



SAGE MAGAZINE

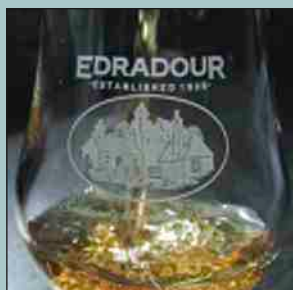
volume III, issue II



Leigha Abergel

SAGE MAGAZINE

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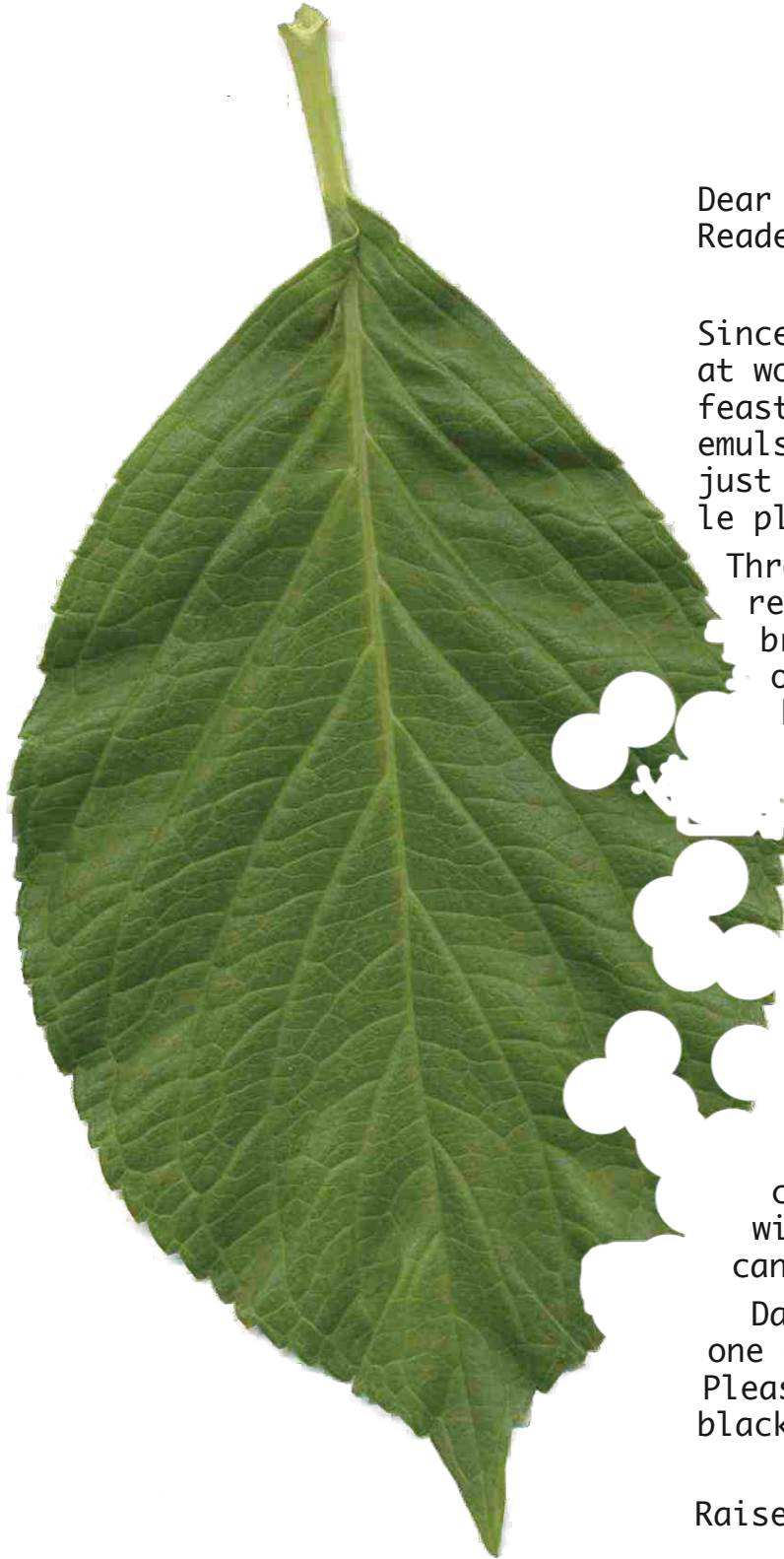
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Dear Delicious...err...I mean...Glorious Reader,

Since our last encounter, we have been hard at work cooking a feast for you, a delicious feast. We have for your consideration an emulsion of environmental delicacies with just enough acidity to whet your appetite for le plat principal!

Through this issue's journey, we briefly renounce our vegetarianism – but only briefly. We simply could not stand to offend our Australian chefs...it would have been a bit of an international faux-pas, if you know what we mean. Because, dear reader, imagine: upon our plate was a semi-sustainable and succulent slice of kangaroo. This rare bite, remouladed into a Welsh Rarebit reduction with a side of boron-tinged semifreddo, fills the coming pages with an aroma of pure culinary bliss. A mere dollop of fresh-cut-grass-infused aioli tilts temptuously over the edge of its grilled perfection. All of this layered upon a bed of shiitake fungi grown in a converted brownfields site and washed down with a dram of the greenest whiskey money can buy. Delicious.

Dare we say, oh reader, that this may be one of the best meals we have ever created. Please excuse us, as we take our final bite of black crow pie. Ah, sinful.

Raise a glass,

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Little Chemical Factories

EVA GLADEK

EVERY SPRING, biology professor Scott Strobel takes a lucky group of Yale undergraduates on a treasure hunt deep in the South American rainforest. They don't carry any faded maps; no red 'X' marks the spot. In fact, even after they've collected their booty and returned safely home, they don't know whether they've uncovered true gold or just the fool's variety. It takes some detective work in the lab to figure out if they've hit the jackpot: a miracle cure for cancer, a non-toxic pesticide, or perhaps a new renewable fuel source.

What Strobel and his students bring back from the jungle are creatures called endophytes. These organisms, usually bacteria or fungi, live symbiotically inside most plants, colonizing plant tissue without causing their hosts any immediate harm. Many have evolved the ability to secrete defensive chemicals that protect their territory from other would-be opportunistic colonists. What's special about

these "little chemical factories" is that they seem to produce an unparalleled variety of bioactive substances of potential use to people—in fields ranging from medicine to industry to agriculture.

As an example, the world's first billion-dollar cancer drug,

Taxol, was an endophyte-derived compound of the Pacific Yew tree; it was first identified as a possible cancer treatment in the mid-1960s and remains on the market today.

The potential treasure trove of chemical and genetic resources in nature is one of the most commonly cited reasons for stepping up our efforts against biodiversity loss,

which is still proceeding at an alarming rate. The Nature Conservancy estimates that every second, we lose a football-field-sized chunk of rainforest, the ecosystem home to over half of



Earth's species.

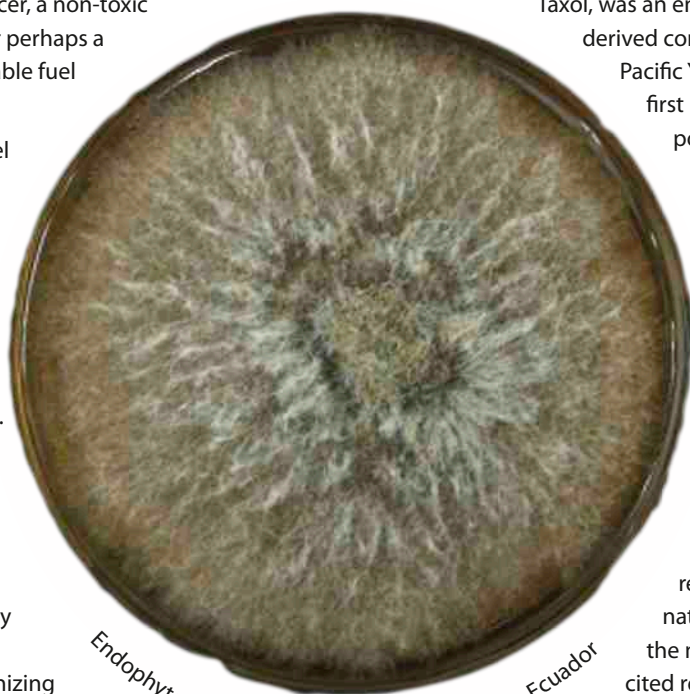
Even those who don't believe

that we are morally obligated to stem the current hemorrhaging of the biosphere are more easily convinced by the less altruistic goal of safeguarding our natural storehouse of "useful" chemical products.

But with such a vast quantity of unknown species, even restricting one's investigation to endophytes alone still leaves a dizzying number of unexplored options. There are nearly 300,000 species of terrestrial plants on Earth, all of which are likely to harbor at least one, but in many cases several, endophytic species. Only a small fraction of these endophytes—estimated at less than one percent—have been grown in a lab for study.

In March of 2007, Strobel and his group of undergraduates collected 304 plant specimens from their target region along the border of Peru and Bolivia. Genetic analyses of the endophytes in this small sample revealed a staggering amount of genetic diversity, justifying fears of what we stand to lose if we don't take action.

One of the more exciting findings to come out of that 2007 expedition was an endophytic



Endophytes isolated from the Amazon basin in Ecuador



Professor Scott Strobel collecting plant samples in Chile

fungus that appears to secrete a chemical mix surprisingly similar to diesel fuel. It's too soon to speculate about this diesel-like substance becoming the ultimate renewable energy source of the future, says Daniel Spakowicz, a PhD candidate working in Strobel's lab. At this point, he explains, the researchers are still trying to figure out what makes this organism tick. They aren't yet sure how much of the fuel-like substance the endophyte makes, nor are they certain that they would be able to manipulate it to make more. But the team is hoping to find additional wild samples of the same species on this year's expedition, which should yield more variants to study.

But despite the potential for great benefits from these kinds of fascinating discoveries, there remain some prickly issues to address.

The majority of the Earth's remaining biodiversity is concentrated, along with the

world's poor, in the Global South. A common shortcut that scientists use for making a beeline to the "good stuff" is to pay attention to native peoples' traditional uses of plants. But of course, native people rarely end up receiving fat checks from pharmaceutical companies. Through international treaties, efforts are now being made to protect indigenous knowledge and ensure that some of the wealth gets returned to the people who are trading in their knowledge or the natural heritage of their local environment for Westerners' patents. However, this has yet to become a common practice.

On the one hand, this smacks of a modern-day colonial exploitation, but on the other, there is real pressure to affordably explore as much biological territory as possible before biodiversity losses take an even larger toll. Given the dire ecological circumstances, it might be unwise to put a freeze on the already-

limited exploration efforts until we work out these difficult—and at times intensely political—issues. With luck, and perhaps some strong international treaties, however, this new Western exploitation of resources will hopefully become, like the relationship between endophytes and their host plants, a mutualistic arrangement with benefits for all.



INNOVATIONS

The Edison Screw

why making a more efficient light bulb is harder than it seems

BRIAN BOWEN

FOR GENERATIONS, the light bulb has been the universal symbol of a bright idea, ranked alongside sliced bread as one of civilization's most celebrated examples of ingenuity. Given the bulb's iconic status and undeniable utility, perhaps it's not surprising that the design has barely changed since Thomas

Edison perfected the first commercially viable model in 1879. But we aren't still cruising around in Model Ts, so why do most people still light

their homes with 19th-century technology? The next generation of lighting may look nothing like Edison's bulb. But are consumers—and their lighting fixtures—ready to adapt?

After unveiling his bulb, Edison quipped: "We will make electricity so cheap that only the rich will burn candles." But with energy prices now a national concern, even revenue-

flush Google has pledged to replace the current lighting in its data centers with low wattage compact fluorescent (CFL) and light-emitting diode (LED) bulbs to help the company

reduce both its bottom line and its carbon footprint. These new technologies promise to cut costs and environmental impact for homeowners and businesses alike. But each technology faces challenges—and the biggest challenge of all may be how to adapt to

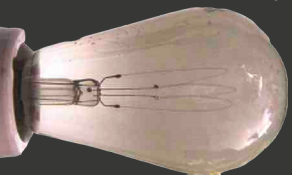
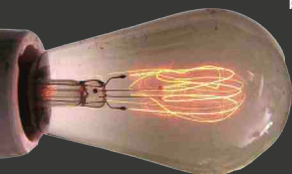
Edison's ubiquitous design.

CFL bulbs, once considered an expensive novelty, are now commonplace in the American home. The typical bulb produces light comparable to that of a 60-watt incandescent bulb using only 13 watts of electricity, and can be purchased for a few dollars. Like the long, glowing tubes humming over America's cubicles, CFLs produce light by exciting florescent gas, a process that requires a small amount of mercury. Low prices have made the technology more accessible, but concerns over mercury contamination from improperly disposed bulbs have led some earth-friendly consumers to think twice. Just one milligram of mercury can pollute 5,300 liters of groundwater. Chains such as Home Depot and IKEA have introduced CFL disposal programs to address the issue, but critics argue that even with proper disposal, CFLs are not a comprehensive solution to our lighting needs.

"CFL is kind of a transitional technology," says Mark Costigliola. As the Managing Director of Advanced Lumonics, makers of the EarthLED series of light bulbs, Costigliola has a vested interest in seeing CFLs ultimately fade. But many environmentalists and discerning consumers would agree with Costigliola. Not only are CFLs potentially hazardous to the environment, they are also prone to flickering, they turn on slowly and they degrade over time. LED bulbs have none of those problems. They're made of low-wattage, light-producing

silicon semiconductors, and they consume less energy than CFLs. Still, LED technology faces hurdles in finding a market.

