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Diary of a Dying Planet

Global warming is more than a theory -- it's happening all over the Earth right now

By **TIM DICKINSON**

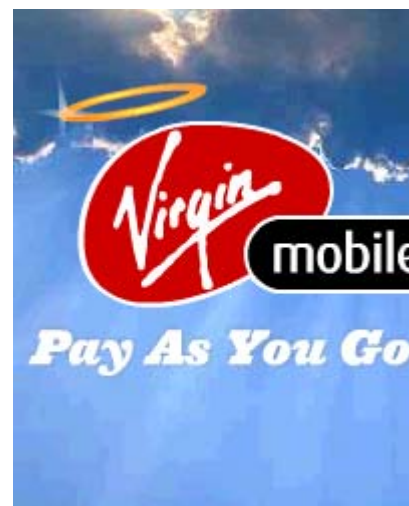
The death toll is rising
Photograph by Jonathan Barkat

The hospitals and funeral parlors of Paris could not keep up with the dead. As morgues filled to overflowing, delivery trucks were pressed into service and bodies stowed in their refrigerated bays. The city set up inflatable tents, chilled to prevent the corpses from rotting, yet still they came -- casualties by the hundreds, then thousands. In desperation, the government requisitioned a former produce market and lined the concrete floor of its cavernous warehouse with 700 army cots, arranged in tight green rows. For many victims, Rue des Glacieres -- Refrigerator Street -- became their next-to-final resting place.

The victims did not perish in a chemical leak, a train bombing, a ricin attack. The dead -- as many as 15,000 in France alone, 30,000 in Europe at large -- succumbed to something far more primordial. They died of heat. For ten freakish days last August, Paris became Death Valley, with temperatures surpassing 104 degrees. Nights offered no relief: On the murderous eve of August 11th, even the low temperature hovered near 80. And so they cooked. Hyperthermia. Elevated body temperature. Dehydration. Nausea, cramping, exhaustion. The elderly were the most vulnerable. Some literally keeled over while walking up stairwells. Others -- so weakened by a week and a half of extreme heat -- died quietly in their apartments, announcing their passing only by the stench of their decay.

In another moment in the world's history, the massacre might have been chalked up to an "act of God." But these deaths had man's fingerprints all over them. And not simply in the stifling medieval architecture of Paris, the dearth of air conditioners, the inadequate emergency response. Man may well have been responsible for the heat itself.

Global warming. It doesn't just make the world hotter -- it makes the weather more extreme. Droughts are longer, torrents heavier, flooding more severe. Heat waves are turned up to eleven. "Because of our fossil-fuel burning, we are changing the climate," says Sir John Houghton, former co-chairman of the Intergovernmental Panel on Climate Change, the United Nations scientific organization that is literally the world authority on global warming. In 2001, the IPCC forecast that Earth would soon see



"higher maximum temperatures, more hot days and heat waves" -- causing increased mortality in "older age groups and the urban poor." Two years later, Europe was hit by Extreme Summer 2003.

Houghton, a mild-mannered knight, insists he's "not a hyping sort of person." Yet as the scientist surveys the recent string of heat waves, floods and other extreme weather wracking the planet, he concludes that they are the "most obvious manifestations" of global warming in our time. "These are the biggest disasters we know in the world," Houghton says. "They cause more death, more economic loss." Little wonder, then, that Houghton offers a stark analogy to underscore the threat posed by global warming. "I have no hesitation," he adds, "in describing it as a weapon of mass destruction."

Global warming is no longer a theory, some distant doomsday. It's all too real -- and it's here now. Indeed, the only serious debate in the scientific community is not *whether* we are changing the climate, but *how much* and *how bad will it get*. "Climate-change scientists are of one mind on this," says Sir David King, chief science adviser to the British government. "We're no longer discussing whether the global warming we're observing is related to human effects. Fossil-fuel burning is leading to significant climate change. The predictions made back in the 1890s are believed to be coming true."

