



RMI Solutions

NEWSLETTER

Hunter Takes off on Solo Career

RMI COFOUNDER BEGINS INDEPENDENT CAREER FOCUSED ON NATURAL CAPITALISM

By Cameron M. Burns

This issue of *RMI Solutions* marks the end of one era and the beginning of another.

Citing a desire to work independently of the Institute, RMI cofounder L. Hunter Lovins resigned in early June.

“I’ve been thinking about going out on my own for some time,” she said. “There are many, many opportunities that come my way. The day-to-day running of RMI has prohibited me from focusing on what I really want to do: take natural capitalism to a greater audience. I still expect to be associated with RMI and some of its projects, but primarily I’ll be working with other organizations.”

Hunter will be greatly missed—not only because she co-founded and for many years co-led RMI with colleague Amory B. Lovins, but because her influence was so great. Her ideas and thinking helped shape RMI’s approach to energy (where she also conceived what became E SOURCE), water, climate, communities, green buildings and development, and business. Meanwhile, her personal life was and remains colorful, interesting, and driven by a strong sense of right and wrong. Her service with the Basalt Rural Fire Protection District, where she has helped save many lives, has been a point

of pride for RMI, and her love of equestrian activities helped define the Institute—indeed, her black cowboy hat is one of the sustainability community’s most-recognized icons.

Hunter’s first major project will be finishing her book, *The Human Dimensions of Natural Capitalism*, with Global



Photo: Norm Clasen

L. Hunter Lovins

Academy founder Walter Link. She will also work on the creation of the Natural Capitalism Academy, an educational organization that will develop curricula and educational programs based on her 1999 book *Natural Capitalism* (co-authored with Amory Lovins and Paul

Hawken). Hunter is passionate about making natural capitalism the leading principle for business, and has long hoped to focus on that goal. “I believe now I’ll be able to bring natural capitalism to a wide business audience,” she said.

Although today Hunter is a world-recognized celebrity in the energy and sustainability communities, her roots are modest. In 1977, she heard Amory Lovins’s ideas about energy policy and realized this message—which encouraged society to ponder the end uses for energy (cold beer and hot showers) before finding the best-matched way to supply it—was worth sharing. She began

traveling with Amory, translating his work from the original “demotic Martian” into plain English, written and spoken. In 1982, as they drove across the country in their little pickup truck, she suggested that they start their own nonprofit think- and do-tank, where like-thinking colleagues would gather together to craft solutions to the world’s problems. Thus was RMI born.

Much of her time in the early days was spent handling everyday operations of the fledgling Institute (whose headquarters she helped design and build), over-

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Least Cost Security

AS THE UNITED STATES
AWAITS ANOTHER
TERROR EPISODE, RMI
OFFERS A FEW
THOUGHTS ON SECURITY

By Amory B. Lovins,
L. Hunter Lovins, and
Cameron M. Burns



In 1992, referring to the break-up of the Soviet Union, then Joint Chiefs of Staff Chair General Colin Powell stated, “We no longer have the luxury of having a threat to prepare for.” Nuclear war was *The Great Threat*, the disaster that loomed largest during the past half-century of human existence. In that utterly annihilating form, its risk seems to have receded.

Yet we are not safer. Any American city is now at even greater risk of disappearing in a bright flash tomorrow morning, vaporized by a bomb with no radar track to show its return address. Such anonymous attacks are undeterrable and nearly unpreventable. Eleven thousand dollars a second spent on the world’s finest military are not making us safe. To start backing away from the long-hidden abyss now opening around our nation’s aspirations requires engagement vastly more comprehensive than traditional military means.

Many of us have long feared that other kind of war, the deadly and erosive attrition that has long been played out on news reports of Israel and Palestine, of Belfast and Ulster, of San Salvador and Managua: *terrorism*. For Americans, it’s now belat-

edly a reality. Its first major episode gave over a million-fold economic leverage to the attackers, who achieved trillions of dollars’ worth of direct and indirect economic damage with about a half-million-dollar investment.

Despite survival rates of around 90 percent in the World Trade Center and 99.5 percent in the

Pentagon, the psychological effect was profound. And despite strenuous efforts at intelligence and prevention, an open society—especially America’s, rife with extraordinarily brittle and inefficient infrastructure—has so many vulnerabilities that many experts expect another reality check to come soon, and more after that. The potential for evil, once so hard to imagine, remains unimaginably vast. As *New York Times* columnist Thomas Friedman remarked, we had two failures of imagination—first in envisaging such evil, and then in envisaging a countervailing good. At the moment when most Americans were ready to stand up and contribute to getting off oil, constructive leadership was largely absent.

While those longer-term tasks gain momentum, we all need to think more

deeply about what security really means and how it is best achieved. How and where do you best invest to make the United States and the world safer?

NEW THINKING FOR A DANGEROUS WORLD

Traditionally, the locus of power and action has been governments. Yet this fixation on governmental institutions and international instruments is dangerously incomplete and obsolete.

Today’s world is tripolar, with power and action focused not only in governments, but also in the private sector the organizations that make up the internet-empowered civil society, and complex interactions among these three actors. In a world where change can occur very quickly and through diverse means and channels, government is increasingly the slowest and least effective part of the triad. Business and civil society, often in alliance, are rapidly taking up the slack.

Further complicating this three-part dance, each member of the triad has a sort of antiparticle: rogue governments, like the Taliban; rogue businesses, like Monsanto and Enron; and rogue nongovernmental organizations, like al Qa’eda.

The old world model saw governments

“Peace is not the absence of war; it is the presence of justice.”
—Martin Luther King, Jr.

ruling physical territory inside which national economies functioned. Strong national economies rested on military might. In a sense, globalization is not new. It began before the great sailing ships. From Alexander, Genghis Khan, and the Romans to the East India Company and the Opium Wars, national military power secured and protected access to resources and markets. What is new is the unfettered power of transnational corporations, which increasingly can influence or evade the rules of whatever country they wish to do business in. Economic decisions now pay little attention to sovereignty. Trillions of dollars flee at the clicks of a few mice, leaving national economies vulnerable and, in some instances, governments unable to look after their people because they cannot control their economies.

Globalists argue that this business autonomy boosts economic growth. But clearly one downside is global volatility. The rise of the private sector might be in part a stabilizing force—war is bad for business, so business should want to work towards stabilizing the world. But while business is indeed driving encouraging movements toward transparency and against corruption, added volatility predominates, destabilizing many societies and delegitimizing globalization.

Instability is globalizing too, and exists in all three poles: weapons of mass destruction are spreading, crime and drugs are global industries, and mass culture is replacing authentic diversity. None of this is welcome to most citizens, whether French farmers being standardized by Eurocrats, fast-food chains, and agribusiness, Indian oil-seed farmers who cannot compete with multinational franchises, or workers in the World Trade Center, who became unknowing targets of a global network of terror. But each of these forms of insecurity is being encouraged or tolerated by U.S. policy's unique talent for inspiring resentment.

A Bright and Simple Idea

Building real security can be as simple and as grassroots-based as a compact fluorescent lamp (CFL). A typical CFL costs \$3–12, saves four-fifths of the electricity used by an incandescent bulb, lasts 8–13 times longer, looks similar, fits the same fixtures and, over the course of its life, will save \$30–80 more than it costs. In fact, it's generally cheaper to give away CFLs than it is to run fossil-fueled power plants needed to power incandescent bulbs.

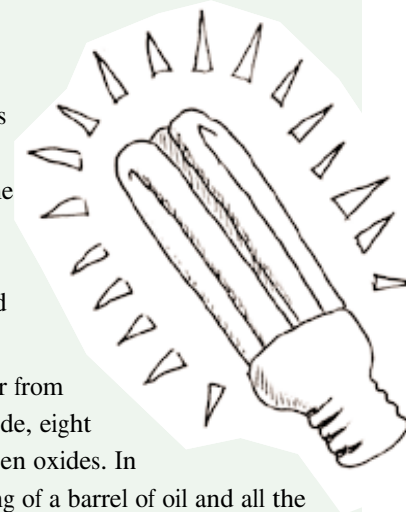
One such CFL, over its life, will avoid putting in the air from a typical coal-fired power plant one ton of carbon dioxide, eight kilograms of sulfur oxides, and four kilograms of nitrogen oxides. In terms of electricity generated by oil, it saves the burning of a barrel of oil and all the attendant emissions. Or, if we're talking about a nuclear power plant, one CFL, over the course of its life, will avoid making two-fifths of a ton TNT-equivalent of plutonium plus half a curie (which is a lot) of strontium-90 and cesium-137.

If widely deployed, CFLs could by one-fifth cut the evening peak load that crashes the grid in Bombay. They could raise a North Carolina chicken grower's profits by one-fourth, and they could raise a Haitian family's disposable income by as much as one-third because so much of the sparse cash economy goes for electricity.

A widely unrecognized advantage of such ways of saving electricity is that making them takes on the order of a thousand times less capital than expanding the electricity supply. When you invest in CFLs you also get your money back about ten times faster—so it can be quickly invested again. If we do the cheapest things first, the power sector, which currently gobbles up about a quarter of global development capital, could become a net exporter of capital to fund other development needs.

Such lamps are also the key to affordable solar power that lets girls learn to read, advancing the role of women and reducing population pressure. Currently half a billion CFLs are manufactured annually; the largest maker is China. They can be bought at the local supermarket, and the average person can service it herself. Most of us would never guess such a simple thing could have such an impact globally. But clearly, if we so choose, we can make the world more prosperous, better educated, less polluted and, of course, safer through shared prosperity and justice—one light bulb at a time.

— Amory B. Lovins



Working in about 50 countries for decades, we've been consistently impressed by how ineptly the United States often behaves on the world stage. Becoming a country consistently worthy of respect and affection in other's eyes—not just Americans'—will be tough until the U.S. stops eroding or undercutting practically every peace-promoting, risk-

reducing effort put forward by the international community, appearing hypocritical and unilateral, imposing tawdry mass-media culture where it's not wanted, and showing so little understanding of the values of diversity and tolerance. The disturbing thesis of Wall Street Journal correspondent Jonathan Kwitney's *Endless Enemies: The Making of an Unfriendly*



With terrorism now a major factor for U.S. national security, our investments in both domestic and international arenas need reexamination.

World remains all too true today, and is getting more so.

But if we substitute the positive goal of striving for a secure world, what does that really mean? *Webster's Dictionary* defines two main elements of security: freedom from fear of privation and freedom from fear of attack. Both are vital to being safe and feeling safe. And each requires the other. How can we achieve them in ways that work better and cost less than present arrangements?

FREEDOM FROM FEAR OF PRIVATION

Freedom of fear of privation has many obvious elements: reliable and affordable provision of energy, food, water, sanitation, shelter, health care; a sustainable and flexible system of production, transport, communication, and commerce; universal education and strong innovation; a healthful environment; vibrant diversity; free expression, debate, and spirituality; and legitimate, accountable self-government. But achieving these is not a zero-sum game in which if I win, you lose. Real security requires that we attain all these things not only for ourselves but also for others. As Dick Bell of the Worldwatch Institute has noted, weapons and warriors cannot keep us safe “in a world of extreme

inequality, injustice, and deprivation for billions of our fellow human beings.”

Decent lives, anywhere, everywhere, are a worthy mission. Today, according to the United Nations Development Programme, every poor person on earth could have clean water, sanitation, basic health, nutrition, education and reproductive health for about \$40 billion per year—less than new U.S. antiterrorism spending and less than one quarter of the recent U.S. tax cut. One can quibble about the numbers and the

There are times when nothing short of decisive military force will do; but there are far more instances when timely “preventive humanitarian” missions earlier could have created military “negamissions” later.

best delivery mechanisms, but the need is undeniable. Yet few in Washington seem to be talking about such investments in a fairer, safer world. The Bush Administration’s recent increase in foreign aid could be a good thing, but it’s only a small start at reordering our priorities toward what Prime Minister Tony Blair called “above all, justice and prosperity for the poor and dispossessed.”

FREEDOM FROM FEAR OF ATTACK

The other limb of security is freedom from fear of attack. The 1993 RMI book *Security Without War* (Westview Press) by Hal Harvey and Michael Shuman defines three key elements: (1) conflict avoidance/prevention, (2) conflict resolution, and (3) non-provocative defense.

Conflict avoidance/prevention (“pre-*response*”) has historically has been given low priority but it should be the top priority. It’s by far the most cost-effective form of security—think about the fights between siblings that parents quell: they save a lot of time, pain, and resources. Conflict avoidance promotes and flows from justice, hope, transparency, tolerance, honest government, resource productivity, and what Harvey and Shuman call “leader control,” which exposes war-mongering leaders to the corrective displeasure of informed constituencies.

Conflict avoidance/prevention can take many forms, but the most important may be advanced resource productivity. That’s the key to enabling the world’s people to have, as the South African Constitution says of water, “some, for all, for ever.” Resource productivity removes apparent contradictions between economic health and environmental health. It’s implementable by any level of government or the private sector, by market or administrative means; it can be deployed in varying scales (from the household to the globe); and it’s adaptable to diverse conditions.

If conflict avoidance/prevention fails, the next part of the security triad is conflict resolution. That's the realm of better international laws, norms, and institutions, business practices, and movements and conventions within civil society. It's being rapidly improved, but needs far more work. If conflict resolution fails, the next layer of protection is nonprovocative defense—reliably defeating aggression, but without threatening others. Neutral Sweden offers a promising example: its coastal guns can't be elevated to fire beyond Swedish coastal waters; its effective air force has only a short flying range; its military radios are incompatible with both NATO and Warsaw Pact frequencies. In many ways, by technical and institutional design, Sweden has made itself a nation both comforting to live next to and uninviting to attack. Systematic and comprehensive design for nonprovocative defense can ultimately yield a stable mutual defensive superiority, where each side's defense is stronger than the other side's offense, so neither wishes to attack.

