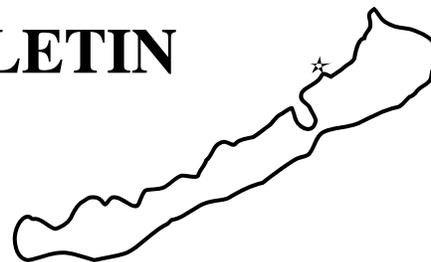


THE BALATON BULLETIN



Newsletter of The Balaton Group

SPRING 1999

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The purpose of your existence is revealed in your desires. To fulfill your purpose, you must fulfill your desires.

The force that creates is not our conscious wanting and effort but our unconscious conviction — our beliefs.

To have a conviction that something you desire will happen means to trust that it will happen. It means truly loving that desire.

The most amazing discoveries and inventions have come to those people who have fully believed in their future. Humanity would be centuries behind if it were not for the courage of those who have continued to do things that they believed in, even though they were often laughed at, even though what they attempted seemed impossible or pointless.

There is great power in trusting the future. It is an amazing force that enables people, to persevere in their intention. It soothes them, gives them courage, and lights them up again and again. Even when others give up, they keep the conviction of great outcomes. Without such hopes humanity would never finish anything.

Everything great had a beginning in dreams, desires and hopes that did not have visible success for a long time. Unbreakable faith in the future keeps courage alive until the thoughts and visions start coming into being.

That kind of faith in the future gives people an unbeatable power.

— from *The Textbook of Life* by Martin Koic, written in 1935.
Translated from Slovenian by
Melita Rogelj and Alan AtKisson

Dear Balatonians:

As you know, our central topic this year is vision: the construction of a responsible, appealing, imaginable, manifestable Green Vision — one that captures the cultural and ecological diversity of the world.

And as bombs fall and a population is displaced very near to our annual meeting place in Hungary, some of us find it difficult to put ourselves in visionary mode. It seems more natural and necessary at this moment to mourn or rage or give up entirely than to think and speak about a world we would actually want to live in.

This issue of the *Balaton Bulletin* encourages both of those sides of us, that which anguishes over current reality, that which can see and long for and dedicate

itself to a better future. It contains a small part of an active Balaton e-mail discussion about Kosovo, which captures our confusion and alarm, but ends with a small note of historical hope. It includes reviews of two books about the inexcusably disastrous state of major world fisheries. But it also spells out a number of visions, about peace, about sufficiency, about a breathtaking restoration of wildlands, and about an energy future that only an **Amory Lovins** could see so clearly.

Vision. Discouragement. Both are in us. Both are needed. We have to be grounded in the world we have. We have to be clear about the world we want. We have to endure the excruciating pain of recognizing the long distance between the two, and still dedicate ourselves to reducing that distance.

Agonizing Over Kosovo A Balaton E-Mail Discussion

Hatred tries to cure disunion by annihilating those who are not united with us. It seeks peace by the elimination of everybody else but ourselves. But love, by its acceptance of the pain of re-union, begins to heal all wounds. Consequently we can only be happy in this world in so far as we are free to rejoice in the good of another.

— Thomas Merton

Wed, 14 Apr 1999
From: **Dmitri Kavtaradze**
<ecopolis@GLASNET.RU>

Dear friends,

Freedom comes with bombs? It happened many times during World War II, but only when the country was under enemy power and dictatorship. Who is the enemy in a civil war?

I have never seen a system diagram with a level of freedom that is linked with the flow of force in a positive loop. There should be a negative loop, but with significant delay. In Balaton is it possible to try to make explanations of the logic of modern force, or does force have no need to resort to logical constructions?

Recently a friend of mine returned from the U.S. really shocked that "American intelligent people generally support the bombing of Yugoslavia. Milosevic is usually used as an explanation."

Is it a deviation of logic? Propaganda? How is it possible to believe a person who burned his mouth with hot milk and then blew on the cow?

Is it the case that international interests have developed a supercomplicated system that has its own behavior? Most older people in European countries remember by sweat on the skin what the noise of falling bombs means — it is a collective historical experience. Experience is impossible to forget. So we remember.

But still there is some information that I guess we are missing in Russia. On TV we see over-excited people: it seems as there is a strange "euphoria" of danger and a coming fight: very, very strange to observe.

Two days ago a woman, a Russian cellist, urgently returned from Novi Sad: she asked why "teaching" dictator Milosevic (there is nothing about his dictatorship in Russian newspapers and media for years) has to be done by ruining the pedestrian bridge to the old castle that is used by tourists and that was bombed to stop navigation on Danube?

People just do not understand each other, was a say-

ing of the modern philosopher Aron Brudny. Our military generals are saying that Yugoslavia has a enough strong army to prevail (each army is the strongest in the world — Anatole France) and it is a country with old traditions of guerrilla war — one of the lessons of modern history. That makes our expectation worse.

In Russia we have a view of the other side of the moon. But there is still only one moon.

Recently documents were published on secret agreement signed by Roosevelt, Churchill and Stalin in Yalta. Following these agreements, Soviet refugees from Nazi prison camps were directed later to the Soviet side. They were escorted to Stalin's camps.

Maybe we will come to understanding earlier? And soon enough?

Dialogues are the oxygen of these days.

* * *

Thu, 15 Apr 1999
From: "Prof. **J.G. Krishnayya**"
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I apologise for the length of this paper; it appears to be extremely sober, and also a corrective to the dominant media version. The source also appears authentic.

THE FATAL FLAWS UNDERLYING NATO'S
INTERVENTION IN YUGOSLAVIA By Lt Gen Satish
Nambiar (Retd.)

(First Force Commander and Head of Mission of the United Nations Forces deployed in the former Yugoslavia 03 Mar92 to 02 Mar 93. Former Deputy Chief of Staff, Indian Army. Currently, Director of the United Services Institution of India.)

My year long experience deployed in the former Yugoslavia has given me an understanding of the fatal flaws of US/NATO policies in the troubled region. It was obvious to most people following events in the Balkans since the beginning of the decade, and particularly after the fighting that resulted in the emergence of Slovenia, Croatia, Bosnia-Herzegovina and the former

Yugoslav Republic of Macedonia, that Kosovo was a 'powder keg' waiting to explode. The West appears to have learnt all the wrong lessons from the previous wars and applied it to Kosovo.

(1) Portraying the Serbs as evil and everybody else as good. According to my experience all sides were guilty but only the Serbs would admit that they were no angels while the others would insist that they were. With 28,000 forces under me and with constant contacts with UNHCR and the International Red Cross officials, we did not witness any genocide beyond killings on all sides that are typical of such conflict conditions. I believe none of my successors and their forces saw anything on the scale claimed by the media.

(2) It was obvious to me that if Slovenians, Croatians and Bosniaks had the right to secede from Yugoslavia, then the Serbs of Croatia and Bosnia had an equal right to secede. The experience of partitions in Ireland and India has not been pleasant but in the Yugoslavia case, the state had already been taken apart anyway. It made little sense to me that if multiethnic Yugoslavia was not tenable that multiethnic Bosnia could be made tenable. The former internal boundaries of Yugoslavia which had no validity under international law should have been redrawn when it was taken apart by the West, just as was in the case of Ireland in 1921 and Punjab and Bengal in India in 1947. Failure to acknowledge this has led to the problem of Kosovo as an integral part of Serbia.

(3) It is ironic that the Dayton Agreement on Bosnia was not fundamentally different from the Lisbon Plan drawn up by Portuguese Foreign Minister Cuteliero and British representative Lord Carrington to which all three sides had agreed before any killings had taken place, or even the Vance-Owen Plan which Karadzic was willing to sign. One of the main problems was that there was an unwillingness on the part of the American administration to concede that Serbs had legitimate grievances and rights. I recall State Department official George Kenny turning up like all other American officials, spewing condemnations of the Serbs for aggression and genocide. I offered to give him an escort and to go see for himself that none of what he proclaimed was true. He accepted my offer and thereafter he made a radical turnaround.. Other Americans continued to see and hear what they wanted to see and hear from one side, while ignoring the other side. Such behaviour does not produce peace but more conflict.

(4) I felt that Yugoslavia was a media-generated tragedy. The Western media sees international crises in black and white, sensationalizing incidents for public consumption. From what I can see now, all Serbs have been driven out of Croatia and the Muslim-Croat Federation, I believe almost 850,000 of them. And yet the focus is on 500,000 Albanians (at last count) who have

been driven out of Kosovo. Western policies have led to an ethnically pure Greater Croatia, and an ethnically pure Muslim statelet in Bosnia. Therefore, why not an ethnically pure Serbia?

As I watched the ugly tragedy unfold in the case of Kosovo while visiting the US in early to mid March 1999, I could see the same pattern emerging. In my experience with similar situations in India in such places as Kashmir, Punjab, Assam, Nagaland, and elsewhere, it is the essential strategy of those ethnic groups who wish to secede to provoke the state authorities. Killing policemen is usually a standard operating procedure since that usually invites overwhelming state retaliation, just as I am sure it does in the United States.

I do not believe the Belgrade government had prior intention of driving out all Albanians from Kosovo. It may have decided to implement Washington's own "Krajina Plan" only if NATO bombed, or these expulsions could be spontaneous acts of revenge and retaliation by Serb forces in the field because of the bombing. The OSCE Monitors were not doing too badly, and the Yugoslav Government had, after all, indicated its willingness to abide by nearly all the provisions of the Rambouillet "Agreement" on aspects like cease-fire, greater autonomy to the Albanians, and so on. But they insisted that the status of Kosovo as part of Serbia was not negotiable, and they would not agree to station NATO forces on the soil of Yugoslavia. This is precisely what India would have done under the same circumstances. It was the West that escalated the situation into the current senseless bombing campaign. NATO's massive bombing intended to terrorize Serbia into submission appears no different from the morality of actions of Serb forces in Kosovo.

Ultimatums were issued to Yugoslavia that unless the terms of an agreement drawn up at Rambouillet were signed, NATO would undertake bombing. Ultimatums do not constitute diplomacy. They are acts of war. The Albanians of Kosovo who want independence, were cajoled into putting their signatures to a document motivated with the hope of NATO bombing of Serbs and independence later. With this signature, NATO assumed all the legal and moral authority to undertake military operations against a country that had, at worst, been harsh on its own people. On 24th March 1999, NATO launched attacks with cruise missiles and bombs, on Yugoslavia, a sovereign state, a founding member of the United Nations and the Non Aligned Movement; and against a people who were at the forefront of the fight against fascist forces during World War II. I consider these current actions unbecoming of great powers.

It is appropriate to touch on the humanitarian dimension, for it is the innocent who are being subjected to displacement, pain and misery. Unfortunately, this

is the tragic outcome of all such situations of civil war, insurgencies, rebel movements, and terrorist activity. History is replete with examples of such suffering; whether it be the American Civil War, Northern Ireland, the Basque movement in Spain, Chechnya, Angola, Cambodia, and so many other cases. The list is endless. I feel that this tragedy could have been prevented if NATO's ego and credibility had not been given the highest priority instead of the genuine grievances of Serbs in addition to Albanians.

Notwithstanding all that one hears and sees on CNN and BBC, and other Western agencies, and in the daily briefings of the NATO authorities, the blame for the humanitarian crisis that has arisen cannot be placed at the door of the Yugoslav authorities alone. The responsibility rests mainly at NATO's doors. In fact, if I am to go by my own experience in the former Yugoslavia, I would say that reports put out in the electronic media are largely responsible for provoking this tragedy.

Where does all this leave the international community, which for the record does not comprise only the US, the West and its newfound Muslim allies? The portents for the future, at least in the short term, are bleak indeed. The United Nations has been made redundant, ineffective, and impotent. The Western world, led by the USA, will lay down the moral values that the rest of the world must adhere to; it does not matter that they themselves do not adhere to the same values when it does not suit them. National sovereignty and territorial integrity have no sanctity. Secessionist movements, which often start with terrorist activity, will get greater encouragement. One can only hope that good sense will prevail, hopefully sooner rather than later.

* * *

Fri, 16 Apr 1999
From: "Niels I. Meyer" <nim@ibe.dtu.dk>

The Kosovo crisis is penetrating the minds of many people in Europe to such an extent that it is difficult to concentrate on anything else. Also there is a lot of confusion because of the dilemma of either passively watching Milosevic continuing his ethnical criminalities, or overruling international laws on moral grounds and try to stop him by military means ("power is the only game the Serbs understand"). It is also uncertain whether the possibilities of negotiations have really been exhausted. A few days ago it was disclosed that a secret Appendix B to the Rambouillet agreement included some unreasonable concessions to the Serbs. This has added to the political confusion and may imply that the possibilities of negotiations were far from being exhausted.

What seems to be rather certain at this point is the following:

1) The West has been overhearing warnings about the coming crisis in the Kosovo area for the past 10 years. If they had used just a fraction of the resources already used in the Kosovo war for support for the opposition of Milosevic much could have looked different today.

2) The NATO strategy has been a human disaster. The refugees are even used in some of the political arguments as tactic elements in the war against the Serbs. It is shocking that the NATO strategic brain trust, supposed to be among the most advanced in the world, has not included the actual reaction from Milosevic among their scenarios. If NATO had done that, they might have changed completely their strategy — or at least prepared themselves much better to protect the Kosovo Albanians. In a way I hope that it is incompetence rather than cynicism — but this does not help the refugees.

The situation looks hopeless just now. The best solution one can hope for is a negotiated cease fire under UN control with secure protection of the Kosovo Albanians. Russia should be an important partner in this connection. But the war seems to go on and to escalate, perhaps including ground troops from NATO. Also Albania is on its way to be included in the war (together with other Balkan neighbours). A frightening scenario can not be excluded.

This is why it is hard to concentrate on other issues just now.

* * *

19 Apr 1999
From: **Donella H. Meadows**
<Donella.H.Meadows@Dartmouth.edu>

Dear folks,

I'm wondering if the worldwide viewpoint of Balaton folks can help us stitch together a comprehensive perspective on Kosovo? I have this terrible impression that we're all looking through partial windows permitted by our particular media and cultures, and that the only way we can see it whole is to share our views. I think this is what Dmitri was saying.

For instance:

Dissident friends in Belgrade are furious that, as their independent presses are shut down and as the Serbs rally behind Milosevic, their fight for democracy "has been set back 10 years." Friends of those friends in the U.S. are furious with those dissidents, because they show more concern for their own struggle than they do for the suffering of the Albanian Kosovars.

But then I'm told that nobody in Serbia has heard anything about the suffering of the Albanian Kosovars — which we see every night on our TV, but they don't on theirs.

The Serbs are trying to rid Kosovo of Albanians, but, I am told, the KLA was trying to rid Kosovo of Serbs. How can we take sides here? Wasn't it, before the NATO bombs escalated everything, just a police action within a country against its own internal terrorists? How has anyone the right to intervene? Would we want to be bombed by NATO if our police tried to put down our own dangerous insurgents?

But then I am told that Milosevic took away Kosovo's autonomy, oppressed the Albanians severely, and gave the KLA cause to organize. I know what happened in Bosnia, in Srbenica and many other massacre sites. I have read many accounts by reporters who were on the scene during the siege of Sarajevo, where people were praying for NATO bombs that never came (or came too little, too late). Milosevic police look like genocidal police to me — they have for 10 years. I've never known a "normal police action" to burn whole villages in order to control terrorists. (The only other place I've ever heard that philosophy, was in Vietnam, where it was, I'm deeply pained to say, U.S. philosophy.)

But then I am told that Croats and Bosnian Muslims and Kosovo Albanians have also committed unimaginable brutality.

But then Serbian friends tell me that the minute Milosevic came to power, he started preaching on state radio ethnic hatred and fearmongering and exaggeration of atrocities against Serbs (without ever mentioning Serb atrocities against others). They tell me it sounded like the early speeches of a Hitler.

But then I am told, look, bombing doesn't solve anything. Bombing innocent Serbs only strengthens Milosevic. Look at all the horror the bombing is unleashed in Kosovo. But I was hearing about horror in Kosovo for months before the bombing began. It sounded ominously like the horror in Bosnia. NATO isn't burning Kosovo villages, the Serbian army is. I do believe — for crass political purposes, if not humanitarian ones — that NATO is trying not to touch civilians. But, of course, bombs are stupid, blunt, violent instruments that can't help but kill civilians.

Why don't we try other paths, I hear? What's wrong with negotiation? But I have watched Milosevic renege on, ignore, lie about, or block every attempt at negotiation for ten years, except when, as at Dayton, it has let him keep his spoils of war.

Intelligent people in the U.S., Dmitri's friends report in wonder, are in favor of this bombing. I think I may be one of them — though I am surprised to hear myself say that, because I have NEVER in my adult life, approved of ANY previous military adventure of my ignorant, overpowerful, underinformed, all-too-arrogant national leaders. I have huge reservations about any use of violence. But I have been horrified by Milosevic since he first started shelling Dubrovnik 10 years ago. I knew Yugoslavia well once, as a peaceful land that had simmering historical hostilities (as does all Europe) but that was learning to be proud of its ethnic and religious diversity. I view Milosevic as a man who systematically stirred up ancient hostilities for his own benighted purposes. He has been responsible for the loss of millions of lives; he has blasted a beautiful and promising part of the world; and he's not finished.

But then I am deeply disturbed by the American political cartoonists, who are beginning to depict all Serbs as brutal thugs. We must discriminate between leaders who are thugs and the people, who have also suffered much at the hands of those thugs.

Here's my question: where are the limits to sovereignty? When is the international community allowed and even obliged to declare a ruler a danger to his or her own people? When he drops nerve gas on them, as Saddam Hussein did to the Kurds? When he starts preaching official hatred as Milosevic did ten years ago? When he encourages all-out ethnic massacres as in Rwanda? What should we stand by and witness without intervening?

And is there any sane, nonviolent, effective way to intervene?

I'm not sure there should be armies or weapons at all, but if there must be, the only good use of them I can see is to prevent others from using armies and weapons against innocent people — even if they are people within their own national borders.

Very concerned Balaton members have suggested that we cancel our coming meeting, because it is so close to Kosovo. But it is just as close to Bosnia, and we had meetings while atrocities were going on there — and, of course, elsewhere in the world.

