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Death of the Rickshaw

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The authors show that the very science on which genetic engineering is based is seriously flawed and that those industries involved are gambling to an unacceptable degree with our health and that of other living things, while people who invest in those industries can only in the long run lose their money.

MAIgalomania: The New Corporate Agenda

by Olivier Hoedeman with Belen Balanya, Ann Doherty, Adam Ma'anit, Erik Wesselius The Multilateral Agreement on Investment is the latest attempt by large corporations to gain near total control of the global economy. If passed, it will become illegal for governments to veto any of their projects, however socially and ecologically destructive they might be. What s more, this unprecedented agreement has been negotiated in almost total secrecy. Only recently have the details emerged, and non-governmental organizations around the world have organized in mass resistance to it.

Learning To Live With Nat	ure:		
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Modern irrigation schemes in tropical areas have proven ecological and economic disasters. They necessarily lead to the flooding of vast areas of forest and agricultural land, the displacement of hundreds of thousands of people and the spreading of often fatal waterborne diseases. In addition, they are poorly maintained and rarely last more than a few years. The remarkable traditional irrigation systems that they have replaced, on the other hand, not only worked perfectly, but also satisfied all social and ecological imperatives.

NAFTA: Four and a Half Years Later. Have the Promised Benefits Materialized?

by Lori Wallach and Robert Naiman

The American public and even Congress itself were hoodwinked both by the Bush and Clinton administrations into believing that the North American Free Trade Agreement (NAFTA) would bring all sorts of benefits – not only to the US, but also to Mexico with which it made the agreement. Four and a half years later, it has become clear that the promised benefits are totally illusory, except, of course, to the transnational corporations who were its most active promoters, and whose immediate interest it was designed to serve.

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Editorials

Poisoning the Public to 'Protect' its Health

Dear Virginia,

Thank you for your letter of 22nd September including one from your constituent, regarding an article in The Ecologist, July/August 1997 entitled '2001: Entering the era of radioactive consumerism'. The article in turn refers to the implementation of the Euratom directive 96/29 which lays down new European Community basic safety standards for protection of the health of workers and the general public from the dangers of ionizing radiation. To conclude, as this article does, that the implementation of this directive will lead to a reduction in radiation protection standards that could endanger public health is incorrect, as are a number of the more detailed assertions upon which this conclusion is based. The latter includes in particular the assertion that implementation of the directive will lead to the uncontrolled recycling of nuclear waste into consumer goods ...

hus begins a tranquillizing letter from Michael Meacher, Minister for the Environment in the Department of the Environment, Transport and the Regions to Virginia -Bottomley, who now that she is out of office has apparently been radicalized. In passing, what a strange assembly of departments. Maybe the logic behind such an aggregation is that pollution knows no frontiers, and that like Sellafield or Chernobyl, radioactive releases to the Environment can be Transported to the Regions to cause ill health there. Perhaps they should include Health as well.

To dismantle Meacher's letter and address each point, is a fairly trivial (and possibly pointless) exercise. However, all of us in the Green movement have received letters like this when we have tried to warn administrators and government departments of dangers inherent in policy, particularly where there is scientific analysis or expertise involved in assessing the issue concerned. A contemporary example is mad cow disease (BSE), where an expert committee concluded that BSE could not cross the species barrier to humans. The government ignored independent experts like Professor Lacey, who warned, with argument and sup-



"To conclude that the implementation of the Euratom directive will lead to a reduction in radiation protection standards that could endanger public health is incorrect ..."

- Michael Meacher, Minister for the Environment.

porting evidence, that it could. Lacey, of course, was right. But no doubt he, and others who wrote on the topic, received the same anodyne responses, and felt the same terrifying sense of impotence in their Kafkaesque exchange with the powerful. The expert in the BSE case was Sir Richard Southwood, who until recently was also Chair of the National Radiological Protection Board (NRPB). It is this latter organization that was mainly instrumental in drafting the Euratom 96/29 directive, neatly tying the appalling decisions in the two areas, BSE and Euratom, together.

It is a sad, but possibly inevitable, fact that our MPs and administrators are, with a very few exceptions, scientifically illiterate. Mr Meacher, for example, is from a background in academia where his field was Social Policy Research. In Europe, populations close to Sellafield, Dounreay, La Hague, Aldermaston and Harwell suffer increased risk from leukaemia and lymphoma. Yet those who are being systematically poisoned by radioactive releases, have to rely on unqualified politicians and civil servants to protect them. The politicians, in turn, and without a thought of independent consideration, or their own consideration, rely on advice from those who are often close to the very people who are doing the polluting. Even worse; in some places, it is the polluters themselves who are consulted! For example, the Oxfordshire Health Authority contains the largest inland radioactive pollution source in the UK - Harwell also the site both of the National Radiological Protection Board and the address of the 'independent' Committee on Medical Aspects of Radiation in the Environment (COMARE). When you ring COMARE you get NRPB! Since

Dr Chris Busby trained as a physical chemist and is an independent researcher on the effects of low-level radiation. His book *Wings of Death: Nuclear Pollution and Human Health* (1995) outlined evidence that radioactive pollution was the main cause of infant mortality in the sixties and contemporary increases in cancer and other illness, especially in areas of high rainfall.



In Europe, populations close to Sellafield, Dounreay, La Hague, Aldermaston and Harwell suffer increased risk from leukaemia and lymphoma.

1948, Harwell has been pumping radioisotopes into the Thames, a source of drinking water as far away as London. Yet, despite the fact that there is a measured increase in childhood leukaemia mortality in the area, health

statistics are refused to independent researchers. The Chairman of this Health Authority since 1992, Dr Peter Iredale, is the ex-Director of Harwell. Stories like this would have been common in the ex-Soviet Union, but are surely surprising in England. Back to Meacher's letter.