Nonprovocative defense need not be of a military nature. A wide range of measures can achieve it, ranging from non-violent sanctions through diversified civilian-based defense systems to paramilitarized homeland defense (like Switzerland's). To be nonprovocative—making one's neighbors feel more secure, not less—defenses must be of low vulnerability, low concentration of value, short range, and dependent on local support. Of course, resilient design does not stop terrorism, but does disincentivize it—something national missile defense can never do.

The U.S. military is being transformed toward more agile, mobile, deployable forces. This is vitally necessary. Yet in the long run it carries the seeds of internal contradiction. Long-range, rapidly deployable capabilities negate any statements that our intentions are purely defensive. Having global offensive capabilities will also make

our country behave in a way that tends to use them. Worse, such a force structure elicits the kinds of behaviors we've already seen—precisely the asymmetrical threats (extraordinary means offset by an adversary's prodigious will) to which this nation is most vulnerable.

Each of these three elements of Least-Cost Security enhances the others. And none precludes projection of military force by legitimate international coalitions—as the last resort, not the first.

WHAT KIND OF COP?

If the United States is going to remain the Global Cop, there are some questions to mull over. Are we to do community policing, and be the friendly cop walking the beat, making friends and preventing problems? Or are we the SWAT team that forays from its fortress only to swarm onto the massacre scene and shoot the perpetrators? Would not our interests in the developing world be better advanced by democratization, anticorruption, sustainable development, resource efficiency, fair trade, demand-side drug policies, pluralism, tolerance, and humility than by expeditionary forces? Had the U.S. supported Massoud against the Taliban, as he begged when the Soviets withdrew, might we have avoided the far costlier commitment of forces to Afghanistan now, and much of the terror that intervened? Had an unwise U.S. Ambassador not blocked Mao's overtures to Washington, might we have avoided the Korean War and the Sino-Soviet alignment? True investments in development, transparency, collective tripolar security arrangements, and nonprovocative defense seem a better investment of tax dollars and of precious young



Solid investments in national security can take non-military forms; they can also involve the military in non-combat situations.

lives than avoidable conflict. There are times when nothing short of decisive military force will do; but there are far more instances when timely “preventive humanitarian” missions earlier could have created military “negamissions” later.

To rebuild her tarnished credibility, the United States will need to re-engage with the world community in many areas, whether non-proliferation treaties, plutonium and land-mine reduction agreements, chemical and biological warfare treaties, or leadership on climate protection. These are but a few of the many pressing issues where the United States should be setting the world example. Another is brainstorming solutions for the globe—one interesting notion would even offer countries that gave up their armed forces the option of buying international “security insurance” that shares multinational or UN-based forces as its guarantee against attackers.

The foundation of a safe world is the shared and lived belief that security rests on economic justice, political freedom, respected laws, and a common defense. Massive, economy-distorting investments in arms alone—not to mention earth-drilling nukes and outer-space military systems—divert America's attention from true security investments that will work better and cost less. ■

Dear Congress,

This nation has squabbled over the oil under the Arctic National Wildlife Refuge as if it were our only meaty energy issue. It is not. It's time to close the door on ANWR, as the Senate did, and consider other priorities.

Reducing or eliminating Mideast oil dependence has never been a more important national issue. It's key to affordable

to 1.15 million barrels a day of gasoline) would only require making the light-vehicle fleet 2.7 mpg more efficient. A saving that size was being achieved every three years in the early '80s. Now America could save six times as much oil. How? To capture huge savings quickly, the President, Congress, and all Americans could:

- Establish revenue-neutral “feebates”:

car average, a superefficient new car would win a roughly \$5,000–15,000 rebate. The rate could be based on mpg per cubic foot of interior volume so it doesn't distort choices of vehicle size. It should also be technology-neutral to stimulate technological innovation.

- A “scrap-and-trade” system would speed fleet turnover: tie the rebate for an efficient new car to the *difference* in efficiency between the new car you buy and the old car you scrap. Put a bounty on clunkers scrapped and not replaced. Scrappage will disproportionately boost fleet efficiency, cut smog and carbon dioxide, and expand automakers' new-car markets and hence jobs. Inefficient

old cars are worth far more dead than alive.

- Accelerate commercialization of breakthrough technologies. For example, a decade ago RMI spearheaded the idea of an uncompromised, same-price, ultralight, ultrasafe, hybrid-electric Hypercar®. To help automakers design and engineer such vehicles Hypercar, Inc. was formed. One of the company's designs is a mid-sized SUV that would get 99 mpg running on a hydrogen fuel cell and would be production feasible by 2006 (www.hypercar.com). Today automakers are introducing doubled-efficiency hybrids and should have quadrupled-efficiency ones on the road by decade's end. Such superefficient light vehicles could ultimately save three to four times Gulf imports nationwide—as much as Saudi Arabia sells to everyone. Worldwide, they'd save as much oil as OPEC now sells.

- Aftermarket tires as efficient as originals, upgraded truck tire efficiency, and eliminated empty backhauls would save more oil than we could get from ANWR—if there's any economically recoverable oil there at all.

How to Get off Oil: An Open Letter to Congress By L. Hunter Lovins

national security, a healthy economy, and unconstrained mobility. If it's not on the minds of all Americans, it should be. Achieving it is possible, cost effective, and practical; indeed, we've done it before.

In just six years, 1979–85, U.S. gross domestic product grew 16 percent, total oil use fell 15 percent, and Persian Gulf oil imports plummeted 87 percent. If the United States had maintained that pace, it could have eliminated all Gulf imports since 1986. Today's more powerful technologies, policies, and motivation can repeat and beat that success while improving jobs, income, and the environment.

Redoubling oil productivity is not a pipe dream. In 2000, America used 40 percent less energy and 49 percent less oil to produce each dollar of gross domestic product than in 1975. Without that reduced energy intensity, we'd have needed five times the domestic oil output and 13 times the Persian Gulf imports we did get. Yet it barely scratches the surface of what's now possible and profitable. For example, displacing all Persian Gulf oil (2.5 million barrels a day of crude oil in 2000, equivalent

when you buy a new car, you pay a fee for its inefficiency or get a rebate for its efficiency. Each year, the fees pay for the rebates, so it's not a new tax—those who choose inefficient vehicles and impose social costs on the rest of us pay for those who choose efficient vehicles and save social costs. At a reasonable rate of several thousand dollars for each 0.01 gallon per mile (not mpg) above or below the new-

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- Feebates could double heavy trucks' efficiency and double or triple commercial planes' efficiency.
- Without the fuel-wasting hub-and-spoke airport monopolies, we could get faster point-to-point flights in smaller planes.
- The Defense Science Board's May 2001 report *More Capable Warfighting Through Reduced Fuel Burden* recommended an array of fuel savings that would improve the Department of Defense's capability while saving many billions of dollars a year.
- For the longer term, we should stop mandating and subsidizing sprawl, level the playing field between cars and other transportation modes, and encourage integrated mobility services, so all Americans—including the one-third who are now too old, young, poor, or infirm to drive—have more choices about how to get around or not to need to.

Together, such proven alternatives in energy efficiency and nonpetroleum supply can displace oil promptly, securely, prof-

Spreading the Word

In recent months, RMI has made available on its website some important pieces of energy-related material, which we recommend to readers. First published in *The American Prospect*, Amory and Hunter Lovins's two-part "Mobilizing Energy Solutions" is a compelling, contemporary overview of U.S. energy policy and the nation's exciting energy opportunities. (See www.rmi.org/sitepages/pid171.php#LibEnergyPol.)

Second, *Brittle Power*, the ground-breaking 1982 Pentagon study on domestic energy vulnerability by Lovins and Lovins, has been loaded onto our website, at www.rmi.org/sitepages/art7095.php. With the current concerns about energy security and terrorism, *Brittle Power* is a most compelling read.

itably—and, in time, completely. All should be shared rapidly with allies and freely with developing countries: many of both depend on Gulf oil far more than we. Then there are many ways to provide oil substitutes:

- **Biofuels.** New ways to turn farm, forest, and even municipal wastes into liquid fuels can now compete if scaled up. Done right, they can protect topsoil, farmers, rural culture, climate, and prosperity. Locally producing such biofuels bypasses vulnerable pipelines and provides more jobs. However, biofuel production should not compete with food production, nor burden already-stressed topsoil. Good technologies would support natural-systems agriculture, which also saves fossil fuel, promotes family farming, and pays farmers to move carbon from air to topsoil.

- **Hydrogen.** Fuel cells using hydrogen made from natural gas or renewable electricity are just entering civilian use and mass-production. The chairs of four major oil companies and three major automakers have said we're entering the oil endgame and the start of the Hydrogen Age. A profitable-at-each-step transition has been devised by RMI, but it depends critically on cars designed for direct hydrogen, *e.g.*, Hypercars. (When parked, those can also serve as clean power-plants-on-wheels, earning back much of their ownership cost and potentially displacing all the existing coal and nuclear power plants many times over.) Hydrogen already competes on cents per mile, but its production, infrastructure, and fuel-cell production scale-up all merit support, as do renewable sources to produce it. Hydrogen deployment also needs Federal modernization of obsolete codes and standards. Any new natural gas pipelines built should be designed to be compatible with later conversion to carrying hydrogen.



Together these efficiency and supply options can replace Mideast oil without relying on inherently vulnerable domestic sources—such as doubled and prolonged dependence on the Trans-Alaska Pipeline System, which would create the fattest energy-terrorist target in the country. Doing that would worsen national energy security. True energy security comes instead from more efficient use and from more diverse, dispersed, renewable, and local sources. They're also the ones now winning in the market.

Sincerely,
L. Hunter Lovins

This piece is adapted from a briefing paper by Amory Lovins and Hunter Lovins for a national political leader, 2 October 2001.

Fostering a Green China

RMI's Bill Browning heads to the Far East's wild west to promote sustainable development

By Jeremy Heiman



Above: Yannan, a city of 100,000 in the loess soil plateau region of Shaanxi province. This city was the home of the Chinese Communist Party and the center of a massive ecological stabilization effort. Photos: Bill Browning

The most fertile ground for growing green developments just might be in the most populous nation on earth. China, a country straining at the gates of the modern age, is planning an orderly redevelopment of its western provinces, now staggering under transportation, infrastructure and pollution problems. To gain knowledge necessary to introduce sustainability to this development process, Chinese officials have begun a consultation process involving RMI and other American experts.

Bill Browning, of RMI's Green Development Services, traveled to China last December along with Ray Anderson, Chairman and CEO of Interface, Inc., a recognized expert on natural capitalism concepts. The two attended a gathering called the International Symposium on Construction and Sustainable Development of West China, hosted by leaders of a government group convened to guide development efforts.

The trip was organized by C.S. Kiang, an old friend of RMI, recently retired as Institute professor at Georgia Tech. Kiang also arranged Hunter and Amory Lovins's visit to China in 2000, when the two

introduced the concepts of natural capitalism to the sprawling nation and launched the Chinese edition of the book. Also participating in the December conference were members of the Federation of Associations of Chinese Professionals in the Southeastern United States, a group of expatriate Chinese businesspeople and scientists.

Browning and the others participated in the symposium as guests of the State Administration of Foreign Experts Affairs. The delegation flew into Beijing. After an eye-opening visit to Xi'an and some nearby rural areas in Shaanxi Province to learn of the problems faced in Western China, Browning and Anderson traveled to the symposium.

The West China development symposium was held in Chengdu, in Sichuan Province, at a former summer residence of Mao Ze Dong. Chinese officials from several provinces were present. They were direct and honest about their problems.

"They have enormous pollution problems," Browning said. Although China is moving away from an economy that depends on central planning, 78 percent of industry in the western provinces (as con-

trasted with about 20 percent in the eastern provinces) is still owned by the government. Many of the existing manufacturing businesses are heavy polluters, and will probably need to be closed down for environmental reasons risking massive unemployment and displacement.

To speed redevelopment and reduce the shock of transition to privately owned businesses, the policy group recommended financing based on a structure used by rural cooperatives in the United States—bonds are guaranteed by the government, but they are financed by purchases made by individual investors. Customers of a rural electrical cooperative, for example, pay bills to the coop, but over time, they become owners of the utility. Chinese planners at the meeting were fascinated and intrigued by the idea of using private financing to develop a business which ultimately becomes a cooperative.

Anderson addressed the conference, speaking on the work of Interface and the effects of the principles of natural capitalism in the business.

The planners were also excited to learn about the green building, distributed generation, and stormwater work that RMI has done in recent years.

"These things have really good traction with Chinese leaders," Browning said, noting that China is on the verge of a great transition, and officials are concerned that change be guided with care and consideration. They are open to ideas from any quarter, as long as they are workable.

In fact, Browning said, one government official declared that China is a communist, centrally-planned economy in name only at this point, and is developing economically by whatever means are appropriate. The discussions among leaders bore a remarkable resemblance to what one might hear in the United States, he said, with officials trying to sort out whose jurisdiction each of these issues falls under.



Though the purpose of the trip was to initiate a learning process for Chinese officials on the subject of sustainable development, it was an eye-opener for the visitors as well. Before the conference, Browning and Anderson got a better look at some of China's problems in the course of a tour through Northwestern China.

