

nicotine throughout their waking hours. But even here, it is not the inherent addictive power of the drug that determines the pattern of use: Pipe and cigar smokers tend to consume tobacco much less frequently than cigarette smokers do (and face much less serious health risks).

For the most part, people manage to use drugs without disrupting their lives; they find ways to balance this particular pleasure with other things they value. These are important skills to learn, since almost any pleasure can be taken to excess and it's unlikely that NIDA-funded research will find a vaccine for them all. Even if it could, who wants to live in a world where the automatic response to pleasure is not only to abstain from it but to suppress the very ability to experience it? That chilling prospect is a logical consequence of viewing drug use as a disease instead of a behavior. By giving short shrift to individual values and choices, preventive antidrug vaccines send a dangerous, demoralizing message: that we are powerless in the face of temptation. —*Jacob Sullum, a senior editor at Reason and a*

syndicated columnist, is the author of For Your Own Good: The Anti-Smoking Crusade and the Tyranny of Public Health (Free Press) and Saying Yes: In Defense of Drug Use (Penguin Putnam)

Extremes

Research at Badwater

First, the numbers: It is 10 a.m. here at the Badwater salt flats, and it's 115 degrees in the shade. At 282 feet below sea level, this is the lowest and hottest spot in the Western Hemisphere. There is a wavering road stretching 135 miles toward the 8,300-foot-high portal to Mount Whitney, the highest peak in the contiguous United States. Forming a line across the road, grinning and cheering, are 24 runners, aged 32 to 62. While their body temperatures cling to a normal 98.6 degrees, the pavement creeps up to 200, melting the rubber soles under their feet.

This is the Badwater Ultramarathon, the most demanding and extreme running race in the world. For three days, Badwater runners try to jog—though many walk, and some report having crawled—through Nevada's Death Val-

ley, up its precipitous walls and over three mountain ranges to the finish line. They try to make their way nonstop, without aid stations, sleep, or IVs; instead, they are trailed by personal crewmembers, medical staff, and the well-loved Ice Man. "If you were to set up aid stations," says race director Chris Kostman, "first of all, the people in the aid stations would die."

Something about the runners defies this logic of the desert. This race is largely a test of will; but in a place like Death Valley, the will must first cater to the body. The resulting struggle—between resilient minds and near-death bodies—brings teams of researchers to Badwater each year.

If a laboratory study were to subject people to Badwater's conditions, anyone—members of the FDA, for instance—would condemn it as medically unjust. As a result, the Badwater Ultramarathon is the ideal lab for studying the body's extremes; it's conveniently populated with voluntary subjects. Like astronauts and Sherpas, Badwater runners can offer physiological data that can't—or shouldn't—be reproduced.

Lowdown The Steve Kurtz Case

Steve Kurtz woke up on May 11 and found that his 45-year-old wife, Hope Kurtz, had stopped breathing. The paramedics, unable to revive her, called the death in to the police. When they arrived, the officers found lab equipment, petri dishes filled with what appeared to be bacteria, and several books on bioterrorism in the Kurtzes' Buffalo home. When asked, Steve Kurtz explained that this material was all for art projects and a new book.

The next day, federal agents apprehended Kurtz as he was leaving the house; they returned again the day after to conduct a search, dressed in hazmat suits and masks. According to an e-mail Kurtz later sent to a colleague, "I was detained for 22 hours by the FBI. They seized my wife's body [and my] house, cat, and car. In the house they seized computers, sci-

ence equipment, chunks of my library, teaching files... and all my research for a new book."

Kurtz is a founding member of the Critical Art Ensemble, an acclaimed five-member collective that makes art, books, and Web sites to demystify concepts like biotechnology and to question whose interests are being served by certain scientific research. In its installation *Free Range Grain*, parts of which were confiscated in the FBI search, the ensemble constructed a portable genetic-testing laboratory and invited museumgoers to bring breakfast cereal to test for common genetic modifications. They refer to themselves as "tactical media practitioners"; their writings, which are suffused with a dark, Orwellian vision of oppressive corporate and governmental power, are coyly provocative, using the language of revolution

but never calling explicitly for illegal activity.

