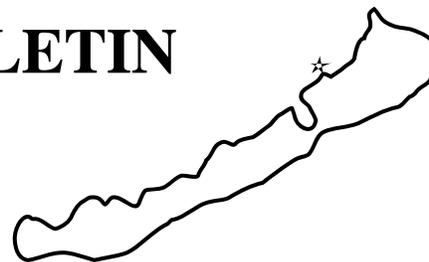


THE BALATON BULLETIN



Newsletter of The Balaton Group

WINTER 1998

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BALATON '98

*September 9-15
Csopak, Hungary*

STEERING COMMITTEE MEETING

The Balaton Group Steering Committee and Friends (**Alan AtKisson, Hartmut Bossel, Joan Davis, Bert de Vries, Joan DuToit, Hermann Knoflacher, Zoltan Lontay, Dana Meadows, Dennis Meadows, Niels Meyer, Aromar Revi, Chirapol Sintunawa**) met December 13-14 at Joan Davis’s lovely Balaton Hotel in Wallisellen, Switzerland, to plan the coming year — and, as it turned out, maybe the coming decade or two — of the Balaton Group.

Next Annual Meeting

As always the first and most difficult order of business was the choice of topic for the next annual meeting. A long list of possibilities was compiled, taken from suggestions made by members at the last Balaton meeting and since.

After much discussion the list was narrowed to six candidates:

- Long-term future scenarios — philosophy, methodology and content, in general and in preparation for the next IPCC climate assessment.
- Employment, livelihood, new paradigms for jobs and work in a sustainable world.
- Experiments in sustainable living (actual living examples at any scale from household to nation).
- Globalization — the driving factor, the tidal wave. Are there alternatives? Should there be? Is the Asian meltdown a small interruption or a portend of things to come?
- Human rights, nature rights, property rights, emission rights, information rights, economic rights (and maybe a few responsibilities too). In honor of the 1998 50th anniversary of the Universal Declaration of Human Rights.
- Infrastructure — interpreted, in Balaton fashion, in its largest possible context, which means not only physical, but social and informational infrastructure.

Excellent topics all. As usual, the decisive factors were timeliness, common interest across disciplines and geography, and above all the willingness of a volunteer to be responsible for organizing the program and the possibility of some supplemental funding to support the meeting.

By those criteria, the decision was
(TA TA!!!)

<p style="text-align: center;">SCENARIOS</p> <p style="text-align: center;">FOR</p> <p style="text-align: center;">SUSTAINABILITY</p>
--

Bert de Vries will be the program organizer. Partial funding will come from RIVM. There is a possibility that outcomes from this meeting can be of direct use to the third-round IPCC assessment of climate change scenarios. A more complete description of this topic and possible speakers and activities follows later in this Bulletin. As always, if you have ideas for speakers or would like yourself to be a speaker on this topic, please communicate with the organizer. We are particularly interested in speakers who are NOT from North America or Europe and who would be good additions to the Balaton meeting, and perhaps to the Balaton Group.

Other topics will, of course, stay on the list for future meetings.

\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$

As usual, the Balaton Group has just about enough money to scrape by for another year, as usual thanks to contributions from its friends. Individual contributors include **Dana Meadows** (from her MacArthur grant — one more year to go on that), Jay Harris, **Elizabeth Krahmer Keating**, Wendy Walsh, and an anonymous donor. **Hermann Knoflacher** contributes the proceeds from a weekly newspaper column he writes for an Aus-

trian publication called *Gaia*. **Alan AtKisson** will contribute part of the returns from the CD of his songs (“Whole Lotta Shoppin Goin On”) he has just finished. **Joan Davis** regularly contributes a major part of the expenses for our Steering Committee Meetings.

So we manage, but we are not exactly a great model of financial sustainability. And if we had more funds,

there is much more we could do, including exchange grants for training and projects (which we once had funded by the Jessie Smith Noyes Foundation), regional meetings, and publications.

So **Alan, Joan, Hermann** and **Aro** have appointed themselves to become a fundraising committee for the Balaton Group. They are developing some wild plans, some of which are outlined below under “Futures for the Balaton Group.”

Balaton Bulletin

About 250 people receive the *Balaton Bulletin*, most of them without charge. We know that many of them treasure the *Bulletin*, read almost all of it (all the cartoons, anyway), pass it on to friends, and even in some cases translate it and distribute it in their home language. It makes us very happy that the *Bulletin* is useful to you, and we are always glad to hear suggestions for ways to make it more so.

It costs us on average \$50 per year to print and mail the four annual issues of the *Bulletin* to a single recipient. It would be a shame to spend that money (and trees and energy) to send it to places where it is not wanted. And so, at the suggestion of the Steering Committee, we are with this issue initiating one of our semi-regular feedback processes to be sure the *Bulletin* is going only where it can be of use. You will find a **check-off list** inserted into this issue. It gives you four options:

- Yes, I want to go on receiving the *Bulletin*, and here's \$50 to pay for this year's cost.
- Yes, I want to go on receiving it, but I can't pay for it.

- Yes, I want to go on receiving it, and here's some extra money to pay for someone else's subscription as well as my own.
- No, please don't spend the money, time, trees, energy, water, and other resources to send to me any longer.

If we don't hear back from you at all before the spring issue comes out, we will assume that you don't read the *Bulletin* and take you off the mailing list. As explained on the card, you can send your reply:

by email to:
 Betty_Miller@Windsor.vegs.together.org
by fax: 1-603-675-5792
or by regular mail:
 Betty Miller,
 P.O. Box 572,
 Windsor VT 05089

If you ever want extra copies, you can also ask Betty for them through these same communication channels.

Balaton Website

Yes, there seem to be more and more reasons to have a Balaton Website. We can use it to post past *Bulletins* (the text, anyway, not the cartoons). We can include connections to the Websites of members and their organizations. We can post meetings and other news. And we can make a protected site, accessible only by password.

We've been promising this for a long time. It's going to happen within six weeks. **Dennis Meadows** will see to it. Please contact him with suggestions and reactions, and especially with **your own web address, so we can reference it on ours.** (dmeadows@christa.unh.edu).

If you want to know whether you're included, here is the list of Websites we have already compiled.

Alan AtKisson <AtKisson@aol.com>
 Redefining Progress <info@rprogress.org>
 One Kearny Street, 4th Floor
 San Francisco, CA 94108
 Tel: 415.781.1191
 Fax: 415.781.1198
 1633 Connecticut Avenue, NW, 2nd Floor
 Washington, D.C. 20009
 Tel: 202.588.8900
 Fax: 202.588.9711
<http://www.rprogress.org/>
 This site provides information on the organization, its programs, publications, and internships.

Philip Sutton <psutton@peg.pegasus.oz.au>
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It is still evolving, but currently includes pages for myself, Jay Forrester, Nelson Repenning, Jim Hines, and other members of our group, with some on-line, downloadable publications, the web site for our introductory system dynamics course, research information, etc.

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The site is primarily for in Hungarian for Hungarians, but there are (very) few Russian, German, French and of course growing number of English things on it. The first part lists several networks and actions that can help rebuild civil society in Eastern Europe. The second part is about environmental ethics, ethical consumers, lifestyle etc. The third part is about our communities and activities.

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<http://www.oneworld.org/iied>

This has details of our work on environmental economics, sustainable agriculture, forestry and land use and dryland management as well as my own programme's work on human settlements.

What might also be of interest is the supersite of which it is part, Oneworld Online, where a large number European research groups and NGOs have their pages (including Human Rights Groups such as Amnesty International) and there are various feature articles, bibliographies and other kinds of information about environment and development).

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CBER focuses on issues of energy and environmental policy and regional economic development by working with towns and cities and corporate clients planning large investments in the region.
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We've started on the construction of our own Web pages.

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<http://iisd1.iisd.ca/measure/default.htm>
Site includes: Bellagio principles of measurement; Answers to most frequently asked questions about measurement of progress; Compendium of sd performance measurement initiatives, including a searchable database of initiatives and publications; Initiatives of IISD's Measurement and Indicators Program; In Focus" latest news and highlights from the world of indicators and measurement

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 This site provides a variety of information about
 RMI and its programs, including secure online or-
 dering for all publications.

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 The site includes general information about the work
 of our Institute and the researchers who carry it out.
 By selecting from a menu of six options, visitors
 can link to specific information about G-DAE.
 For example:
 G-DAE's book publishing program — including
 brief descriptions of each book, a complete table of
 contents, order information; and, soon, a link to the
 first page in each chapter.
 Reports and reprints — a listing and order form for
 article reprints, discussion papers, and research re-
 ports written by G-DAE researchers and associates
 Newsletters — each of G-DAE's semi-annual news-
 letters is posted in its entirety.

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 We have a home page for my work on UV disinfection
 of drinking water for developing world com-
 munities. The site contains a number of documents
 and some photos describing our work.

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 The pages contain a lot of stuff on SD and climate
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 Sustainable Europe Project at Edinburgh University
[http://www.ed.ac.uk/~rodrigo\](http://www.ed.ac.uk/~rodrigo)

Robert Costanza <costza@cbl.cees.edu>
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 Our website is also connected to several other sister
 organizations trying to promote sustainability
 through education and research (e.g., WRI, Center
 for Respect of Life and Environment, University
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The Institute's site provides information about the personnel, divisions, programs, and publications of the IPSSR. E-mail addresses are included to facilitate inquiries and orders.

Balaton Publications

We've also reached the point where we see a purpose and a necessity in putting out our own occasional publications. (Are we growing up, or just getting vain?) This conclusion has become obvious through our joint and individual work on indicators of sustainability, which has resulted in two papers, one a summary by **Dana Meadows** of the Biltoven meeting on indicators attended by many of us, and one by **Hartmut Bossel** on the use of orientors as a tool for making comprehensive indicator sets. Both these papers are near completion. So the Steering Committee considered not only what to do with these papers, but what our general policy on publications should be.

This is what we decided. As always, we are eager for your feedback or further ideas:

1. A paper will be considered for Balaton Group publication if it has clearly originated out of Balaton working groups or the Balaton process.
2. Papers will be written BY their specific authors TO the Balaton Group. (Similar to the many reports TO the Club of Rome). We can't foresee any circumstances in which a paper could properly be characterized as written by the whole Balaton Group.
3. Candidate papers should be sent to **Dana Meadows**, who will distribute them to the Steering Committee (or a publications subcommittee) for editorial suggestions and for decision about publication.
4. If approved, a paper will be published only if we have sufficient money in the budget. Therefore it will enhance the possibility of publication if authors can provide some publication money, ideally out of whatever funded project produced the ideas and the

work in the first place. (That is to say, please write publication funds into grant requests!)

5. Centers for storage, distribution, and accounting for published papers will be established by **Dennis Meadows** at the University of New Hampshire and by **Dana Meadows** at the Sustainability Institute in Vermont. If demand turns out to be much brisker than we think it will be, we may consider establishing other distribution centers in other parts of the world.
6. Publications will be sold to the general public at cost plus a small markup. Any money earned in this way can be used to finance further publications.
7. With permission of the author, the publication can also be distributed via the Balaton Group website.

The working group on indicators decided (in a meeting that took place the day after the Steering Committee Meeting) that **Dana Meadows's** summary of the Biltoven workshop, which most of you have seen in rough draft form, will be the first publication "to the Balaton Group." We will use that paper to work out a format, cover, and style that can also be used for future publications. (This paper will make a good template, because it contains many figures, graphs, tables, quotations, etc.) The **Hartmut Bossel** paper on orientors will probably be published by RIVM or IISD as an occasional paper in their format — if so, we will not make it a "to the Balaton Group" publication (because RIVM and IISD already have much more established and widespread distribution lists.) If it is not published under other format, Hartmut's paper will be the second "to the Balaton Group" publication.

We will inform you through the *Bulletin* when these papers are ready.

Balaton Group Membership

This topic again!

Basically, we decided to keep things in their current murky-but-functional form. The only real privilege of membership is attendance (possibly with expense support) at the annual meeting. We still have room for only 50 at the Hotel Petrol. We still would like to distribute those 50 places roughly as follows:

10 speakers, funders, or other special guests

10 new people, preferably young people nominated by present members

30 “old-timers”

The plenary organizer (this year **Bert de Vries**) and the Steering Committee decide who qualifies under the

first category on the list above. We hope all members will help us with the second category, by nominating great young sustainability leaders who would enjoy and be able to make use of association with the Balaton Group. The third and largest category we try to distribute by issuing some invitations to “core” members, some to people who haven’t attended lately, some to people we know have a special interest in the topic under discussion. Invitations are going out with this issue of the *Bulletin*. **IF YOU GET AN INVITATION AND KNOW YOU CAN’T ATTEND THE MEETING, PLEASE LET US KNOW IMMEDIATELY, SO WE CAN OPEN YOUR PLACE TO SOMEONE ELSE.**

If you don’t receive an invitation but have a real need or strong desire to attend this year’s meeting, please let us know. We do receive cancellations; if you’re on the waiting list there’s a good probability of getting in.

The Long-Term Future of the Balaton Group

One evening after a long day’s work and a little wine, we turned not so seriously to a serious subject: the long-term future (since that’s this year’s topic!) of the Balaton Group.

We had a strong guiding vision 17 years ago when the group was formed. We saw an international association of research and activist centers (hence our official name, INRIC, the International Network of Resource Information Centers). These centers would put forth honest, compelling, sophisticated information and analysis about sustainable resource use in their particular parts of the world and would network together to exchange methods, data, models, educational tools, training, ideas, and moral support. We pictured the centers as self-sustaining, and the network either as raising its own money or as being supported by small payments from each center.

Well, it didn’t work out that way. Through some traumatic experiences with centers and institutions, particularly in a few less-free parts of the world, we decided that our actual loyalty was to *people*, not organizations. People who value equity, sufficiency, and sustainability, people who understand whole systems, people whose deep commitment is to the workability of both society and ecosystems, people, not institutions are the carriers of the paradigm of sustainability. They will carry it, no matter what organization they happen to work in. And they can benefit directly and creatively from being networked with other such people, all over the world.

So we became a network in support of sustainability people. (We really should have changed our name to INRIP.)

We muddled along for 17 years, producing surprising results on low budgets, mostly by letting the good people in our network use their interconnections for their own good purposes. We developed enough friends along the way to pay our expenses, as long as those expenses weren’t high. We have no office, no full-time employees, no infrastructure beyond trust and friendship. We believe we have made some waves in the world’s thinking, but we’ve not made much of a trace in the form of buildings, workers, financial endowments, or historical documents.

Now with the undeniable aging of the original members (there were entirely too many “old geezer” jokes in this part of the discussion), we have to think ahead. We also have to re-assess, as always, the changing conditions in the world, the new opportunities, the things we could do now that we couldn’t do before, the things that the world needs now that it didn’t need (or didn’t know it needed) before.

So, inspired by wine and vision, we brainstormed a list of possible future forms of the Balaton Group. (Before reproducing this list, we must remind the reader of the purpose of a brainstorming session. It is to put forth all ideas, however unserious, because in the core of an apparently impossible suggestion, there may be a creative kernel worth exploring further.)

- The Club of Csopak. Keep on in the same way, getting older. After the grants run out, only rich and increasingly doddering members will be able to keep coming.
- The 20th Anniversary Fade-Out. Declare our last meeting in the year 2001 and dissolve graciously, maintaining our friendships and personal connections on our own.
- Keep on Truckin', or the Endowed Club of Csopak. Raise a million dollar endowment to ensure continued functioning at the present level, develop good young leaders and declare an official retirement age (with emeritus status) for older members.
- Symbiosis, or the Lichen Model. Combine functionally with another group with more resources. One interesting possibility is the Rockefeller Foundation's LEAD program.
- The Balaton Foundation. Raise a really big endowment, ten million dollars or more, institutionalize, and increase our activity and visibility. Set up a virtual global think tank, a group of roving Balaton Fellows with stipends, paid regional coordinators to intensify networks within regions. Establish one great research center for selected thinkers to come together and work on projects — something like the Princeton Institute for Advanced Studies.
- The Balaton NGO (or the Balaton Channel). With or without endowment, become an activist center, spend most of our resources on powerful communication techniques and professional communication training for our members, be the place reporters come to for pithy, colorful statement on Kyoto (or whatever). Be visible, honest, even confrontational, but based on good research.
- The Balaton Consulting Group. Form an international SWAT team, for hire to go anywhere and work on sustainability issues.
- The Balaton Sustainable Living Centers Network. Communities in several parts of the world that are working to build and live sustainably, each coupled with a small research/activist/education center, all coupled in networks of personnel exchange. Initial communities to be established in Vermont, south India, and the south of France.
- The Balaton Systems Worldwatch. A single research center (or networked centers) putting out regular publications in the clear Worldwatch way, but with more formal systems analysis behind the information. Could also be coupled with systems training workshops and training materials. Could put out its own set of sustainability indicators each year in a report that would be commonsensical, funny, visionary, truthful, controversial, and popular.
- The Balaton Mafia. Announce our 20th Anniversary disbandment, but don't disband. Go underground, stay connected, and do worldwide, sustainability-oriented dirty tricks.
- The Balaton Inner/Outer Integration Centers. Any of the above, with a strong element of soul work, combined with mind work. This option would combine especially well with the sustainability living centers, which would then become ashrams.

It was fun thinking up these possibilities, and as always with the Balaton Group, what will actually get done will depend on who steps forward to make it happen. There seems to be considerable energy in the group at the moment in the directions of sustainable living centers, consulting, indicators, connections with LEAD and other leadership training programs, and inner/outer work — so some mixture of several of the above ideas may come to pass. Some of us are willing to work on raising an endowment, but that cannot happen until we have a clear consensus on our future direction.

Meanwhile, this year at least, Balaton will go on as usual.

BALATON '98: SCENARIOS FOR SUSTAINABILITY

The great predicament of the human race is that all experiences are of the past but all our decisions are about the future. Unless we at least think we know something about the future, decisions are impossible, for all decisions involved choices among images of alternative futures. This is why the study of the future is more than an intellectual curiosity; it is something that is essential to the survival of humankind.

— Kenneth Boulding, *The Future*

Scenarios are not predictions. It is simply not possible to predict the future with certainty. An old Arab proverb says that “he who predicts the future lies, even if he tells the truth.” Rather, scenarios are vehicles for helping people learn.

— Peter Schwartz, *The Art of the Long View*

Balaton members have a history of focusing on the future and spinning out long-term future scenarios, often with the aid of computer models. But we have never really talked together about the art and science and politics of making statements about the future. Nor have we tried to map out any detailed, responsible joint vision of a future transition to a sustainable society.

Now an opportunity is before us in the form of the third round of the IPCC (Intergovernmental Panel on Climate Change) climate assessment. In order to simulate possible long-term futures of the climate, the huge general climate models (GCM) need to be given as exogenous inputs a range of foreseeable future human releases of greenhouse gases up to the year 2100. In order to produce those forecasts of greenhouse gases, there must be plausible 100-year scenarios for future human energy use. In order to foresee future energy use, someone has to make guesses about the coming century's population growth, economic growth, energy prices, technical change, government policy, and lifestyles.

Bert de Vries and his colleagues at RIVM are part of a team preparing the set of emissions forecasts that will kick off this third round of climate modeling. The initial scenarios will be prepared and published by mid-summer 1998, shortly before our Balaton meeting begins. They will be posted on the web for six months to collect comments, suggestions, and criticisms from around the world. Then all the comments will be reviewed and a final set of scenarios will be prepared.

One possible outcome of our meeting could be a well-considered set of comments or alternate scenarios, worked out by Balaton members, to insert into this process. We can probably expect, from our experience of many past “official consensus” exercises, that the initial scenarios postulated will be middle-of-the-road, politically safe. Forecasts by the U.N., the World Bank and most governments rarely if ever consider the possibility of concerted, systemic overshoot and collapse.

Nor do they foresee large-scale social change, especially not in the direction of voluntary simplicity, radically high resource-use efficiency, more equality, less militarism, etc. Really bad futures and really good ones both seem to be “taboo” in official thinking.

Yet, from *Limits to Growth* to Hartmut Bossel's Scenario A and Scenario B, those are the two kinds of futures Balaton members think about most — and the ones that many of us believe are most plausible.

So we have the opportunity in the coming meeting to:

- examine the processes by which human beings create images of the future. From crystal balls and Greek oracles to science fiction and computer models, what is the conceptual or mythical basis from which we draw our extrapolations, visions, utopian and dystopian ideas of the future?
- review some of the primary future-envisioning devices used today, including computer models such as TARGETS or Threshold 21.
- learn about futures-envisioning exercises that have stimulated real change, including the one that helped overturn apartheid in South Africa.
- contribute to an important global scenario-building exercise now under construction.
- work in more depth on our own systems-based, long-term vision of a sustainable future.

Here is an extremely preliminary schedule drawn up by Bert. Suggested speakers listed here are not guaranteed or even invited yet. Comments and suggestions are most welcome.

Day 1 The art of looking into the future

Topics: The value of trends; how to deal with taboo scenarios (breakdown, fundamentalism etc.); from myths to formal models to dialogue; ongoing scenario projects; use of cross-impact matrix and other techniques to be used in afternoon sessions

Scenarios for climate change policy: The IPCC process (**Bert de Vries**)

Methodologies to construct scenarios: a prelude to the afternoon sessions (**Dennis Meadows**)

Looking into a crystal ball: the art of long-term envisioning (Anwar Fazal?)