Bill's group went to Xi'an, the ancient capital of China and the home of the first emperors of China, located in Shaanxi Province. Traveling north by bus, they crossed a plateau of loess soil, eroded into thousands of hills and valleys. They visited the tomb of China's first emperor, in a scrub ecosystem similar to the piñon-juniper lands around RMI's Snowmass, Colorado headquarters. The area immediately around the tomb is covered with cedar trees up to 3,000 years old.

"It's exceedingly beautiful," Browning said. "But in shocking contrast to Colorado, the surrounding hills are completely denuded, stripped for agriculture in centuries past. Every centimeter of the hill-sides was cultivated, but erosion on a massive scale resulted."

Browning's group visited the emperor's tomb on the way to the town of Yannan, where Mao Ze Dong's communist party was based in its early days. Along the road, as far as the eye could see, hillsides were terraced.

"Your first reaction is you're just horrified," Browning said. "This was terraforming on a scale that's almost inconceivable." Though the terraces and the dikes at their edges use considerable land area, agricultural production is actually increased, because the terraces make more water available to crops. "They're actually getting far more food out of the same area," Browning said.

Terracing and micro-terraces are used not just for agriculture, but to prevent further erosion. The terraces have cut the erosion by 65 to 70 percent. Micro-terraces are not used so much for agriculture as for

Greening the Summer Olympiad



RMI's Bill Browning with Prof. CS Kiang, the organizer of much of RMI's involvement in China, in a state reception hall in the Forbidden City.

On December 20, Bill Browning, Ray Anderson, and C.S. Kiang had a private meeting with Wang Wei, the operational head of China's Olympic organizing committee, and his assistant. The 2008 Summer Games, to be held in Beijing, are being heralded as the "Green Olympics."

The committee had convened only ten or twelve days before the delegation's arrival, so scheduling a meeting with the committee's head was considered an achievement in itself. But the scheduled half-hour meeting stretched into an hour as the participants discussed the possibilities for reducing the impact of the venues and the games. The Rutgers-educated Wei spoke perfect English, Browning said.

"They've got some enormous challenges," Browning said. Preliminary plans call for a lot of construction on the Olympic site in the northwest quadrant of Beijing. The conversation centered on green strategies used on other projects, and what lessons RMI has learned out of that experience.

Browning said he believes there may be an opportunity for RMI to participate further as the design process progresses.

"The organizers are calling it the 'Green Olympics,' and that's a huge commitment," he said. "They now have to follow through, especially after what the Australians achieved in Sydney. There's quite a bit that they're going to have to do—and it could be very advantageous."

For more information, see <http://www.beijing-2008.org/eolympic/news%20room/bj%20sheet.html>.

— Jeremy Heiman

restoration of grasses and forbs thought to have been native to the area.

Areas have been replanted, Browning said, but it's not certain that the original vegetation is being restored because no one knows for certain what the native species were. One of the suggestions made by visi-

tors was to drill and obtain small core samples of building materials in a Song Dynasty pagoda in Yannan. The cores can be examined for the pollen that floated by at the time of construction, helping researchers determine what vegetation was present.



Passive solar greenhouses such as this have extended the growing season in Western China, expanded the crop mix, and improved the income of remote villages.

Apple orchards have been planted on the terraces with some degree of success. But in some of the most remote areas, the cost of hauling the fruit out by truck exceeds the price of the crop, so apples can be seen rotting on the ground.

In most villages in this region, modern housing has been built after the wise pattern of ancient ones—built into south-facing hillsides to take advantage of passive solar heat. The barrel-vaulted arches of these dwellings repeat the prominent design element in the cliff dwellings.

Some of these villages have also built greenhouses, taking advantage of the southern exposure for year-round crop production. These are built from adobe, stone or rammed earth, with straw for insulation. Their south-facing surfaces have clear plastic stretched over a wood or metal structure. This has allowed even tiny villages to increase the variety of food that they're producing and to create additional income.

"That was a thing that amazed me," Browning said. "There's commerce going on everywhere. The level of economic activity is phenomenal. This is a culture that understands capitalism and has for a very long time."

But capitalism along with growth has a

considerable downside. To accommodate more and more cars, China is developing a network of four-lane highways equivalent to the interstate system in the United States.

"Many times, we'd go into these tiny villages, where people lived in structures that were essentially huts," Browning said. "Then you'd have this massive gas station on the edge of town, which in many cases dwarfs everything else in the community." To accommodate the additional cars, bicycle traffic in some towns has been moved off streets and onto separate bike lanes, with their own traffic lights. As highways send their branches through the countryside, advertising follows. Buildings facing the highways are now adorned with giant characters proclaiming the virtues of products sold there.

"Ten years ago, you wouldn't have seen that," Browning said.

Back in Beijing after the symposium, the travelers met with a vice-premier who is in line to be the next premier of China, Wen Jiabao. Premiers of China succeed each other in a rotation. Wen has been chosen, Browning said, because he's viewed as one of the most progressive and incorruptible of the country's top leaders. The delegation met with Wen for more than an hour.

"His remarks were really astonishing," Browning said. In his discussion of China's energy strategy, he conceded that coal, nuclear, and natural gas will remain the most important sources for the near term, but China must focus on three things. The first is to clean up coal-fired power plants dramatically. The second is continuing the ongoing transition to natural gas. The third, and most important, Wen said, is where the future of China lies.

"Our future is with solar and wind," Browning said, quoting Wen. "China has huge wind and solar resources it has barely begun to use. This is where we will focus our attention." But even more important, Browning said, Wen went on to say that all of the changes in energy presuppose that the nation will do the most important thing first: dramatically increase the efficiency of China's energy use.

One of the hosts introduced Browning, who presented Wen with a Chinese-language copy of *Natural Capitalism* signed by coauthor Hunter Lovins. Browning said Wen was quite excited about the book and declared that he had wanted to read it since he heard of its publication. The Chinese translation of *Natural Capitalism*—the 1999 book by Amory Lovins, Hunter Lovins and Paul Hawken—has done well in China, selling out each printing as soon as it is available.

Before the trip drew to a close, Browning delivered a guest lecture on green building technology at Beijing University. He has been asked to participate in the design of a new 200,000-square-foot classroom, laboratory and office building there. The building, which will be one of the first green buildings in China, is expected to be shared by the university and the 2008 Olympic Committee. **1 ..**

The NEP Initiative— An Idea Whose Time Is Coming

By Marty Pickett, Executive Director

This past spring has been a hectic time at RMI. We successfully completed two of RMI's most ambitious projects, and both seem to be taking root. Our work with refugee camps has stimulated wide interest, and several large foundations are now asking about additional design work and field tests—stay tuned.

Meanwhile, the National Energy Policy Initiative continues to gain acceptance among the nation's top energy experts and is seeing an upswell of grassroots support. Thirty-three leading energy experts have already endorsed the Expert Group's report. Half are or were senior private-sector executives. The backgrounds of the others include two Advisors to the President, two Deputy Secretaries of Energy, five other Subcabinet members, a CIA Director, two Senior Economists from the President's Council of Economic Advisors, five chairs or members of federal and state regulatory commissions, and a House energy leader—heavy hitters all. Why such strong bipartisan support? Because the NEP Initiative matters, plain

and simple. It's the way public policy of any kind should be done—transparently, carefully, candidly, respectfully, and inclusively. It tested the hypothesis that focusing on what most Americans agree about would make most of the things they don't agree about less necessary and important. The Expert Group's clear and concise 17-page consensus on integrated vision, goals, and strategies is an important advance in addressing decisively and creatively the national needs that the House and Senate ducked or couldn't agree on. (And thanks to Rep. Mark Udall, we will present the NEP Initiative to a session of the influential bipartisan/bicameral Energy & Environmental Study Institute, 3 p.m. 26 June in Washington DC. Reps. Mark Udall (D-Colo.) and Zach Wamp (R-Tenn.) will co-host, and RMI is expecting 100-300 members and staffers. Our speakers will include Amory Lovins, Jack Riggs, and Bruce Smart.)

Mike Davis was a member of the NEP Initiative Expert Group. One of the nation's brightest energy minds, he was Assistant Secretary of Energy under the first Bush



Administration. An eloquent speaker, he recently penned a short essay about energy policy's moral context. Mike knows that many of us currently deciding the fate of the world won't be around in 40 years. That's why he feels it's so important that we work for our children's future. With his permission, I've decided to quote it here. Read it, think about it, and see if you can take some of your own steps toward a better future. Energy is an issue that will never go away, so a sound and durable energy policy is an ideal and a responsibility that shouldn't go away either. | ..

A Simple Ethic

By Mike Davis

History has a way of recording those who had an opportunity to make a difference and what actually happened. As our children wrestle with the energy and environmental problems they must solve, because we did not, they and history will most likely flunk our current collective business, political and intellectual leadership.

There is an old saying that goes, 'We do not inherit the earth from our fathers, we borrow it from our children.' This truth is clearly observable today. We are indeed borrowing clean air, clean water, and limited energy raw materials from our children and their children and we are leaving nothing of equal value in return. Simply put, we should be leaving the campground cleaner than when we found it! Are we? The answer is no—but; and there are always but's, very complicated but's that get in the way of action—over the

past 30 years, I have witnessed concern for energy and the environment and calls to action come and go. For all the intellectual capacity, great planning and political rhetoric brought to bear, I have not seen any sustaining leadership or progress toward what should be our goal: leaving more value and opportunity for the future than what we are consuming today!

In my view, the missing link to sustained progress on these topics is acceptance of a simple guiding ethic. We are borrowing the earth from our children. Are they going to be well served by what we consume, produce and leave behind? Our actions can be guided and judged by this ethic.

We certainly know enough today and have sufficient time and resources to take actions that would get a passing grade. Do we have the ethics? | ..

PBFs Make the Grade

By Cameron M. Burns and Huston Eubank, AIA, CSI, CCS

“Phenomenal!” exclaimed RMI’s CEO Amory Lovins when architect Heinz Rudolf, FAIA, told him about the newly-opened North Clackamas High School’s likely future energy savings.

Amory had good reason to be excited. The school has successfully applied many of the concepts he had suggested in its earliest design sessions. Computer and physical modeling of the school predict that it will quickly become one of the best green schools in the nation. The total energy saving is expected to be 44 percent better than the Oregon Energy Building Code requires (and much better than the American Society of Heating Refrigeration and Air-Conditioning Engineers’ energy code recommendations). The school will save roughly \$75,000–80,000 annually on its energy bills, and the total capital cost was a mere \$118.70 per square foot. And now that it’s open, the structure itself is drawing rave reviews.

“This is an incredible building for students and staff,” said Principal Dean Winder. “The natural light and ventilation brighten everyone’s day. The students have more bounce in their step and smiles on their faces. The parents and community are very proud of what they have done for this generation and generations to come.”

PERFORMANCE-BASED FEES

The North Clackamas High School is unique not only because it is now one of the greenest schools in the nation, but because of the use of performance-based fees (PBFs)—one of four projects chosen by RMI to demonstrate their use. As the name implies, PBFs are professional fees in which the savings derived from highly-



The 265,000-square-foot, 1,800-seat Clackamas High School, near Portland, Ore., opened recently. Early in its design, RMI selected the building as one of four U.S. demonstration projects for our “performance-based compensation” experiment. Designed by BOORA Architects and CBG Engineers, it enjoys exceptional amenity and energy efficiency. Photo courtesy David Church

efficient design become part of the compensation package for designers—the greater the savings in electricity, natural gas, liquid fuels, and other resources, the more the architects and engineers earn.

The North Clackamas High School project began in the mid-1990s and involved numerous entities, including RMI, BOORA Architects, CBG Engineers, Eley Associates, The ENSAR Group, Portland General Electric, the Energy Foundation, and, of course, the school district. North Clackamas educators had heard about the effects of natural lighting and ventilation on student and teacher performance,

and investigated.

“The district was not interested in green design for its own sake,” said Bill Dierdorff, Business Manager with the North Clackamas School District.

“The district was interested in an excellent educational environment that would be cost-effective over the 75- to-100-year life of the facility. Green was not a goal, it was a solution!”



With funding from the Energy Foundation, RMI worked closely with Eley Associates to create a set of PBF guidelines. PBFs aren’t rocket science, but using them requires considerable foresight and planning. “The value of

starting early cannot be overemphasized,” wrote Charles Eley, AIA, PE, of Eley Associates in the primer *Energy Performance Contracting for New Buildings*. “Retrofits and late design changes are usually limited to HVAC equipment selection, lighting equipment changes, and possibly glass type. These measures save energy, but they have a relatively low rate of return. The most cost-effective measures happen early on and affect characteristics like building orientation, window size and placement, shading, and space planning. Many of these measures cost nearly nothing—sometimes they even cost less than the base case—but each have the potential for saving a lot of energy.” (See “Enlightenment in Brazil,” p. 14.)

THE SCHOOL ITSELF

The 265,355-square-foot school opened 3 April 2002, after spring break, so that North Clackamas seniors would be able to enjoy the school before they graduate. The building is organized into “bars” along an east-west axis for optimal natural lighting and ventilation. It also employs natural and recycled-content materials that follow principles of environmental sensitivity, simplicity and efficiency—such items as natural linoleum, ceramic and quarry tile, brick, recycled rubber flooring, recycled upholstery, and recycled acoustical tiles. Divided into four academic houses, the building provides small-scale learning environments with emphasis on flexibility, integration of instruction, technology, and spaces for social interaction and community use.

“Because of a tight budget (roughly \$29 million), the building orientation, massing, bay-depth, and micro-climate had to be considered from the beginning,” said architect Rudolf, a principle at BOORA Architects of Portland. “The emphasis on high-performance glass and skin permitted a reduction of the mechanical system.”

