The Dead Sea turns over

Most lakes go through a seasonal cycle called turning over. In the fall, the lake surface cools and becomes more dense. The cooler, oxygenated upper layer then sinks, mixing with the warmer, hydrogen-sulfide-laden bottom water. This annual event is a biological rejuvenation of the lake; the mixing redistributes dissolved oxygen and nutrients.

In tropical regions, however, some lakes never turn over. The surface layer never cools enough to sink, and such lakes become permanently stratified. Their stagnant bottom waters provide a convenient study of the chemical processes that occur in a reducing, or nonoxygenated, environment.

Until recently, the Dead Sea in the Great Rift Valley of Israel was the prime example of a permanently stratified lake. The chemical processes that occurred in its sharply layered, highly saline waters — about nine times more saline than the ocean — were of great economic and geochemical interest. Now, Joel Gat and co-workers from the Weizmann Institute of Science in Rehovot, Israel, report that the Dead Sea has turned over. And, of importance, the event was wrought by human hand.

Throughout most of its history, the upper layers of the Dead Sea have been fed by the Jordan River. The differences in temperature and, in particular, in salinity (288 grams per liter in the upper layer and 324 grams per liter at the bottom) kept the two layers separated like oil and water. In the 1950s, however, the Jordan River was diverted for agricultural and industrial uses. Because it went unreplenished, the relatively fresh upper layer began to evaporate. The salt concentration of the upper layer began to approach that of the bottom. In February, the two layers reached the same salt concentration and mixed. The researchers could no longer detect any stratification of temperature, salinity or trace metal concentration.

Despite the specter of human intervention, the event will give scientists a first-time opportunity to witness the changing chemistry of a long-stagnated lake. The redistribution of dissolved oxygen, in particular, will cause different salts to precipitate out and will create a more oxidizing environment. According to one researcher, Gerald M. Friedman of Rensselaer Polytechnic Institute in Troy, N.Y., one possible effect might be the decline in precipitation of gypsum, a chemical mined for its use in building materials. One immediate effect has been the disappearance of the characteristic rotten-egg odor of hydrogen sulfide, a major product of a reducing environment. A complete report of the researchers' results has been submitted to SCIENCE, according to Friedman.

The once permanently stratified lake may now become a permanently homogenous one due to the lack of an influx of fresh water and the stable temperature in the Dead Sea area. One possibility — again by human intervention — exists for a return to a layered state. The Israeli government is considering constructing a canal that would connect the Mediterranean Sea and the Dead Sea. The resulting giant waterfall (the Dead Sea, at 400 feet below sea level, is the lowest spot on earth) would create a vast hydroelectric power source. If the plan is adopted, the inflow of Mediterranean water will once again create a less salty layer. □

Viking: Stretching out and winding down

After nearly one and a half of the 688-day Martian years, project Viking is winding down.

It had been three months since the Viking 2 lander last communicated with earth from its northerly site in the Plains of Utopia, when last Saturday it finally sent a series of photos and weather data that had been piling up on its tape recorder. The lander long ago lost its ability to radio earth directly, so it must depend on the one remaining orbiter (the other ran out of gas last July) to relay its messages, which can happen only when the orbiter passes almost overhead. The rest of the taped data are to be played back on May 30, says Kenneth L. Jones of Jet Propulsion Laboratory, and with the surviving orbiter getting low on its own fuel, that might have been the end of Lander 2. Flight controllers at JPL may have enabled another relay, however, by speeding up the rate at which the orbiter precesses around Mars, so that it will fly over the landing site this summer instead of in October or November.

The Viking 1 lander, meanwhile, has been operating since early March in an automatic mode that will provide one picture a week as long as the craft's nuclear power supplies hold out. (This could be years, prompting the mission's informal tagging as the "Eternal Mission.") Only one of these pictures has been looked at, however, since the Voyager project's Jupiter encounters have had a higher priority on the tracking-station time needed to play them back, and the one example is scrambled in a way that is causing some concern. It will take additional study, says Jones, to see whether the picture bodes ill for the lander's future.

In February, however, Lander 1 did discover a second of the slight slumpings in the Martian surface material that are so far the only distinct surface changes visible to the lander cameras. The cause is still undetermined, says Jones, but the phenomenon is at least more than a one-time thing, suggesting a need to study possible processes that may have created — and erased — other examples. □

Threat seen to rules on hazardous wastes

Several amendments to forthcoming regulations being developed under the Resource Conservation and Recovery Act threaten to seriously weaken if not cripple the U.S. Environmental Protection Agency's ability to stem pollution from hazardous wastes. Most notable among RCRA amendments in bills just approved by House and Senate committees are those that exempt oil- and gas-drilling muds and brines from hazardous-waste regulations for at least two years, and those that exempt indefinitely materials in water received by or discharged from wastewater treatment facilities.

Spelling out its concern that regulations proposed by EPA "could have a significant economic impact on domestic oil and gas exploration and production," the Senate Committee on Environment and Public Works suspended RCRA coverage of closed waste-disposal sites containing drilling muds and brines in a bill dated May 15. The suspension would be conditional on a proviso that other state and federal programs:

- provide a mechanism whereby affected sites could be located at some future date, and
- ensure compositional analysis of wastes at each site prior to its closure.

Estimates of the annual cost to comply with the regulations have run as high as $45 billion (see p. 350). But the main reason advocates of the bills (a similar version passed the House Commerce committee) give for the exemption is that the materials have not been proved hazardous. EPA disagrees, calling the move political. Citing a long history of costly contamination from drilling muds and brines to ground- and surface water — established in court suits and government studies — EPA claims there is ample evidence of a hazard. Regardless, the congressional committees now ask for two years of additional studies before EPA can propose including these materials under RCRA.

But it's the other amendment EPA considers most devastating. It would exempt any lagoon, holding pond or waste-storage area from hazardous-waste rules — even their "imminent hazard" provisions (see p. 350) — if it would ultimately feed into a wastewater treatment plant. Wastes frequently spend years in pre-treatment lagoons, often contaminating the air, groundwater and surface water with hazardous industrial chemicals during that time. Originally responding to pulp, paper and chemical interests that claimed RCRA was too restrictive and would duplicate other laws, Al Swift (D-Wash.) now admits his counterproposal creates a "broad" loophole over which EPA may have no regulatory authority. □