And so it begins. Our world is measurably warmer -- by a full degree in the last century, more than twice that near the poles -- and getting hotter. The twentieth century was the hottest of the last millennium. Nineteen of the twenty hottest years on record have occurred since 1980, with 2003 the third-hottest year ever. The warming projected by the IPCC for this century -- between 2.5 and 10.4 degrees -- is unprecedented in the last 10,000 years. As we drive our cars and burn coal to light our homes, we force more carbon dioxide, the primary greenhouse gas, into the atmosphere. CO₂ concentrations are higher than they've been at any time since giant carnivorous kangaroos roamed the earth 50,000 years ago. The IPCC concluded in 2001 that "most of the observed warming in the last fifty years" could be blamed on human activity.

Some would write off the French heat wave as a tragic blip. Ditto that 2003 was the hottest European summer in 500 years. Ditto that it came so quickly after extreme floods soaked the continent in 2002, forcing the evacuation of 50,000 in Prague. But these are hardly the only blips. In March, Brazil was hit by its first-ever hurricane. Last June, a heat wave scorching India with twenty-seven consecutive days of 120-degree temperatures, killing nearly 2,000. Flooding in China used to hit once every twenty years now recurs almost annually; a deluge last August left 4 million homeless. The American West is suffering years of record drought, and last May, 562 tornadoes struck the Midwest -- 163 more than the previous monthly record. A retractable barrier built to protect London from floods was expected to be used once every three years. In 2000, it was used twenty-four times.

"One event is not evidence," says Houghton. "But if you get these happening rather often, then you begin to trend."

Take the world's glaciers. Kilimanjaro's permanent ice cap in Kenya -- Hemingway's "Snows of Kilimanjaro" -- is melting at an astonishing rate. In fifteen years it will completely disappear. Four glaciers in Venezuela already have. "These glaciers are very much like the canaries once used in coal mines," says Lonnie Thompson, a glaciologist at Ohio State University. "They're an indicator of massive changes taking place in the climate in the tropics."

But it's not just the tropics. Ice is in retreat worldwide. Glacier National Park in Montana will be namedake-2030. In Alaska, where temperatures have soared four degrees in the last fifty years, the state's permafrost -- is thawing. Oil pipelines are sinking in the softened earth, polar bears are starving, and 2 million acres of spruce have been lost to bark beetles, thriving in the lovely man-made weather. Farther north, global warming has so broken up the polar ice cap that the Northwest Passage -- the mythical sea route to the Orient that explorers searched for in vain for centuries -- is now a reality. In fifty years it's expected to become a major shipping channel: the so-called Panama Canal North.



At the other pole, a mass of ice the size of the island of Hawaii has broken away from the Larsen Ice Shelf. As Antarctica melts, scientists point to what the world's southernmost continent looked like 50 million years ago last time the globe warmed up. "We know a period when carbon-dioxide levels were higher than they are now," says King, his voice arching wryly. "The Antarctic was free of ice, and mammals roamed the Antarctic -- you find their fossils there."

British knights and U.N. scientists aren't the only ones alarmed. The insurance industry -- which has a huge track record in accurately forecasting the threat -- expects climate change to cause an annual \$150 billion in damages within a decade. The heat wave in Europe last summer created \$13 billion in losses, the floods in China wiped out an estimated \$8 billion in homes and crops, and the U.S. tornadoes cost insurers \$3 billion. The human toll is also rising: World Health Organization estimates that 150,000 people are dying each year from increases in malaria and other illnesses exacerbated by global warming. "Today, we recognize that global warming is a fact," says Chris Wainwright, managing director of the Greenhouse Gas Risk Solutions team for Swiss Re, one of the world's largest insurance companies. "One only has to look at the extreme summer heat in Europe or the severe droughts in the West and the United States to understand that the climate has changed -- visibly, tangibly and measurably."

Given the imminent threat from global warming, even the Bush administration might be expected to launch a campaign on Heat. After all, as a candidate in 2000, George W. Bush vowed to "establish mandatory reduction targets for carbon-dioxide emissions, saying he would make the issue a top priority."

Once Bush became president, however, reducing carbon emissions was the first promise he broke -- and his record has been all downhill from there. Only two months after taking office, the administration withdrew from the Kyoto Protocol, the global treaty that the United States signed in 1997 to set strict limits on greenhouse emissions. Instead, Bush instituted a voluntary emissions plan that has been an abject failure: So far, only fourteen countries have pledged to curb their CO2 output.