A DOE-2 computer energy model anticipates annual savings over typical designs of 275,000 kilowatt-hours in lighting, 315,000 kWh in fans and pumps, 150,000 kWh in cooling, and roughly 27,000 therms (2.7 billion Btus) in heating. The building is complemented with indigenous landscaping. An existing six-acre wetland area was preserved and enhanced; it will be used to retain and purify stormwater runoff.

To test their design ideas about lighting and natural ventilation, the architects and students built two full-scale classroom mockups. The first of these was at the Seattle City Light’s Lighting Design Laboratory, where they were able to hone critical aspects of their daylighting and electric lighting design. The second was built by the students on the site of the new school and used to test natural ventilation components of the heating and cooling design.

Performance-based fees can get badly lost in many building and development project processes, especially when there are many change orders. In this project, however, the PBFs survived and even helped steer the process. The money saved through energy efficiency will be split between the designers and the school fifty-fifty for the first two years, with the school’s share going into the general fund to offset increasing cost of energy.

“The PBFs were important simply because they allowed us to spend the extra time and effort required to create a first-class school,” added Rudolf. “The extra compensation allows us to do extra research, evaluations, and testing so that we can develop cost-effective systems, especially passive systems. What is equally important is the fact that once a contract for the extra compensation is in place, it serves as tool to commit everyone to accomplish specific goals, as opposed to slightly increasing the professional fees without

the specific expectations.” In an aside, Heinz chuckled about how the run-up in energy prices last summer might have a very positive effect on the performance-based fees, and how this has highlighted the importance of energy savings for this project.



According to Physical Plant Director David Church, the school has been a hit locally as well as regionally. Several other school districts are working on high schools with similar technology, including the Salem-Keizer School District and the Oregon City School District.

“I was surprised at how a building can be so functional and yet beautiful at the same time,” he said. “My impression in talking with both students and the community that they are very pleased with the school. The School Board is pleased as they know this facility was a great bargain and will continue to save operating costs due to its low energy consumption. The press was very positive and did several stories on the school and its ‘green’ aspects.”

Such green or sustainable buildings aren’t just getting noticed in Oregon. Across the country and around the globe they are becoming the norm, not the exception. Recently, Australian architect Glenn Murcutt won the Pritzker Prize for his beautiful and sustainable designs. In his *New York Times* article about the award, architecture critic Herbert Muschamp—by no means a champion of green design—noted: “Mr. Murcutt’s selection by the Pritzker jury can be seen as an acknowledgement that sustainability now overrides aesthetic criteria in the urbanizing world.”

While we agree, the new North Clackamas High School project points out very elegantly, as do Mr. Murcutt’s buildings, that sustainability and aesthetics can be quite complementary. ■■■

Enlightenment in Brazil

By Cameron M. Burns and
Huston Eubank, AIA, CSI, CCS

For those of us who work on solutions for a deteriorating planet, possibly the greatest investments we can make are in our children and grandchildren. Our current ideas for dealing with climate change, carbon emissions, resource depletion and other problems—although we think they're pretty neat—will seem awkward compared to the elegant, up-to-date strategies our children will invent and deliver.

So how do we leverage that investment in our kids—an investment we know will have greater returns than our own current and immature solutions? We start by making our schools better. But at RMI we're not only interested in inspiring the teachers and administrators or changing the curriculum—we want to change the buildings.

Just one aspect of a “green school”—daylighting—can have extraordinary effects on students. In 2000, researchers evaluated the test scores of 21,000 students in three school districts in California, Colorado, and Washington. They found that in one district, the students in classrooms with good daylight progressed 20 percent faster on math tests and 26 percent faster on reading tests when compared with students in classrooms with poor quality or no daylight. In the other two districts, “students in classrooms with the most daylighting were found to have 7–18 percent higher scores than those in the least.”

In the past year and a half, the Summit Foundation has funded some important RMI work in the Brazilian city of Curitiba, and we are now on the verge of seeing

some remarkable results. While RMI's work covered a number of topic areas (wastewater treatment, executive training in natural capitalism, etc.), it's in the realm of green school design that we've seen the biggest return on investment.

Both Curitiba and the state of Paraná are in the process of planning for many new schools. RMI's studies of existing schools and presentations of what's possible with green buildings caught the attention of both state officials and Curitiba's mayor. Over the course of three trips to South America, RMItes worked with state and city officials to design a new model school that uses 75 percent less energy than current

designs, yet performs at much higher levels of comfort and productivity. The design is funded for construction by the mayor and will be finished in about a year. Then we are planning a year-long period of monitoring during which we will examine the building's energy and resources consumption, and more importantly the performance of the students. (If you would like to support RMI's monitoring efforts, please contact Dale Levy at dalelevy@rmi.org or



Above: Views of adjacent classrooms. In both, the inefficient fluorescent lights are turned off. The difference is due to lightshelves, which RMI added to the classroom windows so that senior Brazilian officials could see just how effective daylighting and other “green” school design elements can be. The lightshelves not only spread light evenly across the room, they also moderate the excessive bright-to-dark ratio that makes the classroom in the upper photo so uncomfortable. Photos: Huston Eubank

970-927-7217). Because the school is funded by the mayor, we are able to experiment with and implement RMI's green building recommendations; once the new school's performance is verified, it will become the prototype for schools funded by Brazil's Federal government.

The Brazilians are very excited about this. Though a relatively modest start, our work in green school design could one day make Brazil a world leader in green school design.



Above: Editor's pick for Best Action Photo: RMI's animated architect Huston Eubank explains the benefits of high-performance design to Governor Jaime Lerner of the state of Paraná, Brazil (note the fast-moving finger). Right: Lightshelves are easy to install, affordable by any society, and provide some of the greatest benefits to students and faculty. The exterior lightshelf shades the glass below it, while both it and its interior extension bounce daylight up onto the ceiling.



And RMI's work with schools in Brazil will not just be for Brazil. All over the world both developing and developed nations are struggling to figure out good educational practices. Even places with very high academic standards are looking to change the way they do education. (See "PBFs Make the Grade," p. 12.)

For example, in 2001 Japan undertook education reform. According to *Japan Digest* (www.indiana.edu/~japan/digest5.html), "many Japanese believe that the examination system is too stressful, that the schools are too rigid and don't meet the needs of individual students, that contemporary students show little interest in studying, and that the educational system needs to produce more creative and flexible citizens for the twenty-first century." They also blame the schools for a "perceived increase in child misbehavior, particularly in junior highs." Thus, Japan is now experimenting with a broadly revised approach to education and curricula nicknamed "the



Rainbow Plan." It is likely that fixing problems with stress, learning and discipline could begin with very simple daylighting and natural ventilation efforts.

Certainly, daylighting is already proven to help stress levels. In studies of 90 Swedish elementary (primary) school students, researchers looked at behavior, health, and cortisol (a stress hormone) for a one-year period in four separate classrooms, each with different amounts of daylight. According to the *Journal of Environmental Psychology*, "the results indicate work in classrooms without daylight may upset the basic hormone pattern, and this in turn may influence the children's ability to concentrate or cooperate, and also eventually have an impact on annual body growth and absenteeism."

In this country, the federal government estimates that between 2000 and 2007, "at least 5,000 new schools will be designed and constructed to meet the needs of American students in kindergarten through grade 12."

The Department of Energy estimates schools in the United States spend more than \$6 billion each year on energy and that 25 percent of that money—\$1.5 billion—could easily be saved through "better building design, widely available energy-efficient and renewable energy technologies, and improvements to operations and maintenance." (We'd prefer to aim for a saving of at least 75 percent.)

RMI's work in Brazil with Curitiba's model green school is obviously in its infancy but could have global potential. Around the world, more and more schools are expanding their hours of operation, reducing class size, and employing other measures—such as one-on-one tutoring—to improve learning. Such improvements put big demands on physical learning space and energy requirements, ironically leaving less money for books and other resources that directly affect education. In the coming years, high-performance school design will become one of the single most important aspects of education, alongside higher quality books, quality teachers, and quality curricula. ■

RMI's Bill Browning Briefs Senate

RMI's Bill Browning participated in the first-ever U.S. Senate roundtable discussion on green building techniques on 24 April 2002. Sen. Jim Jeffords (I-Vt.) organized the meeting to educate Senators about the advantages of making federal buildings more energy-efficient.



Bill Browning,
Hon. AIA

“The federal government owns half a million buildings, which makes it the single largest property owner in the country,” Browning said. “For it to be implementing green building tech-

niques is very significant in creating markets. It will also create a lot of good examples of the feasibility of energy efficiency retrofits in different climates and building styles.”

Browning was invited by Sen. Jeffords to present case studies on existing green buildings, sparking a lively discussion. Browning is the founder of RMI's Green Development Services team and has provided green building consultation and design work for nearly 20 years.

Sen. Jeffords chairs the Senate Environment and Public Works Committee, which has jurisdiction over federal environmental programs but also oversees all federal buildings managed by the General Services Administration (GSA). This includes federal courthouses, the headquarters of federal agencies, and other federal buildings spread throughout the 50 states.

Staffers from the offices of nine senators, including Senators Reid, Lieberman, Boxer,

Wyden, Clinton, and Smith, attended the roundtable, in the Dirksen Senate Office Building. Staff from the Senate Science Committee and staffers representing several House members were also in attendance. Browning said he believes the discussion was a success and that legislative efforts supporting green building improvements for federal buildings may result from the event. “I think this will be the first of a series of annual, or maybe more frequent, Congressional roundtables on green building,” said Browning.

Discussion at the roundtable ranged from acknowledgement of the strong role government plays in fostering green building to the need for more building research, particularly on how buildings affect human health and productivity. Browning said there was a strong dialogue about a federal tax credit for green buildings. “While the economic benefits of green buildings have been well documented, they are still only five percent of new construction,” said Browning. Tax credits could help foster the many societal and infrastructure benefits of green buildings, such as reduced stress on water, electricity, and other utility systems, and better indoor air quality and public health.

Steven Perry, Commissioner of the GSA was at the meeting as well. Representatives of the GSA, the National Park Service, and the U.S. Green Building Council (USGBC) recently signed a memorandum of understanding stating that the GSA and Park Service will begin using the LEED green building rating system developed by the USGBC. LEED (Leadership in Energy and Environmental Design) is a voluntary building rating system based on existing, proven technology. It evaluates environmental performance from a “whole building” perspective, providing a rigorous and applicable standard for what constitutes a green building.

SIP is coming!

At long last, *Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size* is going to press! Written by Amory B. Lovins, Kyle Datta, Thomas Feiler, Karl R. Rábago, Joel N. Swisher, André Lehmann, and Ken Wicker, the long-anticipated book (five years in the writing, 27 years in research) describes more than 200 ways in which the size of “electrical resources”—devices that make, save, or store electricity—affects their economic value. It shows that properly considering the economic benefits of “distributed” (decentralized) electrical resources typically raises their value by a large factor, often as much as tenfold, by improving system planning, utility construction and operation (especially of the grid), service quality, and avoided societal costs. That increase far exceeds the cost differences between, say, modern natural-gas-fired power plants and windfarms. In many applications it could even make photovoltaics (solar cells) cost-effective today. *SIP*, as it's known, will probably change how distributed resources are marketed and used, and it reveals policy opportunities to make these huge benefits explicit in the marketplace.

SIP should be available in August. It will retail for \$60 and will be available through RMI's publications department, 1739 Snowmass Creek Road, Snowmass, Colo. 81654-9199, or through our online bookstore, at www.rmi.org/store/pid385.php.

The book's research, editing, production, and marketing was supported by generous grants from The Shell Foundation, The Energy Foundation and the Pew Charitable Trusts. Shorter papers and presentations will be posted at www.rmi.org as they are completed.



Fortune Coverage of RMI

The 13 May 2002 issue of *Fortune* magazine has some of the best coverage RMI has ever experienced. Writer David Stipp's feature "Can This Man Solve America's Energy Crisis?" centers on RMI's CEO Amory Lovins, and describes his long journey pondering energy policy and its links to environment, development, and security.

The fabulously illustrated and well researched article goes on to describe Amory's musings on security, transportation (i.e., Hypercar®), and other topics. But it's Stipp's ability to blend historical highlights with an interesting character that really makes this story shine.

"The response has been light so far," said Stipp recently. "So far it's been positive."

Ralph Cavanagh, an energy expert at the Natural Resources Defense Council in San Francisco and longtime RMI friend, points out something most of us intuitively feel about the Institute when he comments in the story: "What makes Amory unique is that he has this relentless optimism about the future that's very compelling. It's been good for environmentalism and a scourge to its critics."

However, the RMI Staff Vote for best quote in the article goes to RMI's former co-CEO Hunter Lovins, Amory's 25-year writing and idea-spreading partner, when she notes, "You should see us writing together. Folks think we're going to kill each other."

The entire article is available online at www.fortune.com/indexw.jhtml?channel=artcol.jhtml&doc_id=207774.

Report on San Francisco Released

As mentioned in the last issue of *RMI Solutions*, RMI is assisting the City of San Francisco in the development of renewable energy systems. Recently, RMI's Joel Swisher completed a report for the city, assembling energy data, analyses, and program suggestions into an *Energy Resource Investment Strategy* (ERIS). It prioritizes the city's electricity resources based on cost, performance, and environmental impact. The options include energy efficiency, cogeneration, solar and windpower, conventional gas-fired generation, and new transmission lines. RMI is also helping the city to design policies and programs to improve energy efficiency and harness distributed and renewable energy resources, while ensuring an adequate and reliable supply of electricity for its residents. In the first phase of this work, RMI prepared a scenario analysis for inclusion in the preliminary San Francisco Electricity Resource Plan. The plan is now complete, and although not for a general audience, holds valuable information for municipalities and other communities considering their energy futures. It's downloadable at: <http://www.rmi.org/images/other/E-ScenarioAnalysisForSF.pdf>.