The state of the future 1997 - The AC-UNU Millennium Project (J. Glenn?)

The SEI scenario project: between transformation and barbarism (Gilberto Gallopin)

Worldviews and principles behind two different scenarios for the future (**Hartmut Bossel**)

Afternoon optional session —: Scenario and vision construction exercise (e.g. using cross-impact matrix) (*Dennis, Aromar, Bert*)

Day 2 Regional futures

Topics: Brief overview of regional trends and issues; Sketch of existing scenarios. Speakers are asked to give a) an overview of key trends and issues for the next 10-20 years, b) a brief summary of some scenario/futures studies on the region covering aspects such as population, economy, life-style, resources etc., and c) draw some conclusions with regard to two axes: degree of social/environmental awareness and nature/effectiveness of governance. We will ask them to look from a systems perspective insofar as possible.

Futures for Eastern Europe and Russia (**Victor Gelovani? Genady Golubev? Ruben Mnatsakanian?**) — key issues of economies in transition; export of oil/gas; Central Asian Republics; exploitation of Siberian forests

Southern Africa's futures (**Joan du Toit**) — the "four birds" scenario exercise; and now what?; breaking down of territorial boundaries; impact of AIDS

China in the next century (**Qi Wenhu?**) — prospects for 'socialist market-economy'; pressure on natural resources; China's position

in the world economy e.g. food imports; one nation; income inequality rural-urban

India in the next century (**Aromar Revi**) — role of religious fundamentalism / breakdown of All India; emergence of dual economy; pressure on and shortage of natural resources

The Islamic world: which future? (*speaker?*) — forces behind Islamic fundamentalism; population pressure in relation to carrying capacity; disparity between OPEC wealth and non-OPEC poverty

Futures for the affluent: North America and Western Europe (*speaker?*) — where will affluence lead - boredom, crime, cyberspace, religion, third world support; what will aging mean; the emergence of a rentier class; changes in consumer values

Day 3 Sectoral views

Topics: determinants of important thematic issues/divergent views on technologies and life-styles. We will ask the speakers to give an in-depth discussion of the forces that drive, globally and regionally, the consumption patterns, the medical and food system, the transport system etc. Again, we will ask them to look from a systems perspective.

How are we living and consuming: uniformity or diversity? Will, can, should consumption styles converge? (**Faye Duchin?**) — social accounting matrices work in Indonesia; media, and poverty and income inequality, as factors determining consumption; relation with GDP growth rate aspirations

Health and aging: how will they develop and affect societies (*speaker?*) — views on fertility dynamics; determinants of mortality; nature, effectiveness and technology of medical service sector and its relation with the economy

Transport of people and goods: how much and how? (*speaker?*) — systems envisaged for urban transport; role of communications technology; relation with work and leisure patterns

The development of technological and manufacturing systems: ever rising productivity, unemployment and uniformity? (**Amory Lovins?**) — global convergence in manufacturing; role of technology transfer; prospects for further resource productivity and

renewables; rising labour productivity and green taxing

Day 4 Cross-cutting issues and integration

Topics: environmental security issues in relation to resource access and use/ role of institutions and governance; start to glue pieces together. Speakers should probably be participants of pre-BG workshop on meeting and scenarios

Resources: options and conflicts with regard to food, water and energy

Institutions: how effective can and should governance be? (**Manfred Max-Neef?**)

Culture: which role for country and religion in a culturally diverse world? (**Michael Thompson?**)

Putting the pieces together: another collective exercise in envisioning a future (partly in the afternoon)

Day 5 Two views of the future

[Scenarios A and B: further to be worked out]

Peripheral shows and activities (please inform Bert of other demonstrations, videos, etc. you would like to see or to bring):

- Simulation models:

- population/health models (Bert)
- energy and climate model (IMAGE/TIMER) (Bert)
- Threshold 21 model (Millennium Institute modeler)
- World3 model (Dennis, Tom Fid)
- WaterGap model (Bert)
- food/land model (?)
- artificial life models on social systems

- Movies/videos/books on Science Fiction:

- Blade Runner
- Cold Lazarus (Dennis Potter)
- Earth (David Brin)
- Left hand of Darkness & Always Coming Home (Ursula LeGuin)
- Foundation Trilogy (Asimov)
- Benjamin (on centrally piped music)
- Past visions outlined in Shell scenarios (from old magazines)

THE PAST OF THE FUTURE

by Eric Blom

(Dennis Meadows gleaned this history of past predictions from the Net. Eric Blom is a reporter for Gannett Communications)

By the year 2000, everyone in the world will have brown hair.

Dirigibles will take people to work and to the corner grocery. Picnics on the moon will be commonplace. Divorce will be unnecessary because unhappy spouses will be executed.

Today, with the next millennium in sight, we can chuckle over spectacularly wrong forecasts, such as the late 19th-century predictions mentioned above. We can marvel at dead-on predictions, including the 1930 forecast of a televised moon landing. We can look ahead to speculate, as one futurist does, that humanity will mishandle space alien technology and wipe itself out in the year 3001.

But the turn of the millennium offers more than a chance to laugh at the expense of 19th-century forecasters. The predictions that cluster around the year 2000 can teach us about ourselves — our dreams, fears and prejudices — and our ability to see into the future.

Everyone from schlock movie producers to Soviet bloc planners has used the millennium to anchor visions of the future. "When you wanted to portray the future in the year 1930, you used the year 2000," said Samuel Moskowitz, a New Jersey scholar who has written 60 books about the history of science fiction. "There were many stories simply titled 'The Year 2000.' It was instantly recognizable as the future."

Welch Everman noticed something unusual the other day when he was watching "Flying Disk Man from Mars," a 1954 film. The Martian invaders were using a computer that spit out old-fashioned punch hole cards. The Martians could fly between planets with ease but had never seen a personal computer.

"Technology has on one hand outstripped expectations and on the other fallen short," said Everman, a University of Maine professor and author of the new book, *Cult Science Fiction Films*. "It's interesting to me to see the hits and the misses."

Moon landings were foreseen decades before they took place (with memorable first words such as "It works!"). Kidney dialysis machines, tanks, atomic energy, birth-control pills and genetic engineering all were predicted long before scientists and engineers started

working on those concepts.

One 19th-century art critic "absolutely nails television cold" in an 1893 essay, said David Walter, a Montana historical researcher. "The guy has no business doing that," he said. "He has no right to be correct."

But the misses have been huge as well.

Take, for example, this excerpt from an article about the future printed in the New Year's Eve, 1899, edition of the Portland Sunday Telegraph: "The hat will vanish, and the hair will improve. The home will be a great communal dwelling where all people of the same kinship will live under the same roof — children, parents, grandparents, uncles, aunts and cousins."

Other writers of that era predicted the eradication of saloons and property taxes by the 1990s. They said that crime and private property would disappear by the next millennium.

Otis Mason, a college professor, told the Philadelphia Times in 1899 that "the entire human race will be brunette. The blond people were once brunettes and became as they are through some process of interbreeding."

John Ingalls, a Kansas politician, forecast that "it will be as common for the citizen to call for his dirigible balloon as it now is for him to call for his buggy or his boots."

John Habberton, a New York author, predicted happy marriages, thanks to the death penalty for "any man or woman who assumes a conjugal position without the proper physical, mental and financial qualifications."

Many of these people were experts in their fields — ministers talking about religion, economists talking about the economy and police talking about crime. But they were mostly talking off the cuff. Forecasting has gotten far more sophisticated since then, using computer models and statistical trends to predict the future. Still, even professional futurists using modern analytical techniques — such as those people who predict trends for corporations and government bodies — miss the mark a large percentage of the time. There are just too many variables and unforeseen circumstances to forecast the future accurately.

For example, analysts made 34 forecasts for the rest of the century in the February 1967 edition of *The Futurist* magazine. They predicted 23 events accurately — giving some leeway on what is considered accurate — for a 68 percent success rate, according to a recent analysis of the forecasts by the magazine. These futurists predicted a manned lunar landing by 1970, but also assured us that we would see manned planetary landings by 1980.

Often, forecasts are both a little right and a little wrong. Raymond Gallum, a science fiction writer, predicted in 1931 the creation of atomic energy. He also said it would not happen for a million years.

Overall, science fiction writers have been too conservative about the pace of change, Moskowitz said. "We are living a much better life than we dreamed of in the 1930s," he said. "We're all driving around in automobiles. People all have three televisions in their house. If you had written a story about modern life (60 years ago), it would have been seen as fantastic and unbelievable."

Ancient people had their oracles, astrologers, shamans, soothsayers, prophets and philosophers. Modern societies have consultants, futurists, science fiction authors, fortune tellers and film makers. The ancient Greeks talked about a sea spout carrying ocean-going vessels to the moon. Chinese philosophers in the 11th century B.C. saw comets as harbingers of doom. Futurists now talk about how computer chips could be implanted in our brains to help us think better. Science fiction writers speculate about what life would be like if people could escape reality into computer-generated, virtual worlds.

The most basic reason for speculation — old and new — is that it can be fun. There are no right or wrong answers, at least not any that will be determined before the forecaster's death. Nobody really thought that Venus was populated by lightly dressed showgirls, as Zsa Zsa Gabor's 1958 film, "Queen of Outer Space," suggests. Then again, nobody could really prove differently in 1958.

"The initial boom in magazine science fiction started in the 1930s and it was an object of hope," Moskowitz said, referring to the Depression years. "The present was so dismal that we rode on dreams of the future."

Other people speculated about the future so they could influence its direction, by sacrificing a goat or writing legislation. In ancient times, people speculated mostly about natural phenomena such as weather and the gods, along with their impact on the agrarian economy, said Jerome Glenn, a Washington futurist and director of the Millennium Project for Tokyo-based

United Nations University.

As people moved from farms to factories and developed religious beliefs that posited free will rather than predestination, they felt free to speculate about other things, Glenn said. "The majority of human history was that gods controlled our lives, so why think about the future?" he said. Now people can talk about their place in the universe and how they want to live in the future.

Visions of the future, whether lighthearted or deadly serious, tell us far more about the world in which the forecasters live than about the lives their grandchildren will lead. Sure, George Jetson went to work in a cartoon space saucer and had a robot maid. But "Jane, his wife" stayed home just like most American women of the early 1960s. She pushed so many buttons to cook the family dinner and to launder their clothes that her index finger grew red and sore.

"Popular culture (such as science fiction) generally is about decisions we've already made," said Everman, the University of Maine professor. "If it didn't say what we want it to say, we wouldn't like it."

A series of 74 essays written in 1893 by prominent Americans was supposed to describe the world in 1993. Instead, it serves as a wonderful picture window into the mood of 19th-century America. Thomas Dixon Jr., a prominent New York minister, predicted that laws would be simplified by 1993 and that the number of lawyers would be reduced by two-thirds.

W.A. Peffer, a Kansas politician, forecast in an article titled "Men Will Grow Wiser, Better and Purer" that we'd be working no more than five hours a day. Junius Henri Browne, a journalist of the day, forecast that crime and criminals would be rare in our time. And the postmaster of the United States said stamps would cost one penny in 1993, down from the 1893 level of 2 cents per letter.

These predictions — part of a series of newspaper articles written in conjunction with the Chicago World's Fair — reflected the optimistic spirit of late 19th-century America, said Walter, the Montana researcher who compiled the essays for his 1992 book, *Today Then*.

Writers in the syndicated series predicted a cure for cancer and a life expectancy of 150 years by 1993. More accurately, they forecast development of the West, the rise of Florida as a tourist state and central air conditioning. These authors also talked a lot about the future of railroads, zeppelins and telegraphs. Nobody wrote a word about jet airliners, automobiles or microprocessors.

"They were taking a bit of what they knew and ex-

trapolated it to what they wanted to have happen," Walter said.

In the same way, modern writers, film makers and futurists reflect the times in which they live. The 1950s, a period of mechanization and fast-rising living standards, saw a lot of speculation about the leisure society. No one would have to work by the turn of the century unless they wanted to. Robots would mix martinis at the end of the day. "It was the beginning of plastics and the artificial world," said Bishop, the Texas professor.

But the '50s also was a period of nuclear terror, reflected in that generation's movies. Giant ants ("Them," 1954) and huge bald men ("The Amazing Colossal Man," 1957) were created by radiation poisoning.

Things had changed by the 1960s. With the Apollo space program in high gear, the focus now was on colonizing Mars and mining asteroids. Television shows like "Star Trek" hit the air and children played with Major Matt Mason, a flexible plastic doll in a white space suit.

In the 1970s, after the Arab oil embargo, America saw a spate of movies ("Soylent Green," "Day of the Animals") and books (*The Population Bomb*) about environmental disaster and scarce resources.

The 1980s focus was on crime and social decay, with films such as "Escape From New York" and "The Blade Runner." The 1990s have been dominated by computers, with books and movies such as "The Net" and "Mission: Impossible."

In the 1990s, a dark vision prevails with lots of talk about how computers will dehumanize people, how multinational corporations will control the world and how crime will spin out of control. The old horror theme — aliens attack Earth — has been resurrected in "Independence Day," the wildly popular film.

But James Emerson, an Ohio historian of science fiction, argues that even dark images of the future represent a form of optimism. "There's a whole sense of hope there," he said. "By writing about the future, you have hope there is a future to begin with."

FOUR APPROACHES TO THE FUTURE

by **Russell Ackoff**

(Russell Ackoff is one of the original practitioners of systems theory as applied to management and planning. The following is excerpted from his 1974 book Redesigning the Future: A Systems Approach to Societal Problems (Wiley-Interscience). As far as we know, the four approaches to the future outlined here were invented completely independently from Michael Thompson's four types in cultural theory — though Balaton Group members will immediately see the connection.)

There are many managers and administrators who still do not believe in planning. Attitudes toward planning vary a great deal but they can be grouped into four general types: inactive, reactive, preactive, and interactive. These attitudes are mixed in varying proportions in each individual and organization, and the mixture may change from time to time or from situation to situation. A wide variety of attitudes toward the future may be found in any one organization at any one time. Nevertheless, one of these attitudes usually dominates the others in both individuals and organizations. In a sense, these four attitudes are like primary colors; they can be mixed in many different ways to provide a wide range of secondary attitudes, and these change under different “lighting” conditions. Despite the variety of mixtures, the pure forms are easily recognizable.

After I have described the “pure” attitudes in what is obviously a biased way, I nevertheless argue that under different conditions each may be best. Therefore, as will also be apparent, my bias derives from what I believe our current condition is.

Inactivism

Inactivists are satisfied with the way things are and the way they are going. Hence they believe that any intervention in the course of events is unlikely to improve them and is very likely to make them worse. Inactivists take a do-nothing posture; they try to “side with the tide” without “rocking the boat.” They seek stability and survival. They are “satisficers.”

Inactivists believe that most apparent social and environmental changes are either illusory, superficial, or temporary. They typically see those who cry “crisis!” as panic mongers and prophets of doom. Inactivists recall the pervasiveness of such cries throughout history and point to the evasiveness of the dooms foreseen. Because they have survived all previous crises, inactivists argue, there is no reason to believe they cannot continue to do so.

Inactive organizations require a great deal of activity to keep changes from being made. They accomplish nothing in a variety of ways. First, they require

that all important decisions be made “at the top.” The route to the top is designed like an obstacle course. This keeps most recommendations for change from ever getting there. Those that do are likely to take long enough to make them irrelevant by the time they reach their destination; if not, they are sent back down for modification or evaluation. The organization behaves like a sponge, and is about as active.

Wherever possible, words are used in place of action. Inactivists are prolific producers of policy statements, white papers, strategy documents, position papers, reports, memoranda. Another prevalent means of achieving inactivity consists of setting up committees, councils, study groups, task forces at the drop of an issue. The responsibilities of such groups are left vague, so they can spend most of their time arguing about their functions and having jurisdictional disputes. When a committee manages to generate a recommendation, those who were not represented in the group can object to their lack of representation and form another group. This process can go on indefinitely.

On those rare occasions when an inactive organization does take action, it is certain to be understaffed and underfinanced.

Feasibility is the principle criterion used by inactivists. Ends are fitted to means, rather than the converse. Inactivists tend to want what they can get, rather than try to get what they want. Inactivists have a greater fear of doing something that does not have to be done (errors of commission) than of not doing something that should be done (errors of omission).

The only organizations that can survive inactive management are those that are protected by their environments by subsidies that assure their survival independently of what they accomplish. The most conspicuous examples are universities, government agencies, and publicly protected monopolies, such as utility companies.

Needless to say, inactivists have no need to look into the future. They do not even need to solve problems.

Reactivism

Reactivists prefer a previous state to the one they are in. They believe things are going from bad to worse. Hence they not only resist change; they try to unmake previous changes and return to where they once were.

Reactivists are moved more by their hates than by their loves. Their orientation is remedial, not aspirational; they try to avoid the undesirable rather than attain the desirable. Their reaction to most proposed change is: "We tried it and it didn't work."

Because technological change is so conspicuous and because the past has always had less technology than the present, technology is often the reactivists' main scapegoat for whatever ills they perceive. In dealing with problems, they rely on common sense, intuition, and judgement based on long experience. The longer the experience the better. For this reason they place high value on seniority, immobility, and age.

Reactivists dislike complexity and try to avoid dealing with it. They reduce complex messes to simple problems that have simple solutions — solutions that are "tried and true." They are panacea-prone problem solvers, not planners looking into the future. They try to recreate the past by undoing the mess they believe the planning of others has wrought.

Unlike inactivists, reactivists do not ride with the tide; they try to swim against the tide back to a familiar shore. It is not surprising that once-successful but now-declining institutions, organizations, and cultures are particularly susceptible to this point of view.

Preactivism

Preactivists are not willing to settle for things as they are or were. They believe that the future will be better than the present or the past, how much better depending on how well they get ready for it. Thus they attempt to predict and prepare. They want more than survival — they want to grow, excel, become better, bigger, more affluent, more powerful, more many things. They don't want to satisfice; they want to optimize.

Preactivists are not only concerned about doing something wrong (errors of commission) but also about not doing something right (errors of omission). So they are as occupied with potential opportunities as they are with actual and potential threats. They attempt to deal with problems before they become serious and, if possible, before they arise. They are preoccupied with forecasts, projections, and every other way of obtaining glimpses into the future. They believe the future is essentially uncontrollable, but they can control its effects on them. They plan FOR the future; they do not

PLAN THE FUTURE.

Preactive planning is based more on logic, science, and experimentation than on common sense, intuition, and judgement. Preactivists tend to credit science and technology for most of the progress we have enjoyed. They seek to solve problems more through research and development than by individual or institutional change. They are hardware, rather than software, oriented; thing, rather than people, oriented. When they must deal with people, they prefer to deal with them collectively rather than individually, because they believe collective behavior is more predictable.

Preactive decision makers think of the system to be managed in terms of the resources over which it has direct control. They are preoccupied with allocation of resources within the system. They do not try to influence other systems or the environment; they see the environment as constraining rather than enabling. Hence they are competitive rather than cooperative with other systems.

Preactivists seek change WITHIN the system, not change OF the system or of its environment. They are reformers, not revolutionaries. They seek neither to ride with the tide nor to turn it backward, but to ride in front of it and get to where it is going before it does. That way they can take advantage of new opportunities before others get to them.

Interactivism

Interactivists are not willing to settle for the current state or to return to the past or to get to the future ahead of everyone else. They want to design a desirable future and invent ways of bringing it about. They believe we are capable of controlling a significant part of the future. They try to PREVENT, not merely prepare for, threats and to CREATE, not merely exploit, opportunities.

Preactivists, according to interactivists, spend too much time trying to forecast the future. The future, they argue, depends more on what we do between now and then than it does on what has happened up to now. The major obstacle between us and the future is we ourselves.

Interactivists are not interested in simple survival or growth. They seek self-development, self-realization, self-control; an increased ability to design their own destinies. They are not satisficers, not optimizers, but idealizers. They plan to do better in the future than the best that presently appears to be possible. They pursue ideals that can never be attained, but can be continuously approached. To them the formulation of ideals and visions are not empty exercises in utopianism, but necessary steps in setting the direction for develop-

ment. They accept ideals not as absolute, but as relative, which require continuous reformulation in light of what we learn from approaching them.

Interactivists try to design the systems they control to increase their ability to learn and adapt. They maintain that experience alone is too slow and too ambiguous. They attempt to replace experience by experimentation wherever possible. They see every decision as an experiment. No aspect of a system is precluded from change. Interactivists are willing to modify a system's structure, function, organization and personnel, as well as its allocation and use of resources. Interactivists are also willing to induce cooperative changes in surrounding systems. They consider the world, not merely their neighborhood, to be their arena.

Interactivists consider technology to be neither good nor bad in itself, but to have a potential for either, depending on how people use it. They view behavior and technology as interrelated aspects of sociotechnical systems. To them science is the search for similarities among things that are apparently different, and the humanities are the search for differences among things

that are apparently similar. Scientists seek the general; humanists seek the unique. To deal effectively with a problem, one must be able to do both.

Interactivists are radicals; they try to change the foundations as well as the superstructure of society, institutions, and organizations. They desire not to resist, ride with, nor ride ahead of the tide; they try to redirect it.