At the time of the FBI raid, Kurtz was working on the ensemble's latest and perhaps most controversial project, tentatively called "The Marching Plague." The project simulates government biowarfare tests as part of a critique of what Claire Pentecost—a professor of photography at the Art Institute of Chicago and a longtime friend of Steve

Kurtz—calls "the militarization of public health." The harmless strains recovered from Kurtz's petri dishes included *Bacillus atrophaeus*, which lives in soil and rotting vegetation and has been used as a stand-in for its cousin, *Bacillus anthrax*, in mock anthrax attacks, and *Serratia marcescens*, a bright-red bacterium that has been used for decades to test person-to-person transmission of bacteria. Geneticist



Federal agents search Steve Kurtz's Buffalo, NY, home

They experience such severe foot trauma that they trade their shoes every few hours for larger models, to accommodate blisters the diameter of half dollars. Skewered by heat, fierce winds, and physical exertion, the runners dehydrate, cramp up, vomit, pass out, and sometimes completely lose touch with reality. If their internal temperatures rise above 104 degrees, key enzymes cease to work, and they stop sweating; without aid, they'll convulse, seize, and eventually reach coma and death as their brains shut down.

Lisa Bliss came to Death Valley this year to complete both her first Badwater run and a scientific study, using her body as the subject. As the race's 2003 medical director, Bliss had seen the remarkable differences between runners who had prepared for the race with heat training (including riding a stationary bike in a sauna) and those who had not: Members of the latter group ran a few miles and then typically came to hours later, submerged in tubs full of ice. An ultramarathon runner and a specialist in physical medicine and rehabilitation, Bliss spent much of the



The Ultra Ultramarathon:
Three days from Death Valley
to Mount Whitney, no stops

spring in her sauna—and returned to Badwater this July to swallow a pill-sized internal temperature sensor before the race. At the end of the marathon, her single set of data made its point—in 37 hours of running, her temperature had hardly strayed from 98.6. Bliss believes that hours of saunas, solariums, and running in winter

clothes teaches an ultra-runner's body to disperse the tremendous amounts of heat that would otherwise shut it down.

Her theory was intuited long before a sensor was available to provide precise data. In an age before power bars and breathable fibers, Al Arnold triggered the Badwater tradition when, in 1977, he attempted to run from Badwater to the

Robert Ferrell, of the University of Pittsburgh, allegedly obtained the bacteria for Kurtz and mailed them to him.

On the day after Hope Kurtz died, Pentecost flew to Buffalo to help her grieving friend and was confronted at the airport by two FBI agents who had a series of questions for her: Had Steve Kurtz ever advocated the overthrow of the U.S. government? Could he be involved in terrorist activities? "I can't even imagine it," Pentecost told them.

A few days later, the New York State public health department determined that the bacteria from Kurtz' petri dishes were publicly available, innocuous strains and reported that Kurtz's house posed no safety threat. "That's about the time you'd think they would have let this go," Pentecost suggests.

But on May 29, FBI agents tailed two Critical

Art Ensemble artists to the Holiday Inn across from the Massachusetts Museum of Contemporary Art (MASS MoCa), where they were preparing for an exhibit that was to have included *Free Range Grain*, and served them with subpoenas. The subpoenas—and those served on six other artists associated with the Critical

and wire fraud against Kurtz and Ferrell, who'd mailed the bacteria. The indictment charged that they'd hatched a "scheme to defraud" the University of Pittsburgh human genetics laboratory and the American Type Culture Collection—the company they obtained the microbes from—because they allegedly violated the

Urbana-Champaign, who drafted the 1989 Biological Weapons Anti-Terrorism Act, says it was intended to go after government contractors who were developing bioweapons as well as doing biodefense research, and he calls the FBI's tactics a "pretty outrageous misuse of the law." U.S. Attorney Michael Battle, the lead prosecutor, says that "the world has changed a lot since then... and the law has to keep up with the times."

Kurtz pleaded not guilty on July 8. Lawyers for Kurtz and Ferrell say that because their clients had no criminal intent, they committed no crime. Whether a jury ultimately agrees, as artists and civil libertarians hope, or whether Steve Kurtz and Robert Ferrell pay for their commitment to the artistic criticism of science with a stint in a federal penitentiary will be seen this winter. —Dan Ferber

At the time of the FBI raid, Kurtz was working on the ensemble's latest project, tentatively called *The Marching Plague*.

