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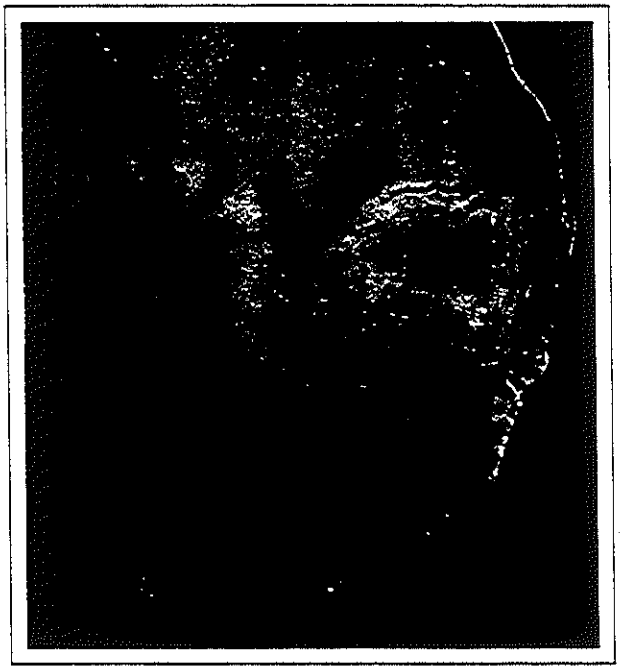


ARTICLES

DEPARTMENTS

The cover: A gray-phase screech owl at its winter roost in a hollow oak, photographed by J. Michael Fuller.

ESSAY

TRUSTING WATER

PETER STEINHART

NOTHING SO ARRESTS our eyes as water. We stand by mountain lake or ocean shore and grow strangely wordless. We gaze into the flow of a river—our thoughts darting over the shallows and swimming darkly where the water curls into the shade of trees or wraps around a sunken log—and we feel the past turning into the future and sense the eternal return of molecule and music. We hear song in the babble of a brook, the sigh of surf washing down a beach, or the gentle lap of waves against the side of a drifting canoe. We lose our thoughts in liquid motion and the dazzle of water-tossed sunlight. Such things take our minds like a magnet. We are powerless to turn away. It is something inbred, like the pull of rustling grass on a hungry coyote or the claim of cold weather on a goose.

Water is the most improbable of substances. We now know that water *exists* on many of our sister planets, but we wouldn't recognize much of it. Pluto and Mercury don't seem to have any water at all, nor even true atmospheres—probably because of the weakness of gravity on Pluto and of the magnetic field on Mercury. On Mars and Jupiter, water exists mainly as ice. The oceans on Jupiter and Saturn are made of liquid hydrogen, not water. Uranus may have a scalding sea of water and ammonia. Only Neptune seems to have a deep ocean of water, and even there it may be mixed with liquid ammonia. Earth alone seems to form life-filled seas, puddles, ponds, raindrops, and rivers.

And on Earth, water is miraculous. It sits shapeless in reservoirs, straining, energetic, singing at the shores. It has life and energy, but no skin or bones. It ignores the rules that bind other substances. Unlike other liquids, water expands when it freezes, so ice floats, saving the planet from the stillness that would prevail if it sank and froze the oceans from the bottom up. Hydrogen atoms bond so firmly that parting them requires a relatively high heat, so water is unusually stable. What evaporates and soars invisibly skyward today will fall tomorrow as rain or snow. Water is always arriving or departing. It is the restlessness of the Earth.

To look at this improbability is to conclude that there is a purpose in liquidity. If there is such a purpose, it is life. Because hydrogen bonds so readily, water sticks to itself and to other surfaces. It forms ponds and puddles and rivulets. It climbs the walls of glasses and cells and the veinous passages evolved by plants and animals to wick up moisture and transport it to leaves and fingers and minds. It is

because water adheres so convivially to things that it is the most universal of solvents. It dissolves and redistributes sugars, alcohols, organic acids, phosphates, and nitrates. It freights the molecules essential to life through the leaves of plants and the blood of animals. No life we know of can survive without it.

I suspect we watch water because it recalls our past. We hail from water in an evolutionary sense, via the lungfish and mudskippers whose experimental breaths of air led ultimately to legs and wings and human beings. We also hail from water in a historical sense. Before the age of pump and pipeline, we all lived in camps and villages hard by lakes and rivers.