Despite the obvious bias in my characterization of these four postures, there are circumstances in which each is most appropriate. If the internal and external dynamics of a system (the tide) are taking it where one wants to go and are doing so quickly enough, inactivism is appropriate. If the direction of change is right but the movement is too slow, preactivism is appropriate. If the change is taking one where one does not want to go and one prefers to stay where one is or was, reactivism is appropriate. If one is not willing to settle for the past, the present, or the future that appears likely, interactivism is appropriate. My bias for interactivism derives from my belief that our society can be much improved and that it is not tending toward improvement. Our active intervention is therefore required.

CLIMATE: MAKING SENSE AND MAKING MONEY

by Amory Lovins

(Amory Lovins is one of the world's most active creators of alternative and sustainable scenarios for the future, especially energy scenarios. Here are excerpts from one of his latest papers, written just before the Kyoto conference. The paper contains not only much of Amory's vision for a sustainable energy future, but a devastating critique of the economic models that foresee that future as wildly expensive. We have shortened the article slightly and taken out the voluminous references and footnotes. For the original, contact Rocky Mountain Institute, or see its Website www.rmi.org))

On 19 May 1997, the chief executive of British Petroleum said: "[T]here is now an effective consensus among the world's leading scientists and serious and well informed people outside the scientific community that there is a discernible human influence on the climate, and a link between the concentration of carbon dioxide and the increase in temperature." He continued: "[W]e must now focus on what can and what should be done, not because we can be certain climate change is happening, but because the possibility can't be ignored." Obviously what should be done is to start lowering the rate of burning fossil fuels—the source of 84% of America's and most of the world's energy.

The prospect of having to reduce carbon emissions has aroused dismay, foreboding, and resistance among many in the business community who fear it would hurt profits and growth. Robert J. Samuelson asserted in *Newsweek*: "It would be political suicide to do anything serious about [climate]....So shrewd politicians are learning to dance around the dilemma."

The dilemma arises because almost everyone *presumes* that protecting the climate will be costly. In Samuelson's widely held view, saving a ton of carbon emissions would happen only under a roughly \$100 tax, and, he warns, even such a burdensome tax might only cut 2010 emissions back to 1990 levels. Thus "Without a breakthrough in alternative energy—nuclear, solar, something—no one knows how to lower emissions adequately without crushing the world economy."

Samuelson, like so many businesspeople, believes climate protection is costly because the best-known economic computer models say it is. Few people realize, however, that those models find carbon abatement to be costly *because that's what they assume*. This assumption masquerading as a fact has been so widely repeated as the input and hence the output of supposedly authoritative models that it's often deemed infallible.

It's not. Not only do *other* economic models derive the opposite answer from different assumptions, but an enormous body of overlooked empiricism, including government-sponsored studies and worldwide business

practice, shows that the technological breakthroughs Samuelson seeks have already happened. The earth's climate can be protected *not at a cost but at a profit*—just as many industries are already turning the costs of environmental compliance into the profits from pollution prevention.

Consider a few examples. Southwire is the top independent U.S. maker of rod, wire, and cable, a very energy-intensive business. During 1981–87, the firm cut its electricity use per pound of product by 40%, gas by 60%—then kept on saving even more energy and money, still within two-year paybacks. The resulting savings created nearly all the company's profits in a tough period when competitors were going under. The two engineers responsible may have saved four thousand jobs at ten plants in six states. The lead engineer, Jim Clarkson, says the technologies were all simple and available; their effective use took only "an act of management will and design mentality, consistently applied."

In 1981, Dow Chemical's 2,400-worker Louisiana division started prospecting for overlooked savings. Engineer Ken Nelson set up a shop-floor-level contest for energy-saving ideas. Proposals had to offer at least 50% annual return on investment. The first year's 27 projects averaged 173% ROI. Startled at this unexpected bounty, though expecting it to peter out quickly, Nelson persevered. The next year, 32 projects averaged 340% ROI. Twelve years and almost 900 implemented projects later, the workers had averaged (in the 575 projects subjected to *ex post* audit) 202% predicted and 204% audited ROI. In the later years, the returns and the savings were both getting *bigger*, because the engineers were learning faster than they were exhausting the "negawatt" resource. In only one year did returns dip into double digits (97% annual ROI). By 1993, the whole suite of projects was paying Dow's shareholders \$110 million every year.

DuPont expects to save the equivalent of 18 million tons of CO₂ by 2000 through simple measures that will also save \$31 million each year. Roche Vitamins (Belvedere, NJ) has profitably cut its steam use per unit of production by more than half in five years. A new chiller

and related improvements at a Kraft ice-cream plant saved 33% of its electricity and 2,500 tons of CO₂ a year; productivity rose 10% and the plant turned from a money-loser into one of the most competitive. A process innovation at Blandin Paper Company (Grand Rapids, MN) saved each year 37,000 tons of CO₂ and more than \$1.8 million. The first two years of billion-dollar carpetmaker Interface Corporation's efficiency efforts have saved "a stunning \$25 million..., with another \$50 million expected the next two years." Greenville Tube Corporation's demonstration of new drivesystems under DOE's Motor Challenge program boosted productivity 15% and energy efficiency 30%, reduced scrap 15%, and saved \$77,000 a year with a five-month pay-back. And Southern Company's 1984–94 improvements in the thermal efficiency of its fossil-fueled power plants saved 400,000 cumulative tons of SO₂ and 35 million tons of CO₂, plus an annual \$108 million.

Over half of the threat to climate disappears if energy is used in a way that saves money. In general, *it's far cheaper to save fuel than to burn it..* Another one-fourth or so of the threat can be abated by adopting farming and forestry practices that take carbon out of the air and put it back in the soil and plants. Soil-conserving and -building practices are generally at least as profitable as soil-depleting, chemical-dependent methods, making the climate protection they provide at least an economic breakeven. The rest of the threat vanishes if CFCs are replaced with the new substitutes that are required by global treaty in order to protect the stratospheric ozone layer on which all life depends. Thanks to industrial innovation, these substitutes now work the same or better and typically cost about the same or less.

So if the "cost" of protecting the climate ranges from strongly negative to roughly zero or irrelevant, what are we waiting for?

Assuming the conclusion

All economists know that real markets are far from theoretical perfection. But most climate/economy models assume that almost all profitable energy savings must already have been bought—as if a perfect market did exist. On this basis, the modelers suppose, buying significantly bigger savings will be worthwhile only at higher energy prices. They then use big computer models to calculate how high an energy tax is needed (based on historic elasticities), how much that will depress the economy, and hence what the "cost" of protecting the climate must be.

Those models have driven policy for the past two decades. Ever more elaborate models continue to be built on the same old assumption—that saving energy isn't profitable at present prices and hence will require higher prices that will burden firms and the national

economy. They're like a model, popular in the Reagan-Bush years, that trumpeted the notion that meeting the Toronto carbon-reduction goals would *cost* the U.S. about \$200 billion a year. Yet the empirical evidence of what energy efficiency actually costs showed that reducing fossil fuel use that much would *save* the U.S. about \$200 billion a year compared with buying and burning that fuel.

Critics of climate protection often cast doubt on the elaborate computer models that simulate the physical processes of the earth's climate. Ironically, those physical models, which now closely fit the historic climate data, are far more detailed and realistic than the climate-economics models used to claim that climate protection is too costly. Ignoring real-world conditions leaves most of the climate-economics models riddled with flaws. For example,

- Most economic models are very sensitive to how fast, if at all, energy efficiency is assumed to improve by itself at present prices: one model, for instance, found that as this rate was increased from 0.5 to 1.5% per year (it actually averaged 1.54% per year during 1973–95, the calculated cost of cutting carbon emissions to 20% below 1990 levels fell from \$1 trillion nearly to zero.
- Few of the models take any explicit account of efficiency technologies, and those that do (like the government studies that show ways to save 20–25% of the carbon at negative cost, with much further potential at low cost) are very conservative for many reasons, including their use of outmoded, costly, incremental, component-based technologies rather than reflecting the modern whole-system approach that can often tunnel through the cost barrier and achieve bigger savings at lower costs.
- The economic models don't let technologies improve as price incentives increase, even though rising prices are well known to spur innovation.
- The economic models all forget that renewable sources get cheaper when produced in higher volumes, as they've been doing for decades—leading Royal Dutch/Shell Group Planning to consider it plausible that over the next half-century, renewables could grow to supply more than half the world's energy.
- Most models quietly assume that carbon-tax or -permit-auction revenues are simply rebated (which lowers GDP) instead of being

used to displace the distorting taxes that discourage savings, work, or investment (which would raise GDP).

- The relatively few models that allow international trading of emissions and reductions assume that *all* countries have essentially perfect market economies—even those, like the former USSR and China, that don't have economies at all, but only giant machines for eating resources.

A lucid guide to 162 predictions by the 16 top climate/economy models found that seven underlying assumptions explained 80% of the differences in their results. Does a model assume there's any "backstop" energy source, such as renewables or nuclear, that can be widely adopted if fossil-fuel prices get high enough? Does it assume the economy responds efficiently to price signals and can make significant substitutions between fuels and between products? Can different countries trade their savings opportunities? Are revenues recycled efficiently? Does the model count the value of avoiding climate change (perhaps a relatively minor term, but enough, with efficient revenue recycling, to improve economic welfare)? Does it count the benefit of abating associated forms of conventional air pollution as a free byproduct of burning less fossil fuel—benefits large enough to offset 30–100% or more of the assumed cost of carbon abatement? For (say) a 60% carbon reduction in 2020, *these seven assumptions can predetermine whether the model shows by then a 7% decrease or a 5% increase in GDP*. That noted economists should find such wildly divergent results underscores not only their lack of unanimity on whether climate protection is disastrous or beneficial for the economy, but also that the difference is due to divergent model structures and assumptions.

In sum, most economic models—especially the extreme ones publicized by fossil-fuel companies' intensive ad campaign—calculate large costs because they assume rigid, constrained, and unintelligent responses to economic signals. The few models that show economic *benefit* from protecting climate merely assume that people and firms behave with the ordinary sagacity and flexibility that market mechanisms offer—and can therefore adopt new techniques that can save far more energy, at far lower cost, at far greater speed, than most theorists can imagine.

Energy savings: big, cheap, and getting more so

If the builders of climate-economic models had ever run an energy-saving business, they'd know that the potential for energy savings, cost-effective at present prices, is both real and vast. GE Chairman Jack Welch said of American industry, "Our productivity is at the

beginning stages. There's so much waste. There's so much more to get, it's unbelievable. And somehow or other people think all these things are finite." Practitioners often find that the more that the industry-pervading waste is corrected, the more new opportunities emerge to save even *more* resources, even faster and cheaper—especially electricity, which is the costliest and most climate-affecting form of energy.

Pumping is the biggest use of electric motors. Leading American carpetmaker Interface was recently building a factory in Shanghai. One of its processes required 14 pumps. The top Western specialist firm sized them to total 95 horsepower. But a fresh look by Interface/Holland's engineer Jan Schilham, applying methods learned from Singapore efficiency expert Eng Lock Lee cut the design's pumping power to only 7 hp—a 92% or 12-fold energy saving. It also *reduced* the system's capital cost, and made it more compact, easier to build and maintain, and more reliable and controllable.

These astonishing results required two changes in design. First, Schilham chose big pipes and small pumps instead of small pipes and big pumps: friction falls as nearly the fifth power of pipe diameter. Second, he laid out the pipes first, then installed the equipment, not the reverse: the pipes are therefore short and straight, with far less friction, requiring still smaller and cheaper pumps, motors, inverters, and electricals. The straighter pipes also allowed him to add more insulation, saving 70 kilowatts of heat loss with a two-month payback.

Schilham marveled at how he and his colleagues could have overlooked such simple opportunities for decades. His redesign required, as inventor Edwin Land used to say, not so much having a new idea as stopping having an old idea. Engineering commonly uses a rule-of-thumb that balances the extra capital cost of fatter pipe only against the saved *operating* cost of reduced pumping energy. Schilham's new design instead optimized for lifecycle savings in pumping energy *plus* capital cost—of not just the pipes but the *whole system*. The extra cost of the slightly bigger pipes was smaller than the cost reduction for the dramatically smaller pumps and drivesystems.

Such opportunities exist in more than just pumps and pipes. Major energy savings are available in valves, ducts, dampers, fans, motors, wires, heat exchangers, insulation, and most of the other design elements, in most of the technical systems that use energy, in most applications, in all sectors. Virtually all energy uses are designed using rules-of-thumb that are wrong by about three- to tenfold. Substituting economically rational design would therefore save much of the energy used by industry, while *reducing* capital costs. Many of those savings can be profitably retrofitted into existing plants, either immediately or as part of routine renovations and expansions.

Among hundreds of examples, similar rethinking of building design has lately yielded:

- houses that are comfortable with no heating or cooling equipment in climates ranging from -47°F in the Colorado Rockies to $+115^{\circ}\text{F}$ in central California, yet cost less to build than houses with normal equipment;
- air-conditioning savings ranging from 90% in a new Bangkok house, at no extra cost to 97% in a cost-effective California office retrofit design,
- total energy savings from over 50% to nearly 90% in cost-effective U.S. house and small-office retrofits, and
- a retrofit design to save 75% of the energy in a typical 20-year-old Chicago curtainwall office tower, providing far greater comfort and a simple payback of -5 to $+9$ months.

A particularly effective retrofit strategy is to coordinate the installation of energy efficiency measures with renovations that are needed anyhow, such as replacing aging glazings and mechanical systems. New superwindows can insulate fourfold better and let in six times as much daylight but a tenth less unwanted heat. That can trigger further savings, notably in lighting, that can cut air-conditioning needs fourfold. Then the mechanical system can be replaced with a redesigned version four times as efficient, yet four times smaller, hence cheaper than renovating the old one. That saves about enough money to pay for the extra costs of the superwindows and other improvements. The retrofit saving three-fourths of the energy then costs essentially the same as the routine renovation that saves nothing; the money is simply spent in a different way that also reduces operating costs by \$1.10 per square foot per year.

Careful scrutiny of actual market prices for equipment reveals that even at the component level, many technical devices—motors, valves, pumps, rooftop chillers, etc.—show no correlation whatever between efficiency and price. A 100-hp American motor, for example, can be cheaper at 95.8% efficiency than an otherwise identical 91.7%-efficient model. But if you don't know that—if you assume, as economic theory predicts, that more efficient models always cost more—then you probably won't shop for it. That can be costly. If the motor runs continuously, each one-percentage-point gain adds about \$50 per horsepower to the bottom line, so not choosing the most efficient 100-hp motor can reduce present-valued profits by \$20,000. Many factories have hundreds of such motors, which are less efficient than even mediocre new models.

Again, the key is not so much adopting new technologies, though they're important, as using proper recipes for combining the best available technologies in the optimal manner, sequence, and proportions. Some of the recipes are embarrassingly obvious. Light-colored roofs and pavement, plus shade trees and revegetation to help bounce solar heat away, could cool Los Angeles by about 6°F and cut the city's cooling loads by about 20% and its population-weighted smog by about 12%, saving \$0.5 billion per year. An urban tree keeps about nine times as much carbon out of the air as the same tree planted in a forest where it won't also save air-conditioning energy by keeping people and buildings cooled and shaded. Such effects multiply: traditional passive cooling methods formerly provided summer comfort even in steamy Bangkok, and can do so again if superefficient cars and buildings are gradually introduced so the waste heat from cars' engines and air conditioners stops making the city so hot. Bangkok will still be hot, but comfort can be achieved more cheaply using much less energy.

Examples abound in every kind of business:

- Properly choosing office equipment and commercial and household appliances has saved over two-thirds of their energy use with the same or better service and comparable or lower cost.
- Skilled retrofits have saved 70–90% of office and retail lighting energy, yet the light quality is more attractive and the occupants can see better. In many cases, the better lighting equipment more than pays for itself by costing less to maintain.
- Motors use three-fourths of industrial electricity, three-fifths of all electricity, and more primary energy than highway vehicles. This use is highly concentrated: about half of all motor electricity is used in the million largest motors, three-fourths in the three million largest. Since big motors use their own capital cost's worth of electricity every few weeks, switching to more efficient motors can pay back quickly. A comprehensive retrofit of the whole motor system typically saves about half its energy and pays back in around 16 months. This requires integrating up to 35 kinds of improvements to the motors, controls, electrical supply, and drivetrains. However, the first seven of those improvements yield 28 more kinds of savings at no additional cost, making the resulting energy saving twice as big as conventional retrofits', yet one-fifth as costly per kW-h saved.

- The chemical industry saved nearly half its energy per unit of product during 1973–90 by plugging steam leaks, installing insulation, and recovering lost heat. Now it's discovered that better catalysts and matching heat to the required temperature can often save 70% or so of what's left, yet pay back within two years. Next-generation industrial plant design, now moving from the chemical industry into semiconductors, is uncovering 50–75% savings with lower capital cost, faster construction, and better performance.

Many of these examples illustrate a new design concept: whole-system engineering can often make it cheaper to save a large than a small fraction of energy use. Integrating the design of an entire package of measures so they do multiple duty (such as saving on both energy *and* equipment costs), or piggybacking on renovations being done anyway for other reasons, or both, can enable designers to “tunnel through the cost barrier.” Good engineers think this is fun. Most economic theorists assume it's impossible.

Moreover, the cornucopia of efficiency opportunities keeps expanding far into the future:

- America's power stations turn fuel into one-third electricity and two-thirds waste heat, thereby throwing away heat equivalent to the total energy use of Japan. But the American firm Trigen uses the waste heat from small, off-the-shelf gas turbines to run industrial processes. Such “cogeneration,” common in Europe, increases system efficiency by about 2.8-fold, harnessing 90–91% of the fuel's energy content, and hence provides very cheap electricity (0.5–2¢/kWh). Fully adopting this one innovation would profitably reduce America's total CO₂ emissions by about 23%.
- Selling waste heat from industrial processes, in turn, to other users within affordable distances could cost-effectively save up to about 30% of U.S. and 45% of Japanese industrial energy.
- Still largely unexploited are new kinds of heat exchangers and motors, membrane separators and smart materials, sensors and controls, rapid prototyping and ultraprecision fabrication, and radically more frugal processes using enzymes, bacteria, and biological design principles.
- Saving materials also saves the energy needed to produce, process, transport, and

dispose of them. Product longevity, minimum-materials design and manufacturing, recovery of any scrap not designed out, repair, reuse, remanufacturing, and recycling together present a menu of business opportunities that also save energy, pollution, mining, and landfilling. Japan cut its materials intensity by 40% just during 1973–84; but far more is yet to come. Americans throw away enough aluminum to rebuild the country's commercial aircraft fleet every three months, even though recycling aluminum takes 95% less energy than making it from scratch. Smart manufacturers take their products back for profitable remanufacturing, as IBM does with computers in Japan and Xerox does with photocopiers worldwide. Interface, the world's top carpet-tile maker, reckons to cut its materials flow by about tenfold, ultimately by a hundredfold, by leasing floor-covering services instead of selling carpet, and by remanufacturing old carpet.

- Innovative new approaches also seem poised to solve the most intractable part of the climate problem—road vehicles. Ultralight, ultralow-drag, hybrid-electric “hypercars” with 70–90% fuel savings, superior safety, comfort, and performance and competitive costs have attracted about \$2.5 billion of private investment by 25-plus firms worldwide, half of them new market entrants. GM has announced it's developing cars with half the weight, half the drag, and hybrid drive (hypercars in all but name). Ford just began road-testing 40%-lighter 6-passenger cars (including two kinds with hybrid drive). Toyota is mass-marketing in Japan a hybrid-electric Corolla-class car with doubled efficiency, tenfold lower emissions, and a reported \$17,700 pricetag. Daimler-Benz has pledged to be making 100,000 fuel-cell cars a year by 2005. Chrysler just unveiled an experimental molded-polymer-composite “China car” with half the weight of a Neon but more room, 15% lower cost, 80% lower investment, 86% lower factory space, and 60 mpg. With such instances of progress being *announced*, imagine what's going on behind closed doors. Ultimately hypercars will save, probably at a substantial profit, as much oil worldwide as OPEC now sells.
- Many energy savings reduce climatic threats from more gases than just CO₂. Advanced refrigerators can save over 90% of standard refrigerators' energy, and thus avoid burning

enough coal to fill the refrigerator every year, but their vacuum insulation and helium-engine coolers also eliminate climate- and ozone-disrupting CFCs from insulation and refrigerant. Landfill and coal-mine gas recovery turns heat-trapping methane emissions into a valuable fuel while making electricity that displaces coal-burning. Recycling paper (the average person in a rich country uses as much wood for paper as the average person in a poor country uses for fuel) saves it from turning cellulose carbon into landfill methane, and also saves fossil-fueled manufacturing and transportation. Superefficient cars simultaneously reduce at least eight classes of heat-trapping gases.

From the firm to the nation

Whole countries, especially heavily industrialized ones, can achieve big energy savings, and alternative supplies, just by adding up individual ones. During 1979–86, in the wake of the second oil shock, America got nearly five times as much new energy from savings as from all net expansions of supply, and 14% more energy from sun, wind, water, and wood but 10% less from oil, gas, coal, and uranium. By 1986, CO₂ emissions were one-third lower than they would have been at 1973 efficiency levels. The average new car burned half the fuel of 1973 models (4% of that gain came from making cars smaller, 96% from designing them smarter and emitted almost a ton less carbon per year. Annual energy bills fell by ~\$150 billion. Annual oil-and-gas savings grew to become three-fifths as large as OPEC's capacity. In those seven years, GDP rose 19% but energy use shrank 6%. No problem.