Others have suggested that we change the subject of the meeting to talk about ethnic violence and big-power bombing. I'm willing to do that, if we have a plan for how to talk about that constructively — frankly I don't know how to do so. I expect that we will call special afternoon meetings on this topic. I dearly hope we will find people among us who can bring light, rather than heat, to help lead those meetings.

Above all, I know that Balaton folks will be concerned for the people and land of all of former Yugoslavia and will be looking for any constructive way of helping those people, that land.

* * *

Mon, 19 Apr 1999
From: **Gwendolyn Hallsmith**
<ghs@QUEST-NET.COM>

Dana's analysis of the current conflict captured the mixed feelings that most of the people I know have about the action in Kosovo. I have to confess that my feelings are not so mixed, although at the outset I was sympathetic to the motivation that pushed the military button. It is hard to stand by and watch genocide without trying to do something about it. At this point, I am completely opposed to further military action there. This is why:

1) The danger of escalation. I am very nervous about the possibility that the conflict in Kosovo will lead to a larger and much more dangerous war. I am afraid that the decision-makers in Washington are underestimating both the level of opposition that the Russians feel regarding our involvement and the degree to which this conflict could mobilize Russia toward military action in opposition to NATO. They are also underestimating how effective Russia could be if they choose this course of action.

2) Measuring actions and outcomes. I don't know why we don't evaluate military action like we evaluate everything else. The night we started the bombing campaign, Clinton got on TV and told us all that he was doing this to AVOID large movements of Albanian refugees across the borders of neighboring countries because of the destabilizing effect this would have. When the bombs didn't accomplish this objective (and, in fact, worked to the opposite effect), I think we should have admitted that the original strategy was a failure and looked for other possibilities. Now, we are indirectly implicated (in my opinion) for all the atrocities that have occurred since then.

3) Mutual Solutions: Again, this is just my opinion, but I think that the best thing for NATO to do now is to stop bombing and actively seek Russia's involvement in solving the problem another way. Or at least work to get the Russians on our side before we pursue any more military action. The polarization that is occurring is very, very dangerous.

4) Positive Feedback Loops: As the bombing started in Kosovo, I saw a scifi movie where a huge, evil star was going to take over civilization as we know it. The captains of the spaceship didn't know what to do, so they asked the military commander. The commander recommended bombing the star. So they fired. As the bombs met their targets, rather than stopping the star's progress, the star got bigger and more threatening. The way that the problem was eventually solved had something to do with love, not war.

War is never the answer. Ends and means have to be congruent to succeed. Peace is the way to peace.

* * *

Mon Apr 19 1999
From: **Jonathan Rowe**
<Rowe@ESSENTIAL.ORG>

Gwen, These are eminently reasonable arguments. A side of me agrees. But then the other side leaps up and says, "Would I still think this way if those people being massacred included my own family?" War is never a good solution, but life does not always give us the luxury of a good solution. Often we have to choose between bad and worse. My quandary is that I genuinely do not know which is worse. But I lean toward the view that doing nothing is worse. I lean also toward the view that if our goal was to protect innocent people, then we needed to send troops in to protect those people. Politically this was not possible. So again, we are left with the less bad of the less bad. If indeed it is.

* * *

Tue, 20 Apr 1999
From: **Judith Akinyi Obiero**
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Egerton University
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Njoro.Kenya

Balatoners, Dana's detailed analysis of the situation in Kosovo captures not only our confusion, but also that of the NATO countries involved in the conflict. Particularly those that believed in Milosevic's speedy surrender. The dreadful is yet to happen because I see all indications of Milosevic heavily mining the entire province of Kosovo to complicate any immediate resettlement of those expelled. I can not agree with Gwen more, that what we are seeing is escalation of disaster and not the reverse, and it is painful.

* * *

Wed Apr 21 1999

From: **Garry Peterson**

<peterson@NCEAS.UCSB.EDU>

I'm forwarding this article on the Kosovo war that claims that Kosovo, like the arrest of Pinochet in Britain, represents an expansion of a global recognition of human rights at the expense of national sovereignty.

AT LAST A GOOD WAR

Toronto Globe & Mail

Saturday, April 17, 1999

by Gwynne Dyer

If you have lived all your history in a world where might makes right, but you want to get to a future where there is peace and justice for all, then you probably would not choose the road that runs through Kosovo.

Yet a future of peace and justice is where the North Atlantic Treaty Organization is trying to get to in Kosovo. The military campaign against Yugoslavia is part of an undertaking now most of a century old in which those countries that are already democratic have increasingly become engaged in protecting the human rights of others. If you want to call that cultural imperialism, go ahead.

The "world's most successful military alliance," as NATO likes to bill itself, has tactfully cancelled the 50th-anniversary celebrations that were scheduled for later this month. It is, after all, fighting its first war, and one with a doubtful outcome. It is also fighting it very badly.

According to a recent NATO estimate, 1.5 million of the 1.8 million Kosovo Albanians whom this war was intended to protect are now homeless and on the move, either inside or outside Kosovo. Serbia's "ethnic-cleansing" campaign has been an almost total success, and NATO's bombing has not the slightest prospect of getting them home again. Indeed, so long as NATO vows that it will not use ground troops, Yugoslav President Slobodan Milosevic has virtually no incentive to negotiate. Why should he fear an alliance that is so afraid of the sight of its own blood?

Even given the political constraints under which NATO's military commanders are operating, they are doing a deeply unimpressive job. But you can say this much for NATO: It is at least fighting an altruistic war, and one that may even have some bearing on whether the rule of law prevails internationally in the next century.

If you've recovered from your attack of apoplexy, let's acknowledge that bombers are not the ideal imple-

ment with which to build a just and peaceful world. NATO, to some extent, is like the man who has only a hammer: Everything looks like a nail. But let's also acknowledge that no just and peaceful world order can exist without enforcement, any more than domestic peace and justice are possible without police. The mere fact that force is being used in Kosovo does not invalidate the enterprise.

The fact that force is being used illegally against a sovereign state, without United Nations approval, is much more serious. But there is something quite strange about this war. NATO has deployed almost 1,000 combat aircraft, it is spending tens of millions of dollars a day — and it may well end up spending the lives of hundreds or even thousands of its soldiers — not for oil or strategic advantage or any traditional goal of realpolitik, but simply to defend the lives and homes of two million Muslim peasants.

Many people squirm away from this intractable fact, because it doesn't fit their historical or ideological world view. The most extraordinary alliances have sprung up against the war in Western countries, uniting the old left that instinctively hates anything American with the hard right that loathes one-world altruism.

In France, National Front chairman Jean-Marie Le Pen joins Communist Party leader Robert Hué in condemning the war. In Britain, right-wing Tory MP Alan Clark (who argues that Britain should never have fought Hitler because appeasement would have paid far higher dividends) finds himself in the same camp as Old Labour grandees such as former defense secretary Denis Healey and perennial peacenik Tony Benn.

And in the United States, the isolationist right's condemnation of the war is echoed by Palestinian-American intellectual Edward Said, who argues from the left that the Clinton administration's true motives are not in the least altruistic: "All this is for the U.S. to assert its will and show the world who is boss. Its ostensible humanitarian concerns are hypocrisy since what really counts is the expression of U.S. power."

But if the goal were to demonstrate U.S. power, then everybody involved in planning the Kosovo operation should be shot. Rarely has a great power backed into a military commitment with such visible reluctance, and you could hardly argue that NATO's performance against Mr. Milosevic will have other would-be malefactors trembling in their boots.

True, there was a genuine issue of NATO's credibility if it did not act against the new wave of ethnic cleansing in Kosovo. Mothers in shopping malls were jokingly bringing their children to heel by threatening to call in air strikes on them. The credibility issue only

arose because the alliance had threatened to “do something” about atrocities so many times before, only to seize on some patently hollow promise by Mr. Milosevic as an excuse to dodge the commitment.

The question the cynics must answer is: Why did the United States and NATO make those threats in the first place if their motives were not humanitarian? There is certainly nothing of economic or strategic value in Kosovo, and the alliance is already paying a high price for its intervention in diplomatic and financial terms — not to mention the price in blood that also may be required.

It is a curious fact that all of the larger overseas U.S. interventions since the 1991 Persian Gulf war (disregarding minor outbursts of petulance such as dropping cruise missiles on a pill factory in Khartoum) have had humanitarian rather than “national interest” motives. Somalia, Haiti, the bombing that brought the Bosnian war to an end in 1995, and now Kosovo: This is getting to be a habit.

In every case, whether it was the United States acting alone or in concert with NATO, there was the same absence of traditional strategic or economic motivations, the same sort of humanitarian emergency caused by tyrants or warlords, and the same tremulous reluctance to act if Western casualties might be involved.

In every case, the decision to act came very late, and the planning and execution were almost always bad. There was the panicky U.S. scuttle from Somalia after 19 American soldiers were killed in a street battle; the cowardly retreat of a U.S. troop-carrying ship from Haiti when thugs working for the military regime demonstrated on the quayside at Port-au-Prince; the helpless surprise when the Serbs seized Western peacekeepers and tied them to stakes to deter NATO air strikes in Bosnia; and now the pathetic absence of a follow-up strategy for Kosovo if unsupported air power doesn't work.

And in every case except Bosnia (where the legal government asked for help), the operation has meant intervening in the internal affairs of a sovereign state that was minding its own business — even if that business was genocide.

Since the end of the Cold War, there has been a steady erosion of the sovereign right of small and even medium-sized states to mistreat their own citizens (though big nuclear-armed states can obviously do whatever they want to their citizens and minorities).

This frontal attack on sovereignty is being led by the United States, the most conservative and traditional of the big Western countries. This is particularly ironic because the U.S. government also fights ruthlessly to sty-

mie or weaken new international institutions, such as the International Criminal Court, that would infringe on its own absolute sovereignty. But, despite all the contradictions, there may be something important going on here.

Zoom all the way out and consider the really big picture. The dominant political trend of the past two centuries, infecting first the West and then the rest of the planet, has been the spread of democracy. It is virtually irresistible because it is driven by the interaction of human nature and the technology of mass communications, rather than by some specific set of cultural beliefs.

Nationalism is the flip side of democracy. When democratic revolutions destroy the old hierarchies and loyalties, there is an urgent need for some new focus of identity. The quick and dirty fix, in most cases, has been ethnicity — and so the wars that redefined borders in terms of ethnic nationalisms spread first across Europe, then the rest of the world.

By 1945, with the aid of modern science and technology, they had produced nuclear weapons and extermination camps. The survivors of the Second World War were frightened people: They had stared into the pit, and it was filled with tens of millions of dead. So after the war, they created new global rules by which we still live. The rules were utterly contradictory.

To prevent new wars, they created the United Nations, whose primary rule was that no country may change its borders by force, or intervene in the internal affairs of another. Like the League of Nations before it, the UN is built on the foundations of the Treaty of Westphalia, which, in 1648, ended a century of religious wars in Europe by recognizing the sovereignty of every existing state. Westphalia deliberately subordinated freedom of conscience to domestic and international peace. States were given absolute control over their own citizens, and guaranteed freedom from outside meddling.

The Treaty of Westphalia did not outlaw wars or forced border changes, because it was still dealing with a Europe of absolute monarchies. So long as religion was left out and popular passions were not aroused, limited wars for colonies and bits of border territory were manageable (and potentially quite profitable).

The 1945 settlement, in that context, is “Westphalia plus”: international war becomes illegal, except in defence of borders as they existed at the time the UN Charter was signed, in which case collective military action becomes an international obligation.

During the long Cold War that followed, the UN was widely regarded as a failed organization, but “Westphalia plus” worked. Empires have been dis-

mantled and federations broken up, but very few international borders have been changed by force since 1945. Even the few enforced changes that did happen, such as Israel's conquest of the West Bank in 1967 or Indonesia's invasion of East Timor in 1975, have been treated as illegitimate and temporary by the UN and almost everybody else.

The price of this settlement was high. Absolute sovereignty means that every government can do whatever it likes to its own citizens with absolute impunity. It is a tyrants' charter, and from Cambodia to Rwanda ordinary people have paid the price. Their only hope of assistance from outside — a pretty flimsy one, most of the time — has been the International Declaration of Human Rights.

This document, adopted by the UN in 1948 and ratified by almost all countries, addressed the other, equally horrifying legacy of total war: not the nuclear weapons, but the death camps. In direct, but unacknowledged, contradiction to the UN Charter, it implies that the old doctrine that the internal affairs of states are inviolate died with the Holocaust. Henceforth, the basic human rights enshrined in the Universal Declaration must be respected by all governments, regardless of ideology or circumstances.

The Universal Declaration was reinforced by the UN Convention on the Prevention and Punishment of the Crime of Genocide, also signed in 1948, but there was no enforcement mechanism. Unless all the great powers on the Security Council could agree (which they rarely could, given their mutual rivalries and fears), nothing much could be done.

There were occasional exceptions, such as international sanctions against apartheid South Africa, but, by and large, sovereignty trumped human rights. In a world living under the shadow of global nuclear war, you can understand why: Nothing was worth risking that.

By the same token, a world released from the imminent threat of nuclear war was bound to start paying attention to the humanitarian part of the post-1945 settlement — especially because changes in media technology had begun to bring the atrocities committed on the other side of the planet into people's homes. "World public opinion" is no longer an empty phrase, and it has a large moral dimension.

Now, therefore, the contradiction between absolute sovereignty and universal human rights moves to centre stage. The hit-and-miss humanitarian interventions of the early post-Cold War years — "Haiti's easy, let's do that"; "pass on Rwanda, it's too far" — didn't tread on the toes of anybody important, so they passed without much comment.

But why the Balkans? One reason, as German Foreign Minister Joschka Fischer put it, is that "this absurd war of Europe's old plagues of fascist nationalism and racism has gone on for 10 years already." The rest of the West finally got so fed up with Serbian behaviour that something just snapped. But we should not underestimate the impact of the specific images of ethnic cleansing in Kosovo: One of Mr. Milosevic's great mistakes has been his failure to realize that every country in the West is haunted by images of the Second World War.

So Yugoslavia's sacred sovereignty becomes less important than human rights in Kosovo, and the can of worms is finally opened. This time, Russia sees worrying parallels with its own treatment of minorities in places such as Chechnya, and China understands all too clearly that what applies to Kosovo could apply to Tibet and Xinjiang. Many smaller countries also feel uneasy, because almost everybody has minorities of one sort or another.

It is going to be a wild ride: Nobody knows where the war in Kosovo will end up, or what outside alliances will form around the struggle. It's doubtful that people such as President Bill Clinton even fully understand that they are making a historic shift.

Since the mid-1990s, we have seen the creation of the first two ad hoc war-crimes tribunals since Nuremberg, dealing with the slaughter in Bosnia and Rwanda. That was followed by the creation last year of an International Criminal Court that is meant to institutionalize the whole process. More recently, we have had the astonishing sight of a former head of state, General Augusto Pinochet, arrested in a friendly country for human-rights violations committed within his own country, Chile. The net of international law is getting more real.

At the ICC negotiations in Rome last year, British Foreign Office Minister Tony Lloyd spoke movingly of the need to end "the grotesque parody whereby the killer of one person is more likely to be brought to justice than the killer of thousands." Whether that sort of change comes fast or slowly now depends to an alarming extent on what happens in Kosovo.

Visions of the People

(The following are excerpts from a collection of statements by people from many countries, describing how they would like things to be in the year 2050. The collection is: *Choosing our Future: Visions of a Sustainable World*, edited by Tanvi Nagpal and Camilla Foltz, published by the World Resources Institute in Washington D.C.)

Abdiel J. Adames, former Rector, University of Panama: “Central America constitutes a community of nations where peace rules, with all countries in the region having eliminated national armies. The region’s only militarized entity is under the control of the Organization of American States for the protection of the Panama Canal.”

Dr. B. Bowonder, engineer, Administrative Staff College of India: “The Indian subcontinent will be able to limit its population to 1.4 billion. This can be achieved through a comprehensive social program, including increases in female literacy, female participation in the labor force, access to public health services and family planning services. Our grandchildren will enjoy our natural heritage: tropical rainforests, wetlands, mangrove forests, and coral reefs.”

Marta Echavarria Uribe, Colombian Association of Sugar Cane Producers, “I hope for a Colombia where once again we may be able to go fishing at night. Going fishing at night presupposes access to free time, proximity to a healthy watershed, and the insurance of personal safety. It highlights the need for environmental awareness, to recognize the worth of our natural and social ecosystems.”

Liberty Mhlanga, general manager, Agriculture and Rural Development Authority, Zimbabwe: “Zimbabwe [would have] a multicultural society, comprising black, white, brown, and yellow people. This is an ideal setting for a rich socio-economic and cultural creation that pulls together the strengths from different societies.”

Florence Robinson, biology professor, Southern University in Baton Rouge: “The unemployment rate is less than 1 percent, and all jobs give those who hold them a sense of dignity. No one has to feel like less than anyone else because of the work he or she does. All jobs will fall within a fairly limited income range, so we won’t have neighborhoods of affluent people separate from that of so-called poor people. No youngster

in America who is talented and wants a college education is denied it. People don’t live in huge ostentatious houses, but ones that are adequate for their needs, sound, and comfortable.”

Alex Steffen, freelance writer, Seattle: “Our streets will have been largely reclaimed from the automobile. Ours will be a city of weekend drivers of cars run on renewable energy. Almost everyone will live within walking distance of a pedestrian zone where they can shop for groceries, stop in for a beer at the tavern, visit the library or community center, stroll through the park, or catch a commuter train. Traffic-free areas will be the hubs around which cities turn, for we will have realized that walking builds community.”

Pauline Tangiora, Maori tribal elder, New Zealand: “Nuclear testing will stop. Dumping of the world’s waste into the Pacific will stop. Native timber will not be cleared to make room for exotic trees just because they can be harvested over a shorter period of time. Overfishing and the contamination of the sea and rivers must be stopped. Fish do not just happen.”