Possibly before that we lived *in* the water. British marine biologist Alister Hardy once held that human beings might have descended from aquatic ancestors. It would, he said, explain such things as the fact that humans alone among primates have subcutaneous fat like marine mammals, the human need for iodine and salt, the human inclination to high protein intake, and the arrangement of human body hair in patterns that suggest streamlining to aid in swimming. Our erect posture, he added, might have been pioneered by ancient ancestors wading into deep water.

There is much on our minds when we gaze into water. We see there intimations of enormity and mystery. Poet Merrill Moore suggested, "Turn the water on; stick your hand in the stream; water will run and kiss it like a dog; or it will shake it like a friend; or it will tremble like a woman sobbing." Philosopher Lin Yutang held that water "mirrors and reflects all creation and its myriad changes and washes away all impurities." Watching a river flow, he wrote, "I lose myself in the universe, becoming a part of the vast creation, go back to the age of the nebulae and mingle with the inaudible and the impalpable."

We have thought much about water, and we have come to expect it to carry purposes and impulses that are broader, deeper, older, and more honest than any we have designed. We see in its transparency the absence of connivance and ill will. We see in its coolness and simplicity the promise of benefaction. The poet Samuel Woodworth saw water as "the emblem of truth overflowing." If nature is fond of us, it says so with water.

BECAUSE WATER is so basic to life, we see it as the very calibration of what is clean and clear. No substance is so connected with rebirth and hope. The baptized are washed in water. So are the newly born and the just-deceased. We wash our food, often whether it needs it or not. The German essayist Christian Enzensberger declared that water "will willingly and unresistingly absorb anything and everything, even the most unpleasant. 'A little water clears us of this deed,' says Lady Macbeth after the king's murder; and a man who has just bathed feels in his own words *newborn*."

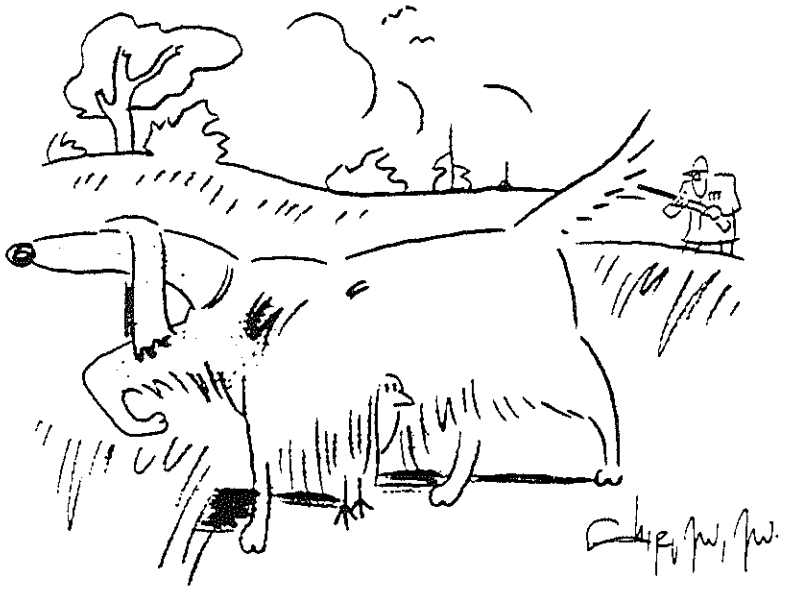
Cleanliness is another word for trust. But increasingly we are losing our trust in water. For decades we have dumped novel chemicals into our waters, chemicals we have created or concentrated into unnatural densities. Living tissues haven't yet evolved ways of dealing with these chemicals, so the substances cause cancer, birth defects, genetic and neurological damage, kidney and skin disorders. The chemicals are increasingly evident. Twenty percent of the nation's public water systems now contain traces of volatile organic compounds. In western wildlife refuges, selenium causes birds to be born without limbs or eyes. Newspapers warn of tainted wells and leaking landfills.

The worst news may be that, while for years we sought to keep such substances out of the water, we are now allowing thousands of chemicals in drinking water. For example, even though the Environmental Protection Agency believes there is no safe level of exposure to trichloroethylene (TCE), a common industrial solvent, it makes no rules prohibiting the consumption of water containing TCE, and communities all over the nation drink TCE in tapwater. In some southern California communities, the water contains more than the five parts per billion TCE EPA *suggests* should be the maximum we drink. TCE has turned up in thirteen percent of the community water supply wells in Nassau County, New York. It has been found in concentrations of 1,400 parts per billion in wells in Pennsylvania.