All that effort in the '80s only scratched the surface. In 1989, the Swedish State Power Board (Vattenfall) published a thorough and conservative technical study of Sweden's further potential to save electricity and heat (which Sweden often cogenerates). The team found that fully using mid-1980s technologies could save half of Sweden's electricity, at an average cost 78% lower than making more. That plus switching to less carbon-intensive fuels and relying most on the least carbon-intensive power stations could enable Sweden simultaneously to

- achieve the forecast 54% GDP growth during 1987–2010,
- complete the voter-mandated phaseout of the nuclear half of the nation's power supply,
- reduce the utilities' carbon releases by one-third, and

- reduce the private internal cost of electrical services by nearly \$1 billion per year.

If this is possible in a country that's full of energy-intensive heavy industry, cold, cloudy, very far north, and among the most energy-efficient in the world to start with, then countries not so handicapped must have important opportunities too. Sure enough, a year later, a study for the Indian state of Karnataka found that even a limited menu—several simple efficiency improvements, small hydro, cogeneration from sugarcane waste, biogas, a small amount of natural gas, and solar water heaters—would achieve far greater and earlier development progress than the fossil-fueled plan of the state utility, with two-fifths less electricity, two-thirds lower cost, and 95% less fossil-fuel CO₂. These two analyses spanned essentially the full global range of energy intensity and efficiency, technology, climate, wealth, income distribution disparities, and social conditions. Yet they both found that efficiency plus renewables yielded a highly profitable carbon-reducing investment package.

The Karnataka study exposes the twin canards that climate is the North's problem and that reducing the South's carbon emissions would inequitably cripple development. Precisely because energy waste hobbles economic progress, some governments in the South and East have been quietly cutting subsidies to energy-intensive industries and to fossil fuels themselves. Reformers are also opening up the energy sector to greater competition, innovation, and efficiency. Such policies have achieved better overall economic efficiency *and*, as a free byproduct, much lower carbon emissions. Such countries are saving carbon about twice as fast as OECD countries have committed to do, and they're probably saving more carbon in absolute terms than OECD countries actually will do, while boosting their own economic growth. In short, they're saving energy for *economic* reasons and reaping the incidental environmental benefits. Among the strongest economic advantages is that building, for example, superwindow and efficient-lamp factories instead of power stations and transmission lines requires a thousandfold less capital. Such demand-side investments also pay back their cost about ten times as fast for reinvestment, thus liberating for other development needs the one-fourth of global development capital now consumed by the power sector.

China has three times the energy intensity of Japan, which itself has surprisingly big efficiency opportunities still untapped. But China is improving rapidly. Spurred by energy shortages that idle an estimated 25–30% of its manufacturing capacity, China now gets a quarter of its total primary energy from renewables and over an eighth of its electricity from cogeneration. It's converting all large industrial boilers to cogeneration. It's cut its coal subsidies from 37% to 29% (1984–95)

and its oil subsidies from 55% to 2% (1990–95). These and other policy initiatives reduced the 1980–90 growth in China’s carbon emissions by 40%, nearly all through better technologies. Now, encouraged by internal rates of return on recent manufacturing energy efficiency projects all exceeding 12% and usually exceeding 20%, China is tackling a further savings potential which the World Bank last year estimated would reach in 2020 a level greater than China’s entire 1990 energy consumption. In steelmaking alone, best practice could reduce China’s typical 1990 energy per ton by 64% promptly and 82% ultimately. And there is a huge potential for profitable Chinese supply-side substitutions, ultimately including the displacement of coal by an East Asian natural-gas grid comparable to today’s pan-European one. Combined-cycle gas-fired power stations emit only about one-fourth as much CO₂ per kWh as do coal-fired stations, are faster and cheaper to build, and free up coal-hauling rail capacity. They can also be easily sited at industrial complexes so their waste heat can be re-used, boosting their efficiency from nearly 60% to about 90%.

Studies for the governments of Canada and Australia confirmed that ~20% CO₂ cuts would be highly profitable. In Australia, for example, a 36% energy and 19% CO₂ reduction from projected 2005 levels would save \$6.5 billion (Australian) of private costs per year by 2005, because each \$5 invested in efficiency would save \$15 worth of fuel purchases *and* 1 ton of CO₂. A new U.S. study similarly found that saving 26% of carbon emissions and 15% of primary energy by 2010 would also save 13% of national energy costs—\$85 billion a year, or \$205 per ton of avoided carbon emissions, or \$530 per household per year—and create nearly 800,000 net jobs. Investments in more efficient energy-using devices to 2010 would average \$29 billion a year, but direct monetary savings would average \$48 billion a year, excluding any value of stabler climate and cleaner air.

America, and the world, have barely begun to capture the energy efficiency that’s available and worth buying. Modern cars, after a century of devoted engineering refinement, use only 1% of their fuel energy to move the driver. An ordinary light-bulb converts only 3% of the power-plant fuel into light. The entire U.S. economy is only about 2% energy-efficient compared with what the laws of physics permit. National materials efficiency is even worse: only about 1% of all mobilized materials are actually put into and remain in the average product six weeks after its sale. Thus despite impressive achievements so far, America still wastes upwards of \$300 billion a year worth of energy: more than the entire military budget, far more than the federal budget deficit, and enough to increase personal wealth by more than \$1,000 per American per year. That waste begs to be turned into profits.

Time to dump the myths

With this understanding of how modern technologies and creatively used markets can profitably protect the climate *and* the economy, we can see the aridity and irrelevance of the myths underlying the conventional climate debate:

- *It’s about climate science.* No; it doesn’t matter what the climate science says, or even whether it’s right, because we ought to be purchasing energy efficiency anyway just to save money.
- *It’s about decision-making under uncertainty.* The uncertainty doesn’t matter, because the robust economic benefits depend only on private internal costs and benefits, not on any imputed environmental values or risks.
- *It’s about carbon taxes.* No; they may be helpful and appropriate, especially as part of a general tax shift from people to resource depletion and from production to consumption, but present prices are ample to elicit all the energy savings we need—if we just get serious about vaulting the barriers that inhibit people from using energy in a way that saves money.
- *It’s about command-and-control.* Wrong; it’s about helping markets to work properly—and then letting them do their job.
- *It’s about who should bear the costs.* What costs? The interesting question is who should get the *profits*. That’s a good thing to compete about in the marketplace, but it shouldn’t require difficult negotiations. The “polluter pays principle”—OECD doctrine since 1974—remains valid, but this time the polluter can profit.
- *It’s about sharing sacrifices for the common good.* On the contrary, it’s about helping individuals, firms, and nations to behave in their economic self-interest.
- *It’s about “cutting back,” shifting to a lifestyle of privation and discomfort*—as the Chairman of Chrysler Corporation recently put it, “dimming the lights, turning off the air conditioning, sacrificing some of our industrial competitiveness and curtailing economic growth.” No; it’s about living even better with less cost, by using smarter technologies that yield the same or better service. The showers will be as hot and tingly as

now, the beer as cold, the rooms as well-lit, the homes as cozy in winter and as cool in summer, the cars as peppy, safe, and comfortable; but we'll have substituted brains for therms and design for dollars.

- *It's about keeping the poor down.* Quite the opposite; if equitably provided as the cornerstone of the development process, both abroad and at home, energy efficiency could be a special boost for those most burdened with the least efficient buildings and equipment, and least able to afford such waste. Even if the price of fossil fuels did rise, that's not very regressive, because poor people spend more of their income directly on energy but less indirectly (embodied in goods and services). Any disproportionate harm to the poor could be corrected by straightforward adjustments elsewhere in the tax or welfare systems. Equity issues do merit careful attention, but they're no reason to keep on subsidizing energy for the rich.
- *It's about consuming too much in the North and not enough in the South.* That's a real issue, and we in the North should start thinking about what we want, how much is enough, how to meet nonmaterial needs by nonmaterial means, what will make us better human beings, and the difference between a good life and what scripture calls "vanity." But the resource-efficiency revolution can buy much time by sustaining or enhancing Northern *and* greatly improving Southern living standards while dramatically reducing the use of energy and materials.

Protecting the climate for fun and profit

A bizarre irony lurks beneath the climate debate. Why do the same people who favor competitive mar-

kets in other contexts seem to have the least faith in their efficacy for saving fossil fuels? Let's recall what happened the last time this gloom-and-doom attitude overcame those people's better instincts. Just before Congress approved in 1990 the cap-and-trade system for reducing sulfur dioxide emissions, environmentalists predicted that reductions would cost about \$350 a ton, or ultimately (said the optimists) perhaps \$250. Government economic models predicted \$500–750; the higher figure was the most widely cited. Industry models upped the ante to about \$1,000–1,500. In fact, the sulfur-allowance market opened in 1992 at about \$250 a ton; in 1995, it cleared at \$130 a ton; in 1996, at \$66. Moreover, national sulfur emissions have fallen 37% in just the past decade—and 38% faster than the Clean Air Act envisaged, because of simple incentives to reward early achievers. Much the same thing is happening with CFCs.

The genius of private enterprise and advanced technologies found a way billions of dollars cheaper than command-and-control regulation. It would do so again if we competed to save the most carbon in the cheapest ways. In fact, an environmental double bonus for business would emerge: we'd automatically and profitably meet most of the stringent new ozone and fine-particle standards too, via the same reduced combustion that helps the climate and cuts our energy bills; and we could easily use similar incentives for doing so early.

In the past half-century, global carbon emissions have quadrupled. But in the next half-century, the climate problem could become as faded a memory as the energy crises of the '70s are now—because it's not an inevitable result of normal economic activity, but an artifact of energizing that activity in irrationally inefficient ways.

Let's vault the barriers, use energy in a way that saves money, and put enterprise where it belongs: in the vanguard of sound solutions. Climatic change is a problem we can't afford, don't need—and can avoid at a resounding profit.

WAYS TO INTERVENE IN A SYSTEM (IN INCREASING ORDER OF EFFECTIVENESS)

by Dana Meadows

(A shorter version of the following essay appeared in the Fall 1997 issue of Whole Earth. This is the full text. The idea emerged, as so many wild ideas do, at a Balaton workshop, the post-Balaton meeting on globalization held in Csopak in September 1996.)

Folks who do systems analysis have a great belief in “leverage points.” These are places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything.

This idea is not unique to systems analysis — it’s embedded in legend. The silver bullet, the trimtab, the miracle cure, the secret passage, magic password, single hero who turns the tide of history. The nearly effortless way to cut through or leap over huge obstacles. We not only want to believe that there are leverage points, we want to know where they are and how to get our hands on them. Leverage points are points of power.

The systems analysis community has much lore about leverage points. Those of us who were trained by Jay Forrester at MIT have absorbed one of his favorite stories. People know intuitively where leverage points are, he says. “Time after time I’ve done an analysis of a company, and I’ve figured out a leverage point — in inventory policy, or in the relationship between sales force and productive force, or in personnel policy. Then I’ve gone to the company and discovered that there’s already considerable attention to that point. Everyone is trying hard to push it **IN THE WRONG DIRECTION!**”

The classic example of such backward intuition was my own introduction to systems analysis, the world model. Asked by the Club of Rome to show how major global problems — poverty and hunger, environmental destruction, resource depletion, urban deterioration, unemployment — are related and how they might be solved, Forrester made a computer model and came out with a clear leverage point:¹ Growth. Not only population growth, but economic growth. Growth has costs as well as benefits. We typically don’t count the costs — among which are poverty and hunger, environmental destruction, etc. — the whole list of problems we are trying to solve with growth! What happens when we reach the point where further growth actually costs more than its benefits? At that point growth becomes **UNECONOMIC**, and the more we get, the worse off we are! It’s almost certain that many kinds of growth in many parts of the world have reached that point.

Which means that the world’s leaders are correctly fixated on economic growth as the answer to virtually all problems, but they’re pushing with all their might in the wrong direction.

Another of Forrester’s classic examples came from his urban dynamics study, published in 1969, which demonstrated that subsidized low-income housing is a leverage point.² The less of it there is, the better off the city is — even the low-income folks in the city. This model came out at a time when national policy dictated massive public investment in low-income housing projects. Another exercise in pushing the right leverage point the wrong way. Forrester was derided. Now in city after city those projects are being torn down.

Counterintuitive. That’s Forrester’s word. Leverage points are not found by intuition. Or if they are, we intuitively use them backward, systematically worsening whatever problem we are trying to solve.

The systems analysts I know have come up with no quick or easy formulas for finding leverage points. We usually discover them through serious study and modeling. Give us a few months or years. But we know from bitter experience that, because of counterintuitiveness, when we do discover the system’s leverage points, hardly anybody will believe us.

Very frustrating, especially for those of us who yearn not just to understand complex systems, but to make the world work better.

So one day I was sitting in a meeting about how to make the world work better. Well, actually it was a meeting about how the new global trade regime, NAFTA and GATT and the World Trade Organization, is likely to make the world work worse. The more I listened, the more I began to simmer inside. “This is a **HUGE NEW SYSTEM** people are inventing!” I said to myself. “They haven’t the **SLIGHTEST IDEA** how this complex structure will behave,” myself said back to me. “It’s almost certainly an example of cranking the system in the wrong direction — it’s aimed at growth, growth at any price!! And the control measures we are talking about to combat or control it — small parameter adjustments, weak negative feedback loops — are **PUNY!!!**”

Suddenly, without quite knowing what was happening, I got up, marched to the flip chart, tossed over to a clean page, and wrote:

PLACES TO INTERVENE IN A SYSTEM (in increasing order of effectiveness)

9. Constants, parameters, numbers (subsidies, taxes, standards).
8. Regulating negative feedback loops.
7. Driving positive feedback loops.
6. Material flows and nodes of material intersection.
5. Information flows.
4. The rules of the system (incentives, punishments, constraints).
3. The distribution of power over the rules of the system.
2. The goals of the system.
1. The mindset or paradigm out of which the system — its goals, power structure, rules, its culture — arises.

Everyone in the meeting blinked in surprise, including me. “That’s brilliant!” someone breathed. “Huh?” said someone else.

I realized that I had a lot of explaining to do.

I also had a lot of thinking to do. As with most of the stuff that come to me in boil-over mode, this list was not exactly tightly reasoned. As I began to share it with others, questions and comments came back that caused me to rethink, add and delete items, change the order, add caveats.

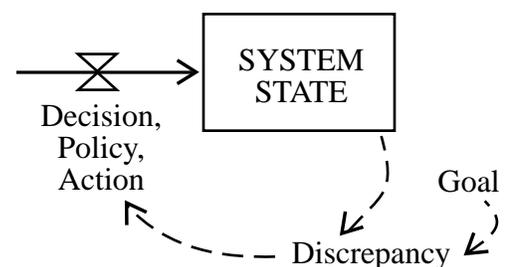
In a minute I’ll go through the list I ended up with, explain the jargon, give examples and exceptions. The reason for this introduction is to place the list in a context of humility and to leave room for evolution. What bubbled up that day was distilled from decades of rigorous analysis of many different kinds of systems done by many smart people. But complex systems are, well, complex. It’s dangerous to generalize about them. What you are about to read is a work in progress. It’s not a recipe for finding leverage points. Rather it’s an invitation to think more broadly about system change.

Here, in the light of a cooler dawn, is a revised list:

PLACES TO INTERVENE IN A SYSTEM (in increasing order of effectiveness)

12. Constants, parameters, numbers (such as subsidies, taxes, standards).
11. The sizes of buffers and other stabilizing stocks, relative to their flows.
10. The structure of material stocks and flows (such as transport networks, population age structures).
9. The lengths of delays, relative to the rate of system change.
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.
7. The gain around driving positive feedback loops.
6. The structure of information flows (who does and does not have access to information).
5. The rules of the system (such as incentives, punishments, constraints).
4. The power to add, change, evolve, or self-organize system structure.
3. The goals of the system.
2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.
1. The power to transcend paradigms.

To explain parameters, stocks, delays, flows, feedback, and so forth, I need to start with a basic diagram.



The “state of the system” is whatever standing stock is of importance — amount of water behind the dam, amount of harvestable wood in the forest, number of people in the population, amount of money in the bank, whatever. System states are usually physical stocks, but they could be nonmaterial ones as well — self-confidence, degree of trust in public officials, perceived safety of a neighborhood.

There are usually inflows that increase the stock and outflows that decrease it. Deposits increase the money in the bank; withdrawals decrease it. River inflow and rain raise the water behind the dam; evaporation and discharge through the spillway lower it. Births and immigrations increase the population, deaths and emigrations reduce it. Political corruption decreases trust in public officials; experience of a well-functioning government increases it.

Insofar as this part of the system consists of physical stocks and flows — and they are the bedrock of any system — it obeys laws of conservation and accumulation. You can understand its dynamics readily, if you can understand a bathtub with some water in it (the state of the system) and an inflowing faucet and outflowing drain. If the inflow rate is higher than the outflow rate, the stock gradually rises. If the outflow rate is higher than the inflow, the stock gradually goes down. The sluggish response of the water level to what could be sudden twists in the input and output valves is typical — it takes time for flows to accumulate, just as it takes time for water to fill up or drain out of the tub.

The rest of the diagram is the information that causes the flows to change, which then cause the stock to change. If you’re about to take a bath, you have a desired water level in mind. You plug the drain, turn on the faucet and watch until the water rises to your chosen level (until the discrepancy between the desired and the actual state of the system is zero). Then you turn the water off.

If you start to get in the bath and discover that you’ve underestimated your volume and are about to produce an overflow, you can open the drain for awhile, until the water goes down to your desired level.

Those are two negative feedback loops, or correcting loops, one controlling the inflow, one controlling the outflow, either or both of which you can use to bring the water level to your goal. Notice that the goal and the feedback connections are not visible in the system. If you were an extraterrestrial trying to figure out why the tub fills and empties, it would take awhile to figure out that there’s an invisible goal and a discrepancy-measuring process going on in the head of the creature manipulating the faucets. But if you watched long enough, you could figure that out.

Very simple so far. Now let’s take into account that you have two taps, a hot and a cold, and that you’re also adjusting for another system state — temperature. Suppose the hot inflow is connected to a boiler way down in the basement, four floors below, so it doesn’t respond quickly. And you’re making faces at yourself in the mirror and not paying close attention to the water level. And, of course, the inflow pipe is connected to a reservoir somewhere, which is connected to the whole planetary hydrological cycle. The system begins to get complex, and realistic, and interesting.

Mentally change the bathtub into your checking account. Write checks, make deposits, add a faucet that keeps dribbling in a little interest and a special drain that sucks your balance even drier if it ever goes dry. Attach your account to a thousand others and let the bank create loans as a function of your combined and fluctuating deposits, link a thousand of those banks into a federal reserve system — and you begin to see how simple stocks and flows, plumbed together, make up systems way too complex to figure out.

That’s why leverage points are not intuitive. And that’s enough systems theory to proceed to the list.

12. Constants, parameters, numbers (subsidies, taxes, standards).

“Parameters” in systems jargon means the numbers that determine how much of a discrepancy turns which faucet how fast. Maybe the faucet turns hard, so it takes awhile to get the water flowing or to turn it off. Maybe the drain is blocked and can allow only a small flow, no matter how open it is. Maybe the faucet can deliver with the force of a fire hose. These considerations are a matter of numbers, some of which are physically locked in and unchangeable, but most of which are popular intervention points.

Consider the national debt. It’s a negative bathtub, a money hole. The rate at which it sinks is called the annual deficit. Tax income makes it rise, government expenditures make it fall. Congress and the president spend most of their time arguing about the many, many parameters that open and close tax faucets and spending drains. Since those faucets and drains are connected to the pockets of the voters, these are politically charged parameters. But, despite all the fireworks, and no matter which party is in charge, the money hole has been sinking for years now. Little if any change in the basic behavior of the system, just change in the rate at which it does its thing.

To adjust the dirtiness of the air we breathe, the government sets parameters called ambient air quality standards. To assure some standing stock of forest (or some flow of money to logging companies) it sets allowed

annual cuts. Corporations adjust parameters such as wage rates and product prices, with an eye on the level in their profit bathtub — the bottom line.

The amount of land we set aside for conservation. The minimum wage. How much we spend on AIDS research or Stealth bombers. The service charge the bank extracts from your account. All these are parameters, adjustments to faucets. So, by the way, is firing people and getting new ones, including politicians. Putting different hands on the faucets may change the rate at which the faucets turn, but if they're the same old faucets, plumbed into the same old system, turned according to the same old information and goals and rules, the system isn't going to change much. Electing Bill Clinton was definitely different from electing George Bush, but not all that different, given that every president is plugged into the same political system.

Parameters are dead last on my list of powerful interventions. Probably 90, no 95, no 99 percent of our attention goes to parameters, but there's not a lot of leverage in them.

Not that parameters aren't important — they can be, especially in the short term and to the individual who's standing directly in the flow. People care deeply about parameters and fight fierce battles over them. But they RARELY CHANGE BEHAVIOR. If the system is chronically stagnant, parameter changes rarely kick-start it. If it's wildly variable, they don't usually stabilize it. If it's growing out of control, they don't brake it.