There is no question that the implementation of

Euratom 96/29 will lead to a reduction in radiation protection standards. The only question is how the Minister can assert this in the face of a simple comparison between the present legislation (the Radioactive Substances Act 1993) and both the Euratom 96/29 directive and the Draft Proposals for Revised Ionizing Radiation Regulat-ions, recently issued by HSC. The reduction in standards will arise out of the decision to follow the Euratom directive in the threshold levels of concentration below which there will be no need for authorization or reporting of practice. In

other words, anyone will be able to work with, move, dispose of and recycle substances which contain radioactive man-made isotopes like Plutonium or Strontium-90 so long as the concentrations are below the values given in the

Those who are being systematically poisoned by radioactive releases, have to rely on politicians and civil servants to protect them. The politicians, in turn, rely on advice from those who are often close to the very people who are doing the polluting.

> Annex to these documents. They will be able to leave a sack of Plutonium-contaminated waste out for the dustman. The present regulations have a threshold of 400 Bequerels per kilogram of material, above which authorization and report

ing is required. The table below compares the present legal limit and the limit proposed under the new scheme.

Deregulation ranges from 2.5 times for Plutonium to 2,500,000 for the reactor gas Krypton-85. It is immediately

> apparent on examining the table of isotope specific threshold values proposed by the Euratom directive that the largest numerical deregulation factors are for those isotopes like Krypton-85 and Tritium that the nuclear industry needs to get rid of. These two isotopes represent together 95 per cent of the waste from nuclear power stations and reprocessing plants. The huge

deregulation of these two substances is a measure, not of any rational assessment of risk from them, but of the embarrassment they cause to the nuclear industry under the present regulations.

The substance of Meacher's response

Radioactive Isotope (decay)	Present threshold limit under RSA 1993 (Bq/kg)	New threshold limit after Euratom transposition (Bq/kg)
Plutonium 239/40 (alpha)	400	1.000
Strontium-90 (beta)	400	100,000
Caesium-137 (beta/gamma)	400	10,000
Krypton-85	400	100,000,000,000
Tritium 11-3 (beta)	400	1,000,000,000



Greenpeace diver sampling from Cogema Nuclear plant outflow pipe, La Hague, France.

is incorrect. It is as we have maintained from the beginning: the uncontrolled recycling of nuclear waste into consumer goods will occur under the new legislation so long as (a) the concentrations of isotopes in the waste are below the new thresholds,¹ and (b) so long as

the consumer goods are 'not cosmetics, children's toys, foodstuffs or personal ornaments.²

Since all radioactive exposure carries a finite risk of cancer or other mutationrelated illness and there is no threshold for such effects,³ it is clear that the new legislation will increase the risk of cancer and mutation-related illness by increasing the exposure to members of the public. To spell it out: this is because there will be no control over releases to the environment of

man-made radioisotopes below the new threshold levels, which are up to 2,500,000 times more lax than the present ones.

Mr Meacher's letter concedes the change in these threshold concentrations but the experts have assured him that there is no problem:

While there are some differences in the individual radioisotope concentrations of which regulation is required to be applied from those used historically in this country, all are set using the most up-to-date Radiological

Knowledge [original caps.] of that so as to maintain the risk to the public at insignificant levels.

Well, the differences can be very large (see Table), and, since they represent a change of practice, should require justification.

To give an indication of the safety margins contained within the new directive, it requires regulation to be applied when, on the basis of cautious assumptions, the radiation exposure of a member of the public could be at a level

Under English Common Law, there is nothing that permits a person to release a substance which has a finite probability of killing another person. The activities of Sellafield, Harwell or Aldermaston and Burghfield in releasing substances that cause cancer are, by this definition, criminal activities, and those that permit or condone their activities are accessories.

> equivalent to one per cent of the safety limits set for man-made radioactivity or 0.45 per cent of the average United Kingdom public dose from natural background sources (rocks, cosmic

If past practice is any guide, the public consultation, if it comes about at all, will be filed and ignored. The implementation of the Euratom directive will go ahead, just as THORP went ahead.

rays, naturally occurring radioactivity in foods etc.)

The assumption here is that all exposure is equivalent. But natural background radioisotopes are not equivalent in risk terms to man-made radioisotopes: this has been formally and unquestionably established for one pair of alpha-emitters, natural Radium and man-made Plutonium, by lifespan experiments with beagle dogs.4 Each radioisotope acts differently biophysically and biochemically. For example, Strontium-90 binds to chromosomes and has long been known to show anomalously high genetic hazard effects. The gas, Krypton-85, dissolves in fat and can contaminate the body, causing damage to the bone-marrow cells. Tritium, a form of radioactive water, is suspected of causing infant mortality and genetic damage effects. Evolution has developed cell repair mechanisms for natural radioisotopes but has not been able to address damage from the new man-made fission-product substances which did not exist on Earth prior to 1945. It is the man-made substances, suspected of causing cancer and leukaemia near every nuclear site in the world, that are being deregulated.