Like silicon computer chips, silicon LEDs remain relatively expensive to manufacture. Online bargain hunters may find the bulbs for as little as five dollars, but the light those models produce is weak compared to most 60 and even 20-watt incandescent fixtures. For sufficient brightness, consumers still face steep costs. For example, EarthLED's state-of-the-art bulb, the ZetaLux, which matches 60-watt performance at only seven watts, costs \$50. Of course, Costigliola notes that LED bulbs roughly double their cost-effectiveness (in terms of brightness-to-price ratio) every six



months. "We are at about the same price point where CFLs were seven years ago," he says, indicating that prices are bound to drop over time.

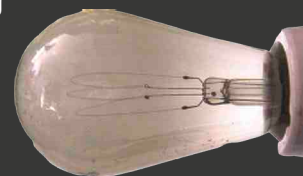
CFLs and LEDs each have particular advantages and disadvantages, but there is one challenge they share: attempting to fit a lot of light into a little fixture. Costigliola estimates that 90 percent of lighting fixtures are "traditional interfaces," which in this country means the familiar screw-in connector that spawned a thousand mediocre jokes. In the lighting industry that fixture is known as "E27," or the "Edison screw," after its inventor. When Edison developed the fixture in 1909 he chose an interface that ensured a safe and consistent connection. He could not have predicted that the Edison screw would present a major hurdle to next-generation

bulb designers.

Compared to Edison's glowing filament, LEDs create relatively little light. Designers have to cram as many emitters as possible into each bulb to achieve comparable performance. "We can get close to one hundred," Costigliola says, "but beyond that it's difficult." High emitter density creates a lot of heat, which in turn increases the potential for failure. To avoid overheating, some high-output LED bulbs must be outfitted with tiny fans like those used in high-performance computers. These components are both expensive and awkward to fit into the Edisonian mold, meaning that LED bulbs often come out looking like Lilliputian spaceships, with metallic heat sinks and whirring fans. The result is a look—and sound—that turns off some would-be buyers. There's no disputing that the ZetaLux would look out of place in a Tiffany lamp.

As LED technology continues to improve, so too will designs. Eventually, manufacturers may do away with the Edison fixture altogether as emerging technologies like organic light emitting diodes (OLED) promise to create light on unusual surfaces. OLEDs produce light using a thin film of organic compounds rather than silicon. They are currently being tested as displays for MP3 players and high-end TVs, but they're still too expensive for the mass market. Since OLED displays don't require a backlight like traditional LCDs or plasmas, they use less energy and are less taxing on the eyes.

Costigliola imagines that eventually OLED technology will enable designers to create light virtually anywhere—on walls, tables, even the windshield of your car. When and at what cost remains to be seen. Costigliola compares the Edison screw and its 21st century innards to the lingering skeleton of MS-DOS in Microsoft Windows: a creaky framework for a modern interface. He indicates that designers will make do with the current infrastructure in the short term. But he says, "Ten to twenty years in the future, we're going to be looking at lighting in a totally different way."



Three of Thomas Edison's original designs

All photos: Wikimedia

5

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Boron
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MARY McGRATH

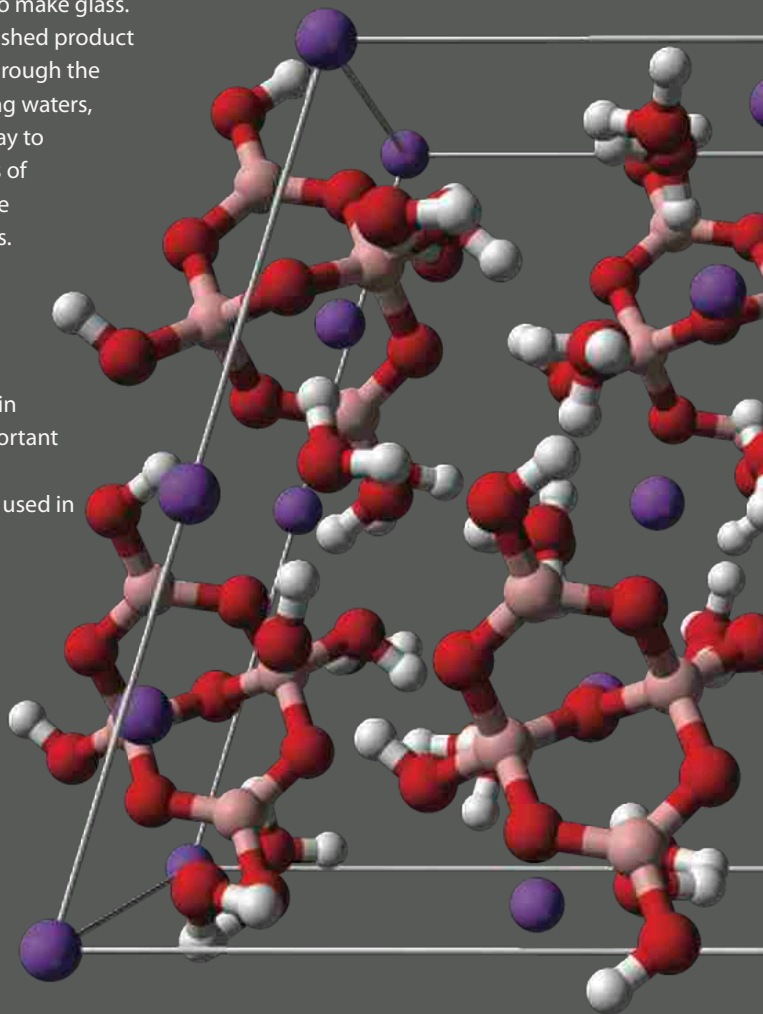
IT'S HARD to pin boron down. Never found in its pure form in nature, it can't even decide whether to be metallic or not, residing instead within a strange gray area—one of only seven elements of ambiguous identity. The unassuming dark powder seems to be all things to all people, serving as a base for jet fuel and flame retardant for our industries, herbicides and fertilizers for our fields, kitchenware for our houses, and nanoconductors for our promised future of Jetsonian medicine and gadgetry, among a raft of other uses. Boron's own identity crisis has allowed it to become a chameleon of the material world.

Given its positively protean properties, it is perhaps unsurprising that the earliest written reference to boron was in the context of alchemy. The Persian alchemist and natural philosopher, Al-Razi, wrote about *buraq* (thought to be the Arabic ancestor of the name borax) in his 10th century *Book of the*

Secret of Secrets. In a departure from the mysticism of preceding alchemists, Al-Razi was one of the first to carefully test and observe the properties and interactions of chemicals. During the same time period, boron-containing compounds were already being used in glassmaking, and people traded the compounds from Persia and Tibet to India and further. The borates act to refine the quality and to reduce the melting point of the materials needed to make glass. (Adding borates produces a finished product with fewer bubbles.) Formed through the evaporation of boron-containing waters, these evaporates made their way to market from the dried salt beds of ancient lakes in Turkey upon the backs of sheep, camels and yaks. The importance of boron in glassmaking has lasted to the present day; its addition allows glass to withstand chemical reactions and sudden changes in temperature—particularly important for the production of scientific glassware. Boron has also been used in fire retardants for this reason.

Boron also has a slightly checkered past. In the 1950s, the United States was scrambling to innovate ahead of the Soviet Union in a number of areas, most notably weapons technology. With the Red Menace looming, the U.S. government looked to boron as a source of high-energy fuel for long-range missiles. Learning that boron-based fuels have the highest energy densities (except for beryllium fuels, which are denser but

toxic), government officials launched a frenzied top-secret boron-based weapons research program. After seven years, the construction of eight research facilities, and five major plant explosions, the project was canceled. Military research has since lulled (as far as the public knows), and the weapons failure has cast something of a pall on boron research in general.



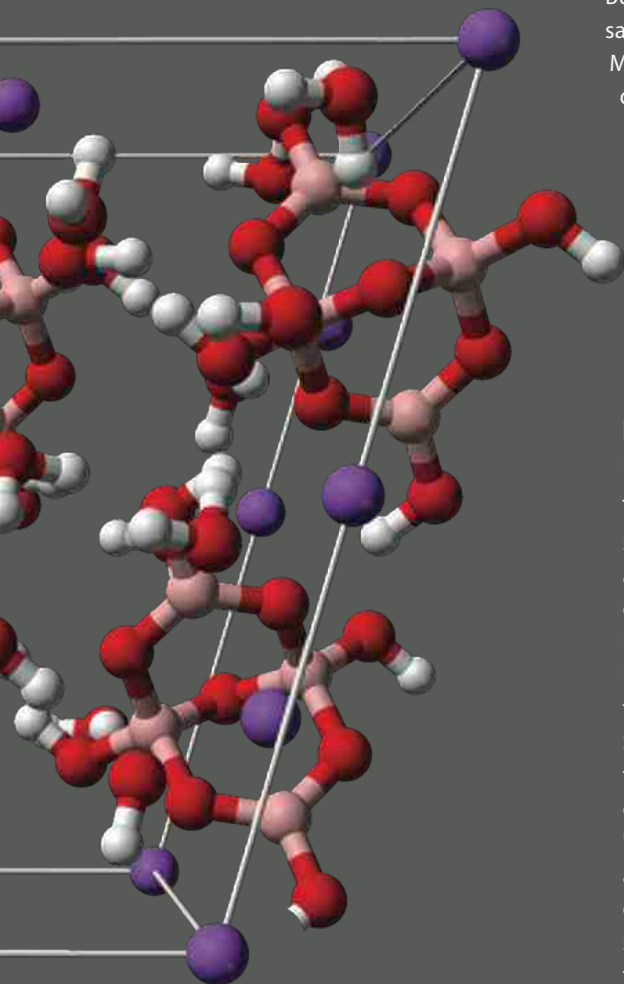
This has not stopped Turkey, home of the world's largest boron reserves, from trying to revive a research program. The Boron Institute of Turkey estimates that the country could support current levels of global consumption for the next 500 to 600 years. The Institute now sponsors several dozen projects exploring new uses for boron. Among twenty projects that have been completed is a fuel cell 100 times

more powerful than traditional models.

Boron-containing compounds, known as borates, may be helpful in finding alternatives to environmentally damaging substances. One example is boron trifluoride, which can be used as a less toxic and less expensive replacement for lithium-ion batteries—the kinds used in laptops, cell phones, and possibly soon cars.

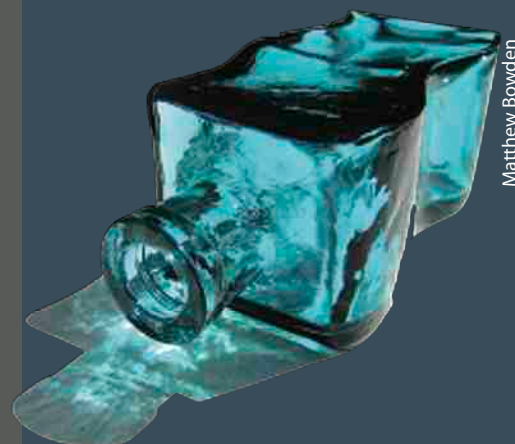
But before boron becomes an environmental savior, it may need to clean up its act. Mining borates can be very environmentally damaging. And in some places, the wastes from mining go unregulated. In China, people dump the leftover sludge, killing vegetation. In Turkey, where 60 percent of the world's boron reserves fall within an area about the size of New Jersey near the Simav river, wastewater from mines has raised boron concentrations of the river to the point where the water cannot be used for irrigation. Boron may not itself be toxic, but that does not make it environmentally benign.

Today, the leading edge of boron research shares more in spirit with the aims of early alchemists like Al-Razi than intervening developments in the element's history. In recent years, nanotechnologists have launched what may turn out to be a fruitful exploration of boron's potential. Sohrab Ismail-Beigi, a leader in nanotech theory, characterizes the aim of nano-engineering as "creating new materials from 'old' ones" by manipulating matter on an atomic scale. And on the nanoscale, boron exhibits useful properties: it is lightweight, strong, conductive and tolerant of high temperatures. It even has potential for use as a superconductor. So move over, carbon and hydrogen, a new element is in town, and its future looks bright.



From Gerard de Cremona's *Recueil des traités de médecine*

Likely one of the first to experiment with Boron in a scientific manner, philosopher and alchemist Al - Razi experimented with a multitude of substances as a chemist, but also as a physician.



Boron has been an important component of glass, refining its quality and lowering the melting point of the process



Boron has potential to be a less-toxic replacement for lithium-ion batteries.

TAKING BACK THE LAWN

SETH ZEREN

As I moved into my New Haven townhouse last summer, I had to carry my boxes past the brownish, scraggly patch of turf grass that serves as my front yard. Three doors down, someone had torn out their patch and planted flowering shrubs, herbs, and even corn. I began to envision planting my own front yard garden: succulent tomatoes and peas climbing up frames, birds and butterflies visiting zinnias and bee balm flowers, and herbs trailing on the neatly mulched-up ground. But when I called the company that manages my property, the person I spoke with wasn't too thrilled by the idea.

"Why not?" I asked.