Dr. Joel Swisher, PE

RMI Helps Design New York Resort

Members of RMI's consulting staff, along with two dozen of the nation's leading

experts on "green" development, met this spring to help steer the design of DestiNY USA, a \$2 billion, 3.2 million square-foot entertainment, retail, recreation, dining and hospitality resort planned for Syracuse, New York.

RMI's Bill Browning, Huston Eubank and Tom Feiler are working with Rick Fedrizzi, founding chair of The U.S. Green Building Council and president of Green-Think Inc., a Syracuse-based environmental consulting firm, to advise DestiNY USA developers on energy efficiency, daylighting, building ecology, materials, indoor light and air quality, solid waste management, public-private funding opportunities, transportation, and many other topics related to the development.

Developer Robert Congel, senior managing partner for DestiNY USA, is committed to making the resort an exemplary green development. "We are working to make DestiNY USA 'climate positive'—using no

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fossil fuels, while lowering our construction and operating costs, ensuring that DestiNY USA will be the international center for environmental excellence,” Congel said.

Besides climate neutrality and super-efficient design, developers hope DestiNY USA will become a fulcrum for sensible urban transit design—indeed, up to 30 million visitors are expected annually.

The complex will also be home to a \$25 million, 50,000-square-foot International Tourism and Exposition Center; a 90,000-square-foot saltwater aquarium; a 500,000-square-foot multi-field indoor sport and recreation complex; a 65-acre glass-enclosed park and a 1,500-foot-long replica of the Erie Canal.

“The DestiNY USA project raises the bar for green development projects all over the

world,” said Fedrizzi. “The developer’s commitment to transforming a brownfield site into DestiNYUSA, combined with the experience and intellectual resources of the consulting team will result in the establishment of a new global standard for environmental responsibility.

It’s that chance to be involved at the front end that makes this project so appealing.”



“Cool Citizens” Offers Climate Change Ideas

In April, RMI released a brief on climate change. Entitled *Cool Citizens: Household Solutions* shows homeowners how to save money while dramatically



Rick Heede

reducing carbon dioxide emissions.

Written by RMI’s Rick Heede, “Household Solutions” describes how homeowners can lighten their impact on the

earth’s changing climate by reducing emissions of greenhouse gases in their households. Most of the recommendations pay for themselves in reduced energy bills in six years or less, and many measures have paybacks shorter than two years.

Funded by and developed in cooperation with the Richard and Rhoda Goldman Fund and Sun Hill Foundation, this guide will be the first really convenient homeowners’ guide of its type. “Certainly, information on this subject already exists, but it is typically hard for most users to find, and little useful advice is offered on reasonable priorities to pursue,” Heede said.

The Cool Citizens premise is that citizens can save money by saving energy—and then use that money to buy further energy savings. The Cool Citizens series makes specific, realistic, and prioritized recommendations on how to reduce the environmental harm of daily activities. It focuses on choices—and changes—citizens can make in the home, at work, in transportation, in recreation, and in purchasing everything from air-conditioners and airline trips to windows and wine. Decisions that citizens make in this arena are critical, because nearly half of total U.S. carbon dioxide emissions are from homes and personal vehicles, and the other half is embodied in products and services that homeowners all demand and consume.

Copies of Cool Citizens “Household Solutions” will soon be available for download from RMI’s website.

The Blinds Leading the Visionary

No one quite knows when and where Venetian blinds originated, but the early Venetians, who were great traders, are often credited with their invention and introduction to the West. Indeed, the French term for these versatile blinds is *Les*

Persiennes (the Persians). The blinds became popular throughout Europe and made their way to the United States in the mid-18th century. Exactly when they reached California is unknown, but their proper use might have saved Californians millions in energy bills last summer had Californians known the Victorian era art of Venetian blind adjustment. “The basic idea is to not close the blinds the way you would close a curtain,” said Amory Lovins, RMI’s chief Venetian blinds technician, “but instead tilt them at an angle (room side up) so that (1) when looking out the window,



one can still get a good impression of the outdoors, (2) the light coming in is not too bright (compared to adjacent opaque wall areas), and (3) the incoming light is bounced up on the ceiling as God intended. Then, turn out the lights (in perimeter offices) and save their direct electricity usage and the associated air-conditioning and fanpower to take away their heat.”

Amory guesses that had state office workers in California used Venetian blinds with the deftness of our Victorian predecessors, California would have saved a great deal of electricity during the summer of 2001. “With summer coming, we need to spread the word and adjust those blinds!” he said.

GDS Staff Teaches in Virgin Islands

In mid-May, three members of RMI's Green Development Services staff instructed students in sustainable building practices on St. John, U.S. Virgin Islands as guests of the award-winning eco-tourist resort of Maho Bay. Ben Shepherd, Bill Browning, and Huston Eubank gave a two-week seminar to students and practitioners in systems thinking, interior design, architecture, construction management, landscape architecture, and related disciplines through a course designed by Colorado State University's Institute for the Built Environment. (How they managed to land such a gig is a mystery to the rest of RMI's staff, but we have vowed to find out.) To interview one of the instructors, please e-mail media@rmi.org.

Building Conference Draws Crowd

On 20 May 2002, RMI, along with the City of Portland, Portland Gas & Electric,

and the Cascadia Chapter of the U.S. Green Building Council held the first in a string of conferences exploring the differences, challenges, and possibilities in building green. The event took place in Portland, Ore. and had over 220 attendees. The next conference is scheduled for 16 July in Chicago, with additional events being planned for Washington, D.C. and Austin, Tex. For more information on the Chicago event, please visit www.epa.gov/region5/sue/greenbldg-conf/greenconf.htm. Information about upcoming conferences will be posted on RMI's web calendar at www.rmi.org/sitepages/pid22.php as it becomes available.

Hypercar® News A Big Hit

As part of our transportation work, RMI staff compiles news on a broad range of alternative transportation technology and fuel-related issues on a biweekly basis (at www.rmi.org/sitepages/pid388.php). Since its creation, the page has become among the most popular on the RMI website. Since March, Recent Hypercar® News has

been viewed over 9,000 times by visitors to the RMI site. Current stories include a collaborative effort, between Honda Motor Company's research division and Plug Power of Latham, New York, a potential method of producing hydrogen fuel in cars, and a project to convert Islay Island in Scotland to hydrogen power. RMI staff also provide visitors with biweekly updates on recent environmental news entitled "What in the World?" (See www.rmi.org/sitepages/pid471.php.)

RMI Teaches Sustainability to Wastewater Engineers

In late April, members of RMI's Energy and Resources team and Commercial and Industrial Services team conducted a two-day training session for Carollo Engineers in Walnut Creek, Calif. RMI instructed a select group of professionals from the wastewater treatment firm who will go on to form a sustainability team to integrate the concepts of sustainability into Carollo's ongoing operations. Joel Swisher, leader of

New RMI Staff

RMI has added a number of new people (staff, interns, and volunteers) during the past year. Pictured at right are (front row): Brian Adams, Ginni Galicinao, Kortney Hartman, Jennifer Sweeting, Ginny Hedrich, and (back row): Brett Nelson, Stephanie Gilchrist, Missy Morgan, Patsy Hernandez, Lori Klein, and Doreen Clavell. (Not pictured are Beatrice Aranow, Ben Emerson, Corey Griffin, Kate Grimberg, Betsy Hands, Vicky Shropshire, and Josh Terry.)



RMI's Energy and Resources team joined with Catherine Greener, leader of RMI's Commercial and Industrial Services to bring a multi-pronged approach to the training.

Amory and Hunter in *Sports Illustrated*

RMI cofounders Amory Lovins and Hunter Lovins made a recent appearance in *Sports Illustrated*. A 13 May 2002 article by E.M. Swift questions oil estimates for the 1002 Area—the fragile coastal plain—which is at the center of the debate.

“How much oil is in the 1002 Area?” Swift asks. “Arctic Power, a pro-drilling lobbying group funded by the state government, oil interests and individuals, likes to cite a range between 5.7 billion and 16 bil-

lion barrels of recoverable oil. But those numbers fail to take costs into account. ‘Oil reserves almost anywhere on earth are more accessible and more reliably deliverable than those above the Arctic Circle,’ Amory and Hunter Lovins wrote in *Foreign Affairs*. ‘Even if drilling in the Arctic Wildlife Refuge posed no environmental or human rights concerns, it still could not be justified on economic ... grounds.’”

RMI Flying High with the Air Force

Last winter, RMI's Green Development Services helped the historic Hickam Air force Base in Hawai'i fly in a new direction by participating in a charrette to renovate a large building on the base. Building 1102

is not only large (500,000 square feet, 2,000 occupants, and a \$140 million “replacement value”); it has historical significance—bullet holes in one of the stairwells symbolize its role in the 1941 Japanese attack on Pearl Harbor. The Air Force has budgeted \$43 million for the renovation—a less-than-ideal amount, but a fine challenge for innovative designers.

Charrette participants were divided into three teams: architecture, mechanical systems, and landscape/water. After an extensive tour and a couple of days of examining Building 1102's condition and potential for triple-bottom-line benefits, they were able to identify changes that could eventually save the Air Force (and you the taxpayer) \$1 million in capital costs (that's \$2.04 per square foot!) and a lot more in operational costs. | ..

Editor's Notes

There are a lot of really cool things to read about in any given issue of *RMI Solutions*. However, “life at RMI” behind the scenes is just as interesting. Institute staff members are always getting involved with important personal projects and activities.

With the help of Global Exchange and TransFair USA, staff member Jennifer Sweeting recently started up a Fair Trade Coffee campaign in the Roaring Fork Valley, encouraging individuals and businesses to buy fair trade coffee, and of course, brewing it at RMI. Coffee is one of the world's biggest commodities (oil is Number One), and there are some big environmental and social injustices that result from its production. “Fair trade” coffee is grown on small farms and cooperatives, in shaded areas (limiting deforestation for production), and the co-ops producing it are guaranteed \$1.26 per pound (\$1.41 for certified organic). For more info, visit www.transfair.ca or contact jennifer@rmi.org.

RMI researcher/consultant Chris Page has been working with Mountain Rescue Aspen, a volunteer search and rescue organization based in the Ute City and subject of the book *The Falling Season* by Hal Clifford. Chris is a former NOLS instructor, and enjoys both the outdoors and helping people learn.

Intern Brian Adams is impressive. Two nights a week, after work, Brian heads off to take part in the local Buddy Program, a youth mentoring program here in the Roaring Fork Valley. Brian spends about six hours weekly with his buddy, an eight-year-old boy who enjoys the outdoors and sports. “I enjoy young people and I want them to be exposed to many different experiences in their lives,” Brian said. “I have the time and desire to volunteer, so I do.” Brian also volunteers with the Basalt Adult Literacy Program.

Marriage seems to be in the air this summer. RMI's Mandarin- (and four other languages-) speaking Public Information



Cameron M. Burns,
Editor

Officer Thammy Evans married Vic Ullom, a native Coloradan, on 1 June.

RMI water intern Jeremy Magliaro was married 25 May to his grad-school sweetheart Stacey Ballard. Jeremy's still at RMI for now, but obviously his interests are broadening! We wish both couples the best.

Meanwhile, I had the opportunity to run an RMI Earth Day booth at an Evergreen, Colo., Earth Day event. I had dozens of comments, questions and suggestions from the members of this enlightened community about energy, green buildings and Hypercars. It seems RMI is very well known outside our little valley—I for one must get out more! | ..

Editor's note: Once again our summer newsletter's "What Are You Doing?" features some of our 2002 interns and volunteers. Of course, this year we have too many to fit onto these pages, so you'll get to read about the other interns and volunteers in our Fall issue. If you are interested in supporting an internship fund, or creating a new one, please contact Development Director Dale Levy at 970-927-7217 or dalelevy@rmi.org.

GINNY HEDRICH



I am so happy to be volunteering at RMI this summer. I have always loved this organization and am delighted to be able to contribute and learn from the brilliant folks

here. Some of my time will be spent in the sales and marketing area, growing RMI's consulting practice. In addition to working in that area, I will be conducting research for the consulting teams. I am currently researching the health benefits associated with the greening of hospitals for Green Development Services (GDS)—the effect of nature on healing. As you will have read earlier in this issue of *Solutions*, "green" buildings can have tremendous positive benefits on humans of all ages—I hope I can help promote those benefits.

COREY GRIFFIN

ERIC KONHEIM INTERN



While studying about energy resources and energy efficient buildings during my time at Stanford University, I had the opportunity to learn about RMI's work and hear Amory

Lovins speak about sustainable design. Consequently, I'm excited to be working with GDS this summer and further pursuing my interests in making the built environment more sustainable. While at RMI, I am

researching *biomimicry* (exploring how we can mimic natural wisdom in building design) and *biophilia* (examining the human response to our environment) through the study of existing projects that incorporate biomimetic or biophilic concepts, as well as searching for ways to encourage these principles in future projects. The research involves the exploration of energy efficiency, energy production, indoor environmental quality of buildings, creating building materials and systems, and applications for construction and the current design process.

BRETT NELSON



This summer I will be working on the Windstar/RMI land. My research project will be a study involving intensive rotational cattle grazing. Forty-one

head of cattle will be rotated around to different paddocks within the grazing pastures. At each spot, the cattle will be contained in a relatively small area until the forage has been grazed effectively. Before and after the grazing, the fields will be analyzed for their health in terms of plant and soil composition. The ultimate goal will be to have healthy plant communities that keep the noxious weeds to a minimum.