Eduardo J. Viola, political science professor, University of Brasilia: “In the Brazil of 2050 people are well fed. Food is produced through sustainable agriculture with biological insect control, soil and water conservation, and minimal use of chemical inputs. The population has been stabilized. Women and men share the same status. Preventive care forms the basis of the health-care system. Basic education is free and public. Teachers are well paid and highly regarded.”

(It seems that people everywhere dream of peace, harmonious communities, environmental wholeness, equality, and simple sufficiency. Leaders everywhere work hard to convince us that war is necessary, hatred is inevitable, the environment is a luxury, the poor will always be with us, and there’s no such thing as enough.

Somewhere there’s a terrible disconnect.)

The Wildlands Vision

Excerpted from High Country News, April 26, 1999

Our vision is simple. We live for the day when grizzlies in Chihuahua have an unbroken connection to grizzlies in Alaska; when gray wolf populations are continuous from New Mexico to Greenland; when vast unbroken forests and flowing plains again thrive and support pre-Columbian populations of plants and animals; when humans dwell with respect, harmony, and affection for the land; when we come to live no longer as strangers and aliens to this continent.

— The Wildlands Project

In more recent iterations of the mission statement above, the word “simple” has been replaced with “ambitious.” Some folks think a more fitting description would be “pie in the sky.”

Maybe, but the project serves a purpose, says co-founder conservation biologist Michael Soulé, who retired from the University of California Santa Cruz three years ago. “Our mission is to embolden the conservation movement to think much bigger and on a larger time scale.” He compares the Wildlands Project to building the great European cathedrals. Many of the workers died before the buildings were finished, but without the grand architectural plans, they never would have been built. “Without an inspiring vision,” Soulé says, “nothing is going to happen.”

The project is aloof by design. **Its founders did not want to compete with existing conservation groups. They wanted to create a framework those groups could work within, and a clearinghouse for information and science.** [Editors’ note: This is the same sort of motivation we see for the Balaton Group articulating an overarching Green Vision.]

Based in a nondescript Tucson, Arizona, office complex, the Wildlands Project now has 10 paid staff and no members. Its money comes entirely from donations and foundation grants. Its mouthpiece is *Wild Earth* magazine, based in Richmond, Vermont.

The task of making wilderness real on the ground falls to regional groups that are busy remapping the continent. In the West there are 10 affiliates. One, called Yellowstone to Yukon, or “Y2Y,” based in Canmore, Alberta, is trying to protect an 1800 mile stretch of the Northern Rockies from Yellowstone National Park to Canada’s Yukon Territory. In Bellingham, Washington, the Northwest Ecosystem Alliance is gearing up for an “R2R” (Rainforest to Rockies) campaign to reconnect the Cascades to the Rockies with a swath of wilderness.

From Casper, Wyoming south through Colorado to northern New Mexico the Southern Rockies Ecosystem Project is mapping territory for reintroducing wolves. Further south the Sky Island Alliance is map-

ping habitat for grizzly bears from New Mexico’s Gila Wilderness to the Sierra Madre in northern Mexico.

Wildlands mappers start with state and federal agencies that have information about the ranges of plants and animals and the extent of human development. But agency data are often fragmented or out of date. So the next step is to get people out on the ground, surveying roads and roadless areas, taking forest inventories, counting trail users, and looking for signs of rare wildlife.

All this information is fed into a computer, which spits out a map of the world from the wildlife’s point of view. “After awhile, you start to see how a landscape fits together,” says Bill Martin, mapping coordinator with the Southern Rockies Ecosystem Project. “The Wildlands Project is big time, big theory. This is a way to communicate. People see things on a map that would take a 20-page paper to write.”

The wildlands maps provide the vision, explains Dave Foreman, another co-founder, while grassroots groups will make it all happen. “It’s like the picture on the cover of a jigsaw puzzle box,” he says. “We don’t know which group is going to put each piece into place.”

Talk of “rewilding” North America gives some people nightmares of wolves running through the streets of Chicago — or of strict regulations on human activity. One critic has posted “simulated” wildlands reserve maps on the Internet, showing the entire western U.S. as either wilderness or “buffer zones — highly regulated use.” Similar maps have shown up in small towns around the west.

“Foreman’s dream, known as the Wildlands Project, has transmuted to an Orwellian nightmare, supported by innumerable U.N. agencies,” writes another alarmed onlooker. “It is being unleashed relentlessly across America.”

The backlash is no surprise to some observers, who say the Wildlands Project is ivory-tower conservation at its worst. In their excitement about creating a wild America, Wildlands backers have forgotten about people, they say.

“You want to talk about island biogeography — let’s talk about island political geography,” says Steve Hinchman, director of the Western Slope Environmental Resource Council in Paonia, Colorado. “They’re branded as the ludicrous fringe. We can’t possibly adopt this strategy — not in our community. Unless it makes sense to any person who grew up here, who lives out here and who’s going to die out here, it’s not going to work.”

That’s a lesson Northwest Ecosystem Alliance Director Mitch Friedman learned the hard way in the early 1990s, when he aired a plan to protect the Columbia Mountains in British Columbia, Canada. The proposal met widespread opposition, even from some environmental groups. A second proposal, this one for an international park on the U.S.-Canada border, was shot full of holes by Gingrich Republicans and United-Nations-fearing conspiracy theorists. “The lesson there,” Friedman says, “was that simply putting out the best science-based land proposal isn’t going to make it happen.”

No one is going to implement this plan because it’s a good idea,” agrees Kieran Suckling, whose Southwest Center started as a Wildlands affiliate but moved on. “You’ve got this big vision thing and this big visionary (Foreman). The big question is, how are they ever going to get it implemented? How do you get it off the paper?”

Despite their vague strategy for making the Wildlands Project happen on the ground, Soulé’s science is compelling and Foreman’s preaching has a way of getting people starry-eyed. Together they’ve managed to enlist a surprising troop of supporters.

“I am aware of the debate between vision and pragmatism,” say Wilderness Society President Bill Meadows, who recently joined the Wildlands board. “But if we don’t have a vision, we won’t get the practical results we deserve. They have a vision that inspires all of us — the grassroots groups and the big national groups like the Wilderness Society.”

It’s not just the big greens who have jumped on the bandwagon. Take, for example, Jim Winder, 38, who grazes about 1000 cows on mostly public land in south central New Mexico. “When I first heard about Wildlands, I was just like any rancher. I wasn’t real thrilled with it,” he says. “But they’re the only people in the environmental community who are doing things in a scientific manner.”

Now Winder is reintroducing endangered fish in a stream on one of his ranches, and he’s started a small eco-tourism business. It’s all in the name of survival, he says, in a time when ranchers are selling out and hanging up the saddle for good. “I want to see ranchers get rich as hell off of healing the land,” he says. “We got rich screwing it up.”

There are also signs that Wildlands Project thinking has permeated the thick walls of land management agencies. The Yellowstone to Yukon initiative, for example, has garnered the support of both the U.S. and Canadian national park services.

Even some skeptics admit that the science behind the Wildlands Project is making waves in the agencies. “The Wildlands Project is a little beyond political and social reality. It can’t deal with the tide of humanity,” says Hall Salwasser, director of the Forest Service’s Pacific Southwest Research Station in Berkeley, California. “But conservation biology is not a pipe dream. We use the concepts and tools that came out of conservation biology pretty regularly. They’re in the regular toolbox.”

Wildlands proponents understand that they’ll never get a second chance to make a first impression. If they blow it, it could take a long time to recover.

They’re gearing up for the big debut, which should hit the pages of *The New York Times* this fall in the form of a two-page ad with maps. By the end of the year, they expect to release a string of reserve maps, including plans for the Sky Island region of Arizona and New Mexico, the Southern Rockies, the Klamate Kiskiyou region of Oregon, the central coast of British Columbia and the northern Yukon territory.

“We’re looking very hard at how to make the Wildlands Project immediately relevant and how to make it have an impact right now,” says Foreman. “Otherwise it’s not worth the paper it’s printed on. It’ll do nothing but collect dust.” Making the project relevant, he says, starts with the grassroots wilderness proposals that are popping up like wildflowers around the West.

The New Mexico Wilderness Alliance wants to protect 2.4 million acres of public land as wilderness. A similar proposal for Arizona is in the works. A Colorado Congresswoman has introduced a bill that would designate 1.5 million acres of wilderness in her state. California activists are pushing for up to 6 million acres of new wilderness. Nevada environmentalists want approximately 16 million acres. In Oregon it’s 4.5 million. In Washington it’s 3.1 million.

Says Michael Soulé, the scientific director of all this effort: “We live in an extraordinarily bleak period for nature. Things are going to get worse before they get better. We’ll lose, I would guess, half of the world’s species in the next 50 years. Worse, we’ll lose species that haven’t arrived yet. The degree to which we manage nature prevents speciation from occurring. No other species of bears or dogs will be able to evolve. It’s not possible under the current hegemony of humans on the planet. It’s quite tragic — and preventable.”

“It’s our responsibility if we’re biologists to dedicate a certain portion of our professional lives to protecting nature. I think a lot of scientists come to conservation biology because they’re compelled to. They can’t stand aside and be an objective observer of the death of nature. Conservative biology is very popular for bright young people. It’s the idealism factor. Young people want to make a difference.”

“We’d like to restore as much true wilderness to North America as we possibly can. It’s out there — relatively undeveloped land. Our job is to minimize the damage, to hold onto as much nature as possible so that future people and organisms can persist on the planet.”

“Enemies of conservation say we’re ‘locking away’ wildlands. They’d like to have people believe that their rights are being taken away. A better metaphor would be that we’re making a deposit in the bank for the future. The economy of the West is rapidly changing. The future is going to be much more diverse, with a great emphasis on tourism and recreation. If people are really concerned, they should support setting aside as much of it as possible as wilderness. That’s going to be the major source of wealth in the next century. Our congresspeople haven’t figured out that the real economy is not what they think it is. They’re 20 years behind.”

A Vision of a Hydrogen Future

by Amory Lovins and Brett D. Williams

(Amory B. Lovins is Director of Research and Brett D. Williams is Senior Research Associate at Rocky Mountain Institute)

Introduction

Transitional paths to fuel cell-powered road vehicles and to a wider hydrogen economy are conventionally assumed to be slow, costly, and difficult, due to two main obstacles:

- A large new infrastructure for producing and distributing bulk hydrogen, costing tens or hundreds of billions of dollars for the United States alone, is normally assumed to be required before hydrogen use can become widespread.¹
- Technological breakthroughs in hydrogen storage are also presumed to be needed because the tankage required for onboard storage of compressed hydrogen gas is currently too bulky to fit acceptably into light and medium vehicles, while cryogenic storage is considered costly and complex.

These twin barriers are commonly assumed to require that fuel-cell vehicles transitionally or permanently carry onboard fuel processors² fueled by gasoline, methanol³, or other liquid hydrocarbons. However, that approach faces formidable technical and economic challenges. Barring a breakthrough, fuel-cell systems based on onboard gasoline reformers offer little or no advantage over advanced gasoline-fueled internal-combustion-engine propulsion.⁴ The case for methanol reforming, although perhaps better, still suffers from modest and compromised net benefits. Onboard reforming would entail slow, uncertain, and niche-focused adoption of fuel-cell vehicles, especially if a new infrastructure were required for safe handling of methanol or if reformers required newly optimized, high-purity forms of gasoline or other reformer feedstocks.

These discouraging conclusions, however, are artifacts of two initial assumptions:

- that the vehicles must be inefficient—essentially conventional vehicles converted from gasoline-fired Otto engines to liquid-reformer-fueled fuel cells—and
- that the deployment of fuel cells in stationary and in mobile applications can be considered independently.

Neither of those widespread assumptions adequately reflects today's technological and market opportunities. This conceptual paper—emphasizing and somewhat simplifying the basic logic—synthesizes an argument that changing both assumptions can yield an effective transitional strategy to the widespread use of hydrogen. The strategy proposed here is not the only one that could work, but it does appear to offer significant attractions.

Specifically, starting with very efficient vehicles, and properly integrating the deployment of fuel cells in vehicles and in buildings, can yield a transition to hydrogen that is rapid, relies on established technologies, avoids most of the normally presumed difficulties, and should prove profitable at each step. As should become clear in the marketplace over the next year or two, this alternative strategy is already starting to be accepted by some large

1 For example, a 1992 A.D. Little study estimated that a from-scratch bulk hydrogen supply infrastructure sufficient for 25 million cars would require about \$95 billion of investment, or \$3,800 per car. This antiquated result is still being quoted, *e.g.* in the Epyx article in the December 1998 *Fuel Cells Bulletin* (Derby 1998).

2 Often but imprecisely used interchangeably with “reformer,” a fuel processor comprises a thermochemical (often catalytic) reformer that extracts the needed hydrogen from a hydrocarbon fuel, plus cleanup stages to remove carbon monoxide, sulfur, and any other impurities that could poison the fuel cell's catalyst.

3 Uniquely, methanol can be reformed to hydrogen at only 260°C rather than the ~600–900°C required for gasoline, ethanol, methane, or other hydrocarbons (Thomas *et al.* 1998a). Methanol also enjoys a short-term global surplus of production capacity sufficient to run about 1.5–2 million relatively inefficient fuel-cell cars (*id.*). However, methanol raises potentially offsetting issues of toxicity and materials compatibility.

4 Thomas *et al.* 1997, 1998, 1998a, Williams *et al.* 1997, Ogden *et al.* 1997, Mark 1997. The gasoline-to-wheels efficiency can even be slightly lower than that of vehicles with combustion engines, and the capital cost is much higher: Thomas *et al.* 1998.

energy and car firms. For the reasons described below, we expect its logic will gradually make it the dominant paradigm of the emerging hydrogen industry.

Superefficient light vehicles

Impressive progress in the 1990s in the operational and cost parameters of fuel cells—mainly but not exclusively the proton-exchange-membrane (PEM) designs assumed in this discussion⁵—have diverted attention from an equally important revolution in automotive design. In pursuit of superior, uncompromised, and extremely fuel-efficient vehicles, offering important advantages for both drivers and manufacturers, a new design approach is emerging that would also make the vehicle platform ready for fuel cells and for their direct fueling with compressed hydrogen gas.

Since 1991, a coherent and attractive automotive concept has been suggested and refined that could make any type of light road vehicle (plus many heavy ones such as buses and trucks) severalfold lighter-weight and lower-drag than conventional versions. This requires a highly integrated ultralight design, typically using a body molded from advanced polymer composites, plus close attention to design synergies, mechanical simplification, and open-architecture whole-platform software and electronics.⁶ These features could together cause mass, cost, and complexity to decompose markedly, and could reduce curb mass by about 2–3-fold, aerodynamic drag by 2-fold, and rolling resistance by 2.5–5-fold. These reductions could in turn cut tractive loads by about 2–3-fold and increase overall vehicle efficiency (fuel to traction) by about 4–8-fold⁷, so that:

- severalfold less fuel-cell capacity is required: ~25–30 kW_e for a 4-passenger sedan or ~30–50 kW for a 5–6-passenger sedan or larger light-duty vehicle⁸;
- this reduced capacity makes a fuel-cell price on the order of \$100/kW_e competitive—a severalfold higher price than could compete in a less efficient conventional car;

5 Successful development of alkaline, high-temperature solid-oxide, or other types of fuel cells would probably not substantially alter our logic. The arguments might change with regard to cars if direct-methanol fuel cells were dramatically improved, but they look uncompetitive with direct-hydrogen PEM fuel cells, at least initially. In the longer term they could get “locked out” by hydrogen’s early adoption.

6 Cumberford 1996, Brooke 1998, Lovins 1996, Moore 1996, 1996a, 1997, Moore & Lovins 1995, Mascarini *et al.* 1995, Brylawski & Lovins 1995, 1998, Lovins, Brylawski, Cramer, & Moore 1997, Cramer & Brylawski 1996, Fox & Cramer 1997.

7 Williams *et al.* 1997 show a ~4–5-fold range based intentionally on more conservative technical assumptions for a 5–6-passenger sedan. Further reductions in platform mass, drag, and other parameters, and many variants in vehicle type, are possible. The extent of such improvements needs empirical clarification.

8 Compared with ~40–80 kW for the somewhat improved illustrative aluminum-intensive sedan considered by Thomas *et al.* 1998a. Although many specific designs are possible, some of the fuel cell’s output electricity would typically be stored temporarily in a relatively small and lightweight “load-leveling device” or LLD. This buffer-storage device smoothes out temporary fluctuations between the rates at which power is generated and required, decoupling the power plant from the demands of driving and thus allowing the power plant to become smaller. LLDs also can be used, via a process called regenerative braking, to store the energy that would otherwise be dissipated as heat by the brakes. A load-leveling device can use any of at least four demonstrated technologies:

- a high-powered battery that weighs and costs less than a tenth as much as the half-ton of batteries that give a battery-electric car its driving range, because while it must accept and deliver energy rapidly, it needs to store only a few percent as much energy;
- an ultracapacitor, which stores electric charge on rolls of foil separated by an insulator (such a device runs today’s portable computers while their batteries are being swapped);
- a superflywheel, which magnetically exchanges energy with a small carbon-fiber rotor spinning extremely rapidly and almost frictionlessly on magnetic bearings in a vacuum; or
- a reversible fuel cell. Doing double duty, part or all of the fuel-cell stack that powers the car could be made reversible at a modest (and recently decreasing) size and efficiency penalty. Within its thermal envelope, it could in principle provide in fuel-cell mode roughly three times its normal output rating for short periods if supercharged with oxygen saved from reverse (electrolytic) operation.

The choice among these technologies, or combinations of them, is not important to success. Indeed, a hybrid-electric car can work quite well without an LLD. However, including a load-leveling device can shift the absolute and relative cost and performance of fuel-cell propulsion systems, as illustrated by Thomas *et al.* 1998a and Williams *et al.* 1997.