Whatever cap we put on campaign contributions, it doesn't clean up politics. The Feds fiddling with the interest rate haven't made business cycles go away. (We always forget that during upturns, and are shocked, shocked by the downturns.) After decades of the strictest air pollution standards in the world, Los Angeles air is less dirty, but it isn't clean. Spending more on police doesn't make crime go away.

Since I'm about to get into some examples where parameters ARE leverage points, let me stick in a big caveat here. Parameters become leverage points when they go into ranges that kick off one of the items higher on this list. Interest rates, for example, or birth rates, control gains around positive feedback loops. System goals are parameters that can make big differences. Sometimes a system gets onto a chaotic edge, where the tiniest change in a number can drive it from order to what appears to be wild disorder.

These critical numbers are not nearly as common as people seem to think they are. Most systems have evolved or are designed to stay far out of critical parameter ranges. Mostly, the numbers are not worth the sweat put into them.

Here's a story a friend sent me to makes that point:³

When I became a landlord, I spent a lot of time and energy trying to figure out what would be a "fair" rent to charge.

I tried to consider all the variables, including the relative incomes of my tenants, my own income and cash flow needs, which expenses were for upkeep and which were capital expenses, the equity versus the interest portion of the mortgage payments, how much my labor on the house was worth, etc.

I got absolutely nowhere. Finally I went to someone who specializes in giving money advice. She said: "You're acting as though there is a fine line at which the rent is fair, and at any point above that point the tenant is being screwed and at any point below that you are being screwed. In fact there is a large grey area in which both you and the tenant are getting a good, or at least a fair, deal. Stop worrying about numbers and get on with your life."

11. The sizes of buffers and other stabilizing stocks, relative to their flows.

Consider a huge bathtub with slow in and outflows. Now think about a small one with very fast flows. That's the difference between a lake and a river. You hear about catastrophic river floods much more often than catastrophic lake floods, because stocks that are big, relative to their flows, are more stable than small ones. In chemistry and other fields, a big, stabilizing stock is known as a buffer.

The stabilizing power of buffers is why you keep money in the bank rather than living from the flow of change through your pocket. It's why stores hold inventory instead of calling for new stock just as customers carry the old stock out the door. It's why we need to maintain more than the minimum breeding population of an endangered species. Soils in the eastern U.S. are more sensitive to acid rain than soils in the west, because they haven't got big buffers of calcium to neutralize acid.

You can often stabilize a system by increasing the capacity of a buffer.⁴ But if a buffer is too big, the system gets inflexible. It reacts too slowly. And big buffers of some sorts, such as water reservoirs or inventories, cost a lot to build or maintain. Businesses invented just-in-time inventories, because occasional vulnerability to fluctuations or screw-ups is cheaper than certain, constant inventory costs — and because small-to-vanishing inventories allow more flexible response to shifting demand.

There's leverage, sometimes magical, in changing

the size of buffers. But buffers are usually physical entities, not easy to change. The acid absorption capacity of eastern soils is not a leverage point for alleviating acid rain damage. The storage capacity of a dam is literally cast in concrete. So I haven't put buffers very high on the list of intervention points.

10. The structure of material stocks and flows and nodes of intersection (such as transport networks, population age structures, flow of nitrogen through soil).

The plumbing structure, the stocks and flows and their physical arrangement, can have an enormous effect on how the system operates. When the Hungarian road system was laid out so all traffic from one side of the nation to the other has to pass through central Budapest, that determined a lot about air pollution and commuting delays that are not easily fixed by pollution control devices, traffic lights, or speed limits. The only way to fix a system that is laid out wrong is to rebuild it, if you can.

Often you can't, because physical building is usually the slowest and most expensive kind of change to make in a system. Some stock-and-flow structures are just plain unchangeable. The baby-boom swell in the U.S. population first caused pressure on the elementary school system, then high schools, then colleges, then jobs and housing, and now we're looking forward to supporting its retirement. Not much we can do about it, because five-year-olds become six-year-olds, and sixty-four-year-olds become sixty-five-year-olds predictably and unstopably. The same can be said for the lifetime of destructive CFC molecules in the ozone layer, for the rate at which contaminants get washed out of aquifers, for the fact that an inefficient car fleet takes 10-20 years to turn over.

Physical structure is crucial in a system, but rarely a leverage point, because changing it is rarely simple. The leverage point here is in proper design in the first place. After the structure is built, the leverage is in understanding its limitations and bottlenecks and refraining from fluctuations or expansions that strain its capacity.

9. The lengths of delays, relative to the rate of system changes.

Remember that bathtub on the fourth floor I mentioned, with the water heater in the basement? I actually experienced one of those once, in an old hotel in London. It wasn't even a bathtub, it was a shower — no buffering capacity. The water temperature took at least a minute to respond to my faucet twists. Guess what my shower was like.

Right, oscillations from hot to cold and back to hot, punctuated with expletives.

Delays in feedback loops are critical determinants of system behavior. They are common causes of oscillations. If you're trying to adjust a system state to your goal, but you only receive delayed information about what the system state is, you will overshoot and undershoot. Same if your information is timely, but your response isn't. For example, it takes several years to build an electric power plant, and then that plant lasts, say, thirty years. Those delays make it impossible to build exactly the right number of plants to supply a rapidly changing demand. Even with immense effort at forecasting, almost every electricity industry in the world experiences long oscillations between overcapacity and undercapacity. A system just can't respond to short-term changes when it has long-term delays. That's why a massive central-planning system, such as the Soviet Union or General Motors, necessarily functions poorly.

Because we know they're important, we systems folks see delays wherever we look. The delay between the time when a pollutant is dumped on the land and when it trickles down to the groundwater. The delay between the birth of a child and the time when that child is ready to have a child. The delay between the first successful test of a new technology and the time when that technology is installed throughout the economy. The time it takes for a price to adjust to a supply-demand imbalance.

A delay in a feedback process is critical **RELATIVE TO RATES OF CHANGE (growth, fluctuation, decay) IN THE SYSTEM STATE THAT THE FEEDBACK LOOP IS TRYING TO CONTROL.** Delays that are too short cause overreaction, "chasing your tail," oscillations amplified by the jumpiness of the response. Delays that are too long cause damped, sustained, or exploding oscillations, depending on how much too long. At the extreme they cause chaos. Overlong delays in a system with a threshold, a danger point, a range past which irreversible damage can occur, cause overshoot and collapse.

I would list delay length as a high leverage point, except for the fact that delays are not often easily changeable. Things take as long as they take. You can't do a lot about the construction time of a major piece of capital, or the maturation rate of a child, or the growth rate of a forest. It's usually easier to slow down the change rate, so that inevitable feedback delays won't cause so much trouble. That's why growth rates are higher up on the leverage-point list than delay times.

And that's why slowing economic growth is a greater leverage point in Forrester's world model than faster technological development or freer market prices. Those are attempts to speed up the rate of adjustment. But the world's physical capital plant, its factories and boilers, the concrete manifestations of its working technologies,

can only change so fast, even in the face of new prices or new ideas — and prices and ideas don't change instantly either, not through a whole global culture. There's more leverage in slowing the system down so technologies and prices can keep up with it, than there is in wishing the delays away.

But if there is a delay in your system that can be changed, changing it can have big effects. Watch out! Be sure you change it in the right direction! (For example, the great push to reduce information and money transfer delays in financial markets is just asking for wild gyrations)

8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.

Now we're beginning to move from the physical part of the system to the information and control parts, where more leverage can be found.

Negative feedback loops are ubiquitous in systems. Nature evolves them and humans invent them as controls to keep important system states within safe bounds. A thermostat loop is the classic example. Its purpose is to keep the system state called "room temperature" fairly constant at a desired level. Any negative feedback loop needs a goal (the thermostat setting), a monitoring and signaling device to detect excursions from the goal (the thermostat), and a response mechanism (the furnace and/or air conditioner, fans, heat pipes, fuel, etc.).

A complex system usually has numerous negative feedback loops it can bring into play, so it can self-correct under different conditions and impacts. Some of those loops may be inactive much of the time — like the emergency cooling system in a nuclear power plant, or your ability to sweat or shiver to maintain your body temperature — but their presence is critical to the long-term welfare of the system.

One of the big mistakes we make is to strip away these "emergency" response mechanisms because they aren't often used and they appear to be costly. In the short term we see no effect from doing this. In the long term, we drastically narrow the range of conditions over which the system can survive. One of the most heart-breaking ways we do this is in encroaching on the habitats of endangered species. Another is in encroaching on our own time for rest, recreation, socialization, and meditation.

The "strength" of a negative loop — its ability to keep its appointed stock at or near its goal — depends on the combination of all its parameters and links — the accuracy and rapidity of monitoring, the quickness and power of response, the directness and size of cor-

rective flows. Sometimes there are leverage points here.

Take markets, for example, the negative feedback systems that are all but worshipped by economists. They can indeed be marvels of self-correction, as prices vary to moderate supply and demand and keep them in balance. The more the price — the central piece of information signaling both producers and consumers — is kept clear, unambiguous, timely, and truthful, the more smoothly markets will operate. Prices that reflect full costs will tell consumers how much they can actually afford and will reward efficient producers. Companies and governments are fatally attracted to the price leverage point, all of them determinedly pushing it in the wrong direction with subsidies, fixes, externalities, taxes, monopolies and other forms of confusion.

These folks are trying to weaken the feedback power of market signals by twisting information in their favor. The REAL leverage here is to keep them from doing it. Hence the necessity of anti-trust laws, truth-in-advertising laws, attempts to internalize costs (such as pollution taxes), the removal of perverse subsidies, and other ways of leveling market playing fields.

None of which get far these days, because of the weakening of another set of negative feedback loops — those of democracy. This great system was invented to put self-correcting feedback between the people and their government. The people, informed about what their elected representatives do, respond by voting those representatives in or out of office. The process depends upon the free, full, unbiased flow of information back and forth between electorate and leaders. Billions of dollars are spent by leaders to limit and bias that flow. Give the people who want to distort market price signals the power to pay off those leaders, get the channels of communication to be self-interested corporate partners themselves, and none of the necessary negative feedbacks work well. Both market and democracy erode.

The strength of a negative feedback loop is important **RELATIVE TO THE IMPACT IT IS DESIGNED TO CORRECT**. If the impact increases in strength, the feedbacks have to be strengthened too. A thermostat system may work fine on a cold winter day — but open all the windows and its corrective power will fail. Democracy worked better before the advent of the brain-washing power of centralized mass communications. Traditional controls on fishing were sufficient until radar spotting and drift nets and other technologies made it possible for a few big and heedless actors to wipe out the fish. The power of big industry calls for the power of big government to hold it in check; a global economy makes necessary a global government, and if it is to have effective feedback, it must be a real democracy, which is probably impossible on that scale. That's one

of my systems intuitions telling me to beware of the globalization fad.

Here are some examples of strengthening negative feedback controls to improve a system's self-correcting abilities:

- preventive medicine, exercise, and good nutrition to bolster the body's ability to fight disease,
- integrated pest management to encourage natural predators of crop pests,
- the Freedom of Information Act to reduce government secrecy,
- monitoring ecosystems well to report on environmental damage,
- protection for whistleblowers,
- impact fees, pollution taxes, and performance bonds to recapture the externalized public costs of private benefits.

7. The gain around driving positive feedback loops.

A negative feedback loop is self-correcting; a positive feedback loop is self-reinforcing. The more it works, the more it gains power to work some more. The more people catch the flu, the more they infect other people. The more babies are born, the more people grow up to have babies. The more money you have in the bank, the more interest you earn, the more money you have in the bank. The more the soil erodes, the less vegetation it can support, the fewer roots and leaves to soften rain and runoff, the more soil erodes. The more high-energy neutrons in the critical mass, the more they knock into nuclei and generate more.

Positive feedback loops are sources of growth, explosion, erosion, and collapse in systems. A system with an unchecked positive loop ultimately will destroy itself. That's why there are so few of them. Usually a negative loop will kick in sooner or later. The epidemic will run out of infectable people — or people will take increasingly strong steps to avoid being infected. The death rate will rise to equal the birth rate — or people will see the consequences of unchecked population growth and have fewer babies. The soil will erode away to bedrock, and after a million years the bedrock will crumble into new soil — or people will stop overgrazing, put up checkdams, plant trees, and stop the erosion.

In all those examples, the first outcome is what will

happen if the positive loop runs its course, the second is what will happen if there's an intervention to reduce its self-multiplying power. Reducing the gain around a positive loop — slowing the growth — is usually a more powerful leverage point in systems than strengthening negative loops, and much preferable to letting the positive loop run.

Population and economic growth rates in the world model are leverage points, because slowing them gives the many negative loops, through technology and markets and other forms of adaptation, all of which have limits and delays, time to function. It's the same as slowing the car when you're driving too fast, rather than calling for more responsive brakes or technical advances in steering.

Another example: there are many positive feedback loops in society that reward the winners of a competition with the resources to win even bigger next time. Systems folks call them "success to the successful" loops. Rich people collect interest; poor people pay it. Rich people pay accountants and lean on politicians to reduce their taxes; poor people can't. Rich people give their kids inheritances and good educations; poor kids lose out. Anti-poverty programs are weak negative loops that try to counter these strong positive ones. It would be much more effective to weaken the positive loops. That's what progressive income tax, inheritance tax, and universal high-quality public education are meant to do. (If rich people can buy government and weaken, rather than strengthen those measures, the government, instead of balancing "success to the successful" loops, becomes just another instrument to reinforce them!)

The most interesting behavior that rapidly turning positive loops can trigger is chaos. This wild, unpredictable, unreplicable, and yet bounded behavior happens when a system starts changing much, much faster than its negative loops can react to it. For example, if you keep raising the capital growth rate in the world model, eventually you get to a point where one tiny increase more will shift the economy from exponential growth to oscillation. Another nudge upward gives the oscillation a double beat. And just the tiniest further nudge sends it into chaos.

I don't expect the world economy to turn chaotic any time soon (not for that reason, anyway). That behavior occurs only in unrealistic parameter ranges, equivalent to doubling the size of the economy within a year. Real-world systems can turn chaotic, however, if something in them can grow or decline very fast. Fast-replicating bacteria or insect populations, very infectious epidemics, wild speculative bubbles in money systems, neutron fluxes in the guts of nuclear power plants. Systems with fast positive loops like these are hard to control. Control must involve slowing down

the positive feedbacks.

In more ordinary systems, look for leverage points around birth rates, interest rates, erosion rates, “success to the successful” loops, any place where the more you have of something, the more you have the possibility of having more.

6. The structure of information flows (who does and does not have access to information).

There was this subdivision of identical houses, the story goes, except that for some reason the electric meter in some of the houses was installed in the basement and in others it was installed in the front hall, where the residents could see it constantly, going round faster or slower as they used more or less electricity. With no other change, with identical prices, electricity consumption was 30 percent lower in the houses where the meter was in the front hall.

Systems-heads like me love that story because it’s an example of a high leverage point in the information structure of the system. It’s not a parameter adjustment, not a strengthening or weakening of an existing loop. It’s a NEW LOOP, delivering feedback to a place where it wasn’t going before.

A more recent example is the Toxic Release Inventory — the U.S. government’s requirement, instituted in 1986, that every factory releasing hazardous air pollutants report those emissions publicly every year. Suddenly every community could find out precisely what was coming out of the smokestacks in town. There was no law against those emissions, no fines, no determination of “safe” levels, just information. But by 1990 emissions dropped 40 percent. They’ve continued to go down since, not because of police action, but because of corporate shame. One chemical company that found itself on the Top Ten Polluters list reduced its emissions by 90 percent, just to “get off that damn list.”

Missing feedback is one of the most common causes of system malfunction. Adding or restoring information can be a powerful intervention, usually much easier and cheaper than rebuilding physical infrastructure. The tragedy of the commons that is crashing the world’s commercial fisheries occurs because there is no feedback from the state of the fish population to the decision to invest in fishing vessels. (Contrary to economic opinion, the price of fish doesn’t provide that feedback. As the fish get more scarce and hence more expensive, it becomes all the more profitable to go out and catch them. That’s a perverse feedback, a positive loop that leads to collapse.)

It’s important that missing feedback be restored to the right place and in compelling form. To take another

tragedy of the commons, it’s not enough to inform all the users of an aquifer that the groundwater level is dropping. That could initiate a literal race to the bottom. It would be more effective to set a water price that rises steeply as the pumping rate begins to exceed the recharge rate.

Compelling feedback. Suppose taxpayers got to specify on their return forms what government services their tax payments must be spent on. (Radical democracy!) Suppose any town or company that puts a water intake pipe in a river had to put it immediately DOWNSTREAM from its own outflow pipe. Suppose any public or private official who made the decision to invest in a nuclear power plant got the waste from that plant stored on his/her lawn. Suppose (this is an old one) the generals who declare war were required to spend that war in the front lines.

There is a systematic tendency on the part of human beings to avoid accountability for their own decisions. That’s why there are so many missing feedback loops — and why this kind of leverage point is so often popular with the masses, unpopular with the powers that be, and effective, if you can get the powers that be to permit it to happen (or go around them and make it happen anyway).

5. The rules of the system (incentives, punishments, constraints).

The rules of the system define its scope, its boundaries, its degrees of freedom. Thou shalt not kill. Everyone has the right of free speech. Contracts are to be honored. The president serves four-year terms and cannot serve more than two of them. Nine people on a team, you have to touch every base, three strikes and you’re out. If you get caught robbing a bank, you go to jail.

Mikhail Gorbachev came to power in the USSR and opened information flows (*glasnost*) and changed the economic rules (*perestroika*). There was a man who, for better or worse, played with high leverage points.

Constitutions are the strongest examples of social rules. Physical laws such as the second law of thermodynamics are absolute rules, whether we understand them or not or like them or not. Laws, punishments, incentives, and informal social agreements are progressively weaker rules.

To demonstrate the power of rules, I like to ask my students to imagine different ones for a college. Suppose the students graded the teachers, or each other. Suppose there were no degrees: you come to college when you want to learn something, and you leave when you’ve learned it. Suppose tenure were awarded to pro-

fessors according to their ability to solve real-world problems, rather than to publish academic papers. Suppose a class got graded as a group, instead of as individuals.

As we try to imagine restructured rules like that and what our behavior would be under them, we come to understand the power of rules. They are strong leverage points. Power over the rules is real power. That's why lobbyists congregate when Congress writes laws, and why the Supreme Court, which interprets and delineates the Constitution — the rules for writing the rules — has even more power than Congress. If you want to understand the deepest malfunctions of systems, pay attention to the rules, and to who has power over them.

That's the main reason why my systems intuition was sending off alarm bells as the new world trade system was explained to me. It is a system with rules designed by corporations for the benefit of corporations. Its rules exclude almost any feedback from any other sector of society. Most of its meetings are closed even to the press (no information flow, missing feedback). It forces nations into positive loops, competing with each other to weaken environmental and social safeguards in order to attract corporate investment. It's a recipe for unleashing "success to the successful" loops, until they generate enormous accumulations of power and huge centralized planning systems that will destroy themselves, just as the Soviet Union destroyed itself, and for similar systemic reasons.

4. The power to add, change, evolve, or self-organize system structure.

The most stunning thing living systems and some social systems can do is to change themselves utterly by creating whole new structures and behaviors. In biological systems that power is called evolution. In human economies it's called technical advance or social revolution. In systems lingo it's called self-organization.

Self-organization means changing any aspect of a system lower on this list — adding completely new physical structures, such as brains or wings or computers — adding new negative or positive loops, or new rules. The ability to self-organize is the strongest form of system resilience. A system that can evolve can survive almost any change, by changing itself. The human immune system has the power to develop new responses to (some kinds of) insults it has never before encountered. The human brain can take in new information and pop out completely new thoughts.

The power of self-organization seems so wondrous that we tend to regard it as mysterious, miraculous, manna from heaven. Economists often model technol-

ogy as literal manna — coming from nowhere, costing nothing, increasing the productivity of an economy by some steady percent each year. For centuries people have regarded the spectacular variety of nature with the same awe. Only a divine creator could bring forth such a self-organizing creation.

Further investigation of self-organizing systems reveals that the divine creator, if there is one, does not have to produce super-complex miracles. He, she, or it just has to write marvelously clever RULES FOR SELF-ORGANIZATION. These rules basically govern how, where, and what the system can add onto or subtract from itself under what conditions. As hundreds of self-organizing computer models have demonstrated, complex and delightful patterns can evolve from quite simple evolutionary algorithms. (That need not mean that real-world algorithms are simple, only that they can be.) The genetic code within the DNA that is the basis of all biological evolution contains just four different letters, combined into words of three letters each. That pattern, and the rules for replicating and rearranging it, has been constant for something like three billion years, during which it has spewed out an unimaginable variety of failed and successful self-evolved creatures.

Self-organization is basically a matter of an evolutionary raw material — a highly variable stock of information from which to select possible patterns — and a means for experimentation, for selecting and testing new patterns. For biological evolution the raw material is DNA, one source of variety is spontaneous mutation, and the testing mechanism is something like punctuated Darwinian selection. For technology the raw material is the body of understanding science has accumulated and stored in libraries and in the brains of its practitioners. The source of variety is human creativity (whatever THAT is) and the selection mechanism can be whatever the market will reward or whatever governments and foundations will fund or whatever meets human needs.