There is an interesting legal point con-

cerning justification in relation to natural radiation exposure which was developed in a recent court case by environmental barrister Hugo Charlton. If I walk down the road and a branch falls from a tree and kills me, then this is considered an act of God. It is a Natural process. If someone picks up the branch and hits me over the head and kills me, that is murder. Under English Common Law, there is nothing that permits a person to release a substance which has a finite probability of killing another

person, and there is no justification argument or cost-benefit risk argument. The activities of Sellafield, Harwell or Aldermaston and Burghfield in releasing substances that cause cancer are, by this

definition, criminal activities, and those that permit or condone their activities are accessories. This argument was part of the defence in the recent case of Peggy Walford and Sarah Hipperson in Reading Crown Court on 16th March. Two ex-Greenham women, pensioners, aged 70 and 77, cut the fence 72 times at the Royal Ordnance Factory,

Burghfield, and were being prosecuted for £10,000 worth of criminal damage. They argued that they were calling attention to, and attempting to stop, the criminal killing of children by radioisotopes releases. Sufficient numbers of the jury believed this radiation leukaemia scenario to result in the release of the defendants. I could see the prosecution lawyer wisely deciding not to advance the *de minimis non curat lex* argument, that the law does not concern itself with the trifling death of one or two children! This landmark result received almost total silence from the media.

Meacher finishes his letter with a statement that there will be full public consultation over the transposition of the Euratom directive. If past practice is any guide, the consultation, if it comes about at all, will be filed and ignored. The implementation of the Euratom directive will go ahead, just as THORP went ahead. Dissenting science will be marginalized. Independent experts will be politely listened to and the advice filed in the waste bin.

The problem is a result of the ignorance of the politicians and their deference to experts, people who are either in the pocket of or embedded in the culture of the industry. This is what happened with BSE, and people have died as a result. This is what has happened with nuclear power and nuclear weapon production and testing since 1945. Politicians have been unable to look independently at the problem or to look at the background of their experts and see that they have been giving biased advice. Politicians have been too pusillanimous to look themselves and make their own decisions, or to ask for advice from independent sources.

This is why those of us who watch the destruction of the planet, the introduction of new diseases, the death of our children and loved ones, will continue to receive fatuous responses to our warnings or enquiries, parroting the received wisdom of the clerk whose job it is to relay the bogus models of whichever industrial enterprise might stand to lose money if adequate safety regulations were implemented. For I believe that the true origin of these letters is that we are speaking a dialogue of Truth to people whose dialogue is Power. This is why, when we actually meet these people face-to-face, they appear to look on us with a mixture of embarrassment and pity. For their agenda is about an easy life, what is good for their party, what is good for their personal advancement in the party and ultimately, what is the least they can get away with doing in what they like to think of as 'the real world'. The last thing they are concerned about is what is good for the people, or what the truth might be.

I would wish that this might change with this new government. But I am old



Modern day heroines – Peggy Walford and Sarah Hipperson, aged 70 and 77, cut the fence 72 times at the Royal Ordnance Factory, Burghfield, and were being prosecuted for £10,000 worth of criminal damage. They argued that they were calling attention to, and attempting to stop the criminal killing of children by radioisotopes releases. They were released, a landmark result which received almost total silence from the media.

enough to remember Harold Wilson, who, before being elected to the 'real world', marched with CND to the Atom site at Aldermaston, the same Aldermaston that releases so much Plutonium and other isotopes that, as the Reading Court Case recently heard, dust collected in filters in the area has a radioactivity content of up to 50,000 Bequerels per kilogram, defining it as nuclear waste under the present law, but perhaps not the new Euratom law. Children are inhaling this dust every day. How can we be surprised that there are increases in leukaemia?

Chris Busby

References

- 1. Euratom 96/29: Art 4.1 and Art 4.3.
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- National Radiological Protection Board: Documents Vol.6 No.1, 1995.
- Henry Eyring and Betsy Stover: Proceedings of the National Academy of Sciences 66/1:132-9, 1970.

Action

For more information, call the Greenpeace nuclear campaign line on 0171 865 8291, or write to your local MP asking them to demand that Michael Meacher stop discharges from Sellafield.

INS News Agency

Smooth Façade: Greenwash Guru Burson Marsteller and the Biotech Industry

J ust a week after the conclusion of the EU summit, Amsterdam hosted the first European Bioindustry Congress, EuropaBio '97 (June 25-27). On this occasion, EuropaBio, the main lobby organization for the European biotech industry, launched its latest weapon in the crusade for biotech in Europe: a report Benchmarking the Competitiveness of Biotechnology in Europe.'

Their "specially commissioned" *independent* study was carried out by a team of researchers from Business Decisions Limited ("a consultancy specializing in competitiveness and regulatory reform issues") and biotechnology experts from the Science Policy Research Group of the University of Sussex.

The report analyses the dif-

ferent factors influencing the competitiveness of the European biotech industry and provides four scenarios for the future development of biotechnology in Europe. The scenario which is most positive for the biotech sector (dubbed the 'fast development' scenario) assumes "consumer and man-

ufacturer attitudes [towards biotechnology] improving quickly" and "a generally favourable regulatory environment for R&D and production". Under such circumstances, the researchers predict a six-fold increase in the use of biotechnology by the year 2005. That would be equivalent to a 20 per cent compound annual growth rate for the period 1995-2005.

The ball is already rolling

pretty much in the direction EuropaBio wishes. Relations with both the Commission and the European Parliament are pretty good, and in July last year, the Commission's proposal for a directive on biotechnology patents emerged from its first reading in the European Parliament relatively unscathed. More recently, on September 10th, the Commission announced that it would draft measures which would obligate Austria, Italy and Luxembourg to repeal their national bans on the use and sale of genetically-modified maize.

But, however rosy the situation may seem for the European biotech industry,

Burson Marsteller advises industry to refrain from partaking in any public debate and to leave it to "those charged with public trust – politicians and regulators – to assure the public that biotech products are safe."