Art Ensemble—cited a USA PATRIOT Act article prohibiting possession of "any biological agent" that's not justified by "prophylactic, protective, bona fide research, or other peaceful purpose."

On June 29, the bioterrorism-based charges were replaced with charges of mail

rules about how to obtain, store, and ship microbes.

Both legal and scientific critics have blasted the FBI for what appears to be a heavy-handed attack on both an important artist and a working scientist. Francis Boyle, a law professor at the University of Illinois,



SUZY BECKER

Russian President Vladimir Putin, who for years has been noncommittal on the issue, has promised to accelerate ratification of the beleaguered Kyoto Protocol—after being offered a deal by the European Union that would bring Russia one step closer to admission to the World Trade Organization. A U.S. pullout in 2001 paralyzed the international climate-change treaty, but ratification by Russia would finally give Kyoto enough clout to move forward.

top of Mount Whitney. Despite Arnold's being in excellent shape and hell-bent on reaching his goal, it took him four years to develop a heat-training regimen that prevented him from nearly dying during his attempts. By the time he finally became the first solo Badwater-to-Mount Whitney finisher, his training had altered his average body temperature down a degree, to 97.6.

Recent Badwater researchers have come to examine more than physiology: The 2003 race brought Andrew Mojica, from the University of Texas, to examine the phenomenon of runners' deliri-

um. At their peaks of dehydration, physical weariness, heat exhaustion, and sleep deprivation, runners' minds manage to drift from the brutal status of their bodies. "I remember every mile I ran in Badwater... all the pains and aches, when I hurt what, when I saw the dinosaurs," says 62-year-old, seven-time finisher Arthur Webb. "I walked up Mount Whitney with a group of yetis, had pterodactyls running into my head—they're out there, just on a different plane." Hallucinations can serve as mere distractions from the body or as obstacles sent by the mind to prevent runners from pushing on. Those attempting the course have reported seeing the white line in the road rise up like a wall before them; trenches opening up in the sand; bats, aliens, and, at least once, the devil.

Much of what occurs in the bodies and minds of ultramarathon runners is so radical as to be almost counterintuitive: A two-time winner consumes nothing but Ensure and Red Bull on her 28-hour run; another runner realizes that she has intoxicated her body with water when she gains ten pounds mid-race; some of the most reliable finishers are over the age of 55. A niche sport by any account, ultrarunning has effects so bizarre that its study might well be a niche science. Perhaps that's why the researchers here are often ultra-runners themselves: Only they can instinctively hypothesize about the toll of these extremes.

Nancy Shura, who was one of the subjects in Mojica's hallucination study, sees the value of Badwater for both runners and scientists. As she admitted

before heading out to crew the 2004 race, "It is a humbling experience to be in the best physical shape of one's life and have to deal with the reality that you are really a helpless organism."

—Adeline Goss

Missile Defense The Maginot Line Metaphor

In August of 1939, Winston Churchill paid a visit to the Maginot Line, a network of French defenses built to safeguard the country's eastern border against an invasion from her perennial enemy, Germany. "My first impression, the strongest," Churchill said upon inspecting the vast expanse of forts, "is that France is protected by a shield of material and, above all, by a shield of men, which should assure you of absolute security in this region and defend you from the horrors of war." Less than a year later, of course, the German Blitzkrieg swept around the defenses and conquered France, transforming the Maginot Line from military wonder to metaphor.

The Maginot analogy will almost certainly be employed by missile-defense critics this fall when the Bush administration publicly declares operational the first piece of the nation's ballistic missile defense system. After all, similarities between the two generations of defense are easy to find: The line's elaborate network of fortresses and underground bunkers were advertised as the technological marvel of their time, just as the "hit to kill" ground-based mid-course defense (GMD) system—which by year's end will consist of six missile interceptors based in Fort Greely, AK,

Icon Dept.



Buckminster Fuller's image has been inseparable from the geodesic dome ever since his tessellated pate appeared on the cover of *Time*—and now the USPS has issued that image as a commemorative stamp. Three chemists paid the visionary engineer even greater tribute in 1985, when they christened their newly discovered carbon molecule the buckminsterfullerene. Buckyballs (as they're affectionately known) now form the basis for nanotechnology. Beat that, Elvis.