"Because we landscape for a uniform, well maintained aesthetic—mainly grass and mulch," the man on the phone said. "If you'd like to make a proposal I can forward it up the chain and we can see what the building manager says."

"Well, could you at least keep the landscapers in check?" I asked. "They wake me up once a week, and the leaf blower fumes creep in through the gaps in the window frames."

"It's our understanding that our landscapers employ standard practices..." he replied. I bit my tongue and refrained from telling him what I thought of his "standard practices."

So, I was out of luck. My dream of a front yard garden to grow food and build community had been undone by the definitive, and indeed default, American landscape: the lawn. The company that manages our apartment for Yale University must, I learned, follow the rules of landscaping aesthetics: anything other than green grass lawns and mulched flowers is downright weird.

Wherever development occurs, the lawn is sure

to follow—invisible and unconsidered. Often, as in my case, the decision to plant a lawn is made by absentee owners with no local, personal, or particular connection to the value and potential of the land. Layer upon layer—the decisions over the landscaping of my yard had been parceled out between me, the property managing company, their landscaping vendor, and who knows which department of the University that oversees the conformity of their rental properties.

III

But why would I even want to replace my lawn? After all, lawns are pleasant for sitting on in the sun and feel wonderful under bare feet. Their traction and softness make them great for sports and for children to play on. We love the fresh smell of cut grass. In some settings, lawns can add important aesthetic advantages to a design plan or enhance sight lines and the space between buildings. Harvard Ecologist E. O. Wilson and Yale Professor Stephen Kellert have even suggested that the human love of lawns may be tied to our evolutionary past in the form of an innate sympathy for healthy living environments, a hypothesis they term *biophilia*. And of course, the lawn is normal; it raises no eyebrows and ensures stable property values.

Unfortunately, we rarely think beyond these seemingly benign features to the negative consequences of our default landscape. The scale of the American Lawn Industrial Complex is stunning. According to the Lawn Institute, a turf grass industry association, lawns cover between 20 and 30 million acres in the United States—an area comparable to that of all the New England States. In contrast, in 2002 there were approximately 3.7 million total acres planted in vegetable crops in the U.S. Alto-

gether, North Americans spent more than \$40 billion on their lawns in 2005—more than the entire continent gave in foreign aid that same year.

Landscape architect and Yale Architecture School Professor Diana Balmori calls this "invisible industry" a serious environmental hazard. Every year, Americans apply 70 million tons of synthetic fertilizers and pesticides to their lawns, more than ten times as much per acre as commercial agriculture. Some pesticide and fertilizer treatments are so toxic that they come with signs warning residents and neighbors to keep pets and children off the grass. The U.S. Environmental Protection Agency estimates that lawn runoff is one of the single largest sources of water pollution nationwide impacting groundwater, freshwater fish, birds and human health.

In order to maintain lawns in a perpetual state of verdant perfection, homeowners and landscapers burn 800 million gallons of gasoline in the inefficient engines of lawn mowers, leaf blowers, and weed whackers. Of all that fuel, an estimated 17 million gallons of gasoline is spilled each year while refilling lawn equipment, 50 percent more than all the oil spilled by the Exxon Valdez in Prince William Sound. Gas mowers emit ten times more hydrocarbons and particulate pollution than a typical automobile; weed whackers emit 21 times more and leaf blowers 34 times more—often within feet of your windows and doors.

The social and economic consequences of the American lawn are equally great. When the grass grows, millions of Americans mow their lawns—for an average of 40 hours over the summer months, equivalent to a lost week of vacation. Lawn maintenance is often considered a public virtue, with adjacent suburban



neighbors linked together by common interests of property values and community covenants. But lawns also disconnect us. They push houses back from the street and spread out the community, increasing our dependency on cars for mobility. There are very real human costs as well: 70,000 Americans are injured every year in lawnmower-related accidents, and, according to the Bureau of Labor Statistics, in 2004, you were more likely to be fatally injured on the job mowing lawns than as a police officer.

The ubiquity of the lawn also affects our relationship with nature and our children's development. The lawn is a human construct dedicated to leisure and recreation. Being constantly surrounded by such a landscape can lead to the narcissistic view that nature exists only to serve human desires. If we are to achieve a better balance between respect for nature, individual desires and community, we should seek to achieve a better balance of landscapes in our daily lives. In his book *Last Child in the Woods*, Richard Louv coined the term "nature deficit disorder" to describe the way that free play in natural spaces has been curtailed by manicured lawns, indoor electronic entertainment, and regimented sports.

III

Nature band-aids. That's what the fiery critic of contemporary American life, James Howard Kunstler, calls lawns. They patch up the wound of ill-conceived development but do little to heal the underlying sickness. To understand the peculiarity of this default landscape choice, we have only to look outside of North America.

The year after college, I taught English in South Korea. Besides the few luxury hotels and western-style parks and golf courses, no one there has a lawn. Even the playing fields at the school where I taught were made of dirt. The ubiquitous green turf American lawn is, from a global perspective, actually rather unique. Of course, there are swaths of grass in parks and formal gardens just about everywhere. But the idea that everyone's home should be set in a continuous carpet of manicured grassy parkland is a distinctly American ideal which owes its existence to circumstances of history and geography.



The origin of the lawn can be traced to the pasture land of Northern Europe. Before the advent of mowing, the only way for grass to be kept golf-course-short was through continuous grazing of livestock. This picturesque pastoral landscape came to be much admired by the English and French aristocracy during the 18th century, but they embraced a more naturalistic landscaping aesthetic in which sheared fields flowed into the surrounding countryside.

Fortune favored the development of the lawn in England, for in its mildness and humidity, England has a climate well suited to the cultivation of turf grasses. Later, the English landscaper Lancelot Brown traded the naturalistic aesthetic for increasingly large areas of perfectly flat lawn, painstakingly graded and cut by hand. In a time when wealth was still tied to owning productive land, the decision to convert swaths of fertile land around the manor house into unproductive, recreational lawn was a blatant example of conspicuous consumption, meant to impress commoners and peers alike.

The lawn arrived in North America with the British settlers. These colonists brought with them a preference for the English landscape, including pastureland and its cousin, the lawn. Under English tillage, pasture became a common landscape in the colonies, and not just in rural areas, but also in the village commons, the precursors to modern American parks.

Thomas Jefferson, so influential in the creation of American government and the national psyche, also had a tremendous influence on the American adoption of the lawn. At his home, Monticello, he incorporated Brown's flat expanse of green grass in the front of the property (which had to be labori-

ously cut by hand with scythes and scissors) with the ideal of the independent farmer—the lawn looked out on his extensive gardens and fields. He also organized the original campus of the University of Virginia around a central lawn, thus giving birth to many of our ideas of institutional landscaping.

Fredrick Law Olmstead Sr., the designer of New York's Central Park and many other urban

American park systems, oversaw the next evolution of the American lawn. He sought to recreate the original naturalistic aesthetic of the English in his great urban parks and integrated Brown's great swath of lawn as an important aesthetic and recreational feature. (To this day, 30 percent of Central Park is covered in lawn.) Olmstead also helped design some of the first high class suburban developments in the late 19th century, including Riverside outside Chicago, where the houses were designed to sit in an integrated expanse of grassy parkland. The proliferation of streetcar suburbs that followed copied this "houses in a park" aesthetic and enforced it with zoned setbacks.

Up until the mid twentieth century, the American lawn was mostly confined to municipal parks or to the professional class living in the first suburbs. But everything changed after the Second World War. Soldiers returning from Europe and Asia came home with dreams of an idealized and orderly life in a single-family home with a lawn and a white picket fence. And for the first time, this dream was within reach. The mass production of suburban houses pioneered by the Levitt brothers' Levitt Town, the first mass market suburban tract homes on Long Island, and the mass availability of the automobile, combined with federally insured mortgages and GI benefits, provided the opportunity for millions of working class Americans to live in the suburbs. With the suburbs came the democratization of the lawn. The ideal was so strong that the lawn spread to inhospitable climates where it would have previously been unthinkable to introduce it: the American plains, the West Coast and the Southwestern desert.

III

Sitting at my dinning room table after talking with my property manager, I thought about the great interlocking barriers that prevent us from choosing landscaping options other than the lawn. Sure, the lawn provides benefits. But the Lawn Industrial Complex has begun to threaten both ecological and human health. So how can we rethink our landscape choices to find a better balance of recreation, nature and community? Gordon Geballe, the Associate Dean at the Yale School of Forestry and Environmental Studies and the co-author of *Redesigning the American Lawn*, describes the change he thinks is needed: "reduce the amount of lawn you have," he says, "replace it with better things." So what are some of these better things?

During the First and Second World Wars, to reduce the public demand for food that was needed for the war effort, the government encouraged Americans to plant "victory gardens" or "war gardens." Huge numbers of American households in cities, suburbs and in the countryside tore up lawns and planted vegetables and fruits. Pamphlets and local university courses taught food preservation and agronomy to housewives and seniors. During the Second World War, Eleanor Roosevelt installed a multi-acre food garden in the White House's extensive grounds. Academic institutions got in on the action: Yale University converted part of its grounds into large garden plots to help feed 120 local households.



There is a movement afoot today to restore the victory garden tradition. Michelle Obama resurrected Roosevelt's idea this spring and, pitchfork in hand, laid out a vegetable garden on the White House lawn. The movement is typified by Fritz Haeg's book *Edible Estates: Attack on the Front Lawn*. Haeg and his contributors argue that growing food locally is not only more environmentally benign than the industrial alternative, but that being outside and working in your front yard garden draws neighbors back to the street and into conversation with one another. Replacing lawns with gardens may be one way to help rebuild communities that have atrophied in low density, car-dependent suburbs. "It made me feel more connected to my community, to nature," said New Havenite

Chris Randall over coffee. Once an uninvolved renter, Chris is now President of the New Haven Land Trust. He sees his first community garden plot as a "gateway to civic involvement."

In San Francisco, the Victory Gardens 2008+ program is trying to jump start backyard gardens, window box gardening and rooftop gardening in dense city environments. The website revivevictorygarden.org provides information, history, advice and links to organizations around the U.S. In New Haven, a resurgent victory garden movement could have tremendous impacts. Based on a technique pioneered by Ohio State University researchers Paul Robbins and Trevor Birkenholtz to estimate percentage of lawn cover in urban areas, if half of New Haven's lawns were replaced with food gardens, the city could, conservatively, produce enough fruits and vegetables for 20,000 residents, or one sixth of the municipal population.

Another alternative to the lawn is to landscape for biodiversity. In their book, *Redesigning the American Lawn*, Herbert Bormann, Diana Balmori and Gordon Geballe suggest planting meadows of native grasses and wildflowers. When using climatically and biotically appropriate plants, such landscapes require little or no maintenance—reducing fertilizer use and pollution while providing habitat for native birds, butterflies and insects. This is a particularly effective technique for replacing lawns around industrial and office parks where the lawn is only aesthetic and isn't used for recreation. A similar approach is to practice permaculture with shrubs and perennial plants. Permaculture involves landscape design that mimics a place's natural ecology. These gardens can be designed to create beautiful displays, and still require less maintenance than traditional industrial lawns. In particularly water-poor regions, landscaping with climatically appropriate plants, sand, and rock—typically known as Xeriscaping—allows institutions and residents to create beautiful, regionally appropriate and irrigation-free gardens.

III

The nature band-aid of grass that buffers our house is now covered with snow. For the moment, the default American landscape still reigns supreme, frozen in its unexamined historical prestige even as the social, economic, and environmental costs continue to add up. My dream of a front yard garden may be on hold, but this spring, when the soil thaws, I'll head back outside, unpack my tools and seeds, and get back to work.

SMART BIRDS *in our cities*

Sarah Overington



James Boicourt

The West coast of Barbados is an unlikely battleground, but a war of wits rages on its white sand beaches. Between high-end hotels and sparkling water, Casuarina trees bend their branches over the white sand, shading tourists and supporting nests built by Carib grackles, black birds that look like small crows with yellow eyes. One evening, I sat beside a young family at a hotel restaurant. The mother was feeding her son, and in the instant she turned away from her food, a grackle swooped down and grabbed a long piece of spaghetti right off her plate. The bird jumped to the ground, the noodle dragging along behind him. The woman turned and watched indignantly as her dinner was carried away. She looked over at me. "Aren't the birds here awful?" she asked. I smiled, but felt just the opposite. He may have been a thief, but that was one clever bird.

In Barbados, Carib grackles are considered pests, even evil and malicious. This can sometimes work to their advantage: islanders say that eating the head of a grackle will drive you insane, which, along with the birds' relatively small size, may have saved them from becoming part of the local diet. Grackles hang out near restaurants and picnic sites, anywhere they can get leftovers. They've even learned the restaurants' schedules. The birds pry open boxes to get at half-eaten burgers and they gather

dog food pellets and dunk them in water until they are soft enough to eat. The grackles' resourcefulness also makes them troublesome. In Barbados, people usually just shoo the birds away, but in other parts of the world, many of their relatives get shot, poisoned or otherwise eliminated.



Wikimedia

This is the contradiction of the smart bird: scientists and bird-lovers fawn over its feats of intelligence, but when the bird uses that intelligence to exploit humans it becomes a nuisance, an enemy. In our own species, we value resourcefulness, flexibility, and innovation—the same qualities that often make pest species impossible to eradicate. Could the birds be outsmarting us?