> one more fundamental problem remains: what if consumers won't accept biotech products due to feared health or environmental risks? As the first biotech products have reached farms and shop shelves, a storm of protest and concern has been raised amongst citizens both in the US and

In EuropaBio's newsletter everything is under control. The word risk is nonexistent, and if there is a problem related to biotechnology it is "the low level of public understanding of and trust in the safety of the new products".

> (even more) in the EU. This resistance poses a life-threatening risk to the biotech industry, which needs to sell these products in order to earn back the huge investments made to develop or obtain the used technologies.

But in the hour of need, a helping hand is always near, especially if there is money to earn. Enter Burson Marsteller, the world's largest public relations (PR) firm specializing in 'perception management' (see box). Just a few days before the EuropaBio conference, a PR strategy proposal for EuropaBio by Burson Marsteller was leaked to Greenpeace.² Here we outline

> an unacceptable scheme aimed to soothe public fears and outrage over the new biotechnologies and to ensure general acceptance.

> According to Burson Marsteller, EuropaBio has "firmly established [itself] as the primary representative of European bioindustrial interests within the political and regulatory structures of Europe" and the organization has an "indispensable direct

role in the policy-making process." However, "this role is no longer in itself sufficient to ensure the supportive environment Europe's bioindustries need to achieve global competitiveness through the new biotechnologies. A sustained communications strategy and programme able to generate favourable

perceptions and opinions beyond the policy world is now essential."³

The leaked paper recommends four basic strategies:⁴ "stay off the killing fields", "create positive perceptions", "fight fire with fire" and "create service-based media relations".

In an explanatory paragraph, Burson Marsteller explains that "public issues of environmental and human

health risk are communications killing fields for bioindustries in Europe." Moreover, "all the research evidence confirms that the perception of the profit motive fatally undermines industry's credibility on these questions."



Burson Marsteller provided so-called "crisis management" for Exxon, after the horrendous Exxon Valdez oil spill (above), and for Union carbide after the equally horrendous Bhopal disaster.

Therefore, Burson Marsteller advises industry to refrain from partaking in any public debate and to leave it to "those charged with public trust – politicians and regulators – to assure the public that biotech products are safe."

Under the heading "fight fire with fire", Burson Marsteller advises the biotech industry to concentrate on:

a) "stories - not issues"

"good stories ... go around the world in minutes. That's the way adversaries play. That's the way industry must play.

b) "products - not technologies"

"Stories must focus largely on the products of the new technologies ... When SAGB⁵ published its communication on the environmental benefits of biotechnologies a few years ago, the biggest media up-take was on the specific product examples – and among them the most interest was generated by ... household detergents!"

c) "beneficiaries - not benefits"

"People stories are always the most compelling (recall the presence in Brussels during the Parliamentary vote on biotech patents of the fellow who claims to have had his genes ripped off without his permission)."

d) "symbols - not logic"

"Symbols are central to politics because they connect to emotions, not logic." Bioindustries should use "symbols eliciting hope, satisfaction, caring and self-esteem".

In addition to these general principles, Burson Marsteller outlines an agri-food campaign designed to make the European public perceive the first wave of genetically-modified food crops as "environmentally superior to standard crop varieties and therefore desirable". To reach this goal, industry should no longer oppose separation of genetically-modified products, defer responsibility for safety issues to official regulators and concentrate on the environmental and economic benefits of biotechnology.

According to Burson Marsteller's analysis, the "public outrage and resentment over the introduction of genetically-modified food" originates in "a sense of powerlessness in the face of what are perceived to be malevolent (and foreign) forces threatening facets of life held dear." Therefore the proposed PR campaign aims to create a general perception that food-producing companies, retailers and consumers can all freely choose whether or not to use, sell or buy genetically-modified products. The Burson Marsteller spin doctors claim that this will "largely defuse" the sense of powerlessness.6

The Greenwash Professionals

Burson Marsteller (B-M) is the world's largest PR firm, with over 60 offices in more than 30 countries and US\$233 million income in 1996. Although its name is unknown to most people, B-M is fast becoming an increasingly important cog in the propaganda machine of the new world order.

B-M boasts its expertise at "neutralizing a threat or gaining the support of key constituencies" for a client. Past successes include "a grassroots campaign ... orchestrated on behalf of several companies against an American energy tax", and a "communications campaign [that] changed the 'fur coat issue' ... from being one of 'animal cruelty' to one of 'the right to choose'."

In the past, B-M performed 'crisis management' for Union Carbide after the horrendous Bhopal disaster and for Exxon after the equally horrendous Exxon Valdez oil spill, and has advised oppressive regimes in Indonesia, Argentina and South Korea. B-M has considerable experience in helping transnational corporations with their PR problems:

 In the 1970s, when Babcock & Wilcox's global sales suffered after the nuclear reactor it built failed at Three Mile Island, Burson Marsteller was there to assist its client.

 When A.H. Robins could no longer handle the international public relations woes resulting from the problems with its Dalkon Shield contraceptive device, it called on B-M.

At other times in B-M's 40 year history, governments have turned to the firm for "issues management". During the reign of Romania's Nicolae Ceausescu, for example, Burson Marsteller was hired to promote the country as a good place to do business. When the former military dictatorship of Argentina was having difficulty attracting international investment, the ruling military junta hired B-M to "improve the international image" of the country over a period during which some 35,000 people were "disappeared". More recently, B-M has served as the lobbyist for the Mexican government, promoting the environmentally questionable free trade agreement between Mexico, the US and Canada.

