

SCHWARTZREPORT

Trends That Will Affect Your Future. . .

Water . . . Water . . . Part One: Hot and Salty

| By Stephan A. Schwartz |

The SchwartzReport tracks emerging trends that will affect the world, particularly the United States. For EXPLORE, it focuses on matters of health in the broadest sense of that term, including medical issues, changes in the biosphere, technology, and policy considerations, all of which will shape our culture and our lives.

Most of us know very little about water. It comes in two types, salt and fresh. It has two hydrogen atoms and one oxygen atom and is written H_2O . In the Dead Sea and the Great Salt Lake, you can float. A random collection of facts—like knowing a dozen Latin tags—is usual, even for many in science or medicine. For most Americans, access to water is a given. Like the right to vote, it seems a birthright. And when you turn on a tap, do you ask whether you can drink the water that comes out? Probably not.

I want to suggest you consider expanding your world view. And that you follow the rapidly evolving water story, because whether you do so or not, water is about to change your life and will profoundly affect the lives of your children and grandchildren in ways both great and small. Water matters to our lives at every level, from the personal to the geopolitical. Its role in global warming, as well as its atomic structure and how it interacts with consciousness, all matter. Water has always driven destiny and is driving ours now. This is my first column on water. There will be others. I believe water will be a far bigger factor in our future than petroleum.

A little baseline data: Water covers over 70% of the earth's surface, and 97% of it is salt. Two percent is frozen into glaciers

and ice caps. Only one percent is drinkable, and half of that comes from below the earth's surface. Globally, water is one large intricately integrated system.

The 97% constitutes a world ocean that is rapidly changing from the sea of your youth. It is more acidic and warmer, and these changes have been quietly altering not only the temperature but the molecular structure of the ocean.¹ And it is unequivocally caused by human activity. A scientific, if not political, consensus has emerged about this, whose central hypothesis is that this global system is very quickly moving into crisis.

The interaction at the interface between the water and the air above results in the sea absorbing carbon. Between 1800 and 1994, according to a study by the National Center for Atmospheric Research in Boulder, Colorado, the world ocean absorbed approximately 118 billion metric tons of carbon—roughly half the amount produced by fossil fuel combustion. One of the effects of this has been to make seawater increasingly acidic,² which in turn has resulted in a decrease of carbonate ions, an essential construction component of marine life used by all manner of ocean creatures for everything from building coral reefs to shells.³

Richard Peely, one of the authors of the National Center for Atmospheric Research study, describes the change this way: "This is leading to the most dramatic changes in marine chemistry *in at least the past 650,000 years* [emphasis added]."⁴

According to Mark Jacobson, a Stanford assistant professor of civil and environmental engineering, between 1751 (the beginning of the industrial age) and 2004, surface ocean pH dropped only from approximately 8.25 to 8.14.⁴ By the end of this century, James Orr, a scientist at the Climate and Environmental Sciences Lab-

oratory, says the change could be another 0.3-0.4 units.⁵

Chris Langdon at the University of Miami, and one of the National Center for Atmospheric Research report coauthors, explains, "This threat is hitting coral reefs at the same time that they are being hit by warm-inducing mass bleaching events."³

The implications of such a change are not fully understood but are generally recognized to be fairly catastrophic. This much of the scenario is already clear: coral reefs throughout the world, as a result of temperature change and increased acidity, are dying, and the ecosystem that depends upon healthy reefs is severely disrupted and getting worse. How worse can it get? The journal *Geology*, in describing exactly the combination of increased temperature and increased acidity, says it may have contributed to the Permian extinction 250 million years ago, when about 95% of the ocean life became extinct—the worst mass extinction on record. Not good.

But acidity, as should already be clear, is just part of the problem. Temperature is no less an issue. In addition to the problems with reefs, there is also the problem with ice. Ice melts.

Only as recently as this past October were scientists finally able to establish by actual measurement, not modeling, that human-induced climate change is the cause of the melting of the Antarctic. The British Antarctic Survey demonstrated this connection in their study of the Larson B ice shelf. In 2002, a section of the shelf collapsed and broke off that was 3,250 square kilometers (1,255 square miles)—bigger than the country of Luxembourg or the state of Rhode Island. The British Antarctic Survey study showed that global warming was the problem. Lead author Gareth Marshall, explaining the study, said, "This is the first time that

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anyone has been able to demonstrate a physical process directly linking the break-up of the Larson Ice Shelf to human activity.⁶