- on normal experience-curve assumptions, that higher tolerable price is likely to be achieved a few years (doublings of cumulative production) earlier than the severalfold lower price normally posited⁹;
- the lower required fuel-cell capacity also increases the range of tolerable fuel-cell mass and volume per kW;
- direct-hydrogen fueling yields reasonable driving ranges with a compressed-gaseous-hydrogen tank combining reasonable cost, packagable bulk, and very low mass¹⁰;
- the direct-hydrogen fueling maximizes the fuel cell's capacity and efficiency, reinforcing its advantage in mass, volume, range, and cost; and
- the combination of the more efficient platform with more efficient conversion of fuel energy into traction¹¹ permits the use even of costly sources of hydrogen fuel without raising fuel-cost-per-km to uncompetitive levels.

These attributes are achievable without compromising any others desired by car owners or manufacturers: on the contrary, design synergies can make such a vehicle equal or superior in all respects to current market offerings. Manufacturers also gain key competitive advantages, including up to an order of magnitude decrease in product cycle time, investment requirements, body parts count, and assembly effort and space. By the end of 1998, such advantages for both customers and manufacturers had led billions of dollars¹² to be committed to this line of development, with a doubling time below two years, in extensive proprietary efforts by both established and intending automakers. Many key elements of this design approach (called here by Rocky Mountain Institute's trademarked term "HypercarTM") have already appeared in concept cars and market platforms in the late 1990s.¹³ Widespread market introduction and rapid spread of a wide range of vehicles incorporating the essential elements of that ultralight-hybrid design synthesis, including fuel-cell versions, appear inevitable soon after the turn of the century.

Of course, a Hypercar could make its traction power onboard from any liquid fuel, including gasoline, methanol, or biofuels, using an engine- or turbine-driven generator. It would simply not be as clean or efficient as a direct-hydrogen fuel-cell version. In round numbers, an engine-driven, liquid-fueled Hypercar would normally achieve about 2–3 L/100 km, while a hydrogen-fuel-cell version would achieve roughly 2 or fewer L/100 km (both expressed as liters of gasoline-equivalent). Since the Hypercar relaxes the fuel-cell-cost and tank-packaging constraints that make direct hydrogen fueling unattractive in conventional fuel-cell-powered cars¹⁴, it also makes unnecessary the many penalties in cost, mass, volume, efficiency, and other attributes that have been well established as consequences of the onboard liquid-fuel reforming strategy.¹⁵

9 Williams *et al.* 1997.

10 This point is frequently misunderstood: The literature is full of statements that gaseous hydrogen tanks are far too heavy and bulky to be feasible for cars. However, because hydrogen could propel a fuel-cell Hypercar four or more times as efficiently as gasoline, very little hydrogen would provide a long range. The 345-bar (34.4-MPa or 5,000-psig) filament-wound-carbon, metallized-polyester-film-lined tank designs pioneered by Fred Mitlitsky at Lawrence Livermore National Laboratory (James *et al.* 1994, 1996, 1997) would be highly suitable. Williams *et al.* 1997 offer a Taurus-class Hypercar design example whose 4.65-kg H₂ tank has 2.5-fold larger volume and 2-fold lower mass than a gasoline tank of equivalent range (over 900 km). Thomas *et al.* 1998a illustrate a less efficient (~40–80-kW_e) fuel-cell sedan that nonetheless packages 3.63 kg of H₂. Preliminary tests, *e.g.* by Ford, indicate that such tanks can be made with standard techniques at affordable costs, are extremely difficult to cause to fail (they could be one of the strongest parts of the car), and tend to fail gracefully. Thomas *et al.* 1998a also correctly note that liquid-hydrogen storage, a technique favored by BMW, is feasible with existing technology, though we consider it unnecessary.

11 Further, because of their high efficiency at part load, fuel cells do better under typical driving conditions than a simple comparison of conversion efficiencies would indicate—especially when compared to a typical Otto engine, which on average is only about half as efficient as its peak value under such conditions (Williams *et al.* 1997).

12 One of us (ABL) estimates ~\$5 billion; an industry panel at the Los Angeles Auto Show's Clean Car Conference on 29 December 1998 estimated comparable or higher values.

13 A periodically updated chronology is posted at www.hypercar.com, which provides >100 pages of nonproprietary explanations of the concept.

14 Williams *et al.* 1997.

15 The cost penalty is well established, both onboard the car and for a total infrastructure system, in Thomas *et al.* 1998a.

Thus the market-driven adoption of a superefficient car relieves the vehicle design constraints that are normally presumed to require onboard reformers and liquid fuels, and unlocks the many benefits of compressed hydrogen gas fueling. The major constraints remaining are the cost of the fuel cell and the buildup of hydrogen refueling infrastructure. Relieving these constraints requires careful coordination between deployment in both vehicles and buildings.

Deployment of fuel cells in buildings and vehicles

To be competitively used in light-duty vehicles, even in Hypercars, fuel cells must become dramatically less expensive than they are in early 1999 at the dawn of their commercial mass-production. There is little doubt that this will occur if they are engineered for and put into mass-production. Compared to car engines, with their thousand parts made chiefly of heat-treated metal alloys and subject to the stresses of motion and explosion, fuel cells should ultimately prove cheap, rugged, and easy to make. It is a truism of modern manufacturing, verified across a wide range of products, that every doubling of cumulative production volume typically makes manufactured goods about 10–30 percent cheaper. There is every reason to believe fuel cells will behave in the same way. In 1998, handcrafted fuel-cell stack prototypes sold for thousands of dollars per kilowatt. In early mass-production, a kilowatt will probably fall to \$500–\$800, and, as production expands over the following few years, to around \$100. That's only severalfold more than the cost of today's gasoline engine/generators (after more than a century of refinement), about tenfold cheaper than a coal-fired power station, and severalfold cheaper than just the *wires* to deliver that station's power to a building, where the fuel cell could already be.

When fuel cells are manufactured in very large volumes, using such innovative designs as (for example) molded roll-to-roll polymer parts glued together, they could become extremely cheap—probably less than \$50 per kilowatt¹⁶, which is about a fifth to a tenth the cost of today's cheapest combined-cycle gas-fired power stations. Most automakers assume they need such low costs before fuel cells can compete with internal-combustion engines. As described earlier, however, Hypercars need severalfold fewer kilowatts to provide excellent performance, so they can tolerate higher costs, perhaps as high as about \$100 per kilowatt. This, and their correspondingly higher tolerance of immature specific mass and volumetric power ratings, gives Hypercars a few years' head start in adopting fuel cells—an important market advantage for both Hypercars and fuel cells.

However, exclusive focus on cars leads to the incorrect conclusion that fuel-cell costs must be driven down to automotively acceptable levels by brute-force, loss-leader scaleup of production for cars. It is more plausible that the initial markets that build production volume and cut cost will instead come from buildings.¹⁷ Enough production volume to achieve \$100 per kilowatt could readily come from using fuel cells first in buildings—a vast potential market, since buildings use two-thirds of America's total electricity. For these reasons, several large makers of cars and car parts are crossing traditional boundaries and quietly launching significant ventures to commercialize fuel cells in stationary as well as mobile applications.

The main reason to start with buildings is that fuel cells can turn 50 or more percent of the hydrogen's energy¹⁸ into highly reliable, premium-quality electricity, and the remainder into 70°C pure water—ideal for heating, cooling, and dehumidifying buildings using a modular “balance-of-system” black box which several capable firms are already developing.¹⁹ In a typical building, such services would help pay for natural gas and a fuel processor.²⁰

16 Several independent studies (*e.g.*, Lomax *et al.* 1997) have used standard industrial engineering techniques to calculate costs around \$20–\$35/kW for the PEM fuel-cell stack at high production volumes. Its accessories could become very, though not negligibly, cheap with low-pressure designs, blow-molded plastic plumbing, mass-produced power electronics, and simplified management of heat, humidity, and water chemistry.

17 However, this conclusion, though plausible and helpful, is not essential to our argument. The key point is that the automotive and buildings markets are *both* so big that once either one starts to happen, it will quickly make the other happen too by increasing volume and cutting cost. For present purposes, the many differences of detail between fuel cells optimized for mobile and for stationary uses are less important than their similarities.

18 Widely quoted efficiency figures around 30-odd to 50 percent assume the fuel cell is fed not pure hydrogen but the more dilute and impure reformat gas converted from a hydrocarbon fuel, and often include also the conversion losses in the fuel processor.

19 Other useful functions can include water heating and space-cooling reheat. The air-conditioning functions can use various combinations of absorption and desiccant cycles, both of which can work well at 70°C (*e.g.*, Yazaki machines), and may be combined with, for example, indirect evaporative cooling. A considerable fraction of U.S. commercial buildings' air-conditioning capacity is slated for replacement in the next decade or so because of age and the need for CFC displacement.

With the fuel expenses thus largely covered, electricity from early-production fuel cells should be cheap enough²¹ to undercut even the operating cost of existing coal and nuclear power stations, let alone the extra cost to *deliver* their power, which in 1996 averaged 2.4 cents per kilowatt-hour.²² Announced market entrants for packaged, natural-gas-reformer-fueled fuel-cell cogeneration systems include General Electric, which says it plans to market the household-scale Plug Power system late in the year 2000.

Even the handmade-by-PhDs fuel cells of 1998 could have turned a profit in buildings if deployed initially to buildings in those neighborhoods where the electrical distribution grid is fully loaded and needs costly expansions to meet growing demand, or where it is nearing the end of its service life and needs life-extension or replacement.²³ Over 100 North American utilities are already prospecting for such “hot spots” where local generation or load reduction can be targeted by “Local Integrated Resource Planning” specifically to avoid or defer costly distribution investments.²⁴ In addition to avoiding distribution costs and losses, fuel cells can offer the utility such valuable “distributed benefits” as reactive power support, stability support (via very fast ramp rates), improved distribution circuit management, simplified fault management, and reduced reserve margin and spinning reserve. Moreover, customers benefit from enhanced reliability and unsurpassed power quality, which can displace uninterruptible power supplies for computers and other critical applications, while investors realize important reductions in financial risk. Collectively, such distributed benefits can often increase the economic value of decentralized generators by about an order of magnitude.²⁵ Counting these benefits is not necessary to make \$500/kW fuel cells competitive in many buildings, but it certainly enhances their margin of advantage and hence accelerates their market adoption. Nor is it necessary to perform detailed and sophisticated analyses to conclude that the site-specific attractiveness of such a cheap, efficient power and heat source should be quite robust in a wide range of settings.

Besides co- or trigeneration (electricity plus heating plus cooling) in buildings, fuel cells offer a nearly ideal fit to some important industrial niche markets. For example, hundreds of microchip fabrication plants, plus another \$169 billion worth on the drawing-boards as of 1997, each use an average on the order of 15 MW with a capacity factor over 90%. Such a “fab” typically loses about 6–8% of its \$5–10-million annual electric bill to the standby losses of a giant and very costly uninterruptible power supply required by its ultraprecise processes. That UPS can be eliminated by a suitably configured array of fuel cells and inverters designed for the desired level of reliability. Moreover, the fuel cells’ ~70°C waste heat is well matched to the fab’s requirements for process heating and cooling; the clean hot water created by the fuel cells is an ideal feedstock for the fab’s ultrapure water system; and the manufacturing process requires pure hydrogen as a reagent, offering the opportunity to share the hydrogen source. These features appear to make even early production PEM fuel cells (or competing types such as the ONSI phosphoric-acid stacks) strong candidates for immediate retrofits into many existing fabs, and the power supply of choice for all new ones. Nor is chipmaking the only important industrial niche application.

20 Obviously, liquid fuels would become potentially interesting reformer feedstocks only if natural gas were not locally available, so that (for example) LPG or biofuels had to be substituted.

21 For illustration, even an \$800/kW fuel-cell system, at a 15%/y fixed charge rate, would incur a capital charge of only 2.7¢/kWh at a 50% capacity factor. Alternatively, the net electrical output efficiency of a PEMFC using reformed methane is often quoted at or above 40% (LHV), often with neither heat recovery from the stack to the reformer nor pressure recovery from the stack’s hydrogen input and stack output to the air compressor; with both, the best technology is now ~50%. At 50% conversion efficiency, natural gas at \$3.7/GJ or \$4/103 ft³ would produce electricity at 5.5¢/kWh: 2.7¢/kWh for the fuel plus 2.7¢/kWh for the cost of a relatively expensive early fuel-cell system at ~\$800/kW, plus a nominal 0.1¢/kWh for O&M. This would undercut typical commercial-sector U.S. electricity tariffs (averaging 7.6¢/kWh in 1997) by 28%, even with *no* thermal credit and no allowance for the improved power quality and reliability or for other distributed benefits.

22 Lovins & Lehmann 1999, representing the capital and operating costs and the losses of the transmission and distribution systems for the average customer at the average hour.

Obviously the actual costs, both total and marginal, depend on who, where, and when.

23 Such deferral of grid investment is among the roughly 75 important “distributed benefits” available to improve fuel cells’ investment value (Lovins & Lehmann 1999). Many others can add important extra value, and most will be increasingly valued and recognized within the new structures, skills, and institutions emerging within the context of the restructuring of the electricity industry. Of course, realizing the profit from avoided grid investments requires institutional arrangements to recognize this value and, if necessary, to reallocate it from the distribution utility to other actors.

24 Lenssen 1995. In emerging competitive markets, the value of such local grid support may become reflected in “decongestion rents.” Some customers, too, already have their own incentives to avoid investments in renewed or expanded service-entrance facilities such as substations or stepdown transformers.

25 Lovins & Lehmann 1999.

Early adopters of fuel cells will naturally prefer those applications and locations that offer the most favorable combination of fuel cost, electricity and thermal value, temporal patterns and matching of electric and thermal loads (both as influenced by load management, storage, and especially end-use efficiency), distributed benefits, net-metering laws, interface requirements, pollution credits, and other technical, economic, and institutional conditions. Although site-specific analysis will be initially important, even a modest subset of the in-building generation market can yield an aggregate fuel-cell capacity larger than should be required to achieve a cumulative production volume consistent with the £\$100/kW_e system costs needed for deployment in Hypercars.

However, once fuel cells become cost-effective for, and are installed in, a Hypercar, it becomes more than just a car. It is also, in effect, a clean, silent, ultrareliable power station on wheels, with a generating capacity of at least 20 kilowatts. The average American car is parked about 96 percent of the time, usually in habitual places. Suppose you pay an annual lease fee of about \$4,000–5,000 for the privilege of driving your “power plant” the other 4 percent of the time. For much of the rest of the time, rather than plugging your parked car into the electric grid to recharge it—as battery cars require—you plug it in²⁶ as a generating asset. While you sit at your desk, your power-plant-on-wheels is sending 20+ kilowatts of premium-quality electricity back to the grid.²⁷ You’re automatically credited for this production at the real-time price, which is highest in the daytime: you’re probably running the power plant at the place and time at which its output is most valuable. Thus your second-largest, but previously idle, household asset is now repaying a significant fraction of its own lease fee.²⁸

If a modest fraction of drivers took advantage of this deal on a consistent basis, most or all existing coal and nuclear power plants could in principle be displaced, because ultimately the U.S. Hypercar fleet could have four or more times the generating capacity of the national grid.²⁹ Fuel cells will not be the only formidable competitor to central thermal power stations, but they may well be the most ubiquitous. As Asea Brown Boveri’s Bertrand Dusseiller correctly notes, the rated prime-mover power of the automobiles now manufactured *each year* exceeds the total rated capacity of the world’s power stations. Even though the latter have far longer operating lives, and Hypercars would have prime movers severalfold smaller than today’s car engines, reducing the duplication between power stations and mobile generators by more fully using automotive generating capacity is clearly an important opportunity—especially since cars, unlike central power stations, tend to be located very near the electrical loads resulting from human activity.

Fueling the hydrogen transition: start decentralized

Perhaps surprisingly, the key to this revolution is not so much the fuel cell—many capable firms are working overtime to start mass-producing them early—but rather how fuel cells’ best source of energy, hydrogen gas, will be manufactured, delivered, and stored. Two hurdles on the way to the hydrogen economy are commonly presumed: safety and the evolution of infrastructure for hydrogen fueling.

For fuel-cell cars, the often-expressed concerns about hydrogen safety are misplaced. Although no fuel is free from potential hazard, carrying a tank of compressed hydrogen in an efficient car could actually be safer than carrying an equivalent-range tank of gasoline.³⁰ The car’s inventory of hydrogen would be modest³¹ and would

26 The interconnection device could be provided at reasonable cost by the landlord, a gas or electric utility, or a third-party entrepreneur. Southern California Edison’s EV subsidiary installs Hughes inductive-paddle rechargers, whose electric capacity is broadly comparable, for ~\$50/kW. This might at first seem significant, but in fact it is a small fraction of the typical value of distributed benefits. Obviously, the interconnection becomes more commercially attractive if the distributed benefits can be properly captured, if they are captured mainly by those making the investments, and if the institutional arrangements are kept simple and transparent.

27 The fuel cell would therefore need to be designed for a much longer operating life than is normal in cars, but this is not unduly difficult if it is consistently fed high-quality hydrogen. The marginal cost of such design would be well compensated by the extra value created. Technologies for making the hydrogen pure enough are well established, as are inexpensive controls to protect the stack and inverter from electrical anomalies.

28 For illustration, a 20-kW “mobile power plant” earning an average of, say, 5¢ gross or 2¢ net of fuel cost per kWh—remember, the car could often generate during peak hours and earn real-time pricing premia—for an average of, say, 15 h/d, or 65% of its nominal parking time, would return \$2,190 net per year, or 59% of the total depreciation and financing cost of the average 1994 U.S. passenger car. A light vehicle with a bigger fuel-cell stack could earn twice that much. Obviously, the surplus, and the costs of capturing it, would actually be shared among a number of actors in proportion to their market power.

29 150 million light vehicles times a minimum capacity of 20 kW_e—the average could be substantially higher—yields 3 TW_e, vs. summer-1997 U.S. peak capability of 0.78 TW and 1996 noncoincident peak load of 0.62 TW (neither of which reflects the ~14% onpeak grid loss).