Birds and mammals diverged from a common ancestor over 320 million years ago, but researchers have found striking parallels in intelligence between the two groups. Bird brains are structured very differently than ours, but they live with us and have been exposed to many of the same adaptive pressures as we have over the millennia. All around the world, birds thrive in cities, often in impressive ways. In the 1920s, small birds in one part of England learned to open milk bottles that were left outside people's doors. In the years that followed, this behavior spread across the country. Since then, as technologies have changed, birds have become tech-savvy. Many insect-eating species changed their daily schedules to hunt at night, when they can gather around streetlamps buzzing with bugs. In New Zealand, a group of house sparrows learned to open an automatic door to a bus station by flying in front of the door's sensor, unlocking the busy cafeteria inside. In Japan, crows drop hard-shelled nuts on the road and wait for cars to crack them open.

One of the most astonishing feats of intelligence by birds is found in the forests of New Caledonia. On these small South Asian islands, New Caledonian crows make and use hook tools to pry food out of crevices. Tool-making was previously thought to be something only big-brained primates could do. But new

solve complicated puzzles and also that they can trick each other about the location of food. Like humans, they use their intellect to adjust to different environments, especially urban centers. But as their numbers grow, the war against these birds escalates.

In Japan, the conflict is about garbage and power outages. People living in cities create waste and crows flock to the leftover food. In 1993, the city of Tokyo began using transparent garbage bags to be sure people were sorting their trash. This also helped the crows, who could now easily spot food-filled bags. The birds started tearing the bags apart, often trailing garbage into the streets. As the amount of available food increases, crow populations rise dramatically. In Tokyo today, as many as 10,000 birds may gather at a single roosting site. All of these crows need places to raise families, and electrical poles turn out to be popular real estate. In many Japanese cities, crows cause multiple blackouts each year by weighing down power lines with their nests.

It's not easy to thwart a clever bird, but people have tried. In 2008, patents were filed in Japan for a variety of bird-proof garbage bags, including one with a life-size photo of a crow printed on it, one made of a translucent material that makes it difficult for birds to see inside, and one that contains nicotine as a repellent. But the crows have outwitted these and all other efforts to change their garbage-stealing ways. The birds have even managed to maintain their destructive nests by building dummy nests in areas where electrical companies send out "crow patrols." To date, no peaceful solution has been found. Instead, governments cull crows in large numbers. In Tokyo, one commonly used crow trap is made of pieces of raw meat placed in plastic bags containing poison gas. In Singapore, the government began working with a local gun club in 1982 to rid the nation of its crows. According to club records, nearly 60,000 crows have been killed since 1999.

Yet crows are notoriously difficult to hunt or

even to study. Many crow researchers tell stories of crow harassment. Crows can recognize individual humans (which is more impressive after you look at pictures of a few crows and try to tell them apart), and the birds will carry out targeted attacks, swooping down at anyone they perceive as a threat. This can be very unsettling for the recipient of the attacks. In Barbados, I regularly trapped grackles as part of my research. Once, after a few days of trapping, a flock of 20 grackles followed me around a local park, filling the air with their anti-predator calls. Later, the birds stationed sentries on the outer branches of a tree and they would squawk to warn the others as soon as they saw me walk up the street. I disguised myself in



Illustration: Ryan Berkley

different clothes and hats every day, but they always knew it was me. The only solution was to use my intellectual advantage over the birds. I stopped trapping them, but kept providing food. After a while, they forgot about the traps and I could catch them once more. I felt superior until I realized the grackles had tricked me into feeding them risk-free leftovers for weeks at a time.

I respect the grackles when they outwit me. But even people who despise smart birds grudgingly admit that the little creatures are intelligent. "Crow-busters" is an organization dedicated to bringing like-minded crow hunt-

ers together. On its website, along with images of men in camouflage surrounded by hundreds of crow carcasses, the group claims that "we are entering the second 'Golden Era' of crow hunting" in the United States. After outlining the many reasons for hunting crows (including being a nuisance and "highly destructive"), the site also describes the species as a "challenging and worthy adversary." Hardly the language assigned to other urban pests like cockroaches.

Maybe we recognize something of ourselves in our avian adversaries. For all of the physical differences between our species, we have a lot in common. Birds form long-term social bonds and remember many individuals. They trick each other, play games, make tools and communicate in complex ways (through song). The organ that makes all this possible is the brain. And as it turns out, crows have unusually large brains, with the tool-using New Caledonian crow ranking near the top. Relative to the size of its body, a crow's brain is about as big as a chimpanzee's.

Across the animal kingdom, there are very few species that have such large brains. This is the starting point for understanding why intelligence would evolve in the first place. If intelligence is so advantageous, we might expect to see more large-brained species. But there are also costs to having a big brain. Large-brained birds take longer to leave their parents and have fewer offspring per nest. In humans, the brain uses nine times more energy than would be expected given the space it occupies in the body. From an evolutionary perspective, the question is: what are the benefits that outweigh the huge costs of these hulking brains? To answer this question, researchers look at the commonalities between distantly related species like chimpanzees, dolphins, crows, and humans, all of whom independently evolved disproportionately large brains.

Dr. Amanda Seed, a researcher at the Max Planck Institute in Leipzig, Germany, argues that the key to bird intelligence is in social

interactions. Seed recently found that rooks—a species of European crow—cooperate to solve problems, and that they do so more often with their friends or “social partners.” In another study, Seed found that after individual rooks got into a fight, they returned to their social partners for reassurance. The idea that the mental challenges of living in a social group require a larger-than-average brain was first applied to primate and human intelligence. In order to be socially successful, humans need to remember who other people are, where each person fits into the social hierarchy, and what one’s own relationship is to everyone else. Birds might have big brains for the same reasons. Birds often form close relationships with one another and some species live in family groups for many years, with older siblings helping their parents out around the nest. Birds that breed cooperatively are among the largest-brained species in the world.

Social living is not always about cooperation—not for humans or for birds. Researchers at Cambridge University have shown that scrub jays (another member of the crow family) use sophisticated strategies to prevent other birds from stealing their hidden food. If a jay knows that others are watching him bury a piece of food, he will move it elsewhere once the coast is clear. Some birds even deceive each other. In a study of captive ravens in Austria, one bird was taught which of a series of colored boxes contained food. But when another bird was nearby, the first bird approached the wrong box, thereby giving a potential adversary deceptive signals. The same researchers found that wild ravens will interrupt their own search for food when another bird is around. These and other studies show that birds will use sophisticated social cues to prevent others from stealing their food. It turns out they’re complex social beings, much like we are.

Big brains can also help animals survive in a rapidly changing world. Species with large brains are highly inventive—think of the crows in Japan that drop nuts in front of cars or the



chimpanzees that use twigs to find termites. By inventing new ways of getting at food, species can take advantage of new opportunities and find ways to live in new environments. Where human and bird populations overlap, they often clash. But Joshua Klein thinks we can learn to live together peacefully. Klein is the founder of the Synanthropy Foundation, which is dedicated to finding ways for city-dwelling species to benefit from one another (synanthropy means “ecologically associated with humans”). He has designed a vending machine for crows. After a few training steps, crows begin collecting coins from the ground to feed into the green metal box, which rewards them with a peanut for every deposit. According to Klein, there is \$216 million in loose change scattered across the US, and crows could help us retrieve some of the money.

The idea of a partnership between smart birds

and humans isn’t entirely new. In Yellowstone National Park, ravens cooperate with wolves by directing them from the air toward elk and later joining them at the carcasses. Researchers think that a similar relationship may have existed between human hunters and birds, a bond that benefited both species.

Humans no longer need avian hunting partners—not with modern technologies like airplanes and GPS. But as independent as people have become, we still share the Earth with birds and other animals, and we have to figure out how to live with them. The smartest birds have followed us most closely, their ancient bodies flying above our modern skyscrapers and road networks. But it is precisely these birds—the clever ones, the flexible ones—that get scorned and killed by people. Could it be that they’re a little too much like us? Is the reflection of our opportunistic nature too glaringly bright?



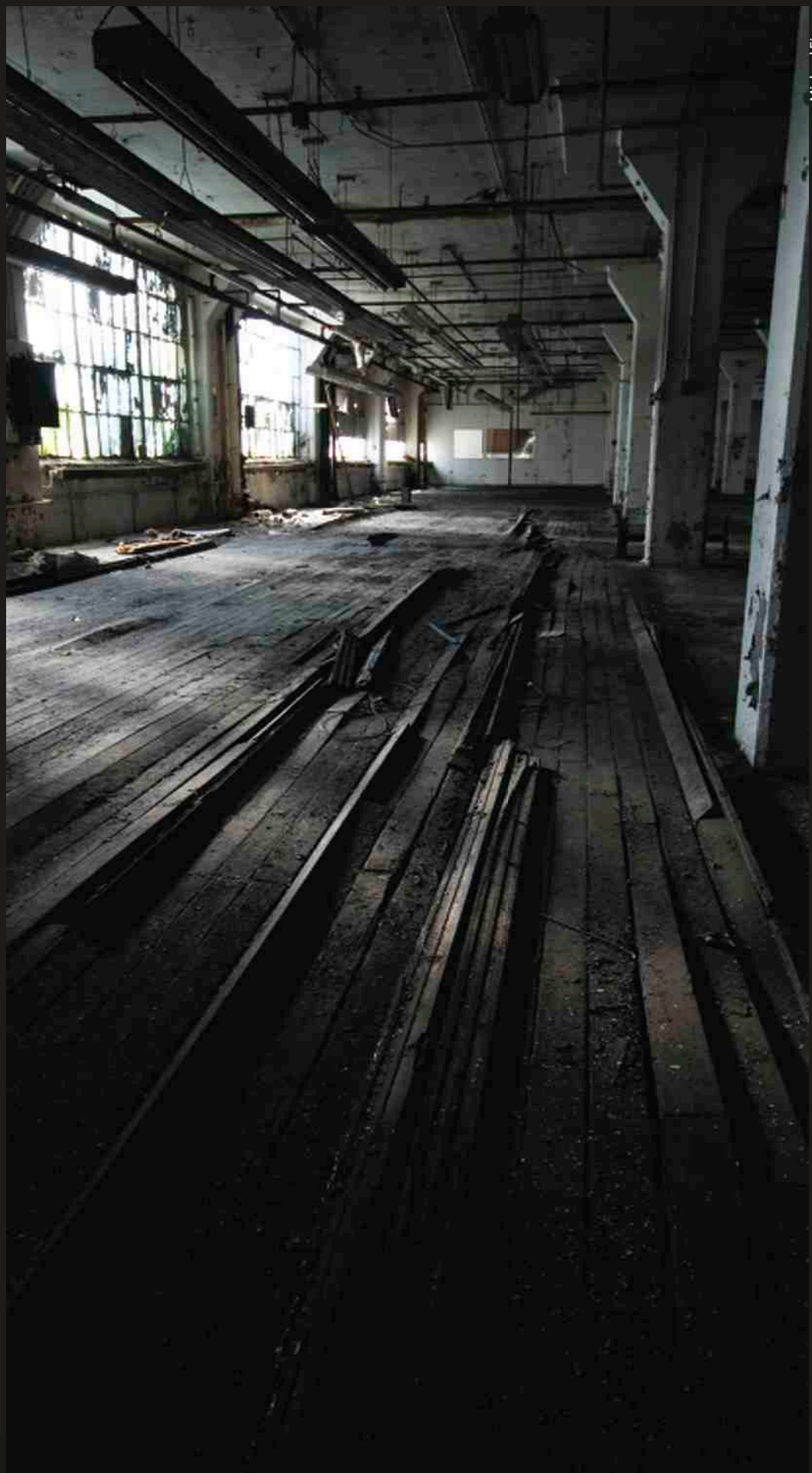
Unnatural. Naturally.

Photos: Michael Finney, Troy Hill
Words: Kate Boicourt

The following photographs are an exploration into an abandoned factory, enveloped and distorted by pollen and mold, freeze and thaw, humidity and roots. Despite only three years having passed since its closure, decay has carved the impression of a much longer vacancy.

We often think of the built environment as decidedly unnatural. Packaged in climate-controlled office towers, urban progress is measured in terms of this very mastery over the natural world – hot and cold water on demand, circadian-defiant lighting, and perpetual (albeit bitter) hot coffee. The average city-dweller, breathing in a cocktail of exhaust and industrial exhale, is used to her surroundings screaming something quite different from the Nature portrayed as a pristine green national park. Stunted trees abut bright explosions of graffiti; cracked cement lots spurt with spindly non-native plants. But when we abandon the sealed structures of our office buildings, apartments—among the rush of inhabitation and decay—we begin to see how thin and tenuous the line is between so-called "nature" and human enterprise. In fact, the speed of these transitions and decays suggests that there was never any distinction at all.

Our filtered, disinfected and walled environments have kept us unconscious of the tiny army of pollen bombarding our windows



and the dormant spores of mold littering our dry floors. We do not operate separately from these natural processes; we have simply kept them at bay with a carefully crafted vacuum.