Similarly, the Greenland ice sheet, up to three miles thick in some places, as big as Mexico, and weighing so much that it literally presses down the tectonic plate on which Greenland rides, is melting at a rate greater than even the most aggressive computer models had predicted—according to the satellite gravity measurements published by NASA's Jet Propulsion Laboratory, an annual loss of up to 52 cubic miles a year. Greenland's ice is melting twice as fast as it was five years ago, even as the ice sheets of the Arctic and the Antarctic are also shrinking. The amount of freshwater flowing into the ocean from melting has almost tripled. "We are clearly seeing the effects of climate change starting to kick in," says NASA glaciologist Jay Zwally, who has studied and worked on the ice for decades.⁷

Next to the Antarctic ice sheet, Greenland's ice cover constitutes the largest reservoir of fresh water on Earth. Approximately 10% of the world's fresh water supply is locked up in this ice. The increasing flow of meltwater, most coming from glaciers on Greenland's eastern coast, is already beginning to change the saline composition of ocean water. This holds profound implications for Northern Europe, which relies on the relatively warm sea currents that go up the coast of nations such as France, England, and Scotland to maintain a moderate climate. The reduced salinity will weaken or even block these warm currents, producing the seemingly paradoxical effect of causing the weather to become colder than normal while the rest of the globe warms.

Researchers led by Joey Comiso of NASA's Goddard Space Flight Center in Greenbelt, Maryland, found that the amount of ice covering the Arctic has declined by six percent over each of the last two winters, compared to a loss of merely 1.5 percent per decade since 1979.⁸ Arctic sea ice has shrunk by a quarter in area and half in thickness since 1978.

Should all of the ice sheet thaw as some models predict, the meltwater could raise the sea level 21 feet. Even the three feet that conservative projections propose would swamp the coasts of every nation in the world. To understand what this means, hold your hand three feet off the ground and imagine a plane at that level reaching out in all directions. Imagine the water being perceptually warmer 30 years earlier. A billion people around the world live along coastlines that will be inundated by just that three-foot rise. At 21 feet, whole countries disappear. America's port cities will see some of their priciest real estate go beneath the flooding ocean—New York, Philadelphia, Baltimore, Norfolk, Miami, San Diego, Los Angeles, and Seattle all will be radically altered. Florida will be a fraction of its former self. The rising waters mean higher tides, even as the warming waters generate more powerful weather events—the strength of hurricanes has already been linked to warm water.

All writers know to make their story personal, so let me end with this: Eskimos with air conditioning sounds like the start of a comedy routine, but the truth is neither funny nor reassuring. Temperatures in the Arctic are rising twice as fast as the rest of the world. Last February when the temperature should have been -30°C (-22°F), it was actually 9°C (48.2°F). The Inuit have become so dependent on air conditioning that the Canadian government has slashed electricity costs so that the low-income Inuit can afford the air conditioning to make their winter-designed airtight homes livable in the heat.⁹

Salmon have begun to appear in their waters, a fish for which the Inuit had no name. Just as they had no names, never having seen them, for the barn owls and robins that now fly in the Arctic air.

In Greenland, farmers have started to cultivate warm-weather vegetables such as broccoli, cauliflower, and Chinese cabbage.⁹

And all of this is but one small fragment of the story water is telling us . . .

REFERENCES

1. McClanahan T. The near future of coral reefs. *Environ Conserv.* 2002;29:460-483.
2. Sieggenthaler U, Sarmiento J. Atmospheric carbon dioxide and the ocean. *Nature.* 1993;365:119-125.
3. Kleypas J, Feely R, Fabry V, Langdon C, Sabine C, Robbins L. Impacts of ocean acidification on coral reefs and other marine calcifiers. Available at: <http://www.ucar.edu/news/releases/2006/report.shtml>. Accessed July 5, 2006.
4. Mongabay. Increasingly acidic oceans harm marine life. Available at: <http://news.mongabay.com/2006/0705-ocean.html>. Accessed July 5, 2006.
5. Orr J, Febry V, Aumont O, et al. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. *Nature.* 2005;437:681-686.
6. Doyle A. Antarctic ice collapse linked to greenhouse gases. Available at: http://today.reuters.com/news/articlenews.aspx?type=topNews&storyid=2006-10-16T144604Z_01_L16585452_RTRUKOC_0_US-ENVIRONMENT-ICE.xml. Accessed October 16, 2006.
7. Hotz R. Greenland's ice sheet is slip-sliding away. *Los Angeles Times.* Available at: <http://www.schwartzreport.net/showarticle.php?id=2136>. Accessed June 25, 2006.
8. Bryner J. Warmer winters cause remarkable loss of Arctic sea ice. Available at: http://www.livescience.com/environment/060913_arctic_ice.html. Accessed September 13, 2006.
9. Lean G. Air conditioning for Eskimos as the Arctic warms up. *The Independent.* Available at: <http://news.independent.co.uk/environment/article1222028.ece>. Accessed August 27, 2006.

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