When you understand the power of system self-organization, you begin to understand why biologists worship biodiversity even more than economists worship technology. The wildly varied stock of DNA, evolved and accumulated over billions of years, is the source of evolutionary potential, just as science libraries and labs and universities are the source of technological potential. Allowing species to go extinct is a systems crime, just as randomly eliminating all copies of particular science journals, or particular kinds of scientists, would be.

The same could be said of human cultures, of course, which are the store of behavioral repertoires, accumulated over not billions, but hundreds of thousands of years. They are a stock out of which social evolution

can arise. Unfortunately, people appreciate the precious evolutionary potential of cultures even less than they understand the preciousness of every genetic variation in the world's ground squirrels. I guess that's because one aspect of almost every culture is the belief in the utter superiority of that culture.

Insistence on a single culture shuts down learning. Cuts back resilience. Blocks social evolution. Any system, biological, economic, or social, that gets so entrenched that it cannot self-evolve, a system that scorns experimentation and wipes out the raw material of innovation, is doomed over the long term on this highly variable planet.

The intervention point here is obvious, but unpopular. Encouraging variability and experimentation and diversity means "losing control." Let a thousand flowers bloom and ANYTHING could happen! Who wants that?

3. The goals of the system.

Right there, the diversity-destroying consequence of the push for control, that demonstrates why the goal of a system is a leverage point superior to the self-organizing ability of a system. If the goal is to bring more and more of the world under the control of one particular central planning system (the empire of Genghis Khan, the world of Islam, the People's Republic of China, Wal-Mart, whatever), then everything further down the list, physical stocks and flows, feedback loops, information flows, even self-organizing behavior, will be twisted to conform to that goal.

That's why I can't get into arguments about whether genetic engineering is a "good" or a "bad" thing. Like all technologies, it depends upon who is wielding it, with what goal. The only thing one can say is that if corporations wield it for the purpose of generating marketable products, that is a very different goal, a different selection mechanism, a different direction for genetic evolution than anything the planet has seen so far.

As my little single-loop examples have shown, most negative feedback loops within systems have their own goals — to keep the bathwater at the right level, to keep the room temperature comfortable, to keep inventories stocked at sufficient levels, to keep enough water behind the dam. Those goals are important leverage points for pieces of systems, and most people realize that. If you want the room warmer, you know the thermostat setting is the place to intervene. But there are larger, less obvious, higher-leverage goals, those of the entire system.

Even people within systems don't often recognize what whole-system goal they are serving. To make prof-

its, most corporations would say, but that's just a rule, a necessary condition to stay in the game. What is the point of the game? To grow, to increase market share, to bring the world (customers, suppliers, regulators) more and more under the control of the corporation, so that its operations becomes ever more shielded from uncertainty. John Kenneth Galbraith recognized that corporate goal — to engulf everything — long ago.⁵ It's the goal of a cancer cell too. Actually it's the goal of every living population — and only a bad one when it isn't balanced by higher-level negative feedback loops that never let an upstart power-loop-driven entity control the world. The goal of keeping the market competitive has to trump the goal of each corporation to eliminate its competitors (and brainwash its customers and swallow its suppliers), just as in ecosystems, the goal of keeping populations in balance and evolving has to trump the goal of each population to reproduce without limit.

I said awhile back that changing the players in the system is a low-level intervention, as long as the players fit into the same old system. The exception to that rule is at the top, where a single player can sometimes have the power to change the system's goal. I have watched in wonder as — only very occasionally — a new leader in an organization, from Dartmouth College to Germany, comes in, enunciates a new goal, and swings hundreds or thousands or millions of perfectly intelligent, rational people off in a new direction.

That's what Ronald Reagan did. Not long before he came to office, a president could say "Ask not what government can do for you, ask what you can do for the government," and no one even laughed. Reagan said over and over, the goal is not to get the people to help the government and not to get government to help the people, but to get government off our backs. One can argue, and I would, that larger system changes and the rise of corporate power over government let him get away with that. But the thoroughness with which the public discourse in the U.S. and even the world has been changed since Reagan is testimony to the high leverage of articulating, meaning, repeating, standing up for, insisting upon new system goals.

2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.

Another of Jay Forrester's famous sayings goes: it doesn't matter how the tax law of a country is written. There is a shared idea in the minds of the society about what a "fair" distribution of the tax load is. Whatever the rules say, by fair means or foul, by complications, cheating, exemptions or deductions, by constant sniping at the rules, actual tax payments will push right up against the accepted idea of "fairness."

The shared ideas in the minds of society, the great big unstated assumptions — unstated because unnecessary to state; everyone already knows them — constitute that society's paradigm, or deepest set of beliefs about how the world works. There is a difference between nouns and verbs. Money measures something real and has real meaning (therefore people who are paid less are literally worth less). Growth is good. Nature is a stock of resources to be converted to human purposes. Evolution stopped with the emergence of *Homo sapiens*. One can "own" land. Those are just a few of the paradigmatic assumptions of our current culture, all of which have utterly dumfounded other cultures, who thought them not the least bit obvious and in fact quite dangerous.

Paradigms are the sources of systems. From them, from shared social agreements about the nature of reality, come system goals and information flows, feedbacks, stocks, flows and everything else about systems. No one has ever said that better than Ralph Waldo Emerson:

Every nation and every man instantly surround themselves with a material apparatus which exactly corresponds to ... their state of thought. Observe how every truth and every error, each a thought of some man's mind, clothes itself with societies, houses, cities, language, ceremonies, newspapers. Observe the ideas of the present day ... see how timber, brick, lime, and stone have flown into convenient shape, obedient to the master idea reigning in the minds of many persons.... It follows, of course, that the least enlargement of ideas ... would cause the most striking changes of external things.⁶

The ancient Egyptians built pyramids because they believed in a particular kind of afterlife. We build skyscrapers, because we believe that space in downtown cities is enormously valuable. (Except for blighted spaces, often near the skyscrapers, which we believe are worthless.) Whether it was Copernicus and Kepler showing that the earth is not the center of the universe, or Einstein hypothesizing that matter and energy are interchangeable, or Adam Smith postulating that the selfish actions of individual players in markets magically accumulate to the common good, people who have managed to intervene in systems at the level of paradigm have hit a leverage point that totally transforms systems.

You could say paradigms are harder to change than anything else about a system, and therefore this item

should be lowest on the list, not second-to-highest. But there's nothing physical or expensive or even slow in the process of paradigm change. In a single individual it can happen in a millisecond. All it takes is a click in the mind, a falling of scales from eyes, a new way of seeing. Whole societies are another matter — they resist challenges to their paradigm harder than they resist anything else.

So how do you change paradigms? Thomas Kuhn, who wrote the seminal book about the great paradigm shifts of science,⁷ has a lot to say about that. In a nutshell, you keep pointing at the anomalies and failures in the old paradigm, you keep coming yourself, and loudly and with assurance from the new one, you insert people with the new paradigm in places of public visibility and power. You don't waste time with reactionaries; rather you work with active change agents and with the vast middle ground of people who are open-minded.

Systems folks would say you change paradigms by modeling a system, which takes you outside the system and forces you to see it whole. We say that because our own paradigms have been changed that way.

1. The power to transcend paradigms.

There is yet one leverage point that is even higher than changing a paradigm. That is to keep oneself unattached in the arena of paradigms, to stay flexible, to realize that NO paradigm is "true," that every one, including the one that sweetly shapes your own worldview, is a tremendously limited understanding of an immense and amazing universe that is far beyond human comprehension. It is to "get" at a gut level the paradigm that there are paradigms, and to see that that itself is a paradigm, and to regard that whole realization as devastatingly funny. It is to let go into Not Knowing, into what the Buddhists call enlightenment.

People who cling to paradigms (which means just about all of us) take one look at the spacious possibility that everything they think is guaranteed to be nonsense and pedal rapidly in the opposite direction. Surely there is no power, no control, no understanding, not even a reason for being, much less acting, in the notion or experience that there is no certainty in any worldview. But, in fact, everyone who has managed to entertain that idea, for a moment or for a lifetime, has found it to be the basis for radical empowerment. If no paradigm is right, you can choose whatever one will help to achieve your purpose. If you have no idea where to get a purpose, you can listen to the universe (or put in the name of your favorite deity here) and do his, her, its will, which is probably a lot better informed than your will.

It is in this space of mastery over paradigms that

people throw off addictions, live in constant joy, bring down empires, get locked up or burned at the stake or crucified or shot, and have impacts that last for millennia.

Back from the sublime to the ridiculous, from enlightenment to caveats. There is so much that has to be said to qualify this list. It is tentative and its order is slithery. There are exceptions to every item that can move it up or down the order of leverage. Having had the list percolating in my subconscious for years has not transformed me into a Superwoman. The higher the leverage point, the more the system will resist changing it — that's why societies do their utmost to rub out truly enlightened beings.

Magical leverage points are not easily accessible, even if we know where they are and which direction to push on them. There are no cheap tickets to mastery. You have to work hard at it, whether that means rigorously analyzing a system or rigorously casting off your own paradigms and throwing yourself into the humility of Not Knowing. In the end, it seems that mastery has less to do with pushing leverage points than it does with strategically, profoundly, madly letting go.

¹ J.W. Forrester, *World Dynamics*, Portland OR, Productivity Press, 1971

² J.W. Forrester, *Urban Dynamics*, Portland OR, Productivity Press, 1969.

³ Thanks to David Holmstrom of Santiago, Chile.

⁴ For an example, see Dennis Meadows's model of commodity price fluctuations: D.L. Meadows, *Dynamics of Commodity Production Cycles*, Portland OR, 1970.

⁵ John Kenneth Galbraith, *The New Industrial State*, 1967.

⁶ Ralph Waldo Emerson, "War," (lecture delivered in Boston, March, 1838). Reprinted in Emerson's *Complete Works*, vol. XI, Boston, Houghton, Mifflin & Co., 1887, p. 177.

⁷ Thomas Kuhn, *The Structure of Scientific Revolutions*, Chicago, University of Chicago Press, 1962.

REPORTS FROM PENANG AND LOS ANGELES

by Alan AtKisson

(Excerpts from an email diary)

Penang, Malaysia
November 6, 1997

The haze is not so bad today. The night I arrived, I went out for a quick walk. Within five minutes my eyes, nose and throat were burning. It's the fire in Sumatra that's burning my throat. That faint, but noxious smell is the scent of whole ecosystems on fire.

They call it the "haze," a word that sounds deceptively benign. It's really a kind of smog, and it comes from the forests and peat bogs of Sumatra, burned to make way for agribusiness. At its worst, you can't see more than a kilometer, and the hills disappear. It tends to clear up on Friday and Saturday; those who set the fires tend to take the weekend off. So it's not just the fire itself that's out of control (though it is; now that the peat bogs and coal seams have ignited, it will be years before they can be put out, if ever). It's the men who set the fire who are out of control.

I'm here to talk about indicators, and ironically, the haze has made an indicator famous in Malaysia: the Air Pollutant Index, or API. Also ironically, the word "api," in Malay, means fire.

Most Malaysians are concerned not with the environmental haze, but the economic one: the currency devaluation and the market crash singed everyone's pocketbooks.

But I am not letting the haze slow me down. I am happily and nostalgically eating my way through this cultural kaleidoscope of a city. I've already had my nasi lemak (rice cooked in coconut milk, with egg and dried fish), Hokkien prawn mee (egg noodles and shrimp in a very spicy broth), and Indian curries. Still to come are roti canai (a kind of fried bread), dosai (Indian pancakes), satay (Malay barbecue), and my all-time favorite, Penang laksa (a tangy fish stew with big white noodles). The prices are cheap, the tastes are rich. Dinner for two at a fine Indian restaurant was about \$4, including drinks. The Hokkien mee, bought from a street hawker in a busy market, cost 75 cents — and I'm still relishing its memory.

I need the calories, because Salma and Lubis, my hosts, are keeping me very busy. Today I did a press conference for the English and Chinese newspapers and gave a talk at the Organic Farming Collective (one of only three organic farms in Malaysia). Tomorrow I do

a press interview, a radio interview and musical performance, a public talk and concert. Saturday and Sunday is the Sustainable Penang Initiative's indicator roundtable, which I am suddenly co-facilitating as well as keynoting.

Khoo Salma Nasution is a Hokkien Chinese, and Penang's resident expert on cultural heritage. Abdur Razzaq Lubis, her husband, is a Mendailing — a warrior tribe originally from Sumatra, an ethnic minority in Malaysia, with a long history of civil war and mercenary adventure — who writes on environment, economics, and culture. Salma studied at Duke, Lubis was a journalist in London. English is their principal language, as it is for most educated Malaysians, though each was raised with a different mother tongue. Their beautiful Malaysian accent, with its musical ups and downs and the frequent use of the Malay ending "-lah", is rubbing off on me. I'll be sounding Malaysian by the end of the week, just as I did when I lived here.

Salma and Lubis are like Penang in miniature: a rich, vibrant, mixture of wonderful intelligence, feeling, and diversity. I'm so happy to be here again I can barely stand it.

Singapore
November 10, 1997

Singapore, on the other hand, is so clean and developed and friendly I can barely stand it. Singapore is a sort of Disneyfied Malaysia. I'm only here for one night, on my way home, so it's not so bad. It's a stifling sort of comfort, but it's comfort nonetheless.

My work in Penang is done, and it's also — I hope — just beginning. I've been so busy I've had no chance to write. And just as I expected, Malaysia has given me an entirely fresh perspective on the work I do. It's underscored for me the linkage between the music, writing, and consulting on sustainability — a combination which made perfect sense here. It's opened new doors, refreshed my enthusiasm. I wish you could have seen and heard the warmth, passion, and extraordinary competence and commitment of the roundtable participants, e.g.:

— a very busy Indian doctor who, in his spare time and as a volunteer, did a breakthrough study of lead levels in schoolchildren, an

issue previously ignored by the government but impossible to ignore now that it made front-page news (Malaysia still sells leaded gas);

— the vibrant and inspirational **Anwar Fazal**, who has been responsible for starting or co-founding literally dozens of NGOs, ranging from the Sustainable Transport Action Network for Asia & the Pacific to the World Alliance for Breast-Feeding Action (he gets people excited about the issue, finds funding, and throws in committed younger people to run them);

— the letter circulated and signed by the group of prominent academics, activists, business leaders, etc. in attendance, boldly challenging the government on its recent gag order (academics are forbidden from speaking of the haze, because the government feared the economic consequences if the foreign press covered what they had to say);

— the commitment of Penang’s state minister for Economic Planning to making sustainability something real, bravely countering the strong development lobby;

... and so much more I can’t begin to record it. In a city where a huge mall gets around zoning and planning restrictions by putting a water-slide attraction on its roof and getting it declared “open space” ... in a country that has been known to jail environmental activists just on general principle ... at a time when even water quality data gathering has been privatized, and getting the data costs literally tens of thousands of dollars ... the odds are stacked against an effort like this: to re-define Penang’s well-being, to promote sustainability, to hold decision-makers accountable with a report-card of comprehensive indicators. But this group has grabbed on to the task with intensity, joy and humor (everybody’s singing my “GDP Song” now). They are lighting candles at a pace that just might outpace darkness. Other projects in other parts of the world would do well to take inspiration from them. And I will do whatever I can to support their success.

Malaysia has, of course, astonished me with its technological advances; Penang is where Intel, Hewlett-Packard, and a bunch of other companies make most of their computer chips. It has the third longest bridge in the world. It’s a sophisticated place, a consumer society, an industrial economy with more jobs than people — not a “developing country.” I could write at length (and I will, elsewhere) in a more travelogue vein about what’s changed in the country since I was last here fifteen years ago — more conservative Islam, more cell

phones, more jellyfish in the ecologically disturbed waters. Much is also still the same — food stalls, crowded markets, hands that touch the heart after they shake your hand. But what’s most important to me is what is both still the same, and changing, growing: my love for these people and this culture, and their love for this wonderful place.

Los Angeles
December 1, 1997

Sometimes a night of watching television in a Travelodge Motel in east Los Angeles will give you a new perspective on life.

Let me explain.

Nighttime on the San Bernadino Freeway. I’m driving toward Joshua Tree National Monument. Sixty-five miles per hour, and it feels like a crawl. I’ve done my morning talk on indicators at a large California Foundation (it went well). I’ve also just finished a harrowing evening performance at a Santa Monica bookstore — exhausted, feeling outclassed by a local comedy songwriter of pyrotechnic talent (Roy Zimmerman, watch for him), and deeply disturbed by the “comic” monologues of a rat-face-making misanthrope who preceded me (“Nobody’s happy ... except when they’re alone! Squeak!”). It was the first time in years that I practically froze up on stage (“I ... amhappy ... to ... with you ... be ... here ... Really!”), and barely managed to croak out my three songs, to a crowd with the responsiveness of tropical fish. Or so it seemed to me, in my shell-shocked state.

I’ve always hated L.A., so I’m high-tailing it out of town. Tomorrow I have the day to myself, no commitments, and I plan to spend it in the desert. Thinking, writing, silent ... a sort of mini-retreat.

But I’m too tired to drive all the way tonight, so I pull into the Travelodge at Covino, in run-down east L.A., get straight into bed, and pop on the TV. This is why I don’t own a TV: because when one is accessible, I watch it compulsively. It’s an addiction acquired in childhood.

The first thing I see is a very naked woman. It turns out that this Travelodge carries the Playboy Channel. I’m wondering about the Mexican family that checked in when I did; what do the parents say to the kids when they channel surf past these shapely young women with a penchant for undressing and sliding down firepoles?

Fortunately, there are a couple of good movies on HBO to distract me away. “Edie and Pen” is a funny, well-acted, richly textured story of two women in Las

Vegas dealing with their recent divorces, the broken-down men they always latch on to, and the improbable coincidences linking their lives. I learned a lot about relationships from this movie: basically, women are superior to men, and men are generally depraved.

But the real stunner, the mind-boggler, is “Gumby.”

You remember Gumby! Little green clay fellow, who can be bent into any number of shapes, and his pal Pokey the horse. Well, apparently a bunch of very smart, very post-modern San Francisco artists got a hold of Gumby, and they have made a wonderfully bizarre clay-mation “children’s movie.” It’s a kind of pop-culture art-bomb. Gumby and his pals have a rock band, and they live in a library, and they can enter any book in the library and be in that book’s world — whether it’s “Knights of the Round Table,” “Down on the Farm,” or “Astral Battles” (a knock-off of Star Wars, complete with light sabers). They’re being attacked by the evil robots and computers from the book “About Robots and Computers.” High-jinks and escapades ensue, with Gumby getting sliced, diced, frozen, splatted, cut neatly in two (by a light saber), yet somehow he always knits himself back together. Sometimes he multiplies little Gumbies who all speak in unison. I’m telling you, it’s weird. Check out the surreal “music video” at the end of the movie, and see if you don’t come away from this film asking some basic philosophical questions about the awesome power of the media in a consumer society, and the roots of personal identity. I mean, who is Gumby, anyway? Who are you?

Watching Gumby was almost like doing psychedelic drugs (or so I presume; I avoid ingesting compounds designed to make you smell colors or converse with giant mushrooms). So, when I emerged from the Travelodge the next morning, I realized I didn’t need to drive two more hours to be in the desert. I was already in the desert called Los Angeles. I decided to explore it, and its mirages, on my terms.

I had planned to spend my day of retreat in fasting, till sundown. And this I did. But instead of contemplating cactus and eternal horizons and the empty landscape of the mind, I went straight to the black hole at the heart of America’s pop-culture mecca. I went to Universal Studios.

This was a kind of spiritual experiment: to put myself in the mode of “being on retreat,” staying mostly silent, not eating, being very attentive to the currents in both the outer and inner world — in a theme park based on America’s movie culture.

The words used to describe this experience all begin with “D”: Dizzying. Disturbing. Distressing. Discouraging. Depleting. And very, very disillusioning

— meaning, it dispelled the star-dust that America conjures up around itself and blows out, magician-like, into the eyes of the world.

I mean, how can you ever take American culture seriously again once you’ve ridden on the “E.T. Adventure Ride”? Your “magic bicycle” carries you past E.T.’s giant-sized “Teacher,” who is dressed in a toga of green leaves and talks like a Hollywood Indian about needing ET to come home and “heal our green planet” because they’re “out of harmony with nature.” Then you visit ET’s planet itself, and it’s like a bad acid trip — you know, multi-colored talking mushrooms, with lots of little ET’s singing a happy little ET song. This one ride co-opts and renders meaningless (1) the global environmental crisis, (2) Native American and other tribal experience, (3) 1960s psychedelica, and (4) the whole of science fiction. (How would a bunch of pseudo-Indian-eco-ETs dressed in leaves ever make it to Earth in spaceships?)

The other rides aren’t much better, and they all have one basic message: Buy Things. When you get off the Jurassic Park boat ride, you are dumped into the Jurassic Park store. Buy Things. Same with Back to the Future: after you get slung around in a hydraulic car synched up to images on a huge movie screen, welcome to the Time Depot. Buy Things.

And if you are fasting, and attentive, you’ll notice this horrible vacancy, a true boredom, on the faces of virtually everyone in the park. Their eyes brighten a bit at the sight of a “Jurassic Park” Brontosaurus or a “Backdraft” fireball, but they are bored and listless on the way in, and bored and listless on the way out. It’s as though their psyches are instantly addicted to the intense experiences offered by the illusion machines, and in between hits, they look like junkies. Dazed, they Buy Things.

Three hours of this and I had taken in my psyche’s fill.

So of course I went to the movies.