I will also be irrigating much of the land, maintaining the nature trails, caring for the greenhouse at the RMI headquarters, and monitoring hydrologic trends in our wetlands.

DANIEL WHEELER



I'll be working with Brett and other land interns and staff in moving the cattle. The idea of the intensive grazing of cattle is pretty new to Westerners, but it

has a great deal of historical precedent in other parts of the world. In Africa, for example, the huge herds of ungulates that migrate across the East African plains hammer the land in short, directed-but-rotational spurts. Yet the savannah seems to thrive—why shouldn't RMI's own high altitude, semi-arid scrublands? Holistic land manager Alan Savory introduced the idea to RMI early last year, and now we're finally getting a chance to put the theory into practice. In addition to that, I'm going to be doing weed control and weed monitoring. I also be doing some water quality monitoring.

BRIAN ADAMS



As a public information intern, my duties here at RMI run the gamut of information dissemination. For instance, I respond to all incoming inquiries from consumers, individuals, homeowners, small businesses and

other technical questions regarding RMI's research results. My answers are usually in the form of emails, phone calls, letters and personal visits. A lot of my time also involves updating recent hydrogen fuel cell vehicle developments and fuel cell energy generation developments. This includes researching the latest news in fuel cell technology, drafting a related news brief and getting it posted on the RMI website. Later in the year, I will also be contributing to a series of RMI syndicated articles dealing with fuel cell technology. I am also working on the RMI *Cool Citizens* campaign, which entails assembling media kits for journalists and marketing the RMI *Guide to Lower Carbon Emissions and Better Business Performance*. ■

Margie Jackson Haley: Raising Activism Standards

Many RMI supporters are well known for their activism in social, environmental and political arenas, but Margie Haley of Dallas raises the bar when it comes to activism that is



applicable to our everyday lives. She has been active with dozens of organizations, hundreds of issues and thousands of people, both in

her native Texas and across the nation—sharing all sorts of ideas and techniques for making human activities less harmful. It was Haley who arranged for RMI's Amory Lovins to be the keynote speaker at the October 2001 Sustainable Dallas conference, and to meet with the *Dallas Morning News* editorial staff. While her dream to give RMI a million dollars is still out there, Haley has given most generously of her time and resources.

Haley and her brothers grew up in Texas with a father who was an avid outdoorsman and a mother who was a self-taught jewelry craftswoman—gaining both a fondness for nature and a self-driven industriousness that would become underpinnings of her life. In university, she earned a bachelor's degree in speech pathology and an MA in audiology from SMU. During the Vietnam War, Haley's husband John pursued his medical training with the Navy to become an ophthalmologist. She, meanwhile, practiced audiology at the Naval medical hospitals where John trained. In their spare time, the couple had two children, Kimberly and Gregory. Upon the family's return to Dallas, Haley became the financial officer for her husband's med-

ical practice until 1995, when she "retired."

In 1990, Haley attended a four-day workshop for Earth Day that changed her life. Renowned environmental leaders from around the globe described the problems humans have created for the planet as well as the challenges of the solutions. Haley decided then and there that simply being environmentally correct was not enough—so she became an activist.

It didn't take long before Haley was a member of the Sierra Club, Audubon, Dallas County Medical Society Alliance, the League of Women Voters and CEED (Coalition for the Earth's Environment of Dallas, which later became ECO Dallas—Environmental Center of Dallas). She became the League of Women Voters' recycling coordinator, and later joined the Dallas County Corporate Recycling Council and the Recycling Coalition of Texas as a board member.

During the early 1990s Haley created a unique program—the CEED/Sierra Club Paper Rescue program. The idea was simply to find corporations with outdated paper products they were planning to landfill and persuade them to turn over the products to environmental groups—saving both paper and money in the process. In 1992, she initiated a League of Women Voters program called Environmental Shopping Tours in Dallas. In the tours she led groups of consumers through grocery stores and explained to them the kinds of food production, packaging techniques, and social situations they were supporting (or ignoring) through their purchases.

"I read about this in an environmental magazine and ordered a video tape from the League's New Castle, New York, office," Haley explained. "They were somewhat

popular. We had a city council candidate come along on one tour. Kroger and Tom Thumb turned us down but Albertsons agreed to it at four stores with advance notice and no more than six participants at a time so as not to crowd the aisles. Our kickoff with the League members was the exception with about 15 participants at three stores. Unfortunately, Albertsons didn't advertise the tours and coverage in the press was minimal, so it was difficult to get the word out." The Tours ran for three years, and although they influenced hundreds of consumers, Haley admits, "I had other fish to fry."

Haley's coup de grâce and most important project became the Sustainable Dallas conference, an annual event about positive, profitable solutions to environmental challenges. She currently serves as its co-chair. She is also the Issues Coordinator for Sustainability for the Dallas Sierra Club and Board Member of the Environmental Center of Dallas.

Her years of hard work have not gone unnoticed. The myriad awards she has received include the Clean Dallas, Inc. 1991 Individual Environmental Excellence Award for Recycling and Solid Waste; the Coalition for the Earth's Environment of Dallas 1991 Green Heart Award; the Household Hazardous Waste Task Force of Dallas County 1992 Environmental Citizens' Award; the National Society of Daughters of the American Revolution's 1993 Conservation Medal; the Keep Dallas Beautiful 1995 Public Education for Environmental Concerns Award; and the High Country Citizen's Alliance 2000 Volunteer of the Year.

These days, Haley is working on developing partnerships between Sustainable Dallas and regional businesses by working through the Texas Natural Resource Conservation Commission, the lead environmental agency for the state. And, as the self-starting activist so frankly notes, "You have to be a sturdy oak to weather some of the political storms in Austin." ■ ..

John C. Fox RMI BOARD CHAIRMAN

The way John Fox pronounces the word *about* (“about”) is a dead giveaway to his origins north of the border.

Originally from Toronto, the newly-elected Chairman of RMI’s Board of Directors now lives in Washington, D.C., where he’s Managing Director of Perseus LLC, a private equity fund management company. A civil engineer trained in business administration, his career has moved him back and forth across the border more than once.

He also currently serves on the boards of other non-profit organizations, including The Alliance to Save Energy and the Washington DC-based International Institute for Energy Conservation, of which he’s past chairman. He’s a past board member of The Energy Foundation and the American Council for an Energy-Efficient Economy (ACEEE).

Though his work consumes a great deal of his time, Fox finds enjoyment in spending as much of the remaining time as possible with his family. He rides motorcycles for recreation, when there’s any time left.

Fox is most interested in “making RMI’s philosophy operational,”

Fox is most interested in “making RMI’s philosophy operational,” as he puts it, or earning commercial acceptance and application of the ideas embodied in RMI’s research.

as he puts it, or earning commercial acceptance and application of the ideas embodied in RMI’s philosophy.

“We’ve had some success at operationalizing the philosophy,” he said. “But the ultimate measure of success will be the acceptance of the business community.”

His more immediate goals for the organization are to try to improve the financial stability of

the organization, and to provide RMI’s staff and leadership with the latitude to continue to be as creative as they have been.

Fox connected with RMI in the late 1980s through his former position as manager of the energy conservation program at Pacific Gas & Electric. PG&E was a subscriber to COMPETITEK, the RMI-



founded electric-efficiency information service, which later became E SOURCE. Through that connection, he was introduced to Amory Lovins, who eventually nominated him as a board candidate. Fox was with PG&E from 1988 through 1993, leading what was then the world’s biggest and best demand-side management effort. He later led the downstream and upstream halves of the great utility Ontario Hydro.

Vice chairman of RMI’s Board of Directors for the past year, Fox was elected Chairman in April. He is a past member of the executive committee, the finance committee, and the recruitment committee. In the decade Fox has been on RMI’s Board, he’s seen an evolution of the Board itself.

“It’s gone from a board that was very supportive of the founders to one that’s more broadly focused on the growth of the organization,” he said. “I think the board is now balanced more than ever in terms of experience, and is able to provide RMI with a broad set of perspectives.” And he’s not at all uncertain about being elected Chairman.

“I’m pleased to be in that position,” he said, “and I do have some experience at keeping boards focused. I see my job as facilitating the collaboration of a very strong set of board members.”

— Jeremy Heiman

Reconciling the Natural and Built Environments

By Stephen R. Kellert

Editor's Note: RMI recently partnered with Stephen R. Kellert, a leading authority on biophilia—the biological inclination to affiliate with nature. RMI's project, co-led by Mr. Kellert, Judith Heerwagen, and Ben Shepherd of RMI's Green Development Services staff, will accumulate, assess, and disperse information about biophilic design in multiple formats, including a yet-to-be scheduled conference. The following is a condensed version of Mr. Kellert's unpublished academic paper "Reconciling the Natural and Built Environments." To support RMI's biophilia research, please contact Dale Levy at dalelevy@rmi.org or 970-927-7217.

Despite notable recent efforts to enhance and restore ecological systems and environmental amenities in many urban settings, my impression is that most of the urban public, its decision-makers and commercial developers remain largely indifferent to and unappreciative of the importance of healthy and diverse natural systems to people residing in modern cities.

Open spaces' natural functions and amenities in most urban areas are typically disregarded. Environmental damages stemming from commercial development, building construction, and road and transportation expansion are rarely considered and mitigated in an effective and sustained way. Few urban commercial developers or municipal leaders recognize or appreciate the connection between a city's natural environment, the quality of human life, and the long-term prosperity and stability



Seoul, South Korea. The city has grown tremendously in recent decades, and the loss of much local agricultural land to development has prompted some to ponder Korea's ability to feed itself.

of these areas. Restoration and protection of natural urban environments is generally viewed as a pesky regulatory obstacle, afforded little planning or budgetary consideration, often disappearing from sight when confronted with political and economic distress.

I believe this prevailing disconnect between people and nature in the urban context is sustained by two widely held assumptions. First, many assume the modern city is largely devoid of healthy and abundant natural diversity. Second and more serious, most believe city life and economies have largely transcended a dependence on the natural world for achieving and sustaining human lives of meaning, satisfaction, and prosperity.

The first assumption of nature being largely absent from the city is a fallacy. Many studies have demonstrated a surprising abundance of biological variability, even in large cities like New York and Hong Kong. Indeed, there exists more biological richness and structure in a handful of urban soil than in the rest of the universe as we know it. The second widespread assumption is that contact with nature is not significant to the long-term health, vitality, and quality of life of the city and its residents. Until dispelled, this widely held and pernicious assumption will probably remain a critical roadblock to the reconciliation

and harmonization of the natural and built environments.

THE GREATER NEW HAVEN WATERSHED STUDY

Recently, a major study was initiated in the New Haven/New York area examining the link between human and natural systems in urban and non-urban settings. The Greater New Haven Watershed Project examined how ecological and social systems shape one another and how the structure and function of natural systems effects human values and socioeconomic behaviors, as well as the reverse. The study area

Stephen R. Kellert is the Tweedy Ordway Professor of Social Ecology at Yale University's School of Forestry and Environmental Studies, and the author of numerous books, including Kinship to Mastery: Biophilia in Human Evolution and Development (1997), The Value of Life (1996),



Ecology, Economics and Ethics: The Broken Circle (1993, co-edited with F.H. Bormann), The Biophilia Hypothesis (1993, co-edited with E.O. Wilson), The Good in Nature and Humanity: Connecting Science, Religion, and Spirituality with the Natural World (2002, co-edited with T. Farnham), Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations (2002, co-edited with P. Kahn).

is approximately 400 square kilometers, including 275 local drainages, part or all of 22 towns and cities, home to nearly half a million people residing in a landscape 13 percent urban, 24 percent suburban, 11 percent agriculture, and 41 percent forested.

Our assumption is that ongoing positive and negative feedback loops exist between natural and human systems and occur anywhere people and nature co-mingle, including urban and non-urban contexts. So far, the data analysis confirms this hypothesis. Subwatersheds characterized by relative health and integrity (*e.g.*, greater species richness, lower levels of fecal coliform, less turbidity, higher dissolved oxygen, etc.) reveal more positive values toward nature (*e.g.*, greater environmental affinity and stewardship), and a higher quality of life (*e.g.*, community optimism, neighborhood quality, social amenities). By contrast, subwatersheds of lower environmental quality report lower quality of life, less outdoor recreational contact or amenities, and a greater inclination to support the dominance and exploitation of nature. In particular, we find the health and integrity of natural systems expressed in varying landscape features (*e.g.*, the presence or absence of open space, particularly favored plant and animal species, clean water bodies) that foster positive environmental values. These values in turn manifest themselves in varying economic, social, and psychological relationships that enhance a sense of and attachment to place and community, which eventually loop back and sustain natural ecosystem structure and functions.

THE NOTION OF BIOPHILIA

These results suggest causal processes that can explain the relationship between varying states of natural health or disturbance, people's environmental values, and quality of life in urban as well as non-urban settings. This causal process is

referred to as *biophilia* (E.O. Wilson, *Biophilia*, 1984; Kellert and Wilson 1993; Kellert 1997), a concept that hypothesizes humans possess a "weak" biological dependence and affinity for the natural world manifest in nine basic values toward nature (briefly outlined below). These nine values function as an anvil on which human fitness is forged. Conversely, the *biophilia* notion suggests that when people impoverish and degrade the natural world, most particularly their meaningful and satisfying experience of it, they diminish their potential material, emotional, and intellectual well-being and capacity. Insufficient space precludes a detailed description of these values, but I will outline them alphabetically:

An aesthetic value underscores the physical attraction and beauty of nature. This perspective has been instrumental in developing the human capacities for recognizing and promoting order and organization, developing ideas of harmony, symmetry, and grace, and in evoking and stimulating curiosity and imagination. Few experiences in human life exert as consistent and powerful an impact as the beauty and physical attraction of nature. In being attracted, people nurture their tendencies for wonder and curiosity that lead to exploration, imagination, creativity, and discovery. People also favor landscapes that enhance safety, sustenance, and security—*e.g.*, ones with water, which foster sight and mobility, that have bright flowering colors and other features that, over evolutionary time, have proven instrumental in human survival.