B-M takes pride in the professional nature of its greenwash activities:

"Often corporations face long-term issue challenges which arise from activist concerns (for example South Africa, infant formula) or controversies regarding product hazards ... Burson Marsteller issue specialists have years of experience helping clients to manage such issues. They have gained insight into the key activists groups (religious, consumer, ethnic, environmental) and the tactics and strategies of those who tend to generate and sustain issues. Our counsellors around the world have helped clients counteract [them]."

Burson Marsteller's services don't come cheap, and with B-M the Business Council for Sustainable Development, for example, joined a corporate tradition of spending large resources not on actual environmental change, but on creating a "green image" for the client. Of course, Burson Marsteller is not the only PR firm helping business paint itself green. Greenwash around the world bears the mark of professional, multi-million dollar public relations campaigns.

Burson Marsteller: PR for the New World Order, Carmelo Ruiz, 1995; "Stay quiet on risks of gene-altered food, industry told", Danny Penman, The Guardian, 6 August 1997; "The acceptable face of disaster", Andy Beckett, The Guardian, 13 August 1997.

Adapted in part from Greenwash: The Reality Behind Corporate Environmentalism by Jed Greer and Kenny Bruno, Third World Network, Penang, Malaysia, 1996.

The leaked paper also contains a detailed PR plan for the EuropaBio conference in Amsterdam. Burson Marsteller's basic advice was to keep the media away from the event as they

would create a serious risk: their presence would "automatically draw protesting environmental groups to the Amsterdam venue. ... EuropaBio will have set the table and Greenpeace will have eaten the lunch."

Therefore, Burson Marsteller advised EuropaBio to keep journalists away from the conference, and instead to feed them with readymade, positive stories. Media interest should not be focussed on the conference itself, but rather the conference should be a news hook for "the stories we really want running back home". Live (radio) interviews with conference attendees should ensure that "(1) the Congress is referred to in all of the sto-

Media interest should, according to BM, be a news hook for "the stories we really want running back home".

> ries that play, (2) we control the choice of commentators discussing the local story and the relevance of the Congress to it, and (3) the Congress link emphasizes the European dimension of the local story and allows us to introduce

the broader competitive issues in all of those interviews."7

Unfortunately, it is very difficult to assess the effectiveness of Burson Marsteller's activities for EuropaBio.

> We don't even know what the actual PR campaign consisted of, as the leaked document is a proposal dated January 1997. However, recent articles in the British *Guardian*⁸ and the Danish *Berlingske Tidende*⁹ confirm that Burson Marsteller subsidiary Peter

Linton Associates is engaged in PR work for EuropaBio.

Yet, however well-conceived, a multi-million pound PR campaign may be spoiled with relatively simple means. In Amsterdam, conference attendees



arriving at the stylish former stockexchange building found themselves welcomed by a group of activists from the Dutch Coalition for a Different Europe loudly voicing their concerns over the risks of biotechnology. And Greenpeace dumped a truckload of soybeans in front of the conference entrance at RAI congress centre early the next morning.

As conference PR manager Peter Linton commented to the Danish *Berlingske Tidende:* "Greenpeace came early on purpose, before the conference had started, and people from industry could argue against them. Now TV stations all over Europe show pictures of a load of beans outside the industry conference. We missed a chance there."¹⁰

But on paper the PR strategy works. In EuropaBio's newsletter everything is under control. The word risk is nonexistent, and if there *is* a problem related to biotechnology, it is "the low level of public understanding of and trust in the safety of the new products". Biotechnology will help to increase food security worldwide and contribute to sustainable development. No strings attached. Biotechnology will lead us towards a bright future.

But there is the odd passage which makes you ask which perverse reality hides behind EuropaBio's smooth façade. Like the biotech-solution that the chairman of EuropaBio's Ethics Task Force, Dr Erik Tambuyzer (also Vice-Chairman in Europe of Genzyme Corporation) proposes for mad cow disease: "to remove the BSE gene from cows, making it impossible for them to catch the mad cow disease."¹¹

Corporate Europe Observatory

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- Benchmarking the Competitiveness of Biotechnology in Europe, Business Decisions Limited and the Science Policy Research Unit of the University of Sussex, Brussels, June 1997.
- Communications Programmes for EuropaBio, Burson Marsteller, January 1997.
- 3. Ibid. p.3.
- 4. Ibid. pp.3-5.
- SAGB stands for Senior Advisory Group Biotechnology, the main precursor of EuropaBio, which ceased to exist when EuropaBio was launched in September 1996.
- 6. Ibid. p.8.
- 7. Communications Programmes for EuropaBio, Burson Marsteller, pp.15-16.
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- 9. "Biotech industry has slept during classes", Jakob Langvad, *Berlingske Tidende*, 27 June 1997.
- 10. Ibid.
- 11. European Bionews, August 1997.

Action

You can find links to most of the sources for this article and related materials on the Corporate Europe Observatory website at:

Corporate Europe Observatory (CEO) intends to continuously monitor how EuropaBio, with the help of Burson Marsteller and the likes, is trying to influence political actors and to bring about a manipulated consent on the use of biotechnology in Europe. Please forward all relevant information you have to CEO, Prinseneiland 329, 1013 LP Amsterdam, The Netherlands. Fax: +31 20665 0166.

The Rickshaw Irony

A clutta has a reputation for poverty, pollution, urban disintegration and squalor. The reality is, however, much more complex. Poverty and pollution exist, though most of the pollution now comes from motorized transport. But co-existing with the poverty and pollution are some remarkably efficient food-production, waste-treatment and transport practices that put the developed world to shame. Waste is dealt with in a way that captures most of the nutrient value and is returned to Calcuttans in the form of food.