But if the nature versus non-nature debate is just artifice, then even the things we call unnatural are, in a fundamental sense, natural. Take indoor climate control—seemingly the height of human antagonism toward nature. But this phenomenon is actually a strategy we share with other species. Communities of termites construct mounds a thousand times their own size, painstakingly adjusting the ventilation to maintain an ideal temperature. And disease- and climate-control rule the structure of the most basic elements of

life: membrane, cell, egg, womb. Like these biological counterparts, our "artificial" buildings are simply high-tech habitats. The only truly unnatural thing about an urban environment is our perception that it is somehow separate

Our filtered, disinfected and walled environments have kept us unconscious

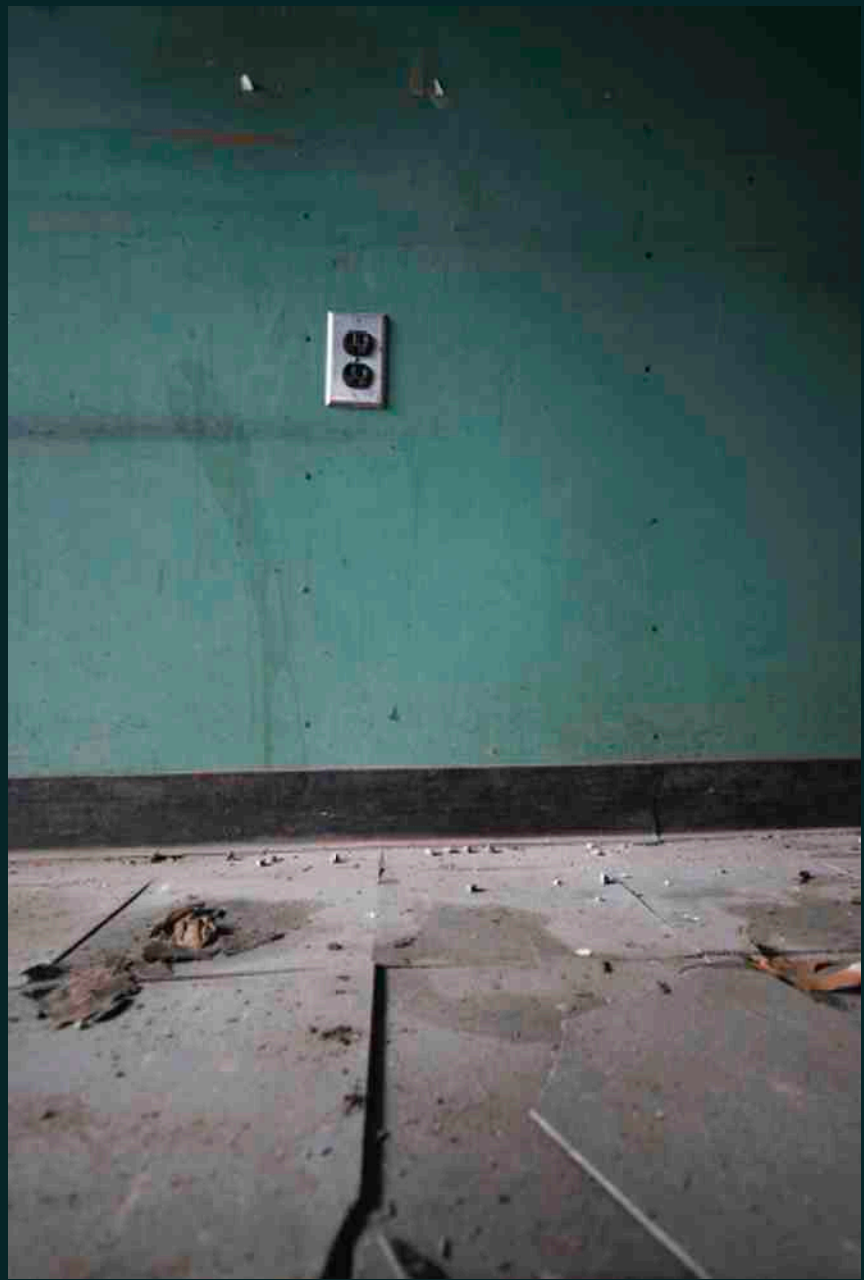
from the processes of nature. But, before we settle comfortably in our Lysol-cleansed desk chairs, let us consider: what is the quality of the habitat we have built for ourselves? If we

are creatures, affected by and responsive to light, temperature, noise, and greenery...how might we build structures, in an increasingly urbanized world, that challenge boundaries and reflect the fluidity between the human and non-human world? The alternative: continue to design buildings like cages, reinforcing our own division from the positive attributes we expect to find in nature. If reverence for a healthy environment is reflected in our structures, we may begin to question actions which disregard environmental health. We may realize that if we are to live well, we are accountable to a world greater than ourselves.



Troy Hill

"...Among the tin cans, tires, rusted pipes, broken machinery - One learned of the eternal.." - Theodore Roethke, The Far Field



Michael Finney

*Nothing would sleep in that cellar; Dank as
Ditch*

*Leaf-mold, manure, lime, piled against
slippery planks.*

Nothing would give up life:

Even the dirt kept breathing a small breath.

- Theodore Roethke, Root Cellar



Troy Hill



Troy Hill

ARTIST'S PORTFOLIO

ROSALIND SCHNEIDER



TIDAL INTERIOR, 2008

26" x 38" MIXED MEDIA, DIGITAL PRINT, INK, GLASS, ACRYLIC MOUNTED ON SINTAR



"I seek sites that carry a primeval power. Light, reflection and shadow are key to the gathering of images. Although images are site specific and relate to the time collected, they must also speak to a greater vision of place. They are a moving sketchbook of ideas...."

TIDAL ABSTRACTION, 2007

26" x 38" MIXED MEDIA, DIGITAL PRINT, INK, GLASS, ACRYLIC MOUNTED ON SINTAR

"Digital manipulation offers me the ability to isolate and translate the mix of elements, progressing from the real into abstraction and a fusion of the two. These multiple realities recreate time and subject into a new landscape both present and illusive. They are expanded visions of the earth."



FROST, 2007

13" x 19" MIXED MEDIA, DIGITAL PRINT, INK, GLASS, ACRYLIC MOUNTED ON SINTAR



HORIZON, 2007

13" x 19" MIXED MEDIA, DIGITAL PRINT, INK, GLASS, ACRYLIC MOUNTED ON SINTAR

Too good to be 'roo?

STEPHANIE NIALL & NICK ABERLE

THERE IS a new breed of vegetarian in our midst. Call them eco-tarians—those who reject meat not to save the animals, but to save the planet. Invoking the environmental impacts of producing meat, these people grudgingly set aside their steak knives in the knowledge that no amount of bike riding can offset the environmental damage of their favorite dish. And this message descends from on high: Dr. Rajendra Pachauri, chairman of the Nobel Prize-winning Intergovernmental Panel on Climate Change, has advocated reducing meat consumption to help tackle climate change. But what if there was another option for these reluctant herbivores—a way to satisfy carnivorous desires without being weighed down by the size of their carbon footprints? The solution may come in an unlikely form—that of the world's favorite macropod and Australia's national symbol, the kangaroo. Eating it, that is.

Farming traditional livestock in Australia is particularly destructive. Cows and sheep are responsible for 13 percent of the country's greenhouse gas emissions via the production of methane, a potent greenhouse gas and a by-product of ruminant digestion. Nitrous oxide, also an infamous greenhouse gas, is a direct by-product of feedstock production, in addition to being generated through storage and treatment of animal waste.

But the animals' negative environmental effects are not limited to the atmosphere. Since European settlement in 1788, the Australian landscape has suffered at the hands (or feet, rather) of livestock. The semi-arid terrain is especially vulnerable to their hard hooves, and their tendency to rip grass out by the roots when eating—both of which

have eroded the already thin topsoil. A recent study found that farming cows and sheep has helped drive at least 20 Australian mammals to extinction and is a significant threat to about a quarter of the country's vulnerable plant species.

Amidst all this destruction, Australia produces a lot of beef: an overwhelming 220 pounds per person every year. That's ten times the global average and five times that of the rest of the developed world. Most of this beef is not consumed domestically. According to the Australian Department of Trade, Australia is the second largest beef exporter in the world, selling over 65 percent of its production overseas.

Kangaroo harvesting is much easier on the environment. In stark contrast to ruminants, kangaroos' digestive systems produce negligible greenhouse gases—so negligible that a recent climate change report commissioned by the Australian Government advocated increasing production and consumption of kangaroo meat to cut Australia's greenhouse gas emissions. A

recent study in the journal *Conservation Letters* supports that argument. According to the study, replacing sheep and cattle herds with kangaroos could account for a third of Australia's current emissions reduction target of 30 percent by 2020. Kangaroo-based agriculture could also reduce emissions of nitrous oxide, which has 296 times the global warming potential of carbon dioxide.

As an added bonus, kangaroos are also kinder to the natural landscape. They have soft paws, and thus cause less damage to vegetation than hooved ruminants. They can also survive on less food and water, both of which are predicted to become increasingly scarce in a climate-change affected Australia.

An important point to make before continuing, because there's a good chance you're already thinking about it: kangaroos are not endangered. There are four species that are commercially harvested—for simplicity, they can be grouped together as Large Kangaroos. These species are not, and never have been, endangered. European settlers actually created the ideal conditions for kangaroo numbers to proliferate: they removed the Large Kangaroos' only natural predator (Indigenous Australians) and built permanent water sources throughout Australia's arid center. As a result, there are currently more Large Kangaroos in Australia than there are people—25 million versus 20 million, respectively. The International Union for the Conservation of Nature has listed the Large Kangaroos as a species "of least concern." To put that in perspective, humans were recently included in the same category.

But can Large Kangaroos realistically displace



Images by Roke, from Wikimedia

global beef production, or at least the beef coming from Australia? Projections by the Australian kangaroo industry are optimistic: the country already exports kangaroo to over 55 countries, producers note, and domestically the kangaroo has become increasingly mainstream. The meat now has its own designated area in most supermarkets with prices comparable to other meats. Despite all the benefits, a number of significant obstacles remain, primarily relating to attitude, cost and scalability.

Many people object to eating kangaroos on account of their being so cute. (To those in this camp, we take offence on behalf of cows, deer, and lambs.) This point does, however, raise an interesting challenge to those promoting the industry overseas. Is the global public ready to tuck in to an animal renowned for its cuteness? In the 1970s, California banned the sale of products made from kangaroos, despite considerable scientific evidence that the animals were not in danger. Soon after, the United States Fish and Wildlife Service listed the Large Kangaroo as threatened and imposed a similar product ban. (Urban legend in Australia holds that the original ban came from a request by the First Lady, who is said to have found the creatures particularly cute.) It took until 1995 for the government to investigate the situation and overturn the listing. California moved even slower, lifting its ban only in January of 2008, a move still met with resistance from animal rights activists.

The next question is how to scale up kangaroo production. The Conservation Letters study projected that such a transition—replacing

the current stock of seven million cattle and 36 million sheep with 175 million kangaroos—could realistically happen by 2020. The President of the Wildlife Protection Association of Australia, Pat O'Brien, described those results as "complete nonsense." He stated that satisfying demand would mean killing 500 times the existing kangaroo population. Although it is clear that Australia could comfortably carry a larger population of kangaroos, particularly if sheep and cattle numbers were reduced, there is a big difference between 175 million and 12,500 million (500 times the current population). While we have found no evidence to support Mr O'Brien's claim, neither could we find any assessment on exactly what sized kangaroo population the Australian landscape could carry without sustaining serious damage. This issue could ultimately prove to be a stumbling block to a large-scale expansion of the industry.

With respect to economics, there is general agreement that it is cheaper to produce one pound of kangaroo meat than it is to produce the same amount of beef or lamb. This is most directly the result of how kangaroos are "farmed." As you can probably imagine, there are certain practical difficulties associated with keeping the hopping marsupials fenced-in. As a result, farmed kangaroos live free in their natural environment and are killed in the wild by licensed shooters who operate in accordance with a strictly regulated Code of Practice, and follow strict government quotas. This might seem like an inefficient way to cull animals, but the expenses of farming traditional

livestock (such as fencing, shearing, branding, castrating, etc.) far outweigh production costs in the kangaroo industry.

And if economics and environmental impacts don't sway you, here is perhaps the most persuasive reason to expand kangaroo harvesting: the meat tastes absolutely delicious. Not only that, but it is high in iron, zinc and protein and is one of the leanest red meats, with only about two percent fat. It also has high concentrations of conjugated linoleic acid, which has a broad range of health benefits, including anti-cancer properties and an ability to reduce body fats.

It is unlikely that kangaroo meat will ever completely displace beef. It may be possible for Australia, but the odds of a global shift are low—the requisite increase in scale could harm the Australian environment. Kangaroo harvesting may not be a silver bullet to reduce global emissions, but it does represent a valuable strategy to minimize the impact of meat consumption. And at the moment, we need all the tools available to tackle greenhouse gas reductions. It could also help ease the consciences of guilt-ridden carnivores, as they tuck into their methane-free, sustainably harvested, low fat, and downright tasty kangaroo steaks.

DRINK FOR THOUGHT

MARY FISCHER

Whiskey

Pitlochry, Scotland, is about as quaint a town as one can imagine. Located two hours north of Edinburgh, the town's main street gives way to green pastures bordered by ancient stone walls, rolling hills, homes with blooming window boxes and a castle in the distance. The town is not only famous for being extraordinarily charming; it is also home to Edradour, the smallest distillery in Scotland.

I arrived on a sunny afternoon in the summer of 2008, ready for a tour and a dram from Edradour. My guide was a Scotsman straight from folklore—ruddy, white-bearded, purple-kilted and charismatic—but he told a modern story. From Edradour's first days as a community-run still, it has been highly sustainable. The distillers have used their resources—from water to peat—responsibly for over 150 years simply because it makes sense. As old as it is, the distillery seems ahead of its time.