A dominionistic value reflects the inclination to master and control the natural world. Adaptive benefits include an enhanced sense of independence and autonomy, greater safety and security, and a willingness to take risks, show resourcefulness, and cope with adversity. People hone their physical and mental fitness through subduing and mastering nature.

We no longer rely on besting prey or eluding menacing predators or surviving in the wild, but the strengths and prowess derived from physical and mental competence in confronting nature remain instrumental in human physical and mental well-being.

A humanistic value reflects strong affection and emotional attachment to the natural world. The natural world has always been a physical location for human affection, especially bonding, affiliation, and companionship. People crave companionship and affiliation, and emotionally identifying with elements of nature provides a valued means for establishing strong relationships and expressing and receiving affection. By contrast, isolation and aloneness constitute heavy burdens for a highly social species like our own.

A moralistic value reflects a spiritual and moral affinity for the natural world. Benefits associated with this perspective include a sense of order, meaning, and purpose, a feeling of shared moral conviction, and an enhanced inclination to treat nature with kindness and respect. Nature is a source of deep and persistent spirituality and religious inspiration stemming from a sense of underlying and fundamental connection of humans with the natural world. Despite incredible variety in nature—1.7 million classified species, an estimated 10–100 million extant species, the disappearance of nearly all species that ever existed—most people recognize a fundamental commonality uniting most lifeforms. A great majority of creatures share common molecular and genetic features, analogous circulatory and reproductive structures, and parallel bodily parts. This intuitive recognition suggests a remarkable web of relationships connecting a fish in the sea, a bird in the treetops, and a human in the modern metropolis. When we discern universal pattern in creation, we give shape and def-

CONTINUED ON NEXT PAGE

inition to our existence. Through shared moral conviction in an underlying harmony and purpose in life, people acquire strength, a sense of cohesion, and feelings of mutual commitment. These spiritual and moral sentiments prompt the view that, at the core of human existence, lies a fundamental logic, worth, and even goodness. Faith and confidence emerge through the recognition of a unity transcending one's individuality, separateness, and aloneness. This perspective fosters an inclination to protect and preserve the natural world. People conserve nature as much because of moral and ethical belief as because of any calculated materialism or regulatory fiat.

A naturalistic value emphasizes close, direct, and immersive contact with the natural world. Adaptive benefits include enhanced tendencies for exploration, discovery, and imagination; increased self-confidence through demonstrating skill and competence; and greater calm and peace of mind through heightened awareness and spatial and temporal immersion in nature. Every creature and landscape can serve as a "magic well," the more one explores and draws from it, the more becomes revealed in an endless flow of wonder and curiosity. People mine physical, emotional, and intellectual ore from deep and detailed immersion in nature's rich tapestry of shapes and forms. In the process, they achieve physical fitness and mental acuity, an expanded inclination for adventure, and an enhanced capacity for reacting quickly, resolving new and challenging situations, and exploiting and consuming with efficiency.

A negativistic value reflects the tendency to fear, avoid, and sometimes disdain aspects of nature. Adaptive benefits include avoiding harm and injury, minimizing risk and uncertainty and, more positively, nurturing a sense of awe and respect for nature's power. The natural world has always been a persistent source of some of our deepest fears and anxieties. Avoidance and fear of nature sometimes provokes irrational and highly destructive acts although

these inclinations are typically moderately and rationally expressed.

Human well-being has always depended on skills and emotions acquired through a healthy distancing from potentially injurious natural elements.

A scientific value of nature underscores the knowledge and understanding people derive from empirically studying nature. Functional advantages include increased intellectual and cognitive capacity, enhanced critical thinking and problem solving skills, and greater appreciation and respect for maintaining natural process and diversity. People possess a universal need to know and understand their world with authority, a tendency independent of culture and history where intellectual prowess is facilitated through the study and observation of nature. What the natural world offers all humanity is a varied and ever-stimulating context for developing critical thinking skills, problem solving abilities, and analytical aptitudes.

A symbolic value reflects nature's role in shaping and facilitating human communication and thought. Adaptive benefits include enhanced capacities for language acquisition and taxonomy, psychosocial development, and the ability to communicate through image and symbol. People employ nature as raw material for expediting the exchange of information and understanding among and between their kind. This is accomplished through metaphor, analogy, and abstraction, and by employing language, story, myth, fantasy, and dream. Nature as symbol is especially instrumental in language acquisition. Language depends on the capacity to render ever more refined distinctions, categories, and taxonomies. The young encounter in nature numerous, readily available, emotionally salient, and especially distinguishable objects for learning to differentiate and classify. Symbolizing and fantasizing nature also assists in confronting maturational dilemmas of identity

and selfhood, authority and independence, order and chaos, good and evil, love and sexuality in a disguised yet tolerable and instructive manner. This is achieved through children's stories and fairy tales, legends and myths, totems and taboos, fantasies and dreams. People further employ natural imagery in the language of the street, in the metaphor of the marketplace, and in oratory and debate. Nature provides, in effect, a substrate for symbolic creation analogous to the way genetic variability offers a biochemical template for laboratory discovery.

Finally, a utilitarian value underscores the material and commodity benefits derived from nature. Advantages include enhanced physical security associated with agricultural, medical, and industrial productivity, various ecosystem services such as pollination and decomposition, and the self-confidence and self-esteem obtained from demonstrating craft and skill in exploiting the land and its resources. Despite this utilitarian significance, modern urban society typically prides itself on a material independence from nature achieved through domesticating the wild, eliminating natural competitors, and converting wild land into cultivated and artificial landscapes—a fallacy at best.

SENSE OF PLACE AND ENVIRONMENTAL DESIGN

The results of the Greater New Haven Watershed Study and the various dimensions of biophilia intimate the extraordinary subtlety of ways people benefit from a complexity of associations with the natural world. The health and vitality of the city depends on our continuing to experience the natural world in aesthetically attractive, ecologically sound, and materially accessible ways. These values and the reported research intimate how by degrading the natural environment world we inevitably diminish the human capacity for experiencing beauty, meaning, and significance in life.

Cities will elicit their greatest loyalty, commitment, and stability when they function as places where people confidently and consistently encounter satisfying connections with natural as well as economic and cultural wealth. As the philosopher Mark Sagoff suggested, the idea “of place combines the meaning we associate with nature and the utility we associate with environment. The result is an idea of surroundings that arises from harmony, partnership, and intimacy. Much of what we deplore about the destruction of the environment has to do with the loss of places we keep in shared memory and cherish with instinctive and collective loyalty. It has to do with loss of security one has when one relies upon the characteristic aspects of places and communities one knows well. What may worry us most is the prospect of becoming strangers in our own land.” The legendary biologist René Dubos further elucidated the importance of a sense or spirit of place by suggesting, “People want to experience the sensory, emotional, and spiritual satisfactions ... obtained only from an intimate interplay [and] identification with the places in which [they] live. This interplay and identification generate the spirit of the place. The environment acquires the attributes of a place through the fusion of the natural and human order.”

The current lack of meaningful contact with healthy natural processes and diversity in the modern city is a design deficiency, not an intrinsic flaw of modern urban life. What we require are planners, developers, and leaders committed to the goal of access to and experience of the natural world as an integral and essential component of modern urban life. We may achieve this reconciliation and harmonization of the natural and built environments in the modern city only if, as Dubos suggests, modern designs “are ecologically viable and also satisfy instinctive needs that human nature has derived from its evolu-

tionary past.”

Effective environmental design in the city, thus, means more than “low impact” design aimed at reducing resource uses, increasing energy efficiencies, and better ways to dispose of wastes. It also means capturing the basic biophilic values of nature in the urban context in a manner that enriches and enhances the human capacity for physical and mental growth and development. Effective environmental design must include an “organic design,” whereby materials, forms, and shapes of nature are incorporated into our built environment, as well as facilitate the personal experience of nature as a consistent dimension of modern urban life. We must further strive for a “vernacular design,” in which our urban structures meaningfully connect with the “spirit” of the places where they occur, ecologically, culturally, and historically. As Thomas Bender remarked: “A building, like a person, can have a soul and can be part of the life of a community. It can be rooted in and convey the spirit of a strong culture and tradition. It can help restore to our surroundings a sense of sacredness and honoring of people, place, and diverse traditions.”

Many believe the modern city cannot afford the seemingly peripheral and merely cosmetic luxury of restoring connections to a healthy, diverse, and attractive natural environment. This assumption is narrow and shortsighted. Cities paralyzed by despair over the degraded condition of their natural environments, the costs of its restoration, or the complexity of meaningfully integrating natural amenities into the fabric of urban life will ultimately impede and eventually cripple their health and long-term prosperity and quality of life. Some of the world’s most vital and attractive cities—Paris, Rome, London, Hong Kong, New York, San Francisco, Prague, Beijing, and others—represent areas of considerable natural beauty and diversity. Planners, developers, and political leaders

imaginative enough to capture the virtues of nature and weave these creatively into the urban environment can achieve and accomplish much. Healthy and attractive natural environments constitute an asset not a liability, and should be a thread woven deeply into the garment of the city’s everyday existence.

I have witnessed the beginning of such bold and innovative urban design in commercial developments in Frankfurt and New York City, in residential developments in Sacramento and Washington DC, in shopping centers in Boston and London. I have also seen it in the recycling of urban landscapes across the centuries, in both Eastern and Western cultures. In each case, it achieves what René Dubos called the successful “wooing of the earth,” the fusion of human culture with nature. As he wrote, the “wooing of the earth suggests the relationship between humankind and nature should be one of respect and love rather than domination. Ecological management can be effective if it takes into consideration the visceral as well as spiritual values that link us to the earth. Ecological thinking must be supplemented by humanistic value judgments concerning the effect of our choices and actions on the quality of the relationship between humankind and earth. With our knowledge and a sense of responsibility for the welfare of humankind and the earth, we can create new environments that are ecological sound, aesthetically satisfying, economically rewarding, and favorable to the continued growth of civilization. But the wooing of the earth will have a lastingly successful outcome only if we create conditions in which both humankind and the earth retain the essence of their wildness. The symbiosis between these two different but complementary expressions of wildness will constantly engender unexpected values and new hopes, in an endless process of evolutionary creation.” ■ ■ ■

A Hearty Thanks to All

Dale Levy, Development Director

Light the candles! RMI is 20 years old. Because of you and many others, we have racked up many impressive accomplishments in our first two decades. But as the saying goes, you ain't seen nothing yet.

As we blow out the candles on our cake, our wish for the next five years: to establish natural capitalism as one of the central leading principles of business, communities, governments, communities of faith, and individuals.

People around the globe are hungry for ways to achieve prosperity that honor, protect, and restore the earth and its people. From Wall Street to Main Street, sustainability is becoming a commonplace topic

and many business leaders are seeking practical ways to implement it. But without a coherent synthesis of what to do, the needed changes in companies and communities are neither obvious nor inevitable and may not be timely.

Because natural capitalism is at once practical, profitable, necessary, and fun, it seems a promising way to make the world more secure, prosperous, and life-sustaining. Here's how we will meet our goal:

1) In the next five years, RMI will comprehensively communicate the vision and benefits of natural capitalism to receptive decisionmakers in business, government, and civil society.



2) RMI already works with business leaders and others to implement natural capitalism, but the early adopters must be multiplied, linked, reinforced, and enlisted to spread the message. RMI will work together with other powerful non-profits and will bring together a network of practitioners.

3) RMI's long-successful model for transforming business is to help carefully chosen early adopters to achieve conspicuous success as natural capitalists. This forces their rivals to follow suit or lose market share.

Healthy challenges! Worthy of our concerted effort together. How can you help? Begin considering what part you would like to play. We'll be providing more details soon. **1 ..**

Staff Spotlight | Marty Hagen

Marty Hagen, RMI's information systems manager, once ducked a \$400 admission charge to hear Amory Lovins speak. A long-time admirer of RMI, Marty had been laid off from his job as simulations engineer at Kenetech Windpower, a California manufacturer of wind turbines. He heard Lovins was to speak to a gathering of solar experts in San Jose. Stone broke, he knew he had no way to raise the admission fee, but he decided to try to get into the talk anyway.

Dressing in a business suit, Marty went to the auditorium and simply walked in. All the other guests wore identification badges, so Marty was sure he was going to be thrown out. When a waiter came by with a tray of wine glasses, he grabbed two.

"I figured if I was gonna get thrown out, I'd at least get a buzz on," he said.

Marty is impatient with those public speakers who adhere to the theory that more of their content is absorbed if they speak slowly. Lovins didn't disappoint him. "Amory got up and spoke clearly, compellingly, concisely and quickly for 45 minutes. I wanted to get up and stand on my chair and cheer," Hagen said.

At various times during his education and his engineering career, Hagen had run across Amory Lovins's writings. He had come to see energy efficiency as one of the most important ideas going. But he wasn't certain how his own expertise could be exploited to its full potential.

