of such clusters in the deep sea. The scientists have taken to calling these clusters of animal communities "clambakes." Their existence, speculates Woods Hole marine microbiologist Holger W. Jannasch, is probably due less to the warm water than to the probable profuse growth of sulfide-oxidizing bacteria that thrive on hydrogen sulfide emerging from the springs. These bacteria then would serve as a lower link in the food chain leading up to the coral-like organisms, clams and 10 other species seen.

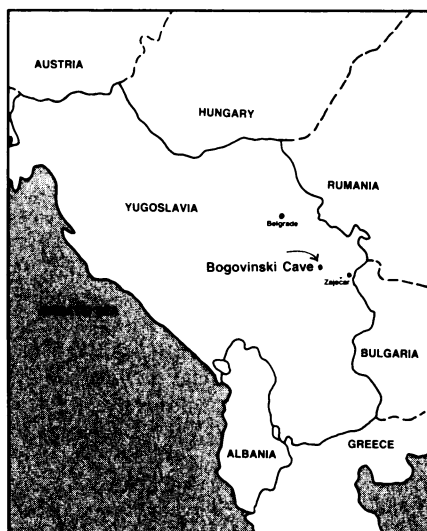
After port stop in the Galapagos Islands, the ships departed for the second half of the cruise, with Robert D. Ballard of Woods Hole on board as chief scientist. Diving resumed on March 8, and by March 16, 10 more dives had been successfully completed. □

Yugoslavs test man in isolation

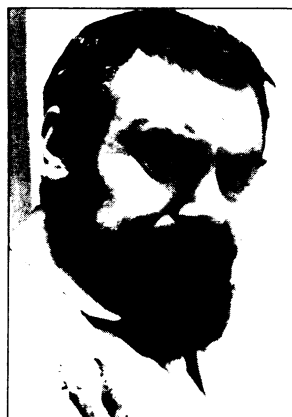
When Milutin Veljkovic emerges from the Bogovinski Cave in Yugoslavia in July 1979, he will not know what day it is or what time it is. He may not even know the season or the year. When he does come out after two years of isolation 3,200 feet below the surface of the earth—if indeed he can stay below that long—he will have set another world record and provided researchers with scores of data on the functioning of bio-rhythms in an enclosed, sunless environment.

Last week Veljkovic, Yugoslav officials and an American company participating in the research announced their plans for the 24-month underground stay. Speaking in his native Serbo-Croatian, Veljkovic described for an American audience his first world record, a lengthy underground sojourn begun six years ago in the Samar Cave in Yugoslavia. There, Veljkovic tended a small number of ducks and chickens for 15 months for experiments on the animals' reproductive behavior in the dark, uniform environment of the cave. Sealed within the extensive caverns cut by an underground river, Veljkovic reported that he suffered from intense feelings of monotony, punctuated by infrequent hallucinations. A clock and a telephone to researchers above ground provided Veljkovic his only link with the daily movements of time and seasons.

His next underground trip will focus on human physiological and psychological adjustments to the isolation of the cave. When he descends into the cave in July this year, he will not be equipped with any clocks, animals or telephones. Instead, a computer terminal will serve as



Veljkovic and site of Bogovinski Cave in eastern Yugoslavia: An attempt to remain in underground isolation for two years.



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Veljkovic's only connection to the team of researchers above ground.

Before entering the cave, Veljkovic will be subjected to a battery of tests to determine his psychological and physiological state. Similar tests will be run upon completion of the experiment in two years. During that time, Veljkovic will continually run tests on urine samples, air temperature, humidity, blood pressure, skin temperature and other factors. In addition, he must record changes in his psychological state by answering various questionnaires. The researchers also want to test the stability of his language structure during the isolation. Finally, records must be made of his sleep-awake cycle.

Research on the experiment is being undertaken by a number of Yugoslav scientific institutions, including the Institute for Nuclear Science, the Institute for Experimental Phonetics and Pathology of Speech and the Institute for Biochemistry of the Belgrade University Medical School. The team is interested in the synchronic interaction of the many variables affecting Veljkovic during his stay. Through a controlled situation such as this, the researchers hope to isolate and identify the factors controlling human adjustment to a new environment. □

Return of Adonis: An asteroid refound

In 1936, astronomer Eugene Delporte of the Belgian Royal Observatory discovered an asteroid which he named Adonis. It was only the second known asteroid whose orbit carried it inside the orbit of the earth, so it was an object of considerable interest. But in the four decades following Delporte's discovery, no one ever saw it again. Until last month.

Charles Kowal of the California Institute of Technology has found a number of interesting objects in the sky in recent years, among them the 13th and yet-unconfirmed 14th moons of Jupiter. And on Feb. 22, in a photographic plate taken eight days before, with the 122-centimeter Schmidt telescope at Palomar Observatory, he refound Adonis.

It is a dim object—only 16th magnitude on Kowal's plate—so it is an extremely difficult one to spot. Although Adonis's orbital period is only about two and a half years, according to Brian Marsden of the Harvard-Smithsonian Center for Astrophysics, it was 1943 before suitable observing conditions came along, but the elusive asteroid could not be found at that time.

Kowal sought the object using predictions made by Marsden based on the original observations by Delporte and others spanning a two-month period. Calculations based on Kowal's plate indicated that Adonis was three days late in reaching perihelion, a conclusion that enabled Marsden to follow the orbit's evolution backwards and determine that Adonis's motion had been deflected slightly by a close encounter with Venus in 1964, and its orbit thereby somewhat altered.

The rediscovery was part of a deliberate effort by Kowal to locate some of the many "lost" objects in the solar system. In January, for example, he spotted a piece of comet Taylor, which broke in two in 1916, the year after its discovery, and hadn't been seen since. In that effort, Kowal used predictions provided by Nikolai Belyayev and V.V. Emel'yanenko of the Institute for Theoretical Astronomy in Leningrad, which were in turn based on calculations published half a century before by Hamilton M. Jeffers of Lick Observatory.

Asked whether he has a "pet object" that he'd like to find in his search for the solar system's lost, Kowal has a ready answer: comet Swift-Tuttle, discovered in 1862. Since it takes about 120 years (give or take a few) to circle the sun, this will be its first visit since that time, so it can't really be considered "lost." But there is nonetheless a compelling reason for interest: Kowal—and others—believe Swift-Tuttle to be the parent body of the annual Perseid meteor shower, which occurs in August. □