Scotland boasts 87 working malt distilleries, which use dried, germinated grain, mainly barley, to craft whiskey. The industry is intimately linked with Scottish national heritage and has long-standing ties to local communities. Making scotch is also a major economic driver for the United Kingdom: Scotch whisky accounts for a quarter of the U.K.'s total food and drink exports, plus about 10,000 industry jobs with a further 30,000 relying on the industry as farmers, suppliers and distributors.

Yet the process is still fairly low-tech. Traditional Scotch whisky has just a few main ingredients: malt, yeast and water. Barley is moistened, allowed to germinate, then dried over a peat fire. The resulting malt is ground

and fermented, then distilled. The process requires large cooling equipment, huge copper stills—the vessels in which whiskey is made—and the drink must age for at least three years in wooden casks. The process requires large amounts of grain and water, plus fuel, usually oil or gas, to heat the stills and plenty of peat to fuel the fires.

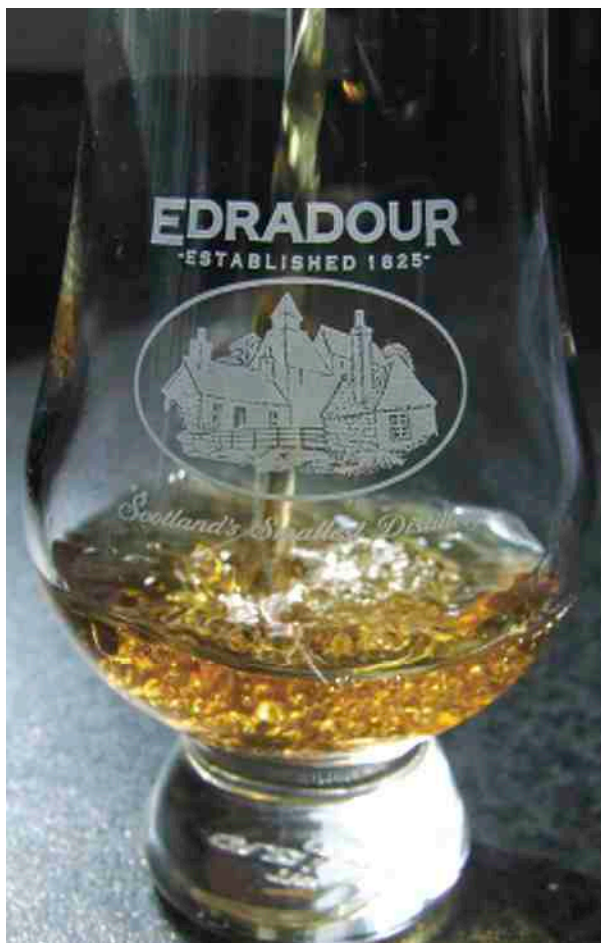
Distilling byproducts include oil, biomass waste, and liquid runoff, sometimes containing high amounts of copper from the stills, which can damage local ecosystems. In 2005, the maker of Johnny Walker, Diageo, was fined £10,000 (about \$17,000 at the time) for leaking heavy fuel oil into a tributary of a popular salmon fishing river in Ross-shire. The industry

has also been blamed for killing fish by discharging hot water, and stimulating fungal growth with organic waste.

Despite potential environmental gaffs, most distillers consider themselves purists. At Edradour, malted barley comes exclusively from local sources. Water, pumped from a nearby spring, is tightly controlled. After distillation, a spirit must meet the company's high quality standard to age in the barrel or it is run back through the process, yielding less waste. The leftover grain residue, known as draff, is provided to local farmers as cattle feed, eliminating the need for other methods of disposal while capturing the remaining protein value of the grain.



The Edradour distillery in action



A lovingly-poured dram of Edradour's finest

But labeling the brown spirit "green" doesn't seem to have entirely swayed Scotch whisky marketers. Practices designed to reduce environmental impacts of distilleries aren't part of targeted, high-powered "greenwashing" campaigns. In fact, it's difficult to find information about most companies' efforts to reduce their impacts, even though the Scotch Whisky Association and the Scotch Whisky Research Institute describe several distilleries that employ practices to capture waste heat,

conserve peat and water, reduce biomass waste, and support community environmental efforts.

Diageo, maker of everything from Johnny Walker to Lagavulin, is probably the most visible in the spirit business. The company plans to build an anaerobic digestion and biomass combustion plant using the spent wash—a mixture of wheat, malted barley, yeast and water—from its whiskey production in Fife, Scotland. It is expected to generate 80 percent of the electricity and 98 percent of the steam needed to run the distillery, while reducing the effluent from the production process. The facility will also recover almost a third of the site's water requirements.

Allied Distillers Ltd., makers of Chivas Regal, Aberlour, and Glenlivet among others, won the 2002 national VIBES (Vision in Business for the Environment) award for its reduction of both landfill waste and water use. The company developed a system to reduce waste throughout its

supply chain and it conducted an innovative study of employee behavior, demonstrating that employees could save money and resources by saving energy in their own homes. Old Pulteney and Bowmore capture waste heat and pipe it to local communities for use in homes and recreational facilities. To preserve peat, Bowmore's kilns use a process called "caffing": they macerate and dampen the peat before adding it to the fire, which extends the "life" of the peat nearly four-fold.

Glenfiddich developed a wetlands area to treat its effluent. And according to the Scotch Whisky Association, some distilleries—which they do not identify—recover carbon dioxide from the fermentation process and sell it for use in fire extinguishers, soft drinks and other foods.

Whether these firms' strides represent a worldwide trend is unclear. At least one American distillery is working to reduce its impact: Maker's Mark has an anaerobic digester on site fed by the water, grain and yeast leftover from making bourbon, the Kentucky whiskey made primarily from corn and rye. The distillery uses the resulting methane and carbon dioxide in its boilers to reduce natural gas consumption by as much as 30 percent.

Despite these advances, there is still a long way to go. Achieving greater energy efficiency in distilleries means improving boiler and heat distribution plants, adding heat recovery and developing better energy management practices.

But technological changes aren't the only option. It turns out the global whiskey industry may have happened on the ultimate recycling strategy without even trying. According to U.S. law, bourbon barrels must be made of new charred oak only. But Scotch distillers view all types of used barrels as ways to add subtle flavor to their drink, and many used bourbon barrels end up being reused overseas to age Scotch. So make a toast to the planet, laddies—drinking Scotch may actually be good for the world.



ENVIRONMENTAL EVANGELISM

*Talking earthly stewardship
in the house of the infinite*

Michael Coren

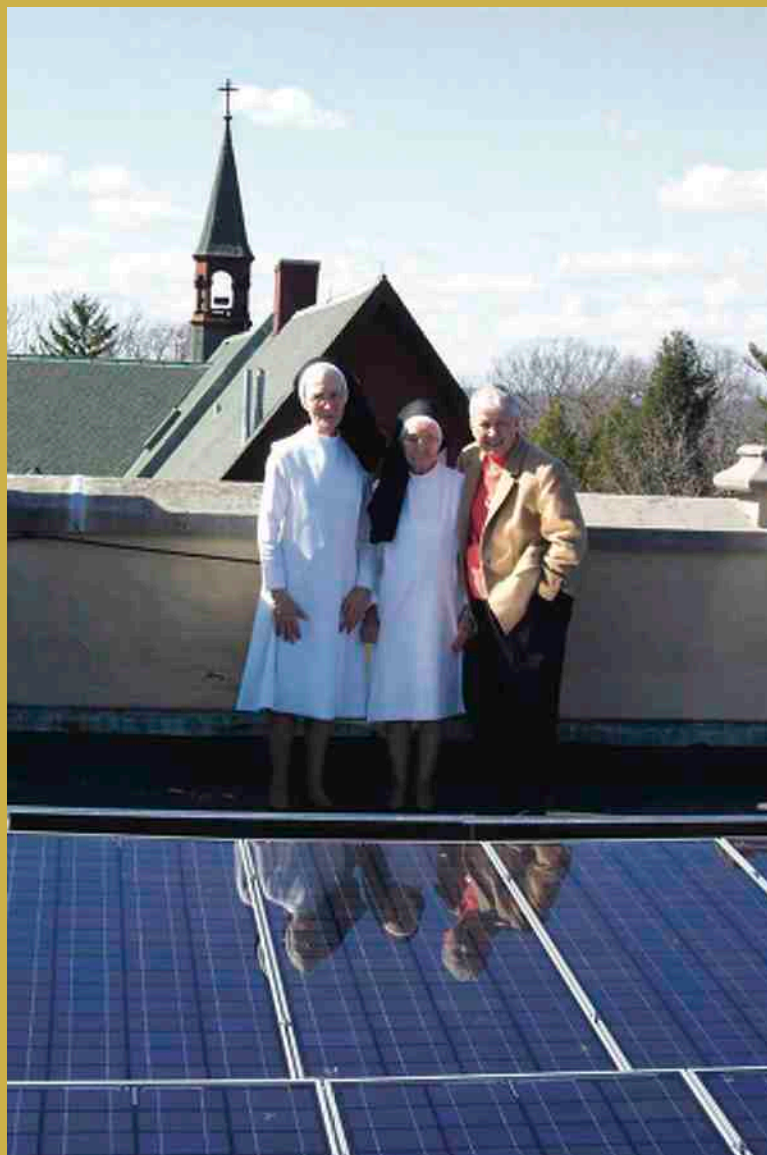
The Yale Project on Climate Change sent out two Divinity students, Sean Lanigan and Tamami Kawamura, to interview evangelical Christians in YEAR to discover the themes about climate change that resonate with the evangelical community. The result is an engaging and compelling series of interviews that form the basis for ongoing research by the Project's director, Anthony Leiserowitz, to guide non-profits and policymakers. To protect subjects' confidentiality, quotes are provided here without attribution. The Project website is: research.yale.edu/environment/climate

On the reality of global warming...

Pastor 1: So we can't tell what's really happening because we haven't seen enough in terms of cycles to really know what's going on. But I feel pretty convinced that if this is one of those cycles, we shouldn't do anything to enhance it. And if this is not one of those cycles, we're in way deeper than we could ever imagine and we've got to try to do something.

Pastor 2: I'm firmly convinced that humanity is playing a role in either dramatically increasing what may naturally be happening, or, independent of that, impacting our climate in a negative way.

Christian educator 2: Climate change is not hard once people see science as valuable... When people believe that the tools of science work, getting them to look at the data is not difficult...I think making a connection between care for the poor and justice and the care of creation is absolutely essential. The science is very easily understood on many parts of the argument. The science is less easy to understand on global climate change. If you can get them to believe the beginning, then you can work on a second part.



Jeanne Goyette

March, 2006: The Sisters of St. Dominic of Caldwell, NJ next to their new solar panels, an installation made possible by the sisters, a solar rebate from the state of New Jersey and a 20 year contract with Sun Farm Network. The panels will eliminate approximately 65,000 pounds of CO2 each year.

On Al Gore and calls to combat climate change...

Theologian: My opinion is that the resistance [to accepting climate change science] is—I think the resistance is a reaction to Al Gore more than anything else...I think there needs to be less spectacular doom and gloom oriented scenarios and a lot more consistent careful science...The spectacular side has not served us well in the whole climate change initiative...there is a politicizing of global warming and climate change because of [Gore] that makes it difficult to deal with it in the

public arena.

Preacher: You don't want to mention Al Gore. You don't want to be tied in with Al Gore on the environmental issue given that you disagree with us as a church we disagree on other issues. We need people like Rick Warren, like T. D. Jakes—national level Christian leaders who have a good reputation on the things that are important to us in the mainstream church to support the environmental issues. Not too many people are afraid of being aligned with Rick Warren, whereas I think a lot of the church

would be a little bit scared or reluctant of getting involved with an AI Gore or some of the other people who have very strong issues in opposition to some of the things that we believe in, as far as things such as gay marriage or abortion, amongst other things... We'd rather that initiative come from someone who's more aligned with our beliefs on some of those core issues. But we want to be involved, we want to be more involved in the managing of God's world here and we should be.

On talking to their congregation:

Faith leaders (pastors, priests and congregational heads) were asked if they had "communicated [the] message about climate change and concern for the environment to the people in [their] community"

Pastor 1: Well, being a pastor, a lot of communication happens with the people in your congregation... I can't say though that many people in the church where I was pastor were open to this. A lot of them called it a social gospel issue. But they don't even know what this term means... When I preach from Luke, Chapter 4, where Jesus is talking about being concerned about the plight of the poor, and their moral and ethical obligations to the poor, and I have people approach me after the service and tell me that what I preached was the social gospel... I tell them it's from Jesus, so there can't be anything wrong with it. That's ridiculous. Especially for people who say they're interested in literal interpretation of Scripture, whatever that means... So I think there will be a few trendsetters who won't get listened to by their colleagues and will take a lot of heat for it. But if it's true, you have to say it and then live it.

Pastor 2: I have not.

On changing ones lifestyle...

Pastor 1: It's hard to do. It's hard in the sense that you have to alter your lifestyle. You don't build a bigger house. And that means so much in our culture. As do big cars. It takes more to turn them from stationary objects into moving things... It's about reading and listening and learning and thinking about the small things that you can do in your own home and in your

own lifestyle. That could make a difference.