Hagen, whose engineering degree is from Cal Poly, had conducted acoustic research related to helicopter rotors for the National Aeronautic and Space Administration (NASA). He studied the physics of rotor blades and air, with the intent of reducing the "wop-wop-wop" sound associated with helicopters. At Kenetech, he analyzed wind turbines for their ability to withstand stress and developed a computer program to predict energy production from turbines.

But Kenetech laid him off three times and rehired him twice before going out of business. Unable to find work in engineering, Hagen was steered into computer technology by a friend. He was employed as a senior Macintosh computer technician for software maker Adobe Systems when he made a more significant connection with RMI.

While staying with a friend in Colorado Springs, he took the opportunity to visit RMI. After a tour of the main building, he purchased some books. Noticing a single sheet of paper on the conference table, he couldn't resist peeking at it. It was a draft of a help wanted advertisement for a Macintosh technician.

"Is there someone I can talk to about this?" he asked. He got a lunch invitation, which led to a job offer. His answer? "Not only yes, but hell yes!"

— Jeremy Heiman



RMI Solutions

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LETTERS TO THE EDITOR

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Rocky Mountain Institute is an entrepreneurial non-profit organization that fosters the efficient and restorative use of resources to create a secure, prosperous, and life-sustaining world.

Our staff shows corporations, communities, individuals, and governments how to create more wealth and employment, protect and enhance natural and human capital, increase profit and competitive advantage, and enjoy many other benefits—largely by doing what they do more efficiently.

Our work is independent, nonadversarial, and transideological, with a strong emphasis on market-based solutions.

Founded in 1982, Rocky Mountain Institute is a §501(c)(3)/509(a)(1) public charity. It has a staff of approximately 50. The Institute focuses its work in several main areas—business practices, climate, community economic development, energy, real-estate development, security, transportation, and water—and carries on international outreach and technical-exchange programs.

Our Sincere appreciation is offered to these friends who have contributed to RMI between 1 January and 30 April 2002. Numbers in parentheses indicate multiple donations. Please let us know if your name has been omitted or misspelled so it can be corrected in the next issue.

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RMI is in the process of refining *RMI Solutions* to serve readers and supporters better. Please help us by answering the following questions. If convenient, please visit our newsletter web page (www.rmi.org/sitepages/pid97.php) where you can fill in answers to this survey electronically. Or, if you don't have web access, just clip out this page and mail it back to us at: Newsletter, RMI, 1739 Snowmass Creek Road, Snowmass, Colo. 81654 or fax to 970-927-3420.

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- Detailed articles
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- Keeps me in touch with projects

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Do you share the newsletter with other people and if so, how many?

- 0-2
- 2-4
- >4



HUNTER FLIES SOLO

CONTINUED FROM PAGE 1

seeing young staff members, and helping interns launch projects. She was often responsible for helping make payroll—a difficult chore during slow economic times. But she also inspired the Institute to grow, and co-created most of RMI's core program areas. Many of the original principles developed by Amory and refined by Hunter about energy (right-sized, distributed, flexible, innovation-friendly) would later be applied to these and other areas.

As RMI entered the 1990s and demand for various services grew, Hunter found herself requested more and more as a speaker, consultant, and author. Her straightforward speaking style and her clear, concise writing had her working with universities, heads of state, governments, and world organizations like the United Nations and World Economic Forum.

Over the years, Hunter authored and co-authored numerous books, including *Brittle Power* (1982), *Energy Unbound* (1986), *Factor Four* (1997), *Green Development* (1998), *Natural Capitalism* (1999), and hundreds of papers and articles, typically serving as general editor and ensuring clear logical structure. With Amory she was designated a 2000 Time magazine Hero for the Planet, and shared the 1999 Lindbergh Award, the 1993 Nissan Award, the 1983 Right Livelihood Award (“Alternative Nobel Prize”), and the 1982 Mitchell Prize. In 2001, she won a LOHAS Leadership in Business award, and shared the 2000–2001 Shingo Prize Research Award for the book *Natural Capitalism*. She has also received two honorary doctorates.

As a result of Hunter's leadership at RMI, today the Institute works in over 50 countries, influencing corporations, organizations, governments and individuals in energy and resource efficiency.

“Hunter's contributions to energy and resource efficiency are among the most important by anyone in those fields,” said RMI Board of Directors Chairman John C. Fox. “In her 20 years at the Institute, she has positively influenced thousands of people and hundreds of organizations.”

Of course, the original RMI is still charging forward, led by CEO Amory Lovins and four-year Executive Director Marty Pickett.

“It's business as usual at RMI,” said Norm Clasen, RMI's Communications Director. “All our projects are progressing well, and we look forward to continuing the important work the Lovinses started here 20 years ago.” He noted that RMI's mission remains unchanged, and that as projects warrant and require, the Institute's “bench” will be further deepened.

As cofounder and co-CEO of RMI, Hunter had many unique and varied roles at the Institute and was heavily involved in many of RMI's far-reaching activities. Her roles will be filled by other staff members.

“Of course, you can never replace Hunter,” Clasen said, “but we have enough latitude and talent at RMI that we believe we'll be able to handle the things she was a part of. The departure of a founder is, in fact, a natural progression, and change is healthy for any organization. Some of our younger staff members will now have the opportunity to prove themselves as they are given more responsibility.”

Some of RMI's current work includes pro-



Hunter, in her element. Photo: Norm Clasen

moting a consensus-based energy policy for the United States, created independently of current Congressional energy policy discussions (the “NEP Initiative”); ongoing work with refugee settlements; various educational programs; and expanding consultancy for major industries, utilities, water managers, and developers and architects.

This issue of *RMI Solutions* includes several articles authored or co-authored by Hunter during the past six months. Enjoy, and next time you see Hunter, say howdy and wish her the best—as do we all, in admiration and gratitude.

“We wish Hunter well in her new endeavors,” said Amory Lovins. “She's a brilliant, charismatic woman with the drive and the strategic insight to change the world. Whatever she does next will build on, and I hope will even eclipse, her extraordinary contributions at RMI. So think of this as like a cell division—now there are two RMIs evolving out in the world!” ■

NatCap Case Stories

America's national parks contain some of the country's most spectacular natural treasures, so it's especially unfortunate when they become so popular that human activities begin to degrade the environment. Across the country, recent concerns over all sorts of high-impact activities—from snowmobiling in Yellowstone to traffic congestion in Zion—have prompted the Park Service to enact measures that will help preserve these grand cathedrals of nature.

Yellowstone and the Grand Canyon, and has also worked with NPS on its procurement process. Below are natural capitalism's four principles along with a few examples of what RMI, concessioner Amfac and the Park Service itself are doing to make more money while generating fewer impacts:

1. Dramatically Increase the Productivity of Natural Resources. Radically increase the productivity of nat-

RMI has helped concessioners implement natural capitalism in

descent lights with fluorescent lights offered savings with payback periods well within the average concessioner contract period.

A fine example of the value of these measures comes from a joint project by RMI, Lawrence Berkeley National Labs, and the DOE's National Renewable Energy Laboratory (NREL)—the "Greening of the White House." (The White House is, after all, an NPS property.) In 1993, the three institutions performed a comprehensive energy and environmental audit of the building. After the assessment, there were two years of "greening up" activities, including increasing the energy efficiency of the building envelope, lighting retrofits, implementing a comprehensive recycling program, using fewer pesticides, installing energy-saving equipment—you name it. In March

Natural Capitalism in America's National Parks

By Christina Page and Cameron M. Burns

But such efforts aren't solely the domain of the National Park Service—and shouldn't be. Visitors, concerned organizations, and local communities all have important roles to play. Perhaps the most important players besides the federal government are the hundreds of concessioners who operate within the parks.

In the National Parks, more business and greater revenues can mean harm to the very thing drawing the spending public—the natural environment. Yet there are ways to "grow" business without increasing environmental degradation. Natural capitalism is a business model developed by Rocky Mountain Institute founders Amory Lovins and Hunter Lovins, and business author Paul Hawken (based on the book *Natural Capitalism*). It promotes prosperity while preserving, and ultimately restoring, the natural capital that all life and wealth-generation depends upon. Based on down-to-earth principles (see below), natural capitalism can be an effective guide for businesses to increase profitability while restoring the planet.

ural resources through a whole-system design mentality that fundamentally changes facilities, production processes, and products. Reducing the wasteful and destructive flow of resources from depletion to pollution represents a major business opportunity.

This principle is best seen at work in energy- and water-efficient buildings, where advanced technologies help to increase productivity and reduce consumption. Lodgings in many parks, from rustic cabins to full-service hotels, already benefit from energy and water efficiency retrofits, especially in temperature-extreme or water-poor regions. Since concessioners within parks are limited by regulation in what they can charge for goods and services, operational savings can provide a powerful way to improve a profit margin. Studies a few years ago on sustainability opportunities within several parks indicated significant potential energy savings from upgrades of concessioner buildings, especially in the area of lighting. Simple measures such as weather-stripping, light sensors, and replacing incan-

1996, estimated savings in energy, water, landscaping expenses and solid waste bills as a result of the greening activities were \$150,000 annually. Between 1996 and 1999, when a *Six Year Report* on the progress was issued, new measures implemented brought the total savings up to \$300,000 annually.

2. Shift to Biologically-Inspired Production Models. Shift production to biologically-inspired patterns that close materials loops, eliminate waste and toxicity, and minimize throughput. Natural capitalism seeks not merely to reduce waste but to eliminate the very concept of waste. In nature, there's no such thing as toxicity. Waste from each of nature's kingdoms becomes food for another kingdom. In the late 1990s, with urging from RMI, Amfac decided to apply this principle to a vehicle maintenance facility in Yellowstone National Park, with a "whatever-goes-in-stays-in" philosophy. In terms of action, that meant recycling oil, antifreeze, chlorofluorocarbons (from refrigeration operations), scrap metals, solvents, fluorescent lamps,

and vehicle batteries. In 2000, over 800 gallons of antifreeze, 55 gallons of solvents, eight tons of scrap copper, steel, and aluminum, and 100 used car batteries were recycled. Meanwhile, 4,000 gallons of used oil were burned for heat recovery. Although a very small amount of non-hazardous residue results from the in-house recycling process, and some hazardous wastes must be recycled outside Yellowstone (mercury lamps, for example), Amfac's cost of hazardous waste disposal went from roughly \$60,000 in 1996 to \$5,000 in 2001.

Also, both the Park Service and concessioners not only have the opportunity to encourage nature-inspired facilities and operations; they can promote natural capitalism among suppliers, too. Amfac's solvent suppliers in Yellowstone were encouraged to reuse the large plastic barrels in which the solvents were delivered.

3. Move to a Solutions-Based Business Model. Move to a solutions-based business model that delivers value as a continuous flow of services rather than the sale of goods—rewarding both the provider and the customer for doing more and better with less for longer. The business model of traditional manufacturing rests on the sale of goods. In the new model, value is instead delivered as a flow of services—providing illumination, for example, rather than selling light bulbs.

As co-CEO (Research) of Rocky Mountain Institute Amory Lovins often remarks, people don't want heating fuel or coolant; people want cold beer and hot showers. While people don't necessarily want large, energy-intensive lights blasting down on visitor center dioramas, they do want to be able to read exhibits.

In 1998, Zion National Park enlisted the help of NREL to build a green visitor and transit center. By placing many exhibits outside where visitors could enjoy the natural environment—the sunshine, the clean canyon breezes, the sound of the Virgin River—the size of the building was reduced

from 18,000 to about 11,000 square feet, thereby using fewer materials. The reduction in space reportedly saved an estimated \$1.5 million in construction costs. Daylighting also lights up 80 percent of the center's interior. By recognizing lighting as a service and not an assemblage of light bulbs, the Park Service will save itself (and you, the taxpayer) roughly \$350,000 over the projected 25-year life of the building, or \$14,000 a year in energy costs. And it has improved the visitor experience in the process.

4. Reinvest in Natural Capital. Reinvest in natural and human capital, which is ultimately the basis of future prosperity. Ultimately, business must restore, sustain, and expand the planet's ecosystems so that they can produce their vital services and biological resources even more abundantly.

Restoration means not only repairing and reinvesting in nature, but stemming depletion where it is occurring. At the Flamingo Lodge Marina and Outpost Resort in Florida (the only "in-park" accommodations in Everglades National Park), the resort's restaurant does not serve certain species of fish that have been overfished or are endangered. In fact, notes Chris Lane, Amfac's Director of Environmental Affairs, his company has a new policy on fish for all its restaurants. "We serve species based upon three aspects," Lane said, "one, a wild population that's abundant enough to sustain fishing; two, low levels of wasted catch or 'bycatch'; and three, fish caught or farmed in ways that minimize impact to the environment." At present, you won't find Chilean sea bass, shark, Atlantic swordfish, or bluefin tuna in any of the company's restaurants. (For a guide to "sustainable" sea food, see www.mbayaq.org/cr/seafood_watch.asp.)

How can businesses adopt these principles in ways that make sense and make money? When making decisions about your businesses, ask yourself if the product or service you're are supplying involves:



Certainly this little antifreeze recycler isn't as pretty as most scenes in Yellowstone, but it's doing its part for the park. Photo courtesy Amfac Parks and Resorts

- a minimum of energy and materials to get the job done
- natural (non-toxic and life-temperature) materials and processes
- materials that can be used again, repaired easily recycled or biodegraded
- whether it enhances rather than depletes the planet's natural capital.

Every concessioner has at least one, and sometimes many, options in how to supply light, heat, and water, what to stock in retail outlets and restaurants, and how services and products are distributed. Often, the difficulty is understanding which choices lead to the greatest environmental responsibility and bottom-line returns. Natural capitalism provides easy-to-follow guidelines that'll make your business and your park a better place. []

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