Food miles are not an issue here. Most transport is accomplished by human power and traditional non-motorized means of transport. Fossil fuel dependence is low and population densities are such that accessibility indices register values that would make many cities in North America and Europe very jealous. Most people in Calcutta live very close to most things they need. One result is that they produce very small amounts of greenhouse gases.

Calcutta with 14 million people is a very special case but their problems are

not unique. Most developing countries are experiencing a seriously deteriorating situation generally, but particularly in terms of a growing level of motorization, rapidly increasing concentrations of pollution and increases in health problems related to traffic and pollution. Road traffic accidents are also increasing rapidly in every large city in Asia and Africa. In an important sense, developing countries are moving from relative sustainability to rampant non-sustainability and are doing so at the behest of their own middle classes anxious to reap the rewards of "affluence" and as a consequence of the activities of the World Bank, motor vehicle manufacturers and economic deregulation. The investment opportunities of rising demand for infrastructure as well as increasing need of fossil fuels produces an increase in economic activity and in the marginalization of millions of those at the lowest levels of income and security.

In Bangladesh, John Howe¹ has shown how a heavy investment in roads has contributed to landlessness and poverty. He concludes: "it is difficult to

understand why one of the poorest countries of the world tries to support and relentlessly enhance a road density far in excess of its neighbours when measured against the resources available for the task." Bangladesh is exhibiting strong tendencies in the direction of non-sustainability, largely led by the transport sector. In Tanzania, Sieber² has shown how non-motorized transport investments can substantially alleviate rural poverty and enhance agricultural production. In a detailed study of the Makete district he shows how investment in donkeys and bicycles is likely to produce the greatest level of benefits. These investments are much cheaper than that required by roads and motorized transport and yet the bias of development, large-scale investment and overseas aid is still in favour of roads and vehicles.

Calcutta brings into very sharp focus all the issues associated with sustainable development and transport. Imagine living very close to a diesel generator, 24 hours a day. The resultant noise and air pollution levels would be off the end of



Rickshaws are being marginalized, even outlawed, in places like Calcutta.

Zed Nelson, Panos Pictures

the scale. This pollution is the daily reality in Calcutta, a city of 14 million inhabitants with a little less than 500,000 vehicles, each one of which emits clouds of poisonous black smoke, grinds around heavily congested streets and constantly blocks the trams and buses.

But Calcutta is essentially a pedestrian and highly accessible city. The vast majority of the population walk everywhere and where they do not walk they use the ubiquitous cycle rickshaws and Calcutta's unique hand-pulled rickshaws. Within walking distances there are hundreds of shops, businesses and schools. Her problem is that the physical conditions for those moving around on foot or by human-powered vehicles are appalling. Calcutta also has large areas of parkland, green space, water, a rich architectural heritage and an efficient tram and metro system.

But that system is, perhaps unsurprisingly, under threat. US consultants have managed to persuade the state government of West Bengal that it is an outmoded system, causes congestion and should be removed altogether from central areas. At the same time, Japanese consultants have conveniently persuaded the same government that six new concrete flyovers should be built to increase highway capacity at a cost of just under £50 million.

In Calcutta, there is no concept of assisting those who walk and cycle or use rickshaws. The pedestrian environment is highly dangerous and over 1,000 pedestrians are killed each year in Calcutta. The pedestrian pavements are seriously damaged, filled with rubbish and in places filled with people who only have the pavement for their homes.

As a city, she now faces serious choices. Under pressure from the developed world as well as her own internal growth imperative, Calcutta is moving to abandon large sections of public transport and encourage motorization. The flyovers will be built next year and will make life much more difficult for all those who live near them (over 250,000) and all those who want to use trams, walk or cycle. Tragically, the State government has banned cycle rickshaws, rickshaw pullers and hand-pulled carts in the central areas. Though not yet implemented, this is already causing distress amongst the poorest, who depend on these services for their income, and will cause untold misery to the lives of well over 100,000 for whom these activ-



While rickshaws are being progressively outlawed in places like Calcutta, they are coming back fast, for example, in Oxford, UK.

ities are the only source of income. Car factories are being built throughout India and car ownership is growing at over 25 per cent per annum. In the summer of 1996 Ford opened their first factory, and Daewoo opened a car plant.

The developed world has now embarked on the mass motorization of the developing world in a way that closely mirrors in its irresponsibility the activities of tobacco and pharmaceutical multinationals. The citizens of Calcutta will suffer as a result of this change in their fortunes and those supporting sustainable policies will be taken seriously only if they have the moral and practical authority that can come from serious traffic reduction and serious sustainability progress in their own countries.

What we are witnessing in places like Calcutta, which is no exception, is the marginalization of existing sustainable technologies and their replacement by that which can only fail in the long term, and which will reap terrible damage in the process. It is ironic that while "developed societies" are trying desperately to reverse the effects of these trends, like for example in Oxford where locals are reintroducing the rickshaw as a preferred means of transport, "development" of the South seems to have taken as its final goal the attainment of exactly that which has been lost in the process of "development".

John Whitelegg

John Whitelegg is working on a transport and environment project with community groups in Calcutta. A fuller report on sustainable transport in Calcutta is available by E-mail from: <pascal@gn.apc.org>

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John Whitelegg is Professor at the School of the Built Environment, Liverpool John Moores University.

The Obscenity of Accelerated Child-Development

A n alarming number of girls in the US are entering puberty much earlier than normal, according to a recent study reported in the journal *Pediatrics.*¹ And there is some evidence that exposure to environmental chemicals may be contributing to the phenomenon.