Theologian: I've trained as a theologian so it's been my growing conviction across the last twenty years that the care of the earth, it's a key part, a key component of those who are followers of Jesus... Biblical justice calls for those with both power and wealth to leverage that in the direction of those who have neither, which then begins to get into energy consumption, the use of water... as well as the issues of justice and labor, the care of humankind

On being labeled an environmentalist...

Pastor 2: Labels are just labels and they create a lot of problems. Yeah, I'm an environmentalist because I live in the environment. I'm not sure how to say yes or no to that one. And I'm deeply concerned about the environment, because God created this world good. As a Christian who embraces that worldview, we have a spiritual, moral responsibility to integrate that concern. Colossians says that all things came into being through the sun and that he holds all things together. That should echo in our stewardship. So we have a mandate in how we approach our stewardship. If that makes me an environmentalist, then I guess I'll take the term. But I consider myself more theologian. I'm comfortable with creation care and caretaker. Husbanding is another word I like, in the old use of the word. To make something grow right. Terms change and words change as the context changes.

Theologian: I'll tell you what I've learned, when you speak about care of creation, stewardship of the resources, concern for the poor, cleanliness of water... You don't pick many fights. The minute you say global warming, you've got fights on your hands.

Preacher: I'm almost quoting the Bishop here: to be a Christian you need to be an environmentalist... If you don't believe that we should be taking care of the environment, where can I send you back to Bible school?

Christian educator 1: Empiricist, Christian, and mystical pantheist... the three of us might all vote the same way on a particular

environmental issue, but our reasons for doing so would be different.

On the clash of theology and environmental stewardship...

Theologian: [There] is the thought that the earth is going to be bombed or blown up or nuked, going down in a ball of fire some day where some kind of catastrophic end that God will bring about in some level of judgment on the earth and there are few apocalyptic passages in the Bible that would support them in that. So if you believe that that is—God intended the end of the world—you probably aren't going to do a whole lot to preserve it or care for it... So under that kind of Christian theology you do get a resistance to both environmentalism and the climate change issues and all of that... But under what I think is a much more solid, mainstream, evangelical theology of the End Times is that God loves his creation, is going to restore it, redeem it and therefore we ought to be involved in that we won't be able to write off the planet as being discardable someday. So underneath what Christians are fighting against or sign onto is a poor understanding of the End Times.

Minister: I can envision a situation where stewardship transforms into subservience, which is a danger. I don't believe in a Wiccan style of reverence for the planet. The goal is not to make the planet sacrosanct. There may be something that environmentalists feel the need to protect, but as Christians we might say: "No, it was given to us to be used." There's nothing intrinsically holy about it. We don't want to be reckless, with species going extinct... but there's nothing wrong with harvesting coal, for example. I really don't think that there are things that are inviolable or untouchable in our environment. It will have to be a case-by-case basis. Protection for the sake of protection is not something Christians are about.

The Final Word

Pastor 1: The thing that's cool about the Genesis story is not only that God says it's good, but that at the end of the sixth day, he says it's very good. I think we need to think about how we can make it very good, too. Not just good, but very good.





THE CA

FAUX NEWS: FLAIR

Dear Environmentalist:

Dear Environmentalist,

Last night I came home to find all of the lights on in my house, the refrigerator open, the oven on high, and all of the faucets in the kitchen and bathroom on full. What a waste! Also, most of our valuables and electronics were out of their proper places. I couldn't find them anywhere. On top of all this, my daughter had locked herself in the closet and tied herself to a chair. My question is: how can we teach young people to be responsible about energy use?

Sincerely,

Concerned about the youngsters

Dear Concerned,

Your conundrum reminds me of the old proverb "haste begets waste." But in this case, we flip it around: "waste is the daughter of haste," i.e., you. Stop being so hasty and jumping to conclusions. For instance, are you sure that girl is actually your daughter? Have you had DNA tests to prove it? Also, waste not, want not. Or as I prefer to write it: Waste—not want. Not! You can't stop waste unless the waste wants to stop you. Also, if people weren't wasteful, how would we know when someone isn't being wasteful? Think about that.

Dear Environmentalist,

I heard that Earth Hour this year is on March 28th, and that we should all turn the lights off for one hour. I also heard that the city where I "live" is planning to participate for the first time this year. This is really exciting news! But I also heard that the guy who has been keeping me locked in a storage space in his basement for the past five years might be out that night. Now I feel trapped. Without a flashlight, I don't think I'll be able to see through the tunnel I dug with my fingernails that haven't been cut since I "moved in" here. Help.

Sincerely,

Trapped

Dear Trapped,

Due to a delay in the publication of this magazine, Earth Hour 2009 has already passed. Better luck in 2010!

Questions for the Environmentalist? Please send them along with cash, check or Exxon stock options to The Editors, SAGE Magazine, 100 Ivy League Row, Fancypants, USA

Dear Environmentalist,

I am a member of a secret society. We meet in a building without any windows. This is great because it prevents people from seeing many of the secret and possibly unethical acts going on inside the building. I am not saying that anything bad is necessarily going on—just that, hypothetically, it might be. The downside is that there isn't any natural light coming in, which I think might be bad for my health and certainly runs up our electricity costs because we have to leave the lights on all the time. Can you suggest some energy-efficient ways to run a secret society?

Signed,

()

Dear (),

The answer to your troubles is right under your secret little nose! I've got two words: insulation and tradition. First of all, without windows, your building is already well-insulated. The light and the air inside can't escape to pollute the great outdoors. Here's a tip: check the walls and ceilings for black mould. If it's growing, your environmentalism is showing! Second, tradition. Instead of turning on the lights, why not use an alternative energy source? Where from, you ask? Look to your roots in pagan cult ritual. Human sacrifice can be a fun and sustainable way to harvest fatty tissue that can be refined into an all-natural liquid fuel. And you don't have to worry about passers-by catching a glimpse through the window! Good luck!

Dear Environmentalist,

My name is Tom and I am 12 years old. I would like to start an environmentalist club at my school. Do you have any advice?

Dear "Tom" (if that is your real name),

Greenwashing is one of my pet peeves. And it's eager "kids" like you, trying to make your "school" seem more environmentally friendly that "make" the whole industry look bad. Most people don't know that schools and students are the biggest polluters in North America. That's a fact that will never change. I've said it before and I'll say it again: environmentalism is not for kids. You can't vote, you can't register as a lobbyist, you probably don't even know how to build a methane ingestor! So you can take your carefully calculated "enthusiasm" and shove it!

CABBAGE

AND FUNBALANCED



IN OR OUT

OUT "What's your sign?"

IN "What's your carbon footprint?"

OUT Going to Honduras for spring break

IN Going to the bathroom for spring break

OUT Pork and beans

IN Mung beans

OUT Shivering

IN Perspiring

OUT Eskimo Pie

IN First Nations' Pie

OUT Cost-benefit analysis

IN Friends with benefits analysis

CABBAGE REPORTS

SCIENCE: DONE AND DONE

Nathan P. Reviewed, PhD MD JD

NEW HAVEN, CT — A startling announcement from esteemed Nobel laureate Richtferm Von Brealyance has created institutional upheaval among the highly cohesive scientific community. Von Brealyance announced the conclusion of a recent global-scale literature review, which concluded that the work of Science is now complete. Nothing more to find out. Von Brealyance coordinated a team of five MacArthur Geniuses, two Fields Medal recipients, and four other Nobel prize winners. This elite group of scientific luminaries commandeered an NSA-designed secret bunker, believed to be located within the confines of a coal-decapitated mountain in Appalachia. This intellectual isolation was considered critical for preserving the beatific purity of this intellectual MI-6.

The actual content of the scientific review, entitled "An authoritative review on the state of Science and its infallible method," has not formally been published due to an ongoing arm-wrestling match between the editors of Science and Nature. Still, Von Brealyance told the media: "This article has been subjected to the highest rigors of peer review. I assure you my mother is a very thorough critic." Final publication is expected to receive an ISI impact factor an order of magnitude larger than that previously know to be achievable.

According to the press release, the team investigated the adequacy of science across all disciplines, from "hard" to "soft," quantum mechanics to ecological anthropology. Von Brealyance says: "We can express a high degree of confidence in the likelihood that science has already succeeded, or will soon succeed within an anticipated 95 percent of its projected capability." Acknowledging the detrimental effects of the financial crisis due to another large influx of unemployed workers, Von Brealyance says he believes these concerns will be offset by other gains: "While many studies have demonstrated the suppleness of a scientist's hands compared to the average individual, we express considerable confidence that scientists across the world... are amply capable of moving objects and other similar non-sedentary activities."

Members of the scientific community expressed concern regarding the results, but welcomed the comprehensive review. Several shared similar conclusions from their own preliminary work and commented that they have already begun career transitions with coursework in woodworking or administrative management. MIT professor Dr. Marlya Matheson succinctly conveyed the importance of the study: "For centuries, scientists have excavated the greatest mysteries of life and through careful measurement and reasoned analysis, produced a body of knowledge so prolific, so absolute, that we can now confidently retire the exploratory phase to the waste bin and proceed with actually doing stuff."

LISTED

Top 6 unexpected environmental gadgets

6. Methane reduction underwear
5. Leave-no-trace shoes
4. Real-time treeplanter (to keep up with carbon emissions)
3. Make your own endangered species kit
2. Instant coral powder
1. Island-sized water wings

Top 7 pasttimes of foresters

7. Tossing axes at logs
6. Chainsaw chicken
5. Tapping that
4. Knitting
3. Harvesting "maple syrup"
2. Thinking like a mountain
1. Logging

Top 14 groups that will benefit from global warming

14. Nudist colonies
13. Retirees
12. Snorkel-makers
11. Water wings
10. People receiving royalties from Seaworld
9. Fish?
8. Cockroaches
7. Miss Hawaiian Tropic
6. Mermaids Mermen Merpersons
5. Canadians
4. Yale School of Forestry
3. Aquacar owners
2. Warren Buffett (he'll find a way)
1. Who doesn't benefit from global warming?

Top 7 uses for your depleted uranium

7. Glow sticks for raves in Tehran
6. Carbon-free lighting
5. Traffic paint
4. Bath salts for the enemies of Vladimir Putin
3. "Do you know where your child is?" glow-tagging system
2. Birth control
1. Nuclear warheads

Top 5 green jobs

5. Oscar the grouch
4. Founding member of Green Man Group
3. Swamp Thing
2. Salad bar attendant
1. Unemployment

Top 5 saddest cases of greenwashing

5. Cadillac Escalade Hybrid
4. Organic Pop-tarts
3. Biodisel ATV
2. LEED-certified Wal-Mart
1. Clean coal

Top 6 environmental cage fights we'd like to see

6. Smoky the bear vs. Exxon Tiger
5. Earth First vs. the Taliban
4. Whales vs. Japan
3. Wal-Mart falling prices vs. Third World Child Laborers
2. Cockroach vs. nuclear winter
1. Sex with pigs vs. sex with Sting

Top 1 environmental name mix-up

1. Howard Stern review of the economics of climate change

Top 4 ways to think like a mountain

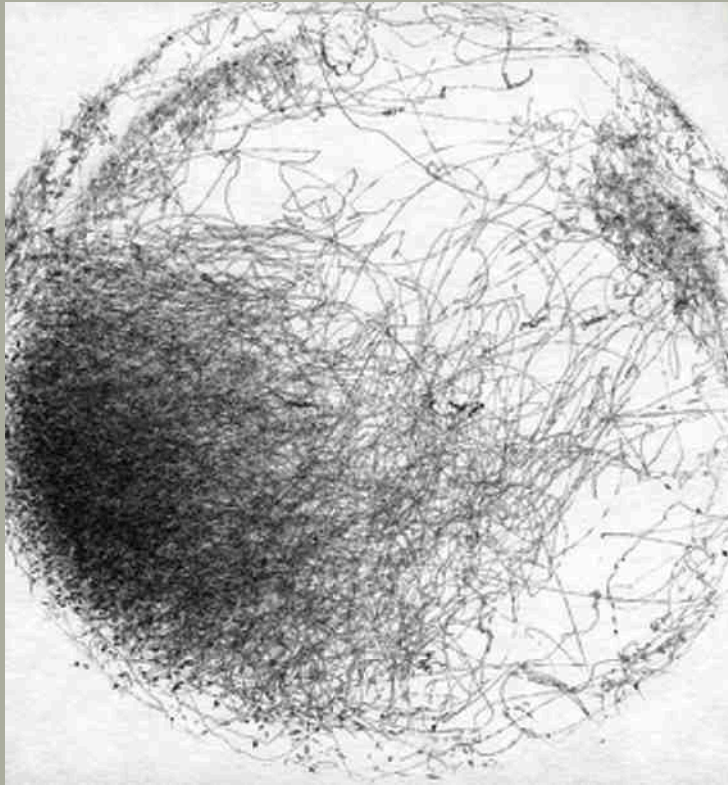
4. Fear of balding
3. Damn those pesky birds
2. Someone's stroking my erosious zone
1. What the hell does that mean?