30 Directed Technologies, Inc. 1997.

typically be stored in an extremely strong carbon-fiber tank. Unlike spilled gasoline, escaped hydrogen likes nothing better than to dissipate—it's very buoyant and diffuses rapidly. It does ignite easily, but this requires a fourfold richer mixture in air than gasoline fumes do, or an 18-fold richer mixture (plus an unusual geometry) to detonate. Moreover, although its flame is invisible, a hydrogen fire can't burn you unless you're practically inside it, in contrast to burning gasoline and other hydrocarbons whose white-hot soot particles emit searing heat that can cause critical burns at a distance. As a result of the gas's unique burning properties, no one was directly killed by the hydrogen fire in the 1937 *Hindenburg* disaster. Some died in a diesel-oil fire or by jumping out of the airship, but all 62 passengers who rode the flaming dirigible back to earth, as the clear hydrogen flames swirled upwards above them, escaped unharmed.³²

Hydrogen, then, would make an excellent fuel. Fortunately, it's not necessary, as is often assumed, to delay the deployment of fuel cells in vehicles and buildings for decades while first building a vast new infrastructure to deliver hydrogen. Nor do automakers need to go through an awkward and costly transitional phase of fitting a fuel processor—a sophisticated portable thermochemical plant—into the car so it can convert liquid fuels (gasoline or methanol) into hydrogen onboard.³³ Instead, a new hydrogen infrastructure could be built step by step, using established methods and markets that could each be profitable. How can this transition actually occur?

Hydrogen technology isn't new. Producing hydrogen is a little-known but large and mature industry.³⁴ Making hydrogen now consumes about one percent of total U.S. primary energy and five percent of natural gas. Essentially all the hydrogen is now used as an onsite reagent, mainly for refining petroleum and for manufacturing petrochemicals, food, and electronics. Industry now either uses grid electricity to split water in an electrolyzer, or more commonly, reforms natural gas. However, reforming or electrolyzing need not be done industrially, at the scale of a refinery; it can also be efficiently and cost-effectively carried out at the scale of an apartment building, an office or retail building, or a neighborhood. One water-heater-sized, mass-produced "fuel appliance" can produce enough hydrogen to serve the fuel cells in one big building or dozens of cars.³⁵

The strategic advantage of initially using "the existing natural gas pipeline system or the ubiquitous electrical power grid as the backbone of the hydrogen infrastructure system" is that "hydrogen is produced where and when it is needed, in quantities that match the incremental growth of [fuel-cell] sales, minimizing the need for multi-billion-dollar investments prior to the introduction of sufficient numbers of [fuel cells] to provide adequate return on investment."³⁶ In addition, thanks to economies of production scale for the hydrogen appliances, the hydrogen costs less than centrally produced hydrogen requiring new pipelines or other distribution means³⁷; but upstream bulk supply (discussed below) can still be added later as it becomes justified. Further, as other, more renewable, ways of producing hydrogen become available and economic, they too can be adopted without waiting for the vehicle fleet's technology to turn over yet again, as would be required by liquid-reforming scenarios. This innovation- and evolution-friendliness is an important strategic advantage.

What's missing is the step that bridges from initial, cost-cutting deployment of fuel cells in buildings to fuel cells' later rapid deployment in hydrogen-fueled cars. This bridge can be built by noting that the hydrogen appliances initially installed to serve fuel cells in buildings (in combination with the hydrogen appliances built to fuel public and private vehicle fleets) represent a constellation of hydrogen sources available also to cars. In particular,

31 James *et al.* 1997. Further, a fuel-cell Hypercar could travel roughly 200 km on 1 kg of hydrogen: A Taurus-class Hypercar was calculated to drive roughly 925 km fueled by 4.65 kg of hydrogen (Williams *et al.* 1997).

32 Bain 1997.

33 Though this approach can doubtless be improved, it gravely weakens or negates many of the fuel cell's original advantages: Thomas *et al.* 1997, 1998, 1998a, Ogden *et al.* 1997, Williams *et al.* 1997, Mark 1997. Further, reformers will always work better, and have an enormously higher capacity factor, offboard the vehicle. Nonetheless, many automakers are pursuing the onboard-fuel-processor concept, presumably because they assume inefficient cars (hence too-large hydrogen tanks), safety problems, and/or infrastructure problems.

34 President's Council of Advisors on Science and Technology (PCAST) 1997 at 6-34.

35 Ogden *et al.* 1997, Thomas *et al.* 1997, 1998a. Although natural gas reformation is generally assumed to be the cheapest option, if offpeak retail electricity costs only ~1.5–3 cents per kilowatt-hour, as it now does in many parts of the U.S., using it to split water could cost less than locally reforming natural gas for small numbers of fuel-cell vehicles: Thomas *et al.* 1998, 1998a. Electrolysis could therefore initially be deployed faster if initial vehicular hydrogen markets were small, but vehicle fleets or, of course, fuel-cell systems in buildings could favor small methane-steam reformers.

36 Thomas *et al.* 1998a.

37 *Id.*

suppose fuel-cell Hypercars are leased first to the people who work in areas with buildings where fuel cells have already been installed. (The same utility could even lease both.) As you park your fuel-cell Hypercar at work³⁸, you plug into both the electricity grid and a snap-on fuel line bringing surplus hydrogen from the fuel appliance in the building. Since that device isn't normally kept fully occupied, in its spare time it makes a surplus of hydrogen, reducing the need to build a whole new infrastructure of hydrogen sources dedicated solely to cars.³⁹ This approach makes the profits of cars-as-plug-in-power-plants promptly available to a set of drivers far larger than those who operate centrally fueled vehicle fleets. In addition, the high purity of the hydrogen required for long life, low catalyst loading (hence low cost), and high efficiency in the buildings' fuel cells also supports the same qualities in the mobile fuel cells fueled by the same hydrogen appliances.

The next stage of expansion for hydrogen supply follows naturally from the in-building initial phase. The more owners of general-market vehicles acquire hydrogen-fueled Hypercars or other vehicles, the more entrepreneurs will want to start installing street-corner "gas stations"⁴⁰ based on the same inexpensive hydrogen production appliances, using either natural gas or electricity, that will already be mass-produced to supply the fuel cells inside buildings.⁴¹ At the January 1999 Detroit Auto Show, Ford cited studies showing that hydrogen "can be cost-competitive with [U.S. taxed] gasoline on a cost-per-mile-driven basis if generated by [such] small factory-built [fuel]...appliances capable of supporting up to 100 vehicles." The retail margin available is far higher than already motivates the widespread establishment of gasoline filling stations, which suffer from cutthroat commodity competition, refiner and wholesale dominance, and high capital cost (including new precautions against leaking underground tanks). Initially, these distributed hydrogen sources will tend to cluster in nodes, corridors, and such regions as Southern California where air quality or other circumstances encourage early adoption. Gradually, economies of scale in hydrogen supply and utilization will fill the geographical thin spots.⁴²

This approach offers several strategic advantages. It uses idle offpeak capacity in the natural-gas and electricity distribution systems that have already been installed and paid for. It is build-as-you-need and pay-as-you-go, requiring investment only in step with incremental demand. It is one or two orders of magnitude cheaper than building a dedicated, centralized hydrogen production and delivery system from scratch: A nationwide system of decentralized hydrogen sources could be built for \$4.1 billion even if *none* of these sources were being built anyway to support the fuel cells in buildings⁴³, as many actually could be. And vibrant competition between gas- and electricity-derived hydrogen, based on the large and expanding range of fungible sources of both gas and electricity, will exert downward pressure on the prices of hardware and hydrogen. Such competition at a fundamental level is more important and valuable than the narrower forms of competition often invoked by advocates of "fuel flexibility"—a euphemism for "continued dependence on liquid hydrocarbons," in whose name the breakthrough advantages of direct-hydrogen fuel cells are often proposed to be sacrificed.

38 Or at your house or apartment, which might offer more opportunities for thermal integration. The workplace example is given to capture the value of daytime (*i.e.*, typically onpeak) generation.

39 Even when far from the office, you needn't worry about running out of hydrogen because your hydrogen-fuel-cell car could have a longer driving range than a conventional car, and its navigation screen could display every available hydrogen source, updated wirelessly. In a pinch, one can imagine that an electrolyzer (standalone or in a reversible stack) could slowly make hydrogen onboard when plugged into any electric outlet. Alternatively, a tow truck could provide hydrogen from a tank or from its own reversible fuel cell or electrolyzer—the hydrogen equivalent of jumper cables.

40 Lovins 1998. Onsite storage of compressed hydrogen is straightforward, although updating of regulations is necessary. In general, current regulations, meant for natural gas, assume metal tanks subject to corrosion and cracking, and are overly conservative for the very different engineering details of composite hydrogen tanks.

41 Such hydrogen appliances could even end up in individual garages—better than schlepping one around in your car, and providing battery cars' overnight refueling advantage. Electrolyzer Corporation of Canada, for example, is developing just such an electrolyzer-and-compressor device for home use.

42 This strategy should prove easier, more profitable, and useful for longer than creating a recharging infrastructure for battery-electric cars or adapting the existing gasoline infrastructure to methanol. Both of these would probably prove to be short-lived transitional investments, unless perhaps direct-methanol fuel cells prove attractive, and both lack the long-term flexibility that lets a direct-hydrogen strategy adapt readily to new sources of hydrogen.

43 Assuming 18,000 stations each able to supply 1,000 relatively conventional (~40–80-kW) fuel-cell vehicles—an offboard investment of \$230 per vehicle: Thomas *et al.* 1998.

Aggregation to bulk hydrogen supply

The bigger the total hydrogen market becomes, the more interested the energy industries will become in serving it, expanding bulk hydrogen from an onsite reagent in refineries and petrochemical plants into an offsite commodity. Though offsite shipment, typically in pipelines, may require special arrangements, many existing natural-gas networks appear to be adaptable for this purpose⁴⁴; and if the construction even of special new pipelines, a routine commercial transaction, is justified by the market value of natural gas, then it should be all the more justified by the market value of hydrogen, which can be used far more effectively.

An especially attractive commodity-market opportunity is to reform natural gas at the wellhead, where a large plant can efficiently strip out the hydrogen for shipment to wholesale markets. Professor Robert H. Williams of Princeton University points out⁴⁵ that the other product of the separation process, carbon dioxide, could then be reinjected into the gasfield (a common practice today in oilfields), adding pressure that would help recover about enough additional natural gas to pay for the reinjection. The carbon would then be safely sequestered in the gasfield, which can typically hold about twice as much carbon in the form of CO₂ as it originally held in the form of natural gas. The world's abundant resources of natural gas—more than a century's worth—could thus be cleanly, efficiently, and profitably used in fuel-cell vehicles, and in fuel-cell-powered buildings and factories, while reducing the threat to the earth's climate.⁴⁶ The hydrogen provider could be paid three times: for the shipped hydrogen, for the enhanced recovery of natural gas (often about enough to pay for the reinjection), and potentially a third time, under future Kyoto Protocol trading or other such arrangements, for sequestering the carbon. This triple profit opportunity, among other value propositions, is already leading several major energy companies to move aggressively into the hydrogen business.

Using electricity to split water to make hydrogen can also be climatically benign if the electricity comes from such renewable sources as solar cells or windfarms—intermittent sources whose economic value would be greatly enhanced by energy storage in the form of hydrogen. One of the biggest renewable energy sources is also the oldest: Old-fashioned hydroelectric dams, like those in the Pacific Northwest and the Tennessee Valley, could make manyfold higher profits if they operated as “Hydro-Gen” plants—using their electricity to make hydrogen to sell as a premium vehicular fuel—than if they kept on selling electricity into an ever more crowded bulk market. This is because fuel-cell cars could use hydrogen at least 2.5–3.5 times more efficiently than today's cars use gasoline. Hydrogen priced to compete at the wheels with \$1.25-a-gallon (\$0.33/L) gasoline can therefore fetch a far higher value than its raw energy content would imply. In fact, that value is equivalent to selling the electricity used to make the hydrogen at a price about 5–7 times higher than Pacific Northwest dams can actually get for their electricity today.⁴⁷ They can thus make far more money by selling not electricity but hydrogen—in effect, shipping each electron with a proton attached. In places like Europe and Japan, where taxed gasoline prices are commonly 3–4 times U.S. levels, this argument is even more compelling.⁴⁸ The more the hydrogen is sold, the more its climatically benign bulk production—in Hydro-Gen plants, windfarms, natural gasfields, biofuels, etc.—will expand too.⁴⁹

44 Older existing pipelines originally meant for “town gas,” the hydrogen-rich synthetic predecessor of natural gas, can be suitable. Middle-aged pipelines without the proper metallurgy and seals could often be retrofitted *in situ* with metallized composite liners. In any case, natural-gas rights-of-way would be available for conversion. As in all other contexts, economic comparisons of such network conversions should be made not per joule of methane or hydrogen carried, but per unit of *service* (such as vehicular traction) delivered; otherwise hydrogen is unfairly penalized by not properly counting its extremely high end-use efficiency.

45 Williams, R.H. 1996.

46 The same would be true of renewable sources of methane—anything that rots—if the CO₂ were sequestered.

47 One gallon priced at \$1.25 contains 125 kBtu or 132 MJ, enthalpically equivalent to 36.6 kWh of electricity priced at

3.4¢/kWh. However, the 2.5–3.5-fold greater efficiency of converting each J of hydrogen into vehicular traction, compared with a J of gasoline (*i.e.*, ~50% system efficiency in a fuel-cell car vs. 15–20% in an Otto-engine car), makes this price functionally equivalent to 8.5–12¢/kWh. That is so much larger than the current Pacific Northwest bulk electricity price of 1.6¢/kWh that the spread could more than cover the cost of electrolysis and hydrogen delivery.

48 This is bad news for aluminum smelters, which now often enjoy preferential access to very cheap hydropower under old contracts that will represent an increasingly severe opportunity cost. However, it might be good news for anadromous fish if hydrogen storage could be large enough to control seasonal water flows for their benefit.

49 New, cheaper ways to use solar electricity to obtain hydrogen from water are rapidly emerging too. So are methods that use light instead of electricity, imitating photosynthesis, but so far these are only in the laboratory.

Implications

This combination of technologies can thus ameliorate, at a profit, close to two-thirds of America's carbon-dioxide emissions⁵⁰ while improving mobility, safety, fun, and comfort. Retail price competition will be strong, because at least four main ways to make hydrogen—upstream and downstream, from electricity (especially renewable electricity) and from natural gas—will all be vying for the same customers. We will be betting not on the supply or price of a single fuel such as oil, but on the entire, expanding, and highly dynamic portfolio of ways to make cheap electricity and gaseous fuels.

Practical application of this strategy will require quantitative, site- and region-specific analysis of such issues as the population of buildings suitable for early conversion to fuel cells, those buildings' best hydrogen sources, technical and institutional arrangements for hydrogen-appliance/parked-vehicle interfaces, distributed benefits, Hydro-Gen-suitable dams (*e.g.*, near hydrogen-ready pipelines), pipeline and gas-distribution conversion details, and institutional requirements to provide the best match between fuel-cell and hydrogen investors or operators and the allocation of distributed, environmental, and other benefits. But despite the diversity and complexity of these remaining issues, no breakthroughs are required: The needed technology already exists.

Even without fuel cells, successful Hypercars will ultimately save as much oil as OPEC now sells, making gasoline prices both low and less relevant.⁵¹ Between Hypercars and other new ways to displace oil at lower cost in each of its main uses today, oil will probably become uncompetitive even at low prices before it becomes unavailable even at high prices.⁵² Like most of the coal and all of the uranium now in the ground, most oil will probably become no longer worth extracting—good mainly for holding up the ground.

The implied shift from oil and electricity to hydrogen as an increasingly dominant energy carrier has equally important implications for vehicle and fuels strategy. The key issue is whether to deploy extremely efficient (£2 L/100 km) cars as a matter of urgency. Early signs can already be seen that dramatically more efficient vehicles will soon be entering the marketplace, but helping this to happen faster and more aggressively could be highly consequential. Without such hydrogen-ready cars, the very low on- and off-vehicle costs of a direct-hydrogen fuel-cell propulsion system would become unavailable. That lack, in turn, would lock in extra capital costs on the order of \$1+ trillion for the next car fleet and its liquid fueling infrastructure⁵³; would lock out a highly diverse portfolio of vigorously competing fuel sources (*i.e.*, the hydrogen production portfolio), perpetuating dependence on a narrower, less secure, and less competitive supply base; and would greatly retard the evolution of an affordable, effective, and benign fuel-cell- and hydrogen-based energy system. Thus the cost of not adopting the rapid commercialization strategy is the major delay and compromise of competitive advantage. But starting aggressively down the hydrogen path offers the full benefits of the rapid commercialization of fuel-cell vehicles and the promise, at last, of a more sustainable transportation and electricity system.

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50 Only the road-vehicle portion of transportation's emissions, of course, but fuel cells in buildings and industry would also displace much of the fossil fuel now burned for space, water, and process heating.

51 This probably won't trigger an orgy of driving: other costs in money, time, and frustration won't greatly change.

52 Lovins 1998.

53 If one multiplies the per-vehicle costs in Thomas *et al.* 1998a times the world's fleet of a half-billion light vehicles, which is growing by about 5% a year.

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Some Observations Regarding A Missing Elephant

Donald N. Michael

(Don Michael is a psychologist, a wise man, and an old friend of the Club of Rome, the *Limits to Growth*, the Global Business Network, and other endeavors toward sustainability and global understanding. He is the author of many wonderful books, including the recently reprinted *On Learning to Plan and Planning to Learn*. The following paper was given on the occasion of the conferral of an honorary Doctorate in Humane Letters by Saybrook Graduate School and Research Center, San Francisco, October 21, 1998.)

I'll begin with a Sufi story we're all familiar with. It's the story of the blind men and the elephant. Recall that the blind men were each coming up with a different definition of what was "out there" depending on what part of the elephant they were touching. Notice that the story depends on the fact that there is a story teller who can *see* that there is an elephant, different parts of which the blind people are fumbling around with. What I'm going to propose is that today, the storyteller is blind too.

Less metaphorically, I'll put it this way : What is happening to the human race, in the large, is too complex, too interconnected, too dynamic to comprehend, in the large. There is no agreed-on interpretation that provides an enduring basis for coherent action based on an understanding of the enfolding context.