Current medical texts tell us that only one per cent of girls show signs of puberty, such as breast development and pubic hair, before the age of eight.² But the *Pediatrics*

Peter Montague is the editor of The Environmental Research Foundation's weekly publication *Rachel's Environment and Health Weekly*, from which this editorial has been adapted. PO Box 5036, Annapolis, MD 21403-70336, USA. study found that one per cent of all girls now have one or both of them at age three.

"Current medical texts tell us that only one per cent of girls show signs of puberty, such as breast development and pubic hair, before the age of eight. But the Pediatrics study found that one per cent of all girls now have one or both of them at age three."

Data for the study were collected by 225 physicians in suburban practices who recorded the physical growth of 17,077 of their young female patients, of whom 90.4 per cent were white and 9.6 per cent were African-American.¹

The authors of the study say their sample of girls was not selected randomly and therefore may not accurately repre-

> sent the entire US population of female children. However, they know of no systematic bias in their sample and they believe the girls they studied are typical.

> The early onset of puberty was observed in both white and African-American girls, but with significant differences between them. African-Americans showed the first signs of sexual maturity about

a year earlier than whites. Previous studies had observed these racial differences, but no one has provided an explanation for them.³ (There is also some evidence that these racial differences have developed only recently. A



1944 study reportedly found no such differences.)⁴

The new *Pediatrics* study found that, at age seven, 27.2 per cent of African-American girls, and 6.7 per cent of white girls had either breast or pubic hair development; by age eight, 48.3 per cent of African-American girls and 14.7 per cent of white girls had one or both of these characteristics. The study also found that one per cent of whites and three per cent of African-Americans had such

characteristics at age three. The study found that the average age for onset of puberty was just under nine for African-Americans and ten to ten-and-a-half years for whites. Again, current medical texts tell us that puberty

begins between the ages of 11 and 12, on average.

The study found that the age of first menstruation has not changed from an average age in white girls of 12.8 years, and eight months earlier in African-Americans. This, the authors tell us is a pattern that has held steady for 30 or 40 years. The principal author of the study, Dr Marcia E. Herman-Giddens told the *New York Times*, "The reason I did this study is that in my clinical practice, I was seeing a lot of young girls coming in with public hair and breast development, and it seemed like there were too many, too young. But I don't think any of us expected to see such a large proportion of girls developing this early."⁵ Dr Herman-Giddens is an adjunct pro-

"I was seeing a lot of young girls coming in with pubic hair and breast development, and it seemed like there were too many, too young."

fessor of maternal and child health at the University of North Carolina (Chapel Hill) School of Public Health.

The *Pediatrics* study suggests that environmental chemicals that mimic oestrogens might be involved. The authors point to a small study of ten girls who entered puberty early as a result of exposure to hair-care products that had oestrogenic properties.⁶ They suggest that other well-known oestrogenic chemicals, such as PCBs (polychlorinated biphenyls) should be studied to see if they are implicated in early-onset puberty.

As it happens, a very recent preliminary report indicates that PCBs and DDE (a breakdown product of the pesticide DDT) may indeed be associated with early sexual development in girls.

Both DDE⁷ and PCBs⁸ are known to mimic, or interfere with, sex hormones.

According to the British journal New Scientist, Dr Walter Rogan described preliminary data at a conference on environmental oestrogens in July in Arlington, Virginia.⁹ Rogan is acting clinical direc-

tor at the US National Institute of Environmental Health Sciences (NIEHS) in Research Triangle, North Carolina.

According to *New Scientist*, between 1979 and 1982 Rogan and his colleagues measured PCBs and DDE in blood and breast milk of hundreds of pregnant women in North Carolina.

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They also measured the chemicals in foetal blood collected from umbilical cords after birth. They then monitored the physical growth and maturity of 600 of the children of these women. They discovered that those girls with the highest pre-natal exposures to the chemicals entered puberty 11 months earlier than girls with lower exposures.

Rogan minimizes the importance of his data, but others say his findings are significant because few studies have ever looked at chemical effects on the

offspring of exposed women, and the women Rogan studied were exposed to PCBs and DDE from normal diet and environmental sources, not from industrial accidents or other abnormally high exposures.

Is it biologically plausible that oestrogen-mimicking chemicals could speed up the sexual maturation of girls? At least three laboratory studies of other mammals seem relevant here:

- Female rats were fed a diet that contained a phytoestrogen (a naturally-occurring plant that mimics oestrogen). The ovulation of their offspring was prematurely terminated – a sign that their sexual development had been speeded up by their mother's diet.¹⁰
- Exposing immature female mice to

high levels of methoxychlor stimulated them to early sexual maturity.¹¹ Methoxychlor is currently used in the US as a substitute for DDT, which was banned in the 1970s, partly because of its oestrogenic properties. The oestrogenic properties of methoxychlor have become well-established in recent years, but its use continues.

 Rats treated once with certain PCBs on the second or third day of life exhibited a permanent alteration in

Young female rats treated once with Monsanto's Arochlor 1221 (a PCB) achieved sexual maturity in 28 days, whereas untreated controls reached sexual maturity in 42 days.