Top 7 places to put surplus mountaintops

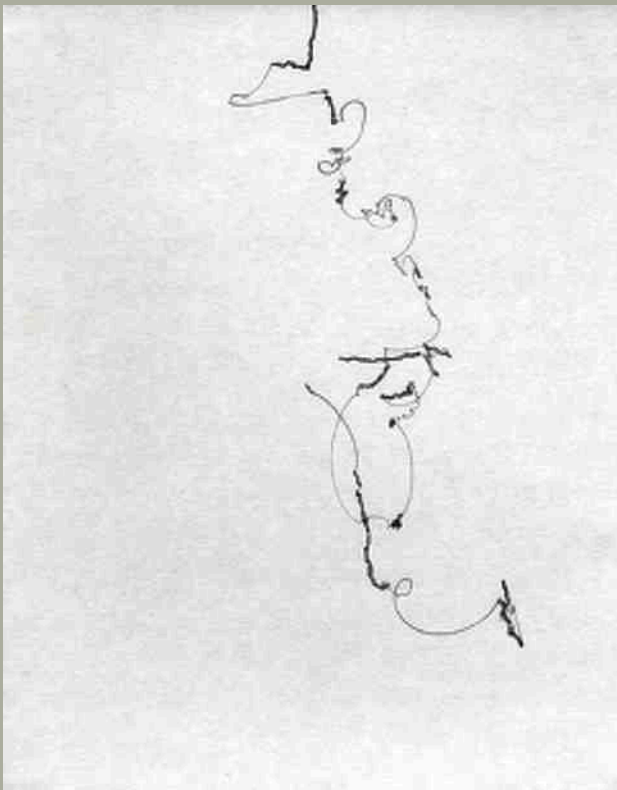
7. Fill in neglected streams
6. New theme park: Mountainland
5. Replace the top of Mount St Helens
4. Mix things up in the great plains
3. Right where it is
2. Replace melting glaciers
1. Up your ass

RECORDING OUR PACES

SARAH CULLEN

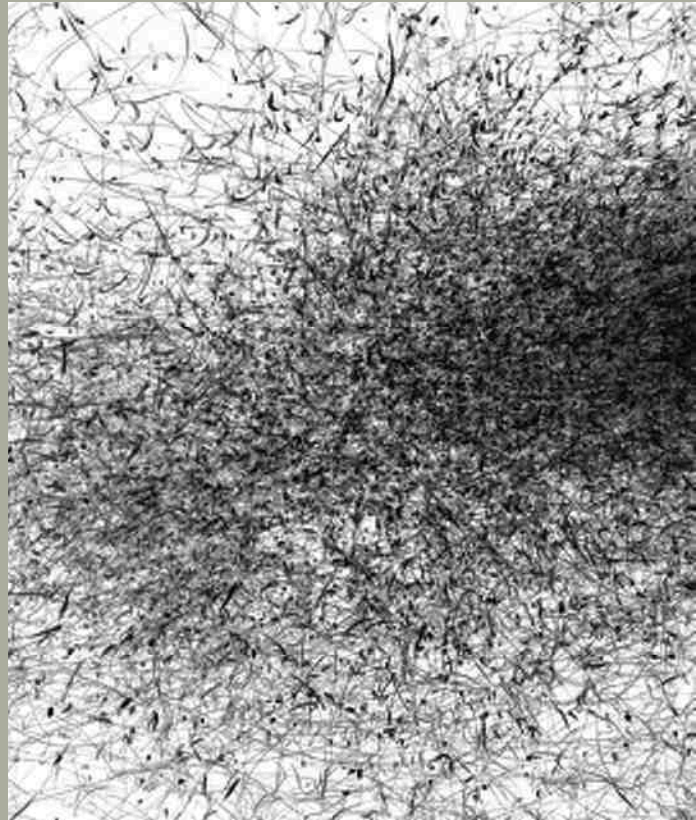


BANFF, CANADA



BANFF, CANADA

To understand and discover our surrounding environment, the stroll is the best technology. For the past five years, I have been using walking in my art practice, accompanied by a handheld pendulum mapping/drawing device, which I designed and constructed. This device captures one's movements in graphite on a piece of paper. The resulting image I consider to be a type of map.



ITALY

These maps are readings of physical movement through a space. They are records of how and where the carrier has been, a trace made by moving.

To date, my mapping devices have charted geographies in the U.K., Europe, North America, Iceland and Japan. Lately, I have been handing out devices to other people, allowing them to chart their own paths.

Sarah Cullen is an artist with a BFA from the Ontario College of Art and Design, and is currently pursuing an MA in Geography at Queen Mary, University of London.

DOWNSTREAM

Tallying damage and development in northern Quebec

SIMON TUDIVER

In the harsh depths of the northern Canadian winter, when bears hibernate and temperatures dip below -40 degrees Fahrenheit, the tallymen of the Cree nation walk their traplines. They do this in every season, but winter is the bleakest, the coldest. The tallymen—those age-old caretakers of the northern landscape—trek from beaver lodge to marten trap, through forests of stunted trees, following their ancestors' hunting routes. They traverse the wilds of northern Quebec—the bush, as people call it—to take stock of the land, count the animals, record the changes. For thousands of years, their careful stocktaking has driven a meticulous ritual of resource management. The tallymen spend their lives in the bush, following its seasonal cycles, reading its patterns, absorbing its pulses—until the rhythms vibrate through every step, every observation. These men of the bush have charted a course of conservation since the time of the Roman Empire.

"My mother taught me how to look at trees, how to find direction," says Sherman Herodier, a Cree hunter and trapper. A tree's pattern of growth tells a story about the elements, he explains. Branches grow thicker on the south side because of the cold winds blowing in from the north. "That's how you find out about your north and south," Herodier says, "—by looking at trees."

Herodier leads me through stands of ever-

greens on a tour of the old Cree community of Fort George, now mostly abandoned. He points out natural markers like tree growth, and also recounts the social history of this place. Herodier knows the land the way a seasoned tallyman would—with an encyclopedic intimacy. He interprets its signals as if translating the words of a close friend. At another point in history, Herodier might have been formally knighted a tallyman, with a trapline to walk and a territory to manage. But today, as the bush recedes from everyday life, Herodier instead fills a modern need, leading tours and working for the local Cree government. But the land stays within him. He calls the bush "a good medicine."

Survival in the bush is not a short-term proposition for the Crees—it's something they've worked at for thousands of years. And surviving that long has meant giving as well as taking, learning to preserve resources rather than exploit them. The tallymen see themselves and their communities as parts of an ecological whole, just one species among many. As one Cree trapper told a northern researcher: "All creatures are watching you. They know everything you are doing. Animals are aware of your activities." For millennia, these sorts of principles have guided the tallymen, whose traditional tasks have been to count animal populations and to regulate hunting and trapping in their communities.

But in recent decades, massive changes have

swept across the northern Cree lands. In the early 1970s, the province of Quebec decided to turn this wilderness into a giant power plant, erecting some of the world's largest hydroelectric dams and flooding some 2.5 million acres of bushland, an area roughly the size of Connecticut. The ensuing changes have disrupted weather patterns, made rivers impassable, wiped out fish species, and altered much of the cultural character of the Cree communities. The once-predictable rhythms of the bush have become chaotic in places, impeding traditional management. All across the lands, the changes have been so immense and so unprecedented that the old model of tracing traplines and counting beavers—however holistic and effective in the past—seems scarcely applicable. How can the Crees take stock of these big, blunt changes with the finely scaled tools of the tallyman? They are measuring mountains with yardsticks—a meticulous methodology, but one that risks missing the forest for the trees.

Intrigued by the northern changes and their impacts on the Crees, I traveled to northern Quebec last summer to visit two Cree communities on the shores of James Bay. I went in search of tallymen—but not the resource managers of yore, walking traplines and monitoring flora and fauna. I was looking for a different kind of tallyman engaged in a different kind of stocktaking. Instead of following caribou and rabbits and bears, I wanted to follow the rivers



Margaret and Bill Cromarty at their home on Fort George Island, in northern Quebec. "We need to stop trying to get material wealth," Margaret says.

that now ebb and flow with the demand for electricity, the fish contaminated with mercury from overactive reservoirs, the suburbanization of the Cree communities. The modern tallymen I found could read the landscape like the best of their ancestors. But they had spent their lives taking in this new kind of landscape, their bodies and minds still vibrating with the disruptive rhythms of massive development.

I sit on an old couch in Bill and Margaret Cromarty's worn living room. A big black drum of a woodstove commands the center of the linoleum floor between us—a rebellion of old technology in this land of modern energy. The Cromartys have felt the modernization of the north like tremors through the earth. In the 1970s, when the hydro project was first announced, the Cromartys still lived here full-time, on this small sandy island in the mouth of the Grande River. They were part of a community of several hundred other families with roots dating back centuries to the early days of European contact and trade. But with

the dams came faster currents and faster erosion, which forced the community to abandon the island for a new site on the mainland. Many buildings were floated across the river; others were demolished. But the Cromartys fought to keep their home standing—to retain an outpost rooted on the ancestral island.

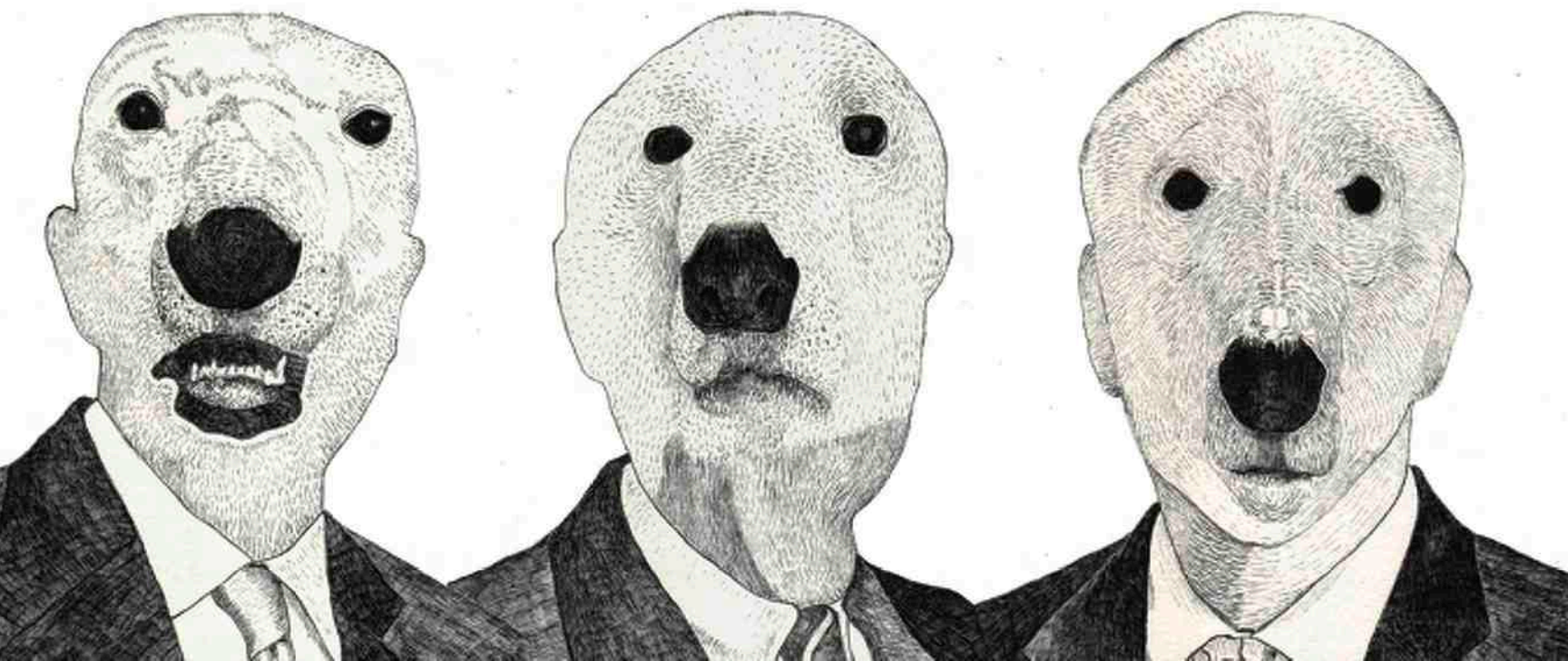
I ask the Cromartys how things have changed and they launch into a physical stocktaking. Many fish species disappeared, they tell me: sturgeon, pike, jackfish, river cod—all gone. The birds now migrate further inland because of the massive water bodies. The river itself has lost its saltiness and has changed color. And for every physical change, a cascade of social and cultural impacts often follows. Less time in the bush hunting and fishing has shifted eating patterns toward more processed foods, which in turn has led to a host of health problems, including obesity and diabetes. Life in the northern communities has changed dramatically in a single generation. And people like the Cromartys and Sherman Herodier haven't just absorbed

the physical changes, but have also tallied the social chaos of development—the invasion and land grab by the southern whites, the Cree leadership that has often pocketed the profits of development, the loss of cultural traditions that comes with easier access to the comforts of the modern North American lifestyle.

The Cromartys are philosophical about the implications of all of these changes. "We need to stop trying to get material wealth," Margaret tells me. "There's no future unless we stop." It's a dismal diagnosis. Is this the culmination of too much tallying, of a body overly attuned to the tremors of physical and cultural collapse? The tallymen of old walked the land to protect it. They managed the hunt to preserve the rhythms of the bush. Today's tallymen walk a changed land and feel a harsher set of rhythms. And though their tools are better tuned to tally the new landscape, they have lost the power to protect. Tallying has gained perspective and simultaneously lost all control.



The "giant staircase," a spillway where the Grande River used to flow, now the site of the world's largest underground power station near Radisson, Quebec.



POLAR BROKERS
Byron King



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