Take any subject that preoccupies us. Attend to all the factors that arguably might seriously affect its current condition, where it might go, and what might be done about it, and how to go about doing so.

Take, as an example, poverty. Think of the variety of factors that connect with poverty. One would have to attend to at least: technology, environment, greed, crime, drugs, family, media manipulation, education, governments, market economy, information flows, ethics, ideology, personalities and events. All of these factors infuse almost any topic that we pay attention to and try to do something about. But, clearly we can't attend to all of these (and others) because each has its *own* set of related factors to be attended to.

Poverty is one of endless examples. What we're faced with, essentially, is the micro/macro question: how circumstances in the small affect circumstances in the large and how circumstances in the large affect circumstances in the small. And we don't know — "butterfly effects" and chaos theory, notwithstanding — how the micro/macro interchange operates in specific human situations. For reasons I shall come to, I don't think we *can* know. In effect, we don't comprehend the kind of beast that holds the parts together and how they're held together for the human condition we call poverty — or any other human condition.

Having claimed this, let me emphasize, before we go any farther, that I'm in no sense belittling our daily efforts to engage issues like poverty or other aspects of the human condition. I wouldn't be taking your time if I believed that what many of us are about is futile. Instead I hope to add a deeper appreciation of the existential challenge we face, the poignancy of our efforts, and the admiration they merit as we try to deal with our world.

Because if we could acknowledge that we don't know what we're talking about when we try to deal with any of the human issues we face, if we could acknowledge this, it seems to me that would have very significant implications for how we perceive ourselves and how we conduct our activities.

I'll come to those implications later. First, I want to offer some observations in support of my proposal that we don't know what we're talking about in the large, by describing six characteristics that seem to be to be the causes of the storyteller's blindness.

First, **we have too much *and* too little information to reach knowledgeable consensus and interpretation within the time available for action.** More information in the social realm generally leads to more uncertainty, not less. (Consider the status of the world economy. We need more information to understand the information we have. So too, with global warming.) Obtaining the additional information takes more time. So the time it takes to reach agreement on the interpretation increases. During that time the information changes. We need more information to interpret the information we have and on and on..

Among the information we are exposed to is that which increases our doubt about the integrity and sufficiency of the information we do have. Nevertheless, there's enough information (or too little in many cases) to generate multiple interpretations of that information. This then adds another layer of information and interpretation that's required to apply the information.

Related and central, information feedbacks and feedforwards very seldom arrive at the time appropriate for their use.. They arrive either too soon or too

late, if they arrive at all. So there is too much or too little dynamic information available when it is needed for comparison with other information.. So, the first ignorance generator is inadequate information to reach knowledgeable decisions in the finite amount of time available for taking action.

Second: **there is no shared set of value priorities..** We make much of the fact that we share values and we frequently say that, well, basically humans want the same things so we ought to be able to work things out. Perhaps, at a survival level, but beyond that, and even there, there is not a shared set of *priorities* with regard to values. Instead, priorities change with circumstance, time, and group. Here are some examples where value priorities differ depending on the group and circumstance: Short term expedience versus long term prudent behavior and vice versa. Group identity versus individual identity. Individual responsibility versus societal responsibility. Freedom vs equality. Local claims versus larger claims for commitment. Universal rights versus local rights (which can repudiate universal rights; fundamentalism, for example.) Human rights versus national interests (e.g. economic competition or nationalist terrorism). Public interest versus privacy (the encryption conflict health information, whether private or not). First amendment limits (pornography, etc.). Seeking new knowledge and its potential benefits vs its potential costs. Who sets the rules of the game and who decides who decides? These are all issues where the priority of values are in contention. There's no reliable set of priorities in place that can be used to decisively choose among actions toward the larger issues.

A third contribution to this lack of comprehension is what has been called **the dilemma of context**. How much do you need to know in order to feel responsible for actions and interpretations? How many layers of understanding are necessary to have enough background to deal with the foreground? There are no agreed-on criteria or methodology for how deeply to probe. (I should have said at the beginning that these six factors are interconnected, interactive.) So the question of how much context is necessary in a situation to decide what to do about that situation very much depends on what values are held by participants in that decision making. And *that* raises other intractable context questions: who are the legitimate participants in the decision making with regard to what constitutes the context? And who says so?

You can choose any issue that's important to you and ask: how much do I/we need to know about, say, that list of topics I enumerated in the poverty example, in order that I can believe I have adequate context for thought and action? This is an unresolved realm. (And it is unresolved for me as well in the very act of giving this talk.)

A fourth item. **Our spoken language and the language we read can not adequately map the complexity that I'm talking about.** Our language, because we hear it or we read it, is linear; one thought follows another. Our language can not adequately engage multiple factors simultaneously. (Poetry can but we haven't yet figured out how to use poetry for policy making, resolving issues of context, or value priorities or the like. Perhaps some forms of visual language can help because they can be simultaneously presented in three dimensions.) Our noun/verb structure emphasizes, items, events, staticness. We say "this is a microphone," rather than engaging it as a multitude of processes in time and space we call a "microphone." Nor can our language adequately map in our on-going minds the circularity of cause and effect producing causes producing effects. Nor give the dynamic feel of a system sustaining itself as a system by virtue of the in-built, circular, mutually influencing feedbacks that hold boundaries together.

In other words, our spoken/ written language doesn't allow us to examine complexities in ways that are inherently informative about the complexities. In fact, our language compounds these complexities because it unavoidably distorts a world of simultaneous multiple circular processes.

The fifth contribution to our inability to know what we are talking about: **there is an increasing, and, given the other factors, an unavoidable absence of reliable boundaries.** Boundaries circumscribe turf, relationships, concepts, identity, property, gender, time, and more. Without boundaries, we can't make sense of anything. One of the Saybrook's forbearers, William James, wrote of a boundaryless world as one of "booming, buzzing confusion." Boundaries are how we discriminate, partition experience in order to create meaning, not just turf.

But what is happening in this world, for reasons I've been describing (and others as well), is that these boundaries and their reliability are increasingly eroded and disintegrated, becoming more and more ambiguous. All systems, including social systems, require boundaries in order to be coherent. It's the feedback that is filtered and shared within the boundaries of the system that allows a system to be self-sustaining. No boundaries, no feedback, no self-sustaining quality that we call a system or that in the old story was called an "elephant."

All that I've been describing reduces the agreed-on criteria for boundary-defining feedback. Here are some examples, just to remind you — the blurriness that goes now with those boundaries that are claimed for political correctness, identity, public versus private, intellectual property, biological ethics questions — all of these are blurred, ambiguous, areas, taken very seriously, that

nevertheless don't allow the kind of linguistically and behaviorally discriminating boundary defining that would be necessary to begin to comprehend the incomprehensibility of the complexity that we humans live in.

The sixth contributor to our inability to know what we are talking about is **the self-amplifying, unpredictable acting out of the shadow residing in each human**; our mostly unconscious instincts motives, and conflicts, our extra-rational responses. This situation could be considered a consequence of the other contributors to our ignorance — though each of *them* is also a consequence of all the others. (Or so I think) To be sure, this acting out allows for more creativity than when we are bound by the exclusively rational, but often in this complex world the shadow is also in the service of violence, oppression, selfishness, extreme positions of all stripes — that whole up-welling of the non-rational, the non-reasonable that is so increasingly characteristic of all the world, not just the United States.

There was a time — a long time — when this sort of shadow-driven acting out did not well up to the current degree. The elephant depends on constraints, on boundaries, in order to be an elephant. In the past laws, rituals, repression, and suppression served to constrain such acting out or to quash it entirely; one's social and economic survival depended on playing by many explicit and implicit rules (boundaries). (Think of the upwelling of violence *after* the collapse of the Soviet Empire.)

These six circumstances make human governance uniquely problematic. By governance, I mean those shared practices by which a society's members act reliably toward each other. *Government* is one such way such practices are established via laws etc. Shared child socialization practices and formal religions are others. For the reasons I am proposing here the processes of governance can only become less and less effective. This in turn increases unreliability and adds its own contributions to the incomprehensibility of our world.

So much for six “ignorance-maintaining” characteristics. Perhaps they are variations on one theme. Surely others could be added. But I hope these are enough to make a case that our daily activities are ineluctably embedded in a larger context of ignorance — that we don't know what we're talking about.

So what to do, how to go on being engaged in a human world we don't understand — and, if I'm on to something, we *won't* understand?

Here are eight ways I find helpful in responding to the fact of our ignorance. Perhaps they may be helpful

for you. I hope so! (In spite of speaking assertively, I hope it's clear that I include myself among those who don't know what they're talking about!)

The first is to **recognize that, given our neurology, our shaping through evolutionary processes, we are, unavoidably, seekers of meaning.** Recognizing that, we also need to recognize that, unavoidably, **we live in illusions — socially and biologically constructed worlds — that are, nevertheless, personally necessary.** I'm not implying that we can live outside of these constraints. But we need to be self-conscious about the fact that we do live in illusions and there is no way for humans to avoid this. So, each of us needs to be self-conscious about our deep need that there *be* an elephant or for someone to tell us there really *is* an elephant. (Lots of authors and publisher thrive on this yearning.)

Second, it seems essential to **acknowledge our vulnerability, our finiteness, both ours and our projects.** We will be unavoidably ignorant, uninformed about the outcomes — the consequences of the consequences — of what we do.

Third, as all the great spiritual traditions emphasize, **seek to live in poverty.** Not material poverty but rather to be poor in pride and arrogance and in the conviction that I/we know what is right and wrong, what must be done, and how to do it. Nevertheless, we must act — not acting is also to act — regardless of our vulnerability and ignorance.

Thus, my fourth suggestion: that we **act in the spirit of hope..** Hope, *not* optimism. Here I draw on the insight of Rollo May. As he put it, optimism and pessimism are conditions of the stomach, of the gut. Their purpose is to help us feel good or bad. Whereas hope has to do with looking directly at the circumstances we're dealing with, at the challenges we must accept as finite and vulnerable beings, recognizing the limits of our very interpretation of what we're committing ourselves to, and *still* go on because one hopes that one can make a difference in the face of all that stands in the way of making a difference.

Fifth, this means **act according to what I call “tentative commitment.”** Tentative commitment means you are willing to look at the situation carefully enough, to risk enough, to contribute enough effort, to hope enough, to undertake your project. *And* recognize, given our vulnerability our finiteness, our ineluctable ignorance, that we may well have it wrong. We may have to back off. We may have to change not only how we're doing it, but doing it at all. And then *do so!* Tentative commitment becomes an essential individual and the group condition for engaging a world where we don't know what we are talking about.

Suggestion six, then, is to **be “context alert”** as a moral, and operational necessity. This carries a very radical implication, given the current hype about the information society that promises to put us in touch with practically infinite amounts of information. If you are context alert, you can only be deeply understanding of very few things. It takes time to and effort to dig and check and to deal with people who have different value priorities. This means there are only a few things you can be up on at any given time. This limitation is a very serious, unsolved, indeed unformulated, challenge for effective participation in the democratic process — whatever that might mean.

Number seven: One must **be a learner/teacher**, a guide in the wilderness. Be question-askers, not answer givers.

Number eight again echoes the great spiritual traditions (all of which recognize our essential ignorance): **practice compassion**. Given the circumstances I have described, facing life requires all the compassion we can bring to others *and* to ourselves. Be as self conscious as possible, as much of the time as possible, and thereby recognize that we all live in illusion, we all live in ignorance, we all search for and need meaning. We all need help facing this reality, help that goes by the name of compassion.

The blind must care for the blind.

The Collapse of Two Fisheries

Book Reviews of *Song for the Blue Ocean* by Carl Safina and *Lament for an Ocean* by Michael Harris

Reviewed by Dana Meadows

Who knows what admirable virtue of fishes may be below low-water-mark, bearing up against a hard destiny, not admired by that fellow creature who alone can appreciate it! Who hears the fishes when they cry? It will not be forgotten by some memory that we were contemporaries.

— Henry David Thoreau

Song for the Blue Ocean by Carl Safina, New York, Henry Hold and Company, 1997.

Carl Safina is a fanatic fisherman. He's especially fanatic about ocean fish, which got him interested in seabirds, which got him into serious biology, which got him infuriated about what he was seeing in the fisheries, which got him to found the Audubon Society's Living Oceans Program.

All of which prompted him to write *Song for the Blue Ocean*, a gripping book, believe it or not, about fish. Safina takes you out in the boats with commercial fleets. He takes you to Tokyo's Tsukiji fish market, where a large fraction of the world's catch ends up. He takes you to national and international meetings, where your jaw drops at the utter ineptness of fishing regulatory bodies. Best of all, Safina takes you into the astounding life of the fish, especially his favorite, the giant bluefin tuna.

The bluefin is a muscular torpedo of a fish. It can sprint at 50 miles an hour and migrate thousands of miles. Full-grown bluefins reach 1200 pounds, though there are probably none left that big. They don't begin to breed until they get to 300 pounds. Most are caught before they reach breeding size, a practice which, everyone knows, dooms a fishery.

But the fishery is doomed, because even a 200-pound juvenile, even a 60-pound baby bluefin, is a big, valuable fish. Safina says a bluefin can sell at the dock for more than \$50 a pound. In Tokyo "one bluefin tuna recently sold for \$83,500. The 715-pound giant was to be reduced to 2,400 servings of sushi, for \$75 per serving, bringing in an estimated \$180,000. One fish."

A few quotes from Safina's book pretty much sum up the problem of the bluefin fishery.

Charlie Horton, professional fish spotter (from a small plane) for commercial boats: "The truth is, the fish guys have done a lousy job. I mean, a really *lousy* job. So I'll support anybody that'll save these resources. It's possible we could wipe the fish out, just like it's possible to wipe out any species."

Roger Hillhouse, another fish spotter: "We're not seeing any big, major year classes. We are not seeing the babies — we are not seeing the spawning."

Ed Miller, Montauk marina owner: "What's surprising about the bluefin tuna fishing is how fast the big fish have declined around here.... I don't know if it's overfishing or natural, or some combination, but it sure has gone downhill fast."

Steve Weiner, East Coast Tuna Association: "If other people cared as much about their fisheries as we do about ours, we'd have very healthy fisheries worldwide. The bluefin regulations are working and the fish are coming back."

Gerry Abrams, fish dealer, founder of the East Coast Tuna Association: "I don't buy the argument that man is the thing that is expendable in the quest to correct whatever is wrong. If we're going to err, we ought to err on the side of employment.... The bluefin is not a legitimate conservation issue, because the resource is not threatened. Abundance is tremendous."

In 1981 scientists advising ICCAT (International Commission for the Conservation of Atlantic Tuna — Safina calls it the International Conspiracy to Catch All the Tuna) warned that the bluefin population was depleted and the catch should be reduced to zero, which it wasn't. In 1990 the scientists estimated that the breeding stock had declined 90 percent and that the ICCAT quota (2660 metric tons per year) would continue the decline. ICCAT has not cut the quota, nor even enforced it strictly.

Alex Adler, Cape Cod fisherman: "Where we now see five to twelve fish in pods, in the past the schools were frequently sixty to eighty fish, and I'd often see schools of two hundred to four hundred fish. It's great to have a shot at catching a fish worth ten grand, but they're worth so much money now, these guys will take the last buffalo. It's a sad deal. Deep down, I know the bluefin is in danger."

Frank Mather, tuna researcher: "When the seiners started, they were catching young fish. They'd get a hundred tons of ten-pound fish, about twenty thousand young bluefins.... they were catching almost everything they saw.... A lot of fish were wasted because if a boat netted a hundred-ton school and only had room left on board for ten tons they would just drop the rest, which were already dead.... Now they say the breeders are down ninety percent ..., but the young fish were already creamed in 1970."

Japanese ICCAT delegate: "This year we are pleased to see the stock has been showing a stable trend." (The scientific report actually showed a 20 percent drop.) "Current catch limits should result in increases in the population within five years." (The report said the population will decline further unless the catch is halved.) "We see no reason for further catch reductions."

U.S. ICCAT delegate: "I've been coming here since 1983, and nothing — *ever* — happens. Nothing. Nothing. Nothing!"

Crashed populations of bluefin, cod, haddock, swordfish, are now costing New England fisheries \$350 million in potential revenue annually and more than fourteen thousand jobs. Former fishing towns in New England and eastern Canada are experiencing 60 percent unemployment and a welfare burden of \$2 billion. The U.S. as a whole is losing three hundred thousand jobs and \$8 billion a year from depleted fisheries.

Ron Bulmer, Fisheries Council of Canada: "The cod crisis has taught us a valuable lesson that others are going to have to learn, that we must err on the side of conservation."

These quotes are just from the first third of Safina's book, on the bluefin tuna. The second third is about Pacific salmon, the third third about coral reefs in the South Pacific.

Lament for an Ocean: The Collapse of the Atlantic Cod Fishery: a True Crime Story, by Michael Harris, McClelland & Stewart, Inc., Toronto, 1998.

You would think the Canadians could do better. They couldn't. But the Norwegians could. This book is primarily a detailed, blow-by-blow description of how the Canadians mismanaged and lost one of the world's greatest fisheries. By contrast it also contains a chapter on how the Norwegians saved theirs.

The Grand Banks off the coast of Newfoundland was fished for over 400 years, since the French, English, Portuguese and Spanish began working its waters. Codfish, split and salted, were shipped back to Europe, where they fed the masses and made fortunes for shipowners and merchants. The cod were so thick off Newfoundland that an early observer wrote: "we heardlie have been able to row a boate through them."

England claimed Newfoundland, but the Grand Banks were international waters, fished through several centuries not only by Newfoundland, but by the French, the Norwegians, and then by the new nation of Canada. (Newfoundland did not join Canada until 1949.)

The first factory trawler, a \$3 million British ship that could process and freeze fish on board at the rate of 600 tons per day, appeared in 1954. That was the beginning of the end of the cod. A single haul of the net can pull up 50-60 tons of fish at a time. The smaller fish — up to half the catch — are thrown overboard dead, so the freezers fill up with the largest, most valuable fillets.