Alien Resurrection.

It was hilarious. Thoroughly stupid. I loved it. All I could think of was how ennobling it must have been to be on one of those soundstages, watching people dressed up in alien suits. I watched the movie with a detachment that carried me far beyond irony, beyond despair, “beyond the beyond” in the Buddhist phrase, to a plane of perspective I’d never quite visited before.

Yes, the movie was as real as anything else in Los Angeles. More real, actually.

As the sun set, I wended my way down Santa Monica

Boulevard, through Hollywood and Beverly Hills, cruising slowly in my rented car, feeling a great sense of equanimity and beatific calm. I no longer hated Los Angeles. How can one hate an illusion? All the emotions of the day — despair, dismay, delight, disbelief — had left me drained, emptier than two weeks on a

meditation cushion. Los Angeles simply is/is not. I simply am/am not. I parked on Ocean Drive, stood on the beach, pointed my finger at the waxing moon, then walked to the big mall at the end of the Santa Monica Promenade. I bought a big spinach salad.

Every bite was a revelation.

THE 50TH ANNIVERSARY OF THE UNIVERSAL DECLARATION OF HUMAN RIGHTS

(Fifty years ago, in the aftermath of World War II, a battered but still idealistic group of United Nations leaders drafted and pushed into adoption the Universal Declaration of Human Rights. Already in 1948 the chief controversy was between the Soviet Union's emphasis on economic rights, and the United States's insistence on political rights. Eleanor Roosevelt, chairman of the drafting commission solved the controversy by including both.

Many people in the year 1998 will be using the fiftieth anniversary of this historic declaration as an opportunity to look back on 50 years of bleak implementation of these principles, and to look forward to the next fifty years and hope to do better. Above all, this will be a good year to remind ourselves of the principles — and to add a few more on behalf of the rights of other species beside our own. Here is the Declaration as written 50 years ago.)

PREAMBLE

Whereas recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice and peace in the world,

Whereas disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind, and the advent of a world in which human beings shall enjoy freedom of speech and belief and freedom from fear and want has been proclaimed as the highest aspiration of the common people,

Whereas it is essential, if man is not to be compelled to have recourse, as a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law,

Whereas it is essential to promote the development of friendly relations between nations,

Whereas the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have determined to promote social progress and better standards of life in larger freedom,

Whereas Member States have pledged themselves to achieve, in cooperation with the United Nations, the promotion of universal respect for and observance of human rights and fundamental freedoms,

Whereas a common understanding of these rights and freedoms is of the greatest importance for the full realization of this pledge,

Now, therefore, The General Assembly, Proclaims this Universal Declaration of Human Rights as a common standard of achievement for all peoples and all nations, to the end that every individual and every organ of society, keeping this Declaration constantly in

mind, shall strive by teaching and education to promote respect for these rights and freedoms and by progressive measures, national and international, to secure their universal and effective recognition and observance, both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction.

Article 1

All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.

Article 2

Everyone is entitled to all the rights and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.

Furthermore, no distinction shall be made on the basis of the political, jurisdictional or international status of the country or territory to which a person belongs, whether it be independent, trust, non-self-governing or under any other limitation of sovereignty.

Article 3

Everyone has the right to life, liberty and security of person.

Article 4

No one shall be held in slavery or servitude; slavery and the slave trade shall be prohibited in all their forms.

Article 5

No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment.

Article 6

Everyone has the right to recognition everywhere as a person before the law.

Article 7

All are equal before the law and are entitled without any discrimination to equal protection of the law. All are entitled to equal protection against any discrimination in violation of this Declaration and against any incitement to such discrimination.

Article 8

Everyone has the right to an effective remedy by the competent national tribunals for acts violating the fundamental rights granted him by the constitution or by law.

Article 9

No one shall be subjected to arbitrary arrest, detention or exile.

Article 10

Everyone is entitled in full equality to a fair and public hearing by an independent and impartial tribunal, in the determination of his rights and obligations and of any criminal charge against him.

Article 11

1. Everyone charged with a penal offence has the right to be presumed innocent until proved guilty according to law in a public trial at which he has had all the guarantees necessary for his defence.

2. No one shall be held guilty of any penal offence on account of any act or omission which did not constitute a penal offence, under national or international law, at the time when it was committed. Nor shall a heavier penalty be imposed than the one that was applicable at the time the penal offence was committed.

Article 12

No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.

Article 13

1. Everyone has the right to freedom of movement and residence within the borders of each State.

2. Everyone has the right to leave any country, including his own, and to return to his country.

Article 14

1. Everyone has the right to seek and to enjoy in other countries asylum from persecution.

2. This right may not be invoked in the case of prosecutions genuinely arising from non-political crimes or from acts contrary to the purposes and principles of the United Nations.

Article 15

1. Everyone has the right to a nationality.

2. No one shall be arbitrarily deprived of his nationality nor denied the right to change his nationality.

Article 16

1. Men and women of full age, without any limitation due to race, nationality or religion, have the right to marry and to found a family. They are entitled to equal rights as to marriage, during marriage and at its dissolution.

2. Marriage shall be entered into only with the free and full consent of the intending spouses.

3. The family is the natural and fundamental group unit of society and is entitled to protection by society and the State.

Article 17

1. Everyone has the right to own property alone as well as in association with others.

2. No one shall be arbitrarily deprived of his property.

Article 18

Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief, and freedom, either alone or in community with others and in public or private, to manifest his religion or belief in teaching, practice, worship and observance.

Article 19

Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

Article 20

1. Everyone has the right to freedom of peaceful assembly and association.

2. No one may be compelled to belong to an association.

Article 21

1. Everyone has the right to take part in the government of his country, directly or through freely chosen representatives.

2. Everyone has the right to equal access to public service in his country.

3. The will of the people shall be the basis of the authority of government; this will shall be expressed in

periodic and genuine elections which shall be by universal and equal suffrage and shall be held by secret vote or by equivalent free voting procedures.

Article 22

Everyone, as a member of society, has the right to social security and is entitled to realization, through national effort and international co-operation and in accordance with the organization and resources of each State, of the economic, social and cultural rights indispensable for his dignity and the free development of his personality.

Article 23

1. Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment.

2. Everyone, without any discrimination, has the right to equal pay for equal work.

3. Everyone who works has the right to just and favourable remuneration ensuring for himself and his family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection.

4. Everyone has the right to form and to join trade unions for the protection of his interests.

Article 24

Everyone has the right to rest and leisure, including reasonable limitation of working hours and periodic holidays with pay.

Article 25

1. Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

2. Motherhood and childhood are entitled to special care and assistance. All children, whether born in or out of wedlock, shall enjoy the same social protection.

Article 26

1. Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.

2. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.

3. Parents have a prior right to choose the kind of education that shall be given to their children.

Article 27

1. Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.

2. Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

Article 28

Everyone is entitled to a social and international order in which the rights and freedoms set forth in this Declaration can be fully realized.

Article 29

1. Everyone has duties to the community in which alone the free and full development of his personality is possible.

2. In the exercise of his rights and freedoms, everyone shall be subject only to such limitations as are determined by law solely for the purpose of securing due recognition and respect for the rights and freedoms of others and of meeting the just requirements of morality, public order and the general welfare in a democratic society.

3. These rights and freedoms may in no case be exercised contrary to the purposes and principles of the United Nations.

Article 30

Nothing in this Declaration may be interpreted as implying for any State, group or person any right to engage in any activity or to perform any act aimed at the destruction of any of the rights and freedoms set forth herein.

BOOK REVIEWS

Keeping Together in Time: Dance and Drill in Human History, by William H. McNeill, Harvard University Press, 1995. Reviewed by Garry Peterson

In this book William McNeill proposes the hypothesis that the “Extravagant expenditure of muscular energy in dance and song is the most fundamental of all human devices for consolidating community feeling, simply because it arouses a warm sense of togetherness, diminishing personal conflicts and facilitating cooperation.” He names this process ‘muscular bonding’, and he speculates upon its effects upon the evolution of humanity, small communities, religion, and war. He uses it to connect together dancing in early hunting and farming communities, religious trance, close-formation military drill, and mass calisthenics.

McNeill begins the book by speaking of his own experiences with army drill during World War Two, and he provides many other demonstrations of the effect of synchronized human movement on group cohesion. He is upset that it appears that there is almost no experimental evidence (that he could discover), that actually physiologically or psychologically tests the effects of dance or drill on individuals.

McNeill proposes two corollary hypotheses for the physical and social adaptive nature of rhythmic coordination. The first is that the rhythmic coordination of muscular effort makes collective tasks more efficient. Consequently, groups that rhythmically coordinate their work can outperform groups that are not coordinated. He cites a number of studies that support this case. Secondly, he proposes that the social cohesion produced by ‘moving together in time’ would have allowed the formation of larger stable communities than otherwise would be the case. Larger communities would be better able to defend themselves or impose themselves on surrounding groups, and consequently ‘rhythmic coordination’ would provide a cultural advantage.

McNeill only briefly touches on music, his main focus being on how it is used a tool for synchronizing groups, but the basic human attraction to rhythm and

melody surely merit further research. Across cultures people celebrate and relax by coming together to dance and listen to music. Why is this the case? What are the physiological effects of music? How does it alter people’s sense of time? How does it alter their thinking? Around the world, due to recorded music and radio, music is ubiquitous. Music in the foreground or more commonly in the background is everywhere. It’s on the bus, in the street, in home, in the workplace and in stores. It is interesting to speculate what effect this ubiquity of music (or perhaps muzak) has had on human consciousness. Does this continual music tranquilize, focus, or do nothing to people? Recent studies on the effects of music (Rauscher, Shaw, and Ky. 1993. *Nature* 365 (14 October 1993) & Gardner, Fox, Knowles, and Jeffrey. 1996. *Nature* 381 (23 May 1996)), suggest that music may indeed influence people’s thinking.

In his conclusion, McNeill speculates that “Large and complex societies, in all probability, cannot long maintain themselves without such kinesthetic undergirding. Ideas and ideals are not enough. Feelings matter too, and feelings are inseparable from their gestural and muscular expression.” However, the institutions that provide ‘muscular bonding’ are often resistant to secular skeptical reason, preferring mysticism, which makes many liberal rationalists deeply uneasy. McNeill proposes that the post-fascist discrediting of community building collective ‘muscular bonding’ in the liberal west, has left a void that will only be filled by non-liberal forms of community offered by sports, cults, and ethnic nationalism. He argues that secular, liberal society cannot survive unless it acknowledges and understands fundamental aspects of human existence, such as our love of rhythm. He argues that liberalism must incorporate physical community in new forms. Forms in which it is mixed with, and bounded by, skeptical, liberal, humanistic values.

One World, Ready or Not: The Manic Logic of Global Capitalism, by William Greider, 1997, 528 pages, Simon & Schuster. Reviewed by **Dana Meadows**

Greider, a great journalist, goes around the world and documents what “globalization” really means, from the 98-acre Boeing assembly plant in Everett, Washington, to the Kader toy factory in Bangkok, where Muppets and Bart Simpson dolls were made and where 188 workers, mostly women and girls, some as young as 13, all of them working for \$2-\$4 a day, were killed in a fire.

The book sounds much like our Balaton meeting on the subject of money flows. Greider expects a big crash, and tells us why, with anecdotes, statistics, and global-level analysis. By the time he’s done, you almost wish for the crash to end the craziness, except that you see it will bring even more massive human suffering. The book has sensible suggestions for how to have a sound economy without such suffering; what’s striking is how impossible they all sound in the present political climate.

Here are some provocative quotes:

“The United States crossed a critical threshold in its national worth during Bill Clinton’s presidency, though no one blamed him and, indeed few Americans seemed even to notice. In the fourth quarter of 1993, for the first time in nearly a century, the outflow of financial returns paid to foreign investors on the assets they held in America exceeded all of the profits, dividends and interest payments that American firms and investors collected from their investments abroad.” (p. 201)

“Since returns on capital are rising faster than the productive output that must pay them, the process imposes greater and greater burdens on commerce and societies — debt obligations that cannot possibly be fulfilled ... Amid the glow of personal accumulation, this divergence is difficult for individual investors to see. Instead, they plunge forward optimistically, embracing new and more speculative opportunities, despite occasional evidence that something may be awry. A period of manic investing typically unfolds at this point, as masses of investors, large and small, rush this way and that in their search.” (p, 227)

“I didn’t sell my daughter,” Pon Chaitop insisted. “She saw me suffer. She saw the family suffer. And she wanted to help.” The common transaction with brothel owners resembled bonded chattel, in which the girls were required to pay back double the amount their parents had received before they could keep any of their earnings. At another village Guan Somyong was no longer ashamed that his fifteen-year-old daughter was the first in their village to enter the sex trade. From the money she sent home, the family now had a brick house, refrigerator, TV, and stereo. “Now all the girls want to go,” her mother said. (pp. 353-354)

Wall Street, by Doug Henwood, 1997, 372 pages, Verso, 180 Varick Street, New York NY 10014-4606. Reviewed by **Dana Meadows**

Less journalistic, more analytical (therefore harder to read), more grounded in the history of economic thought, more icily angry than Greider, Henwood takes us into the thought processes of the people who play financial games. He agrees completely with Greider that these peoples’ abstract fantasies increasingly rule the world. He makes the case even more thoroughly than Greider that there is no reason whatsoever why they should. Not only does the financial world have no grounding in reality, no concern about real people or production, and no understanding of how the world works, its daily action aren’t even important to capitalize real investments.

Henwood is especially attuned to power, and to the strange but overwhelming power that abstracted financial casino players exert upon us all without even quite meaning to. He offers fewer solutions than Greider and they all come from the classic “left,” so they sound even less likely to be taken seriously.

“What are we to make socially and politically of the facts that the financial markets have so marginal a role in guiding production in advanced economies, and that the stock market’s influence on real investment is thankfully minimal? It’s that rentiers serve little social role beyond their own enrichment. As Marx said, rentiers, like paupers, live only on the revenue of the country; from an economic point of view they are equally unproductive; rentiers are simply ‘respectable paupers....’” (p. 236)

“Money, ‘the god among commodities,’ becomes *the* principal object of greed — greed in its most general form, for wealth itself, rather than more specific obsessions, ‘for clothes, weapons, jewels, women, wine, etc.’ Certainly 19th century magnates loved their money, but they also took pride in the physical capital they owned — steel mills and transcontinental railroads. Such obsessions now seem quaint; modern tycoons love their portfolios most of all. Interest-bearing capital, Marx wrote, is the most fetishistic form of all, capital *par excellence*, with profit (interest) appreciating with no more than the mere passage of time, with no apparent engagement with production: money-bearing becomes characteristic of capital ‘just as growth is characteristic of trees.’” (p. 236)

NEWS FROM THE MEMBERS

Alan AtKisson writes:

Budapest, Zurich, Munich, Berlin, Holland, Paris, Edinburgh, San Francisco, Seattle, North Carolina, Bangkok, Malaysia, Washington, New York, Boston, Zurich ...

Well, I've been doing my part for accelerating CO₂ emissions, so that nonlinear climatic turbulence can happen sooner, and the feedback will be noticed by decision makers and acted on sooner. How's that for a rationalization? Hey, at least I don't own a car. Or a television for that matter. Will someone please crunch the numbers and do a lifecycle analysis on my lifestyle?

My year of sabbatical and world tour has turned into a world hop-around. Instead of circumnavigating, my travels have proven much more stochastic and nonlinear (isn't that appropriate?) I alternate travel to speak/consult/sing with writing retreats. AtKisson & Associates has reopened its consultancy office in Seattle; Rain City Records is humming along selling my CDs and tapes out of Boston; I continue to do indicator work as a Senior Fellow at Redefining Progress. I have had so much joy in working with Balaton and Balaton-related friends from East Asia to Western Europe, that I look forward to 1998 with much anticipation.

Current projects: developing a one-man comedy/musical show built around my sustainability songs; another one-man theater/musical piece built around my Rilke songs; and a bunch of writing. And promoting the music, of course.

Need a troubadour/speaker/consultant on sustainability? You know where to find me ... on the internet. It goes wherever I go (AtKisson@aol.com). Keep tending the flame, folks ...

* * *

A hurried note from **Valdis Bisters**:

The last three weeks I was completely absorbed by running four workshops for local authorities on the topic: Local Democracy and Sustainable Development. Basic focus on public participation in development planning and project management.

Yesterday I returned from a two-day workshop for Eastern Latvia Region Development where the Canadian Urban Institute invited me and Agija to facilitate part of the workshop. It was the first time that we facilitated a high level meeting where politicians, planners and business people were working for finding development options for the whole region.

And a later note from the same busy source:

I have started to work for the Ministry of Environmental Protection and Regional Development, meanwhile remaining a lecturer at the University of Latvia Centre for Environmental Science and Management Studies. I relate this change to some political possibilities to build in demand for training and addition I do it for financial reasons. It will make easier for me to manage my family budget. Agija is expecting a baby in mid-February. Major projects at the University expire already this summer and there were big difficulties to new ones due to raising of the university bureaucracy.

My new position at the Ministry of Environmental Protection and Regional Development is Head of External Relations Division. I have five people on staff working on international and public relations, including Special Attaché on environmental protection and regional development issues in Brussels.

There will be regular work with different target audiences including mass media on issues related to the National Environmental Policy Plan and different activities of the ministry. I already started to launch the process of Environmental Education and Communication Strategy design. I will coordinate also training activities coming from international partners. I have agreed with my direct boss, who is Director of Investment Department, that my special interest is sustainable development (capacity building through project work and training) and also pedagogical work related to my PhD.

My new address for mailing is

Valdis Bisters
External Relations Division
Ministry of Environmental Protection and
Regional Development of the Republic of
Latvia
Peldu St. 25 Riga LV-1494 Latvia

Dennis Meadows adds a P.S.: In addition Valdis has purchased personally 27 acres of undeveloped forest and open land near his home outside Riga. He intends to create a team-building center there to raise the capacities of groups interested in sustainable development.

* * *

John de Graaf has good news about his documentary "Affluenza":

Just wanted to let everyone know that the PBS national broadcast of AFFLUENZA in the U.S. was a ter-

rific success. Around 3 million people watched, which is only about average for PBS programs, but the response afterward was overwhelming. Some of the local networks had their phone systems completely tied up by people calling to get more information, get videotapes or just say they liked the program. New York reported that they received no negative calls at all (which for NY is very unusual indeed). Conservative Salt Lake City received more than 350 calls from viewers. By contrast, in a typical week, the top program of the week receives about 30 calls.

We have been bombarded by letters, calls and e-mails here, nearly all of them positive. I think people really responded well to the sustainability part of the message and the warnings about the impact of American consumerism on our global environment. It shows that there is a small but significant group of people out there ready to make some big changes and that the message to consume less resonates with many people in this consumption-crazy country. We hope the program will be broadcast in many other countries and we will let people know about that as it happens.

Additionally, I'm developing a documentary television program on the downside of global tourism—the negative effects of the travel industry on environment and cultures—and about alternatives. It's tentatively called "GOING, GOING..." If you know of any good stories from around the world or your own countries about this issue, please let me know.

It was a wonderful pleasure to meet all of you at Balaton!

* * *

Email from **Ashok Gadgil**:

I have missed the Balaton meeting for a couple of years now, so here is my news in some detail.

Since the beginning of 1997, I have been spending a quarter of my time in India, helping the Industrial Development Bank of India (which is also the 4th largest development bank worldwide) to set up their policies on lending for industrial energy efficiency and industrial environmental management. This I am doing with another colleague from my institution (Lawrence Berkeley National Laboratory) and with help of 15 Indian industrial engineers based in India each of whom is a sectoral expert in specific branches of industry. This 18 month project is funded at LBNL by the Asian Development Bank, and will end in mid 1998.

Another project with which we made progress this year deals with the effects of rapid privatization of energy (particularly electric) utilities in the developing

world. This is happening in a headlong rush with support from the World Bank and USAID, opening up power sectors of the developing countries to multinational corporations related to electric power (Bechtel, GE, Enron,...). While the thinking supporting such privatization is superficially good, it leaves out the crucial "public goods" aspects of private-but-publicly-regulated or state-owned power utilities (i.e., responsibility and action for the larger societal and environmental protection and benefits).

In the US, this topic has come up in connection not with privatization, but with deregulation of public utilities. In the US case too, deregulation effectively removes any pressures on the utilities to undertake actions for societal good, and produces a focus on purely near-term stock-holder returns. In California, the debate around the deregulation process has recognized this downside risk and explicitly agreed on a small tax (between 1 and 2%) on all deregulated energy sold in the state to pay for the public goods (subsidized "life-line" electricity rates for the poor, research and development in energy efficiency and environmental impacts of energy use, funds for market transformation in favor of energy efficient and environmentally friendly products and processes). With my Brazilian colleagues, we have been presenting this important issue to the Brazilian decision makers and opinion makers to make the case that a similar protection is needed in their privatization efforts too.

My work on water disinfection for rural communities in developing countries is moving forward. Two companies, one in Napa California, another in Mumbai (formerly Bombay), India, started production of the device in November 1997. We have one on-going field test site outside Durban in a region called the "Valley of the Thousand Hills", at an HIV-hospice for orphans, from mid 1997. We plan to monitor the device performance at the site for one year. (Early in 1997, I had the pleasure of meeting with **Joan du Toit** at the University of Stellenbosch when I visited South Africa in February).