The president also folded the interagency group that monitors climate change into the Commerce Department, led by Secretary Don Evans, a former oil and gas executive. And he called for additional climate research that would delay any meaningful regulation for at least another decade. "We do not know how much our climate will change in the future," Bush declared in a speech in the Rose Garden. Such statements spurred an open letter signed by twenty Nobel laureates, who blasted the administration for having "consistently sought to undermine public understanding of man's role in global warming. (Bush's science adviser refused to be interviewed for this article.)"

Then the censorship began. In September 2002, the Environmental Protection Agency released an air-quality report that - for the first time since 1996 - included no mention of global warming. Seven months later, the U.S. House made wholesale revisions to the climate-change chapter of the EPA's "Report on the Environment," pulling down human influence, deleting references to the health impacts of global warming and inserting climate data funded in part by the American Petroleum Institute. The EPA withdrew the altered chapter, acknowledging an internal memo that it "no longer accurately represents scientific consensus on climate change."

Even some Republicans have been astounded at Bush's meddling in EPA affairs. "What seems constantly evident with George W. Bush is that EPA is expected to take its marching orders from the White House on regulator matters," says Russell Train, who headed the agency under Richard Nixon and Gerald Ford. "During my time, it never had that happen. Never." Train, a recipient of a Presidential Medal of Freedom from the elder Bush, criticizes the administration's approach to global warming "totally wrong" and "irresponsible."

Bush can rely on key Republicans in Congress to block any efforts to curb pollution and stave off disaster. Sen. James Inhofe, chairman of the Environment and Public Works Committee, dismisses global warming as a "hoax." In a speech last July, Inhofe compared the IPCC to the Soviets and extolled the virtues of what he called a "Climate-enhanced" world. "It is my fervent hope," he concluded, "that Congress will reject the prophets of doom who peddle propaganda masquerading as science in the name of saving the planet from catastrophic disaster."

As Inhofe railed against global warming from the Senate floor, one "prophet of doom" was quietly working to defend America from global warming. Now in his eighties, Andrew W. Marshall is so renowned for his visionary powers that his admirers call him Yoda. But Marshall doesn't work for an environmental group such as Greenpeace, or even for what Inhofe calls the "Gestapo bureaucracy" of the EPA. He works for the Pentagon

As director of the Office of Net Assessment, a small branch of the Defense Department charged with identifying

long-term threats, Marshall had been worried about worldwide climate reports ever since the military's disaster experience in Somalia. In 1993, a U.S. helicopter was shot down in the capital city of Mogadishu, and the body of an American soldier was dragged through the streets. What was the U.S. doing there in the first place? Guaranteeing a famine-relief effort that had been precipitated by a severe drought. If localized dry weather could lead to *Black Hawk Down*, the Pentagon worried, just imagine what kind of trouble a sudden shift in the global climate could bring.

So Yoda called on an old friend, Peter Schwartz, co-founder of a futurist think tank called the Global Business Network, in Emeryville, California. He asked Schwartz to study current warming trends and answer a simple question: What's the worst that could happen?

The headquarters of the Global Business Network looks like some mysterious dot-com offshoot of the CIA. A large "X" is all that marks the entrance of a blue warehouse, secreted away in an aging industrial district across the bay from San Francisco. Imagining the worst apparently gets you the best: The GBN parking lot is home to a Mercedes C230 Kompressor, an Audi TT, a new T-bird and a convertible Z3.

Peter Schwartz is a compact man with lively eyes and an air of importance. A rocket scientist by training, he researched climate change at Stanford Research Institute. Drawing on knowledge of past climate shifts, Schwartz spun out the most dire scenario he could defend scientifically. Starting tomorrow, he assumed, the world warms faster than even the most alarming predictions -- by as much as half a degree a year. The heat sets off a chain reaction. Droughts spark catastrophic fires, which release still more heat-trapping CO₂ into the air. Increased water vapor in the atmosphere traps still more heat. Superstorms break dikes in Europe, and coastal cities such as the Hague in the Netherlands become uninhabitable. Levees break in California, creating an inland sea and disrupting the water supply in Los Angeles.