Soviet and French factory trawlers appeared on the Grand Banks too, but the big investors in the huge ships were the Spanish. From 1961 to 1972 Spanish boats alone brought in over 200,000 metric tonnes of fish a year from the Grand Banks. The highest catch in history occurred in 1968: a total, by all nations, of 810,000 tonnes.

Meanwhile Newfoundland's economy was based on many smaller boats, an inshore fishery, and processing plants on land. As the Grand Banks catch in deep water soared, the inshore catch, unsurprisingly, plummeted. The inshore fish migrated in from the Banks; but now there were hardly any left to migrate.

Canada thought its fishery was saved when the 200-mile limit came into being in 1977. Now all but the eastern edge of the Grand Banks was under firm national control. Anticipating the resurgence of the overfished stocks, Canadians invested in deepwater boats and onshore fish-processing plants. The capacity of processing plants more than doubled. The onshore plants accounted for 62,000 jobs in 1,339 small communities. About 30 percent of all jobs in Newfoundland were directly based on the fishery. Eighty percent of the processed fish were exported, mainly to the United States.

As the inshore catch dropped from 160,000 tonnes per year to 35,000 tonnes, the Canadian government, in support of its suffering fishing communities subsidized

the construction of fishing boats by 35 percent, subsidized 30 percent of the cost of fishing gear, and exempted all taxes on fuel and equipment used at sea. The number of registered fishermen tripled. Offshore or inshore, there was hardly any place where a cod could escape a net.

It took 20 more painful years before the complete collapse of the fishery. The politics and denials of those 20 years are described in detail in Harris's book. It is striking to see how many people, including political leaders, knew exactly what was happening, but buckled under the pressure to throw out a few more subsidies to keep the fishing communities alive for just one more year.

“Hooked on the myth of the ocean's inexhaustible bounty, bureaucrats devised a federal fisheries policy that was skewed by incompatible visions of what the industry should be: a social fishery that employed and subsidized thousands of Canadians, or a big business that ran on the principles of economic viability and the demands of the market. Under successive federal governments, the economics of the fishing industry were balanced against the reality that most inshore fishermen can't make enough money to survive. With few or no local employment alternatives, politicians tended to let a bad situation get even worse. In the 1980s, without anyone noticing, the Department of Fisheries and Oceans became a specialized social welfare department in which the biology of fish and the conservation of stocks were often afterthoughts.”

In 1989 Norwegian scientists issued an alarm call about the state of the Barents Sea cod population, quite similar to the alarms that were being sounded in Canada. In a fishery that expected quotas of 800,000 tonnes per year, the Norwegian scientists recommended a drastic cut to only 90,000 tonnes. Here's what Norway did that differed from Canada — it followed the scientists' advice right away. Almost, anyway. For 1990 it slashed the cod quota to 113,000 tonnes. Three years before it had already closed the fishery for caplin, the main food of the cod. In 1990 it also banned fishing in the cod spawning ground, something Canada had never done, because there had never been direct proof that fishing interfered with spawning. Said a Norwegian biologist, “Although it's difficult to find the relation between recruitment and spawning stock, we are convinced that there is such a relation.” When in doubt, Canada's government acted in favor of the fishing fleet, Norway's government acted in favor of the fish.

The outrage in the Norwegian fishing communities was every bit as loud as that in the Canadian ones. There were demonstrations and threats and two thousand bank-

ruptcies, though the government set up an emergency fund to help fishermen with loan repayments. “But from the very beginning of the crisis, Norwegian politicians knew that there could be no giving in to the protests for short-term political gain. A Norwegian fisheries official said, “The main qualification to survive one week as minister of fisheries is that you have to be tough, because it's the most unpopular occupation you could have in Norway.”

The hardships were severe, but they didn't last long. “In 1991 the fishermen began to see large populations of cod along the coast, and the quota for that year was increased to 128,500 tonnes. Even though the reports on fish populations were encouraging, the government proceeded with caution. By 1992 the spawning biomass of Barents Sea cod stock was bigger than it had been in 25 years. Norwegian fishermen immediately pressured the government to return to the old quotas. Firmly committed to building stable quotas for the future, Oslo resisted a dramatic increase. By 1993 the quota was raised to 248,000 tonnes, double the 1990 quota, but nowhere near historic levels.”

Norway's fisheries minister, Oddrunn Pettersen, said, “It is irresponsible of politicians if they don't managed the resource in such a way that it should last not only for our generation, but for generations to come. One has to do what is right and try to convince people that what you do is done for the best.”

In 1995 Canada announced that the spawning biomass of northern cod on the Grand Banks was just one percent of what it had been in 1990. The fishery stayed closed.

By 1997 Norway thought it was safe to lift its cod quota to 850,000 tonnes. A good fraction of the enormous catch from the restored Norwegian cod population was shipped to Newfoundland to be processed in the idled Canadian fish plants. That same year Canada's Fisheries Resource Conservation Council issued a report that recommended cutting fishing capacity by a factor of two or three, protecting nursery and juvenile fish, and banning technologies like bottom-trawling that upset the whole marine ecosystem. The report said: “We must address the failures and abuses that led to this path of destruction: overestimation of the biomass; overestimation of recruitment; failure to recognize environmental changes and their impact on the ground-fish fishery; failure of the management system to recognize the impact of technological change; underestimation of foreign overfishing; pressures of our own Canadian industry, which led to misreporting, dumping, discarding, and high-grading; and failure of the political system to make the necessary conservation decisions when the red flags did go up.”

The Opening and Blessing of Kotare Research & Education Centre

by John Peet

It was a dull Saturday afternoon (6 March 1999) at Kingfisher Farm, Hoteo North near Wellsford, just over an hour's drive north of Auckland. There were around 200 of us there, from as far north as Whangarei and as far south as Christchurch. We stood in the road, where we could see and hear the distant figure of the woman whose call/karanga began the welcome for us, the visitors/manuhiri. We had come to meet those who had planned for, built and prepared the Centre, and to share in its opening and blessing. Katherine was there as a Trustee; I came because I wanted to, and also to represent ESR (and the Balaton Group).

We slowly walked down the dirt road towards the Centre. Women have the right of first voice in Maori custom/tikanga. The visitors are reminded what and who they are approaching, and the response pays respect to the place, its history and the ancestors of those present.

Down, past the marquee put up for the day, to the meeting place where hosts/tangata whenua stood on one side and we manuhiri on the other. We would then sit and participate in the formalities that enable visitors to become tangata whenua themselves.

Three speeches, predominantly in Maori, from elders/kaumatua of the local marae and the Kotare Trust (all male, as is again the custom) were responded to by three from the visitors. After that we filed past the line of host people, greeting each other with the traditional touching of noses/hongi, in which we share the life force/mauri. Formalities over, the Centre was blessed jointly by the senior kaumatua and a Kotare trustee, a Catholic sister.

Kotare is a charitable trust established in 1996 by a wide range of people involved in community, church, youth, union, local economic development and adult education networks. They were aware that unless people from all sectors, and from both rural and urban districts, could be inspired and resourced to develop and sustain their own organisations, much of the potential of so-called ordinary people and their communities would never be realised.

Kotare is the Maori name of the Kingfisher. It has an additional membrane over its eyes, which enables it to see clearly when underwater. That characteristic is intended to be broadly symbolic of the Centre's aims!

The Kotare Trust believes that for real change to be effective, solutions must come from the people who are most directly affected. From their many years of working in the field, Kotare's educators understand that de-

veloping and enhancing leadership skills is one of the fundamental requirements for successful community development in all its forms. Kotare's educators and researchers are formally trained and accredited by the Trust.

The residential Centre is situated on a hectare (2.5 acres) of farmland, part of Kingfisher Farm, which in turn is steadily transforming itself into a unit where permaculture and sustainable horticulture are the basis for self-reliance. The Genesis organic farm in New Jersey, USA, was one of the farm's inspirations.

The Centre itself took physical shape with the relocation of three buildings purchased from Manukau Polytechnic onto the site in early 1998. With further covered-in walkways and courtyards, some already completed, these buildings form the core of a well-designed Centre that in the long run will be the base for Kotare's activities, on site and elsewhere. Various working bees and the steady labour and project management of the home people at Kingfisher Farm have kept developments going. There is still plenty of work to do, but with piles secured, sewage, electricity, water, showers in place, and interior partitioning and renovating begun, the place is now very much a functioning unit.

Kotare people have only been on the farm for four years, and most of the effort to date has gone into ensuring that the farm feeds the occupants, with some to spare for neighbours and/or workshop groups. They also breed racehorses (in a small way) which provides useful extra income!

A library and resource base are being developed at the Centre, and a computer is beginning to enable them to catalogue and administer this valuable material. The goal of incorporating participatory research into the range of activities has been assisted by a trustee's experience with similar organisations overseas. The Highlander Centre, (New Market, Tennessee, USA) and the Danish and Swedish folk high school systems have been inspirational in this respect.

The occasion of our visit marked, in a sense, a baptism of fire for the Centre, in that it meant 200 people were warmly welcomed and then fed a superb meal of traditional food/kai cooked in an earth oven/hangi and complemented by "modern traditional" salads, pavlova cake and fruit salad.

As dusk approached, a light drizzle set in and people moved under the sheltering awning or inside the Centre, to finish their meals and the conversations that are al-

ways part of the process of networking. Most then departed into the night, leaving a core of about 15 of us who stayed on to clean up and stay the night. Katherine (who is a Trustee) and I had brought our sleeping bags in anticipation, so we spent a comfortable if noisy night (thunder, lightning and heavy rain on the roof). Morning brought lots more cleanup jobs, followed by a somewhat muddy but enjoyable tour of other parts of the farm.

While it is early days yet, we are confident that Kotare Research and Education for Social Change is

set on a path that will ensure it enables people to learn from each other. It also provides a living example of how to farm and garden more sustainably. As one speaker put it (with tongue firmly in cheek), it shows what can happen when Christians, Marxists, Greens get together! Well, maybe there's a grain of truth in that comment, but in reality the range of people represented there came from such a wide base that one couldn't really generalise. It was and is for everyone who is serious about the challenges which face this and future generations. It's also a fun place!

Announcements

Betty's Email Address and *Bulletin* Subscriptions

The enclosures to the Winter 1999 issue of the *Balaton Bulletin* contained an incorrect email address for Betty Miller. The correct address is Betty_Miller@windsor.k12.vt.us.

If that incorrect address prevented you from submitting a contribution toward your *Balaton Bulletin* subscription, please let us remind you again. So far 40

individuals (or their organizations) have contributed \$2,695 in support of the *Balaton Bulletin*. Last year, 58 people contributed \$3,334.

Betty's mailing address is
P.O. Box 572,
Windsor VT 05089, USA.

Books by Balaton Members

We have received an impressive collection of important new books by Balaton members!

Indicators for Sustainable Development: Theory, Method, Applications: A Report to the Balaton Group by **Hartmut Bossel**, published by the International Institute for Sustainable Development (IISD), 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada, 1999.

Many of us saw and commented upon drafts of this work; now in its final form it is printed by IISD, with the help of **Laszlo Pinter**. This is Hartmut's explication of how to use orientor theory to guide the selection of sustainability indicators, and especially to be sure that one's indicator set omits no dimension of system viability.

The book contains very clear explanations of sustainable development, indicators, and orientors. It discusses indicators in the context of the dynamics of sys-

tems — the necessity of choosing indicators that give information *in time* to react to changing system states. In that context, the book contains what must be the first reference in print to “Biesiot indicators” — defined by our late Balaton member **Wouter Biesiot** as those that capture the ratio between respite time and response time of systems.

The final chapter lists sample indicators for systems at four widening geographic scales: the city of Seattle, the state of Upper Austria, the country of New Zealand, and a generic global region.

Global Change Scenarios of the 21st Century: Results from the IMAGE 2.1 Model, edited by **Joe Alcamo**, Rik Leemans, and Eric Kreileman, Pergamon, Oxford U.K., 1998.

This volume is a selection of papers on results spun out by the IMAGE global model, assembled at RIVM by a team of modelers that included both **Joe Alcamo** and **Bert de Vries**. IMAGE represents 13 world regions and connects three primary model systems: Industry/Energy, Terrestrial Environment, and Atmosphere/Ocean. It has been used for — among other purposes:

- helping with UNEP's Global Environmental Outlook,
- estimating regional and global trends in greenhouse gas emissions,
- assessing the effects of climate change on agriculture,
- forecasting long-term trends in forests,
- analyzing questions leading to the negotiations at the Kyoto Climate Summit.

The papers in this book concentrate primarily on causes and consequences of acidification and climate change and possible policies regarding them. For example, there is an extended analysis of possible trajectories for switching to biomass as an energy source

(combined with greater end-use efficiencies) and what that would mean both to greenhouse gas emissions and to land-use patterns. IMAGE cranks out not only aggregated planetary results (steadily falling carbon dioxide emissions, atmospheric concentration leveling off at about 400 ppm, temperature rise leveling off at 1.2 degrees C. by the year 2100), but also detailed maps of the consequent land use changes (Latin America and Africa become the biomass exporters of the world, converting almost 600 million hectares to biomass production, primarily at the expense of forests — the authors point out that there are severe biodiversity consequences to this scenario.)

Another valuable part of this book is several chapters devoted to the lessons learned from interaction between modelers and their policy audience, especially in global climate discussions leading up to Kyoto. The “Delft process” is described, in which the modelers and policymakers came up with a “safe landing” concept — the policymakers stipulate a target range of acceptable consequences, then the modelers find trajectories that keep the system within that range. (It was found that keeping each region on a “safe” trajectory was more difficult than keeping the aggregated world system on a “safe trajectory. Another finding was that immediate actions are far more effective than delayed ones.)

State of the Environment Report 1997-98 by **Anupam Saraph** and his organization Change Reengineering, for the Pune Municipal Corporation.

This report was produced through a massive process that involved more than 500 officials from government at many levels, plus industry bodies, plus area NGOs. It contains an enormous amount of useful data (in time graphs, stock-flow diagrams, pie charts, tables, bar charts — you name it). This metropolitan area is growing exponentially at 3% per year (and has just exceeded a population of 4 million) and is exhibiting all sorts of environmental and economic problems.

The report is unabashedly straightforward in its findings. Here are just a few sentences from the introductory overview (*italics* as in the original):

Pune's environmental deterioration is accelerating.

Pune's town plan has fuelled environmental deterioration through sweeping changes altering almost 50% of Pune's land use.

Pune remains in the demographic trap with its crude birth rate having increased to 26 per 1000 from about 20 per 1000 in 1994.

A young city, Pune lacks playgrounds, parks and open spaces for its youth. Less than 0.001% of Pune's land is used for parks.

Pune's forests remain unprotected in the confusion between jurisdictions of different authorities.

Adding 168 vehicles per day, Pune has failed to evolve a local transportation strategy.

Pune's daily combustion of fuel violates the air quality norm, exposing every citizen to air quality unacceptable as per WHO standards.

None of Pune's water sources are protected. All are deteriorating through encroachment, eutrophication or release of effluent and sewage.

Pune's growth is out of the control of Pune's environmental managers. *The consequent acceleration of our natural capital deterioration, our resource imports and our waste generation is growing to rates we are unlikely to be able to cope with.*

There is no mechanism to allow the authorities to inform each other about changes taking place in the same unit of land.

A number of concepts dear to the hearts of Balaton members are explained throughout the report — the difference between growth and development, the proper relationship between a system and its subsystems, a focus on demand management and least-cost-end-use planning. Here, for example, are two quotes that appear in boxes:

Since the economy is a subsystem of a finite and non-growing ecosystem, then as its growth leads it to incorporate an ever-larger fraction of the total system into itself, then its behavior must more and more approximate the behavior of the total system, which is development without growth.

— **Herman Daly**

Growth modes are not forever sustainable, so we must always look toward the choice of some equilibrium mode.... In choosing a mode, we are choosing the ensemble of pressures under which we want to live. To sustain that mode, we must be willing to accept and in fact maintain the corresponding pressures.

— **Jay Forrester**

There are probably few cities in any part of the world, including the so-called "developed" parts of the world, that have such a comprehensive and wise report on the state of their environments.

News from the Members

From **Joe Alcamo**:

I am sorry that I have lost touch with Balatoners over the past year, but I had to lay low with some networks in order to keep my head above water in other ways.

A lot has been going on:

First and foremost, my wife Barbara had a baby girl called Loretta. She's got big brown eyes, and insists on doing everything her own way. That seems to be only type of person I know.

Second, I published a new book called "Global Change Scenarios of the 21st Century" based on global modeling studies that I carried out with many colleagues at RIVM and at the University of Kassel (including Balaton's very own **Bert de Vries**).

Third, I had the honor of being a co-winner of the 1998 Max Planck Research Prize, an international award given out by the Max Planck Society and Humboldt Foundation. I was happy to be the first environmental scientist to receive the award, and to be invited to give the oration at the awards ceremony on behalf of the other prize-winners. I think the award is also a recognition of the kind of systems thinking that the Balaton group has inspired and pioneered over the years.

I intend to use the prize money (250,000 DM) for financing visiting researchers in connection with a study of Food and Water Security in Russia. I would be very happy if members of the Balaton group would like to get involved in this. And if by chance the Balaton group is interested in devoting one of its annual meetings in the next three years to this or similar topic, then I would be happy to use some of the prize money to help finance that meeting.

By the way, I think the idea of green scenarios as a topic at the next meeting is great, and that we should go ahead with the theme and location of the meeting despite its proximity to Kosovo. At times like this we have to insist on the future in order to get through the present.

* * *

Dennis Meadows forwards this email from the son of **Enrique Campos Lopez**:

Some news about my father: he is working a lot on team and collaboration workshops, and a little on systems thinking. I think he has had a lot of impact in

Saltillo. It is very common to hear from him there. Some of the most important industries in Saltillo are now clients of Aprendizaje Sistemico (Chrysler, Ericsson, CIFUNSA, and TEC-LAC, of course). He is also working with the Mayor of Saltillo, the Regional University (UAQ) and got involved in a range of community problems, including his activism to stop a project to establish a toxic waste disposal in General Cepeda (a small town in Coahuila).