Trichloroethane (TCA) is a related solvent. Tests suggest it causes cancer in mice, and epidemiological studies implicate it in human birth defects. But because the cancer evidence is not incontrovertible, we put TCA into hairsprays and the correction white-outs used by office secretaries. It's even put into some of the floatants so widely used by the purest of purists, dry-fly fishermen, who are usually the first to decry any potential pollution of their pristine trout streams.

TCE and TCA are but two of more than 65,000 chemicals brought into commercial production since 1945. Only a few of them have been screened for health effects, and EPA has no plans to try to evaluate them all. We have standards for only a few in drinking water.

We haven't begun to investigate what happens when two or more combine. Evidence suggests, for example, that TCE causes more kidney damage when people are also exposed to polychlorinated biphenyls (PCBs). Nor do we know what happens to the chemicals when they are exposed to bacteria in soils. Conventional wisdom once held that they broke down before they reached the groundwater. But there are more than 2,000 wells in California contaminated with dibromochloropropane (DBCP), a pesticide manufactur-



ers assured us would decompose in soil. And an EPA study suggests that TCA may biodegrade in soils into vinyl chloride, a potent carcinogen.

PUBLIC OPINION polls and the behavior of citizens suggest that the public is losing its trust in water. In Los Angeles, seventeen percent of the people now drink bottled water. In sections of San Jose, more than half the citizens spurn tapwater and either buy bottled water or install home purification systems.

Increasingly, however, government and industry tell us to shut up and drink. Says Ted Smith of the Silicon Valley Toxics Coalition, a California clean-water group, "There's a very serious effort to get people to accept contaminants in drinking water the way people have come to accept contaminants in air."

The effort consists largely of putting economics ahead of biology. The EPA once spoke much of the need for "risk assessment," or the study of the toxicity and exposure rates of chemicals. But risk assessments were manipulated. For example, when EPA did an initial risk assessment on particulate standards in air, it showed that weakening existing standards would increase the health risks. The Office of Management and Budget then told EPA to change the assumptions made in the risk assessment in order to lower the estimated risk. And after an epidemiologist, a toxicologist, an industrial hygienist, and a statistician working for the Occupational Safety and Health Administration found formaldehyde to be a carcinogen, three economists from OMB reviewed the OSHA data and declared formaldehyde to be merely an irritant.

In bowing to the superior political might of OMB, EPA has begun to talk less of "risk assessment" and more of "risk management." Risk management assumes that, after a certain level of effort to clean up the water, additional effort will not be worth the loss in jobs and profits. It also assumes, according to an EPA publication, that "the number of potential risk targets is very large in comparison with the number we can realistically pursue," and that we must therefore choose to fight some threats and concede others. It's a view industry also touts. An industry-funded Clean Water Task Force in California declares the drinking water in Santa Clara County to be clean; but when asked how clean is safe, the group replies, "Safe enough at what cost?" or, "Safe enough compared with what other exposures?"

We are increasingly replacing risk assessment with risk management. OMB recently demanded that EPA lower standards for maximum contaminant levels in drinking water because its economic analysis held that the costs were too high. EPA recently wrote an integrated environmental management plan for the Santa Clara Valley in which it apologized for knowing little about the neurological effects of chemicals already in the water, little about their effects on the unborn, how much is already in the water, how rapidly they move through soil, or how thoroughly existing hazardous materials management ordinances will be implemented. The plan concluded that because we know more about the risks of automotive air pollution, it makes more sense to fight that.

Industry now speaks not of risk management but of "risk communication." It employs public-relations specialists to tell us that "there is no such thing as a risk-free world." The implication is that chemical pollution is as natural a risk as, say, lightning or allergy to pollen, and that we ought to live with the chemicals in the water. Such assurances ask us to change our definitions of cleanliness and trust. If they succeed, they will save water as an industrial resource but effectively prohibit its use as a spiritual resource.

What we do to water is part of a revolution in the way we look at ourselves and the world. Human beings are, in a sense, bags of water which evolved spine and intelligence enough to walk around and manipulate other forms of life and matter. It is not hard to imagine that, when we stop to look into the sea or listen to a mountain creek, the attraction we feel is the water inside calling to the water outside, two ponds, perhaps, stopping by the road of time to trade the news.

As we increasingly distinguish between the water within and the water without, as we define human liquidity as clean and the rest as risky, we alienate ourselves from what lies outside our skins. We draw deeper into our own uncertainty and isolation and distrust of the world. If we lose the view that water is a miracle, we lose also some of our ability to look upon the world around us with passion and gladness. And that may be a loss greater than any that government and industry have calculated into their bromidic equations.