Then Schwartz drew upon one of the least intuitive impacts of global warming: the idea that turning up the thermostat could lead, perversely, to a cooling crash. As high temperatures melt ice at the North Pole, the resulting cold water could disrupt the Gulf Stream. This conveyor of warm water is what gives Europe its temperate climate. Flip off the Gulf Stream, say climate scientists, and the continent hits a deep freeze. Mainstream projections shouldn't happen before 2100; Schwartz envisioned it happening in 2010.

As Europe plunges into a Siberian chill, the rest of the globe continues to sizzle. Sea levels rise. Megadroughts strike worldwide, spawning dust bowls and destroying crops. The world suffers from "catastrophic shortages of water and energy supplies." Earth's "carrying capacity" -- military-speak for the number of people it can feed -- drops radically. Given the deadly shortages of food, civilization erodes as "constant battles for diminishing resources" become the norm. "Every time there is a choice between starving and raiding," Schwartz writes, "humans raid." America turns inward, attempting to shield itself from the flood of refugees from the drought-stricken Caribbean. Hostilities arise between the U.S. and Mexico as both countries jockey for water from the Colorado River. Europe considers invading Russia for its food, and Japan eyes Russia's oil. Africa starves. Bangladesh is unlivable. Famine drives chaos in Asia. "Envision Pakistan, India and China - all armed with nuclear weapons - skirmishing at their borders over refugees, access to shared rivers and arable land," the scenario suggests. "In this world of warring states, nuclear-arms proliferation is inevitable."

"Once again," the report concludes starkly, "warfare would define human life."

This apocalyptic vision is not a prediction, Schwartz insists, but rather a scenario at the "outer edge of plausibility." To him, the report represents a climatic version of September 11th -- a "low-probability, high-impact event" that can change the world. But while he isn't convinced that the worst-case scenario will come true, he is concerned that those who focus on gradual warming "have the wrong mental map." Schwartz points to a wall-size reproduction of an antique map of North America that looms over the reception desk. It's an odd sight: California is drawn as an island. Maps like these, he says, were in circulation for 160 years before anyone caught the mistake. For Schwartz, the map offers an object lesson in the dangers of conventional wisdom.

Challenging the conventional thinking on climate change, Schwartz argues that abrupt change is more likely than gradual warming. Complex systems such as the Earth's climate "don't change state gradually," he says. "Think about igniting a rocket motor. You don't gradually go from gases flowing to things exploding. You put some fuel there, you light it and it pops. That's what happens." The same process, he says, applies to a gas such as carbon dioxide.

Schwartz says there is no doubt about what must be done to prevent catastrophe. "In my opinion, we should dramatically lower greenhouse gases -- particularly CO₂," he says. "I don't think there's any other choice -- other than civilizational collapse."

In January, some of the world's top scientists and engineers gathered at the Isaac Newton Institute in Cambridge, England, to explore how technology might slow global warming and stave off planetary meltdown. John Shepherd, who organized the conference as director of the Tyndall Centre for Climate Change Research, admits that some of the ideas being considered by scientists "are big and rather scary, and some may even appear to be crazy."

That's putting it mildly. Some engineers proposed releasing billions of metal-coated balloons to filter out the sun's solar radiation. Others want to launch "orbiting deflection systems" -- monumental mirrored satellites -- to shield ourselves from solar radiation. More-modest suggestions included erecting skyscraper-size "scrubbers" in cities across America to reduce carbon dioxide or using marine algae to absorb it. Or how about deploying a fleet of oceangoing whiplashers to churn up sea foam and spray it into the atmosphere, increasing cloud cover and cooling the planet?

If many of the ideas sound absurd, that's because they are. Shepherd argues that we need to evaluate -- and in some cases toss out -- such options as soon as possible. Otherwise, politicians may be tempted to postpone action on global warming, waiting for technology to bail us out.