If you have web access, visit the project site below for more information and some photographs:

<http://eande.lbl.gov/CBS/archive/uv/>

* * *

Janos Hrabovszky writes a holiday letter:

We are happy to report to you that 1997 was a much better year than the past two. At last our health is fine. At the end of 1996 we celebrated our 40th wedding anniversary. It was a "catch-up" year with respect to travel.

The first big trip was to Morocco in May. We never knew that a good share of Morocco is so green and that the High Atlas is so imposing with its peaks over 4000 meters. The dry south on the edge of the Sahara reminded us of Rajasthan in India. The old cities and their rich artefacts and buildings were fascinating. One could see the long history.

The second trip was to “down under,” mainly to New Zealand. We landed in Auckland on the North Island, hired a car and travelled around both islands for 30 days. It was truly lovely. The variety of landscapes and their beauty was very impressive. The Southern Alps are just like “our” Alps, except that they are much less populated. We enjoyed the traverses, when we passed through rich green farmlands, into equally green rolling hills, then the arid yellow tussocklands of the inland high plains, and finally the majestic snow-covered peaks. The thermal regions with their geysers, boiling mudpools, and sinter terraces with all the colors of the rainbow, were fascinating.

Maori art, culture and history was a new dimension to learn. We ate traditional Maori food, “hangi” cooked in an earthen pit with the help of hot stones. Their dances and songs were wonderful. Both in the cities and in the countryside we felt at home with the very friendly and helpful people. It’s a pity that N.Z. is so damn far away!

Our regular traipsing around was not neglected, I visited Hungary a number of times, we went for our annual pilgrimage to Rome, and a special joy was a week in Urbino in the Marche of Italy.

We have read with great interest the *Bulletin* on the topic of “time,” especially time in economics and in a broader philosophical sense. Please keep sending us *Bulletins*, and we may join you in one of the meetings. And in the meantime we hope that there will be in the future a move away from pure materialism and that the values and ideals of a more humane society will gain more ground.

* * *

Drew Jones has graduated from the system dynamics program at MIT and is “nesting” in the mountains of Southeastern USA. He and his wife, Anne Fitten, are buying a house in the small city of Asheville, North Carolina, with an organic garden and an extra bedroom for Balaton visitors. He’s consulting to businesses and local governments on sustainability and systems thinking and also volunteering locally. Lately he’s enjoyed creating a basic Introduction to Systems Thinking course that he’ll run locally, but is open to teaching to interested Balaton folks.

* * *

A New Year’s greeting from **Dmitri Kavtaradze**, with only slight changes in his beautiful and distinctive English:

As it was before, the last year was full of work, meetings and writings that of course is one of the best way to be addicted. My wife has finished her doctor thesis and discovered a lot of things about chromosomes in myosis that stop fertilization (some times as result of using strong medicine): it goes in the flow of *Our Stolen Future* and shows the power of professional blindness and weakness of human body.

My son was successful in his course work on history of the terrorism as the Soviet foreign policy in 1920-50 that again make him satisfied by discovering more bad things. He accompanied me to the European conference in Basel and give me the pleasure to discuss impact of highways on the nature with his assistance. So my family gets moral profit from studying bad things that creates positive causal loop: the worse thing go, the better scientists succeed.

There was also a very sad part of the life. Last year was the last for my mother in the law, Olga was excellent surgeon, who saved thousands of human life in World War-II and later in the time of peace. She was very patient person and was always busy in helping other people. We miss her very much and it is strange to say but we are touched also by the dogs that are still looking for her. Dogs always know some more deep things.

So the last year not only brought, it also took a lot. Social problems were occasionally in the focus of my attention and I designed and published a new simulation, “Election day in the Country of Independent Buttons” that demonstrates the political behavior of us humans. Another game that I started has the working title “VIA-VITAE” and shows how planning decisions are done on environment and highway impact.

There was a very strong student group that took my classes on simulation and games and they built and adapted more than 20 original small models and games, part of them deserved to be published. Students in Russia became more and more strongly motivated and make you happy working with them. The same I found while giving game sessions in the Far East: Vladivostok and Khabarovsk: we worked 12-14 hours a day with school teachers that have not received salary for 2-4 months.

In my laboratory we became the national coordinators of the IENE (Infra Eco Network Europe), a project that is oriented to giving practitioners a manual on mitigating highway planning, impact and maintenance to protect nature.

To my friends abroad, TV brings pictures of pov-

erty, aircrashes, crime and other social spicy things: it is news. At the same time we need to work, think if possible and even plan this and that. So I wish to have chance in this 1998 year to see you, have nice evening in conversations and all other unexpressed feelings that keep us friends. Best wishes for your spirit, health, perception of reality, and happiness that you have time to share with others.

* * *

Liz Krahmer became Elizabeth Krahmer Keating on November 9 upon her marriage to Robert R. Keating (Bob). For her Ph.D. thesis at MIT she is studying the financial performance of U.S. credit unions (which are essentially depositor-owned cooperative banks), as compared to consumer banks and thrifts. "Within the Balaton Group, I am sure that someone may have a great contact or two for me," she writes.

* * *

News, offers of help, and requests for help from **Jaswant Krishnayya** in Pune:

Systems Research Institute is busy helping various organisations, like CARE and UNICEF and Health Departments and others in India make better use of spatial information.

Currently we are working with the Indian Space Research Organisation to use IRS 1-C imagery to update maps, prepared 5 years ago, to identify the tasks involved in such updating where terrestrial maps were also used, and the GIS is in current use; and to look into some of the dimensions of the problems related to *Impedance Matching* between high tech and "field users," especially in local government agencies and NGOs. We hypothesise that what may still be needed in the context of making full use of the massive data-production capabilities of the space segment of the ISRO satellite setup, especially for the Indian subcontinent, in the managerial link-up on the ground ... is the "impedance-matching" between "high-tech remotely sensed data analysis" and "down to earth practise in the field" at District, Tehsil, Mandal and village level.

We are proposing that this impedance matching function be performed by a large number of Intermediate Institutions (several hundred), and our present project includes part of the design activity for these I.I.s. This includes testing out many low-cost GIS software packages, and evaluating their capabilities.

In this work, we would be very grateful for advice and help from any other Balatoners who have had working experience with different GIS packages: What properties have they found particularly useful? What prop-

erties most annoying? .. etc.

We also hope to start work in 1998 on a new very-easy-to-use vector-GIS package for grass-roots workers and organisations, which might be able to take analysed imagery layers from the IIs nearby and, e.g. drape them over 2 1/2 D views of their small watershed areas of concern. Since micro-watersheds have been adopted as the foci of sustainable planning in India, it is important to provide the 1000s of micro-watershed planners with indigenous software that is very easy to use for agriculture and land-use and water para-professionals.

We propose to place this product in the public domain when it is ready after testing in about 3 years.

I'd be happy to send a copy of a paper we have on the whole issue of the changing technology of space imagery and its potential impact on the way we \should plan for rural sustainability, by e-mail or hard copy to anyone who asks.

Also to exchange views with any of the readers of the *Bulletin* who can offer us any advice or guidance!

* * *

Steven McFadden writes:

Hiyo, one and all!

Back in 1990, farmer and philosopher Trauger Groh and I wrote a book on community supported agriculture (CSA) entitled "Farms of Tomorrow." The book saw some success, helped some communities, and was eventually translated into Russian, Japanese, and Korean. Now we have just finished its sequel: "Farms of Tomorrow Revisited."

We wrote the new book because community farming is growing and changing swiftly, and because CSA is one of the few bright lights amidst the continuing industrialization and globalization of agriculture, as epitomized by the Rome-based Codex Alimentarius Commission, a little-known but highly potent fragment of the overall WTO bureaucracy.

Our new book serves a need that is becoming more and more explicit: the need to share the experience of farming with everyone who understands that our relationship with nature and the ways that we use the land will determine the future of the earth. We must eat. Thus, we must depend on farms and farmers, who will be the foundation of whatever kind of societies emerge in the new millennium.

As we conceive of it — and as it is being practiced

at over 1,000 US farms involving over 100,000 families, and at many more farms in other nations — community farming (CSA) is not just another new and clever approach to marketing. Rather, community farming is about the necessary renewal of agriculture through its healthy linkage with the human community that depends upon it for survival. From experience, we also see the potential of community farming as the basis for a renewal of the human relationship with the earth.

“Farms of Tomorrow Revisited,” is being published in November, 1997 by the Biodynamic Farming and Gardening Association, Kimberton, PA 19442 (Phone: 1-610-935-7797). Chelsea Green of Vermont is handling promotion and distribution.

With the farm project complete, I have turned my hand to a massive manuscript entitled “Odyssey of the Eighth Fire,” which will ultimately tell the tale of an 8-month walk across North America. Under the guidance of Algonquin Indian elders, about 40 of us walked 3,500 miles in 1995-96 to fulfill ancient Native American instructions related to the survival and well-being of life on earth. It was an amazing pilgrimage — involving women and men of many traditions and cultures — and it will surely be a powerful story. From it we may all take hope.

Alas, the income from these projects is negligible. Thus, I continue teach on occasion, and to seek paid work as a writer or editor while I continue my labors of the heart early in the day, long before the Sun breaks the horizon.

Same as it ever was.

* * *

The new Sustainability Institute founded by **Dana Meadows** is now the official owner of two adjoining farms (100 hectares) in Hartland, Vermont, which will become an eco-village, an organic farm, and the office of the Institute.

The Institute has recently received three grants that will permit it to begin in-depth system dynamics modeling studies of three global commodities — shrimp, forest products, and corn (maize). The purpose of the models will be to understand the dynamic forces that cause these (and other) commodities to have characteristically unstable prices, unsustainable extraction rates, and low rewards for the people and community that do the actual harvesting from nature (the farmers, loggers, fishers), while there are large rewards for processors, shippers, importers, exporters, and retailers. Once the models are done, they will be translated into training games, similar to Fishbanks, Susclime, and other Balaton Group games.

* * *

Laszlo Pinter sent us a copy of a speech he recently gave to a gathering of Winnipeg’s Hungarian community on the 41st anniversary of the 1956 Hungarian revolution:

In Gyor, a town in Western Hungary there is a stone plaque commemorating the 1848 Hungarian revolution. Old age and lack of attention turned the surface of the plaque dark gray, but during the Kadar-era in the 1970s someone polished the stone around the last sentence that said: “was all the blood shed in vain”?

Although the plaque commemorated the 1848 revolution, for us, high school students in Gyor in the Kadar era, this one sentence symbolized the 1956 revolution.

Was all the blood shed in vain?

The 1956 revolution was lived again and again in many ways by many people. For those who chose to stay home, first came the retaliations, the feeling of powerlessness against the regime that over the years was transformed into a euphemistic state that nobody seriously believed in. Public discontent was kept at bay through allowing small cottage ownership, cheap food and free education and healthcare. Those who were forced abroad were left with the memories of a failed revolution, the seeming impossibility of political change. The 1956 revolution was again perceived differently by the West, that part of the world that could have had significant influence over its outcomes. While official politics seemed to show indifference, the events struck a chord with civil society all over the world and the grassroots were mobilized to help the refugees.

From the perspective of 41 years the revolution is clearly seen as a self-organizing, grass-roots event of Hungarian civil society. If successful, the events would have lead the country into the direction of an alternative social development path. This path could have been based on local and national autonomy, strong communities, a self-conscious national and local identity, the ability for constructive coexistence with minorities, and, not the least, a value-system that points beyond material goods.

All this is, of course, speculation. It is, however, a fact that the changes that took place in Hungary in 1989 had quite different characteristics than the promised changes of the 1956 revolution. The changes in 1989 were started, maybe to an extent orchestrated from the political center. There were no fights and refugees, if you don’t want to count the crowds of young professionals who were and still are leaving Hungary, looking for work abroad. Because the regime in the late

80's was more humane than the one before the 1956 revolution, after the 1989 changes the new political leaders left many, most cadres of the old regime in place. One of the consequences is that today's thin upper class contains disproportionately many, and the vast class of the poor disproportionately few representatives of the past political elite.

Although Hungarian democracy has gained international recognition, it is still in growing pains: not even a week ago the constitutional court threw out the referendum plan that was submitted by the government and signed by President Goncz as unconstitutional. This can be of course considered a good sign: if with difficulties, law and order eventually prevails.

At the same time, however, there are several leading indicators that foretell trouble: dropping life expectancy and steeply falling birth rates, haunting pollution problems from the past, high, and in particular regions structural unemployment, weak participation of Hungarian companies in the weak and just starting economic revival, scary health statistics, falling, though still quite high level of education.

We are remembering 1956 today, but it is unavoidable by now to link such a commemoration with the situation of the free and already democratic Hungary of today. It appears that one of the main dreams of the 56 revolution, an autonomous society freely and actively engaging with the rest of the world, is still relevant. It is relevant not only in Hungary, but also for the citizens of the EU and NATO, where Hungary aspires for membership in the near future. These questions are timeless. They accompanied us during many difficult centuries and will accompany us in the future.

The plaque in Győr has been restored and polished by the new local government. Was all the blood shed in vain? Although the sentence does not stand out any more on the plaque, its validity on account of 1956 is as clear as ever.

* * *

Bishan Singh explains why he couldn't come to Balaton this year:

I was in Nepal for field site work in rural areas last summer, then in Indonesia. At the end of August and early September I was in Guangzhou in China. Hence I was unable to attend the Balaton Meeting. I really tried shifting the dates but could not.

As you know, I am working on UNDP/FAO project called Farmer-centered Agricultural Resources Management (FARM) Programme covering 8 Asian countries.

We have two field sites in each country. My job is to train the extension services to work as a 'multi-disciplinary team' and the farm household to undertake their own planning through a 'Participatory Assessment and Planning,' which my group has innovated for natural resources management and sustainable agriculture. Next year the model is expected to be institutionalised as a new extension and community development approach in these countries.

Next year I hope I will have the good fortune of participating in the meeting. Thank you so much for the kind offer and good luck for the coming meeting. My sincere regards and best wishes to all.

* * *

A report from **Mathis Wackernagel**:

It has been an exciting year for both the Centre for Sustainability Studies at Anáhuac University in Xalapa and the ecological footprint. We have developed our first projects, watched with thrill and pleasure as the footprint has grown in acceptance, use and popularity.

At our Centre we try to promote a sustainable future through the applied development of tools for planning and the teaching of sustainability-related skills. Currently, most of our research work is based on footprint applications.

In the last year, we have strengthened our ties with other organizations, such as the Earth Council (who sponsored our recent "Ecological Footprints of Nations" study), the Stockholm Environment Institute, the International Council for Local Environmental Initiatives (ICLEI) and The Natural Step (with Karl-Henrik Robert in Sweden and Paul Hawken in the US).

We were invited for various lectures and conferences in the Americas and Europe, including the Rio +5 Forum at which we presented our report which footprinted fifty-two of the world's nations and various engagements on the North American east coast (with EPA, University of Toronto, Rensselaer Polytechnic Institute, Buffalo University, SUNY-Syracuse and the Tellus Institute). September saw me heading to Lund University in Sweden for a research visit. Hosted by Lillemor Lewan and the Department of Human Ecology, we calculated in detail the footprint of Sweden and one of its watersheds - and met for seminars and meetings with a many institutions (TNS; SEI; Institute for Physical Resource Theory; Dept. of Environmental and Energy Systems, Lund; Studies Swedish Association of Local Authorities; Baltic Youth Forum; Dept. of Systems Ecology, Stockholm). In November, I was lucky to experience another spring in Montevideo and Santiago de Chile where I was invited for a "Friends of the Earth"

conference and met with ICLEI, Santiago municipality and “Chile Sustentable”.

The footprint concept is quickly gaining in popularity, particularly in the NGO and educational field. Various UN documents have made use of the concept. Another indicator of its popularity is its presence on the Internet. There are now hundreds of references to our ecological footprint work. On the same note, our own homepage has just been established. It includes an explanation and background of the footprint concept and links to other footprint pages. Its address is: <http://www.edg.net.mx/~mathiswa>.

Best wishes and season’s greetings from Mexico.

STORIES, QUOTES, JOKES

David Korten was Right.

Sent by **Laszlo Pinter**

In its resolution of 26 July 1996 on new and innovative ideas for generating funds, the Economic and Social Council requested the Secretary-General to submit a report, to be prepared in cooperation with the UNDP, on all aspects of new and innovative ideas for generating funds for globally agreed commitments and priorities....

While the emphasis in the present report will be on issues related to the financing of multilateral, intergovernmental (or public) development cooperation objectives, the underlying premise is that the private sector is the primary source of financing for meeting these objectives. When private financing is not forthcoming, public incentive policies and other forms of public-private partnerships should be explored. Resorting to purely public finance should only be pursued when the other two approaches fail to work.....

With the expanding role of the private sector in development and more developing countries being able to offer attractive investment conditions to private business, the possibility could be explored for having the private sector also play a more active role in the delivery of aid.

One way to achieve this objective is to involve the private sector in publicly funded projects such as bilateral or multilateral aid initiatives. Progress in this direction is already well underway.

Another option is to reward successful private ... investments ...by granting tax concessions on profits stemming from such investments.

Many companies have a philanthropic tradition of supporting developmental initiatives in the community in which they are located.... Similarly there is the practice in several countries for private construction companies and real estate developers to assume responsibility for certain aspects of infrastructure development.

If this practice were globalized, companies’ need for developmental initiatives could be expected to rise, offering new opportunities for national as well as international development agencies to provide services.

— “New and Innovative Ideas for Generating Funds for Globally Agreed Commitments and Priorities,”
Report of the U.N. Secretary-General,
52nd Session of the General Assembly,
23 June 1997.

More Time Quotes

Whoever said that time is money understood money a lot better than they understood time.

— Jonathan Rowe

The world, one could say, was now divided by three different planes of consciousness in terms of how people thought about time. The global financial market and its electronic participants traded continuously around the clock and no longer paused to recognize day or night. Most people in modern society measured time in segments of hours and days, weeks or months. But the primitive among us, still existing in many places, continued to think and function according to the ancient cycles of seasons. A country like Thailand encompassed all three of these time zones. Its furious pace of economic growth has put the three in a lopsided contest for power, one that brutalized the innocent ancients.

— William Greider, *One World, Ready or Not*

Sent by **Steven McFadden**:

In our way of life, with every decision we make we always keep in mind the Seventh Generation of children to come...When we walk upon Mother Earth, we always plant our feet carefully, because we know that the faces of future generations are looking up at us from beneath the ground. We never forget them.

— Oren Lyons, *Onondaga Nation, Earth Day 1993 Pledge*

Sent by **Anwar Fazal:**

I would like to share Okot p'Bitek's poem "Song of Lawino" with you. In this song, originally written in the language of the Acoli people, the wife of an altogether "modernised" husband laments what has been lost.

Song of Lawino

*Time has become
My husband's master.
It is my husband's husband.
My husband runs from place to place
Like a small boy,
He rushes without dignity.
And when visitors have arrived
My husband's face darkens
He never asks you in,
And for greeting
He says
"What can I do for You?"
I do not know
How to keep the white man's time.
My mother taught me
The way of the Acoli
And nobody should
Shout at me
Because I know
The customs of our people!
When the baby cries
Let him suck milk
From the breast.
There is no fixed time
For breastfeeding.
When the baby cries
It may be he is ill;
The first medicine for a child
Is the breast.*

*Give him milk
And he will stop crying,
And if he is ill
Let him suck the breast
While the medicine-man
Is being called
From the beer party.
Children in our homestead
Do not sleep at fixed times.
When sleep comes
Into their head
They sleep.
When sleep leaves their head
They wake up.
When a child is dirty
Give him a wash,
You do not first look at the sun!
Where there is no water
In the house
You cannot wash the child
Even if it is time
For his bath!
Listen, my husband,
In the wisdom of the Acoli
Time is not stupidly split up
Into seconds and minutes,
It does not flow
Like beer in a pot
That is sucked
Until it is finished.*

**The Ten Commandments of Globalization
(gleaned from the Internet by Laszlo Pinter)**

I am Neo-classical Economics, thy God, who brought thee out of the land of self-sufficiency, and delivered thee from slavery to community consciousness.

Thou shalt have no other gods before me.

Thou shalt not honor anything in heaven above or on the earth beneath or in the waters below unless it has been processed and packaged by one of My Transnational Corporations; nor shalt thou use anything unless it bears an authorized corporate logo.

Thou shalt not misuse the logos of Transnational Corporations, nor take their names in vain.

Remember the Sabbath day by consuming vigorously.

Honor thy Financial Institutions, so that thou mayst live long in the quarters that thou or thy landlord hast mortgaged unto them.

Thou shalt not murder, but hearken: thou shalt not look too closely at the effects of thy investments, nor shalt thou fail to honor an associate just because he is a tyrant or a murderer.

Thou shalt not forget that thou art an economic production unit, nor shalt thou forget that if thou cannot find a job it is because thou art a lazy good-for-nothing, nor that if thou likest not thy pay or thy working conditions, there are many unemployed who would be happy to have your job.

Thou shalt not steal except from thy workers or the consumers of thy products.

Thou shalt not question the Inevitability of Globalization, nor the teachings of Neo-classical Economics.

Thou shalt covet thy neighbor's job, and his TV and computer, his car or bicycle, and every single thing that belongs to thy neighbor unless it is older or smaller than thy thing.