Besides his work with AS, he is now writing for the biggest newspaper in Saltillo, called *Vanguardia*. In his weekly column, he is applying systems principles to analyze regional politics. I've read the first two columns and found them very good: he used systems archetypes success-for-the-successful and the metanoia concept to characterize second-generation PRI politicians and their inability to adapt.

* * *

Herbie Girardet sends news and an invitation for Balatonians:

I am firing on all cylinders at the moment. I have just written and published 'Creating Sustainable Cities', an 80 page book in the series of 'Schumacher Briefings' of which the Schumacher Society will publish three to four a year. These will be quite similar to the Worldwatch Papers though more concerned with first principles. The next two will be on 'Health and Ecology' and 'The Ecology of Money' - the latter based on last autumn's Bristol Schumacher Lectures and written by Richard Douthwaite.

I am working on a new website on sustainable development, Vision (www.visionmag.com). We have just put up the announcement site. You will find **Ashok Gadgil's** UV water works story there.

We are looking for more material and I would love to tap into the knowledge of the Balaton group. My Vision colleagues and I are looking for stories that indicate that significant moves towards sustainable development by companies and cities are possible. Would you be prepared to give us some new material?

Meanwhile my son Alexis and I are completing four more of the three-minute Deadline 2000 films, for Channel 4 TV, on ecology and design, as shown at last year's Balaton meetings. We have done 28 in all.

I am currently writing a chapter on ecological design for the UK government's 'Urban Task Force' report on sustainable settlements.

Otherwise happy to dig my vegetable garden in beautiful spring weather today and celebrating the first birthday of our second granddaughter.

* * *

Masayo Hasegawa has moved from the world of foundations to the world of transportation. Her new address is:

Masayo Hasegawa
Project Manager
Environmental Affairs Division
Toyota Motor Corporation
4-18, Koraku 1-chome, Bunkyo-ku, Tokyo
112-8701Japan
Phone: 81-3-5800-7277 Fax: 81-3-3817-9035
E-mail: hasegawa-ax@mta.ax.toyota.co.jp

Masayo says: "I am still in the chaos of my transition from the Sasakawa Peace Foundation to the Toyota Motor Corporation. However, I am enjoying my life. The Toyota Motor Corporation is generous enough to authorize my work for the LEAD Japan Program as a part of my job at the company.

I will report back to you after I learn what the automobile industry will be able to contribute to sustainable development."

* * *

From **Drew Jones**:

I'm enjoying digging in a level deeper into two system dynamics modeling projects with Sustainability Institute. In New England forest systems, working with **Dana Meadows**, we've been exploring how reduced calcium levels may affect forest growth and the forest-based economy and lately have been thinking about how sawmills and pulp/paper mills may react to resource scarcity. In urban systems, working with **Bob Wilkinson**, we've begun modeling the growth of Santa Barbara, California and its effect on quality-of-life and environmental indicators.

Annabelle (7 months) and my wife Anne Fitten make me want to do as much of this research as possible over the Internet and telephone.

* * *

A piece of good news from **John Peet**:

My city, Christchurch, has just introduced 3 hybrid electric shuttle buses running (free-of-charge) in the city center.

It is described in the latest copy of the Energy-Wise News, published by our Energy Efficiency & Conservation Authority (<http://www.eeca.govt.nz>) - electronic copy at <http://www.energywise.co.nz/61mar99/conten.htm>

A short article summarising the shuttle is linked on that page, or directly addressable at <http://www.energywise.co.nz/61mar99/61bus.htm>

The same issue of the newsletter gives information on a (nearing-completion) wind farm and other worthwhile events. It's published quarterly, and (I think) anyone can get on the email list.

NZ is slowly catching up with NW Europe and parts of the USA!

* * *

From **Garry Peterson**:

I was planning to come to the meeting last year, but work and life intervened. However, I am looking forward to the meeting this year. In the interim, I have accumulated a bit of news.

I defended my PhD dissertation, 'Contagious Disturbance and Ecological Resilience' at the end of last year, and in a few weeks I should have a doctorate. Following the completion of my studies at the University of Florida, I have moved to the National Center of Ecological Analysis and Synthesis, in Santa Barbara California, where I am post-doctoral researcher. I am working on a project that I am very excited about called "Theories for Sustainable Futures: Understanding and Managing for Resilience in Human-Ecological Systems."

This project aims to synthesize and extend existing theory of ecological management (broadly defined as people's attempts to manipulate and use natural systems). This involves organizing an international, interdisciplinary group of natural and social scientists to develop a set of case studies, simulation models, and papers. While this project includes a strong ecological-economic component, we are trying to move beyond only the economic into the political. However, the problem seems to be that economists have quantitative models, while political scientists and anthropologists have too many qualitative models. However, I hope that this project will produce some simple, alternate political ecological models.

This project has three main products: a publicly available internet based ecological management resource center (consisting of papers, tutorials, models, and case studies), an edited volume (combining authors

from the biological and social sciences), and a short course for graduate students and ecological managers (to be held at NCEAS in the spring of 2000). I hope that this short course at NCEAS will be successful, and then replicated at several locations internationally.

In May, I will be one of several ecologists participating in a workshop on 'Construction Ecology and Metabolism,' in Gainesville, Florida that will discuss the theory and practice of building construction. This workshop also aims to produce an edited book.

Furthermore, I recently was co-editor of a special issue of the journal 'Ecosystems on the role of Complex Adaptive Systems theory in ecology. Some of the articles may be of interest to some Balatoners. Currently, Springer-Verlag has 'Ecosystems' freely available on the internet, and my special issue is at: <http://link.springer.de/link/service/journals/10021/bibs/1n5p427.html>.

I look forward to seeing you all again at Lake Balaton.

* * *

Carlos Quesada is as busy as ever, if not more so:

In our new location, I got \$10,000 grant to remodel a very spacious garage, in order to have a classroom where we can have short courses. It is next to a middle-size yard where we could built some low elements.

The family is fine, Alicia is trying to finish her dissertation, the girls are doing great. Tania is working in her M.Sc. program on biotechnology, and Ixel is working in an international receptive tourism agency and planning to go to Norway for her graduate work on communication.

Last year was probably one of the most successful ones professionally, since our Center is quite consolidated, and our work has increased both in quality and quantity.

Most of the work has been done with students. I just hired two full time young professionals who just finished their theses under my direction, to expand their work on GIS as part of an environmental project.

More important is that we are doing very interesting applied, but innovative, research. Through it, the Center now has gained full recognition by university authorities and has an interdisciplinary Scientific Council (sort of a governing board). I was recently elected for another four year period. For the first time, I have the main projects and basic operations financed till September of next year. That has been like a "second wind" and I am most grateful for it. A very important aspect

was concentration in the type of work we were doing and allocating time to lobby in order to convince the University bureaucracy that what we are doing is of significant value, and that no one else is doing it in the country or the region.

* * *

Anupam Saraph writes:

On 1/1/1999 Parivartan (Sanskrit word for Change) was born. A not-for-profit society focusing on research and decision support directed at improving the community's potential for managing its own change. I have been appointed its first Executive Director and with the support of our Board of Governors hope to lead the society to focus on working to realise its vision.

We have just finished a State of the Environment Report we did for the Pune Municipal Association.

Despite the pressures on time I am continuing to teach; I realise I enjoy it immensely. I also got voted the best teacher last semester, causing my work load to go up rather than down.

Sometimes I wish I could pack more hours into a day. Or simply slow down. But I am increasingly realising how some things just seem to go faster and faster.

I loved some of the scenarios **Bert** sent about a Balaton Place in France. I have been trying hard for four years to launch something on similar visions. But now it looks like it will eventually happen.

* * *

Lucia Liu Severinghaus is starting a big project and could use some help:

Dear Balaton friends,

I am seeking advice from you regarding a 3-year study called TAIWAN 2011. This is a follow up study of Taiwan 2000 that I reported in the 1989 Balaton meeting. We did an update study 5 years ago. This is the third stage. Again, I am responsible for the natural resources sector of the project. By the way, year 2011 is the one hundredth year of the Republic of China.

I am spending the first of the three years (August 1997-July 1999) to update what happened to Taiwan's environment in the last 5 years. I plan to spend the second and third year focusing on studying two watersheds. These two watersheds differ in the time, scale and mode of development, population and environmental pressure, etc. In many ways they are at the two ends

of a continuum. The goals for the watershed study are as follows:

1) Gather as much data as possible on the natural and human components that contribute to the current status of environmental and human conditions in these two watersheds.

2) Evaluate the environmental conditions and development paths of these two watersheds in terms of sustainability.

3) Quantify the interconnections between these components, and identify key factors and key links in each of the two social-ecological systems. The numbers or values obtained can then be used to construct a model, for use in (a) demonstrating to policy makers and the general public the relatedness and trade-offs between or among what might be considered distant variables. (b) projecting the human and environmental conditions at year 2011, under different policy options.

In addition to pooling together existing data, I plan to do a small-scale opinion survey of people on their sense of well being, and a quick biodiversity survey. The model construction should be from the natural resources angle, and this is where I particularly need your advice, since I am not a modeler. Most of the people I know who use models here either have very little concern for natural resources, or do not know how to build such models.

Given the huge number of items one can collect data on, and given the likelihood I might collect data not useful for the model while missing out on data needed for the model, it would be nice to have the modeler's input from the start. Would you please suggest some names who are good at this type of models and who might be interested in working with me on this? In my mind, what I need from this person this coming year (summer-summer) is mostly advice over e-mail, while the next year I hope he/she can come to Taiwan and work with me and others in model building. Of course I will raise the money to pay for the advice and the work.

Perhaps I am too idealistic in what can be accomplished in such a project, especially given the tight personnel support. Or perhaps I am too ambitious in thinking this is a feasible study. Does anyone have any experience with this type of work? Am I too naive in thinking the key interconnections in these hugely complex systems with many trade-offs can be identified and the values worked out? Please let me have your reactions. If there are ways to accomplish my goal of influencing policies without using a model, please let me know too.

Thanks a lot for whatever comments you are will-

ing to make. Looking forward to hearing from any one of you. Best wishes.

—Lucia Liu Severinghaus

Research Fellow
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zolls@GATE.SINICA.EDU.TW

* * *

A mid-March email from **Chirapol Sintunawa**:

I have just come back from Japan from the first meeting of a core group of founding members for a Sustainable and Peaceful Energy Network in Asia. It is a small and newly formed network of researchers, scientists, NGO and GO representatives. The words "Sustainable and Peaceful" are included to signify a non-nuclear option for energy in this region, since government movements to promote the use of nuclear energy are going stronger and a lot more money has been made available to provide one-sided information on nuclear energy. Scientists from nine countries — China, Japan, South Korea, Indonesia, Malaysia, The Philippines, Taiwan, India and Thailand — were present at this meeting to discuss common goals and strategies to achieve those goals. **Jørgen Nørgard** has been Sahabat (means good friend) to this network since October last year. The term Sahabat is introduced because members of this network like the name of "good friend" more than adviser.

This network will have its first regional meeting in Thailand in November 1999. expecting 40-45 participants. At this stage information exchange and getting to know each other better will be the immediate focus of this group. Members will learn from each other on energy strategies and will try to apply whatever they learned to their situations. I hope this new-born network will support individuals, groups, and organizations in this region to have impacts on changes in energy and environment.

Since I came back from last year's annual meeting in Csopak I helped regional LEAD to organize a workshop at Salaya campus in early December 1998. Once again I worked with **Dennis** and **Gillian** in another workshop held in Phuket at the end of January and the beginning of February this year.

Our organization, ADEQ, has bought a piece of land in Karnchanaburi province (about 150 km to the West of Bangkok), where the bridge over river Kwai was

buillt during the Second World War. This piece of land will be used as our training center on energy and environment, it is only 8 acres and located next to a wildlife sanctuary. We can have access to this sanctuary all year round.

The underground water well is being drilled by a local contractor, the master plan and macro design are being conducted by an architect. Detailed design of buildings will be made as soon as the master plan is settled. Funds are being raised from power companies and also from both local and overseas funding agencies. Local species of trees are being transferred to plant on this piece of land to make a short cut in the greening process. I'm hoping that the construction of the first building will be started in May.

Abandoned and discarded sleeper cars of trains will be renovated and used as accommodations for our visitors, including school kids, teachers, journalists and public educators from both government and non-government sectors. Basic team-building facilities will be built.

Sansanee (Fa) has graduated and come back from Edinburgh to join ADEQ to work on our on-going activities.

* * *

Diana Wright notes:

Our second daughter, Clara, was born at home early in February. We are enjoying watching the two girls become sisters. And we are facing the challenges of raising these kids to live lightly, despite our hyper-materialistic culture.

* * *

Jorje Zalles has been having a hectic time in Ecuador:

I got married in March, amid terrible national turmoil (100% devaluation, followed by a two-week long forced bank holiday, including a week-long transportation strike). Half of my wife's family (on her mother's side) couldn't make it because they were coming by car from southern Colombia. Anyway we caught the tail end of it and managed to pull it off very well. If it had been one week before we would have had to re-schedule since the country was for all practical purposes shut down, no transportation, public or private, no banks, no stores, nothing.

My e-mail was down for two months as a result of the dollar's wild, wild ride (it's back down and stabilized at pre-crisis levels) so I just got a ton of Balaton and other mail. I never got the Winter 1999 *Bulletin* or the invitation to this year's meeting. If it was in the mail system during March there is no telling where it may be, everything went to pot those days. I am still very interested in participating in Balaton.

* * *

Quotes, Jokes, Stories, Poems

The line separating good and evil runs through the heart of every human being, and who is willing to destroy a piece of his own heart?

— Alexander Solzhenitsyn

Sent by **Nanda Gilden**:

A tiny, very tiny bird lived in the rain forest in Brazil. The bird is called a humming bird. You know, the one with the long bill, who gets its food and drink from beautiful colored flowers. Once upon a time it happened that a fire started in a part of the forest. All the animals ran away and birds and insects flew away to bring themselves to a safer area.

The humming bird flew to a lake nearby. He took a drop of water in his bill and flew back to the fire. There he dropped the water and flew back to the lake, straight away, to get another drop of water. Flew back to the burning forest to leak its drop, flew back again to get another one. On and on it went.

In the meanwhile, all the other animals were still running away from the fire. One of them, a bigger bird, was wondering what this humming one was doing. Why didn't he stay in a safe place? Then this big bird saw the humming bird landing on a branch of a big tree, because he was tired of all the flying to and fro. He landed on the branch below the humming bird.

This is my chance, he thought, and asked the humming bird why he brought these drops of water to the burning forest. "Oh, well," said the humming bird, "I'm just doing my share."

*You do not have to be good.
You do not have to walk on your knees
for a hundred miles through the desert, repenting.
You only have to let the soft animal of your body
love what it loves.
Tell me about despair, yours, and I will tell you mine.
Meanwhile the world goes on.
Meanwhile the sun and the clear pebbles of the rain
are moving across the landscapes,
over the prairies and the deep trees,
the mountains and the rivers.
Meanwhile the wild geese, high in the clean blue air,
are heading home again.
Whoever you are, no matter how lonely,
the world offers itself to your imagination,
calls to you like the wild geese, harsh and exciting —
over and over announcing your place
in the family of things.*

— Mary Oliver

A Y2K joke sent by **John Peet**:

There was a lawyer named Young who told his executive assistant that it was essential that the 'Y2K change mission' had to cover all features of his office — particularly word processor communications — and should be carried out as soon as possible. He warned that Y2K changes had to be completed well before the end of the year. Then he went off on a week's holiday for his birthday.

The first indication that all was not well came when he returned to find the nameplate on his door: "J.Koung - Lawker." In the middle of his desk he found a page from his laser printer, which read as follows:

Dear Mr Koung: I went through everk piece of our software to be certain of the "y to k' change. One thing I wanted to be sure of was that our pak daks would not be affected, and was surprised to find just how mank months (Januark, Februark, Mak and Julk), and everk dak of the week (Sundak through Saturdak) had to be fixed! Ankwak, it's all been done now - I hope kou'll be happy with it. To be honest, none of this 'y to k' problem made ank sense to me. But I understand it's a global matter, so I'm pleased to help in everk wak possible. Bk the wak, what does the kear 2000 have to do with it?

Happk Birthdak!

- Pennk

Forwarded by the tireless **Isa Daudpota**. The letters are genuine:

Kids' Letters to God

Dear God,
Did you mean for the giraffe to look like that or was it an accident?
Norma

Dear God,
Instead of letting people die and having to make new ones, why don't you just keep the ones you have now?
Jane

Dear God,
Who draws the lines around the countries?
Nan

Dear God,
I went to this wedding and they kissed right in church. Is that okay?
Neil

Dear God,
Thank you for my baby brother, but what I prayed for was a puppy.
Joyce

Dear God,
It rained for our whole vacation and is my father mad! He said some things about you that people are not supposed to say, but I hope you will not hurt him anyway.
Your friend (but I am not going to tell you who I am.)

Dear God,
Please send me a pony. I never asked for anything before. You can look it up.
Bruce

Dear God,
If we come back as something, please don't let me be Jennifer Horton, because I hate her.
Denise

Dear God,
I bet it is very hard for you to love all the people in the world. There are only four people in our family and I can never do it.
Nan

Dear God,
My brothers told me about being born, but it doesn't sound right. They are just kidding, aren't they?
Marsha

Dear God,
If you watch me in church Sunday, I'll show you my new shoes.
Mickey

Dear God,
We read Thomas Edison made light. But in Sunday school, we learned that you did it. So I bet he stole your idea.
Sincerely, Donna

Dear God,
I do not think anybody could be a better God. Well, I just want you to know that I am not just saying this because you are God already.
Charles

Dear God,
I didn't think orange went with purple until I saw the sunset you made on Tuesday. That was cool!
Eugene

Dear God,
Maybe Cain and Abel would not kill each other so much if they had their own rooms. It works with my brother.
Larry

There is a marvelous story of a man who once stood before God, his heart breaking from the pain and injustice in the world. "Dear God," he cried out. "Look at all the suffering, the anguish and distress in the world. Why don't you send help?"

God responded, "I did send help. I sent you."

— David J. Wolpe