In fact, the world's leading scientists agree that it's already too late to halt global warming entirely. "We can't prevent some damage," says Stephen Schneider, co-director of the Center for Environmental Science and Policy at Stanford University. Even if we were to magically end CO₂ emissions tomorrow, the gases that we've already unleashed will continue to raise temperatures for another 150 years. "That's unpreventable," Schneider says.

By starting now, however, we can still prevent many of the more catastrophic effects of global warming. If we're ambitious, we may be able to keep the concentration of carbon in the atmosphere below 450 parts per million -- only 70 ppm higher than today. That should be enough, scientists say, to prevent the Greenland and West Antarctic ice sheets from melting and eventually submerging the world's coastal areas.

Much of the industrialized world is already taking action. Even though the Bush administration withdrew from the Kyoto treaty, Europe is moving ahead with one of its central planks. Starting in 2005, firm limits will be placed on the total amount of carbon dioxide that can be released into the atmosphere. Industries that reduce their emissions can then "trade" their unused limits to other businesses like a commodity. That creates a financial incentive to reduce pollution -- and pushes industry and government alike to seek out cleaner forms of energy. In 2003, the world invested \$9 billion in wind power. Germany now generates twice as much energy from wind as the United States, and Spain will soon surpass us.

But limiting global warming will take a combination of aggressive policies -- and the full participation of the United States. "The United States emits something like one-fourth of the world's carbon dioxide," says King, the British science adviser. "There's little doubt we need American leadership." Increasing fuel standards is essential: Cars, trucks, ships and airplanes account for almost a third of global emissions. Planting more forests would help reduce carbon in the atmosphere -- China is currently spending \$8 billion to plant nearly 9 million acres of new trees. Even a little energy efficiency would help: The amount of energy burned by 9 million American homes could be saved in 19 million in Europe. Ultimately, though, putting the brakes on global warming will mean shifting to energy sources that are less destructive to the atmosphere. Even Gov. Arnold Schwarzenegger, the world's most famous Hummer fan, has called for investment in a "hydrogen highway" in California, paving the way for CO₂-free cars.

"We don't have to do it all overnight," Schneider says. "It's a problem we can fix by a whole series of consistently increasing small steps. We can get there over a generation." The problem is, the Bush administration refuses to acknowledge that humans are changing the climate, let alone mount a full-scale campaign to head off disaster. "They do not have a credible plan, either domestically or internationally, for addressing the problem," says Iain Oppenheimer, a climatologist at Princeton University. They argue that they don't want to address global warming because, he says, "because the science is shaky. And that approach is indefensible, because the science *isn't* shaky."

Even when moderates in Congress have tried to fashion a compromise on global warming, Bush has stood in the way. Senators John McCain of Arizona and Joe Lieberman of Connecticut joined forces last year to introduce a measure that would have capped carbon emissions well below the Kyoto levels and allowed industries to trade pollution rights. "Every day there is no action on this issue," McCain warned, "the more serious the consequences will be." But the White House opposed the plan, claiming it would cost \$106 billion to implement -- even though

the EPA put the price tag at only \$2 billion. The bill lost by twelve votes.

On a recent morning at Stanford University, the cool air hangs heavy in the palm and eucalyptus trees on the sprawling campus - a welcome relief from another record heat wave in the Bay Area. Stephen Schneider is at work in a concrete laboratory complex near the Rodin sculpture garden. His office, like his hair, is a perfect academic catastrophe. Few people have done more to awaken the world to the realities of global warming than Schneider, the recipient of a MacArthur "genius" grant. He knows that measures such as the one proposed by McCain and Lieberman won't stop global warming, but they would at least slow it down. And that's not not

"Slowing it down matters," Schneider says. "The faster and harder you push on the ecological system, the more harm to nature -- and the more the likelihood of surprise."

What kind of surprises?

Schneider considers the question. "If you had asked me one year ago how many people could have died in Florida by the most exaggerated heat wave -- souped up by global warming -- that I could imagine, I would have said 100,000. Chicago in 1995," he says. That year, a similar heat wave killed several hundred people. "I would have said 500 max," Schneider says, shaking his head. "And I would have been off by a factor of thirty."

"I'm talking about nasty surprises," he adds. "Are there more of those lurking? Undoubtedly."

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