> sexual development. Specifically, young female rats treated once with Monsanto's Arochlor 1221 (a PCB) achieved sexual maturity in 28 days, whereas untreated controls reached sexual maturity in 42 days.¹²

The authors of the *Pediatrics* study wrote, "This study strongly suggests that earlier puberty is a real phenomenon, and this has important clinical, educational and social implications." They hint that the clinical implications may be serious. The arrival of puberty is driven by naturally-occurring oestrogenic hormones coursing through the bloodstream. There is now considerable evidence that breast cancer is promoted by the presence of these same naturallyoccurring oestrogens. Women who go through puberty early have a longerthan-normal exposure to these oestrogens and therefore may be in greater danger of getting breast cancer.^{13,14}

Breast cancer now kills 46,000 American women each year and the number is steadily rising; the reasons for the rise are poorly understood but there is widespread agreement that oestrogen plays a role in the disease.¹⁵ In recent years, researchers have hypothesized that environmental chemicals that mimic oestrogens may also promote breast cancer.¹⁶

The social implications of earlyonset puberty are obvious: young children with mature bodies must cope with feelings, urges and differences from their peers that most children are not well-equipped to handle. For many children, early pubescence has become a significant burden to bear.

Peter Montague

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Domesticating Biotechnology: How London's Science Museum has Framed the Controversy

hen we visit a science museum, we participate in a cultural ritual. We see objects celebrated as icons of progress. We are given an object lesson in the progress of civilization. Indeed, science museums promote a 'public understanding', or belief, that our future is already being secured through further discoveries about the nature of things.

In recent years, science museums have exhibited controversial subjects and have even provoked further controversy. Although art museums have done so too, the stakes are higher for science museums, given that they lend a special authority to representations of 'objective' reality. In one notable case, for example, a critical exhibition came under attack for supposedly exceeding the proper boundaries of 'science'.¹

While some exhibitions overtly take sides in a controversy, generally they would claim to portray it in a neutral manner, with a 'balanced presentation' which encompasses all viewpoints from the controversy. More ambitiously, they could try to map the debate conceptually, by analysing the disputes which arise within science.²

In practice, the choices are far more complex than a 'partisan versus neutral' role. The 'balance' metaphor presumes that a controversy has only two sides. Yet there are many possible ways to portray the disagreements; the metaphorical pivot depends upon which ones are emphasized. Indeed, there is no neutral way to portray a controversy. A museum display can frame the controversy in a partisan manner simply by pre-empting or trivializing some issues. There are many reasons for a museum to display controversial themes, but recently the accommodation of sponsors has become central. Such financial dependence, quite naturally, influences how museums portray controversial issues, though in ways which may not be obvious. Let us examine how all the above features – cultural icons, framing and sponsorship – have converged at London's Science Museum, and more specifically in its



biotechnology exhibition.

"Museum upsets Greenpeace", ran the headline in the newspaper report on 'Future Foods: An Exhibition Looking at Genetically Modified Food'. The reverse was also true: biotechnology critics upset the Science Museum. Just before the opening ceremony was to begin, an activist jumped up onto the lectern and gave a five-minute speech denouncing biotechnology. Greenpeace criticized the exhibition as "awful", for failing to reflect people's concerns.3

Perhaps such an outcome was unsurprising, given that the exhibition was sponsored by organizations whose publicity emphasizes the benefits of biotechnology.⁴ Yet the museum curators had consulted *some* NGOs beforehand on how to design the exhibition. They sought to accommodate both promoters and critics of biotechnology, while also attracting the attention of visitors. How, then, is the exhibition designed to do all this?

Familiarizing the stranger

Visitors encounter a playful, reassuring atmosphere which associates biotechnology with familiar images and devices. Interactive game-displays put visitors in the vicarious role of genetic engineers solving the world's agricultural problems. The panels have large, colourful, repetitive motifs of familiar foods – cheese, wheat sheaves, beer mugs, etc.

These features provide a friendly ambience for the panel text, which in turn promotes industry claims – namely, that biotechnology is a modest extension of traditional agriculture; that genetically-modified food aims to benefit people and the environment; that safety regulation is strict, but that regulatory controls should not require segregation nor encompass the agrochemical implications. Let us examine further how these messages are conveyed.

The exhibition begins with a display of 'future foods' which are designed to benefit consumers, such as 'natural decaffeinated coffee', slow-ripening fruits, and broccoli with an anti-cancer agent. Such prominence implies that these benefits are central to the R&D investment; yet such products remain marginal, and most are designed primarily to cheapen the processing costs for industry. In a panel about 'Playing with nature?', we are invited to push buttons which change traits of flowers, and then we are reassured that "Changing the genes of plants is nothing new."

Les Levidow has been researching the safety regulations of agricultural biotechnology at the Open University. He has been Managing Editor of Science as Culture since its inception. He is also co-editor of several books, including Science, Technology and the Labour Process; Anti-Racist Science Teaching, and Cyborg Worlds: The Military Information Society.

Engineering security?

'Battle for the Cornfields' is an interactive display akin to a Space Invaders game. Visitors are invited to "save your corn from caterpillars and beat today's high score." The display simulates the micro-biolistic technique of shooting genes into the cell nucleus. When we insert a poison-producing gene and plant an entire field of such corn, all the plants survive a caterpillar attack. This game is presumably based on crops which have

an insecticidal gene inserted from the naturally-occurring microbial pesticide, *Bacillus thuringiensis* (B.t.) yet ignores its problematic aspects. From the exhibition alone, we would not know that B.t. cotton has

failed to provide protection in some parts of the USA, that B.t. crops in general may generate resistant insects, or that EU safety regulation has regarded B.t.-resistant insects as an acceptable effect.

'Feeding the world', another interactive display, emphasizes the growing world population, which supposedly requires an increase in food supplies

through higher productivity. Visitors are invited to "design your crop" – to push buttons which simulate genetic modification, for example for a gene which protects cassava from virus attack. Again, this display depicts a real innovation, though in a partisan manner.⁵ Viral susceptibility

arises from genetic uniformity and monocultures, so farmers minimize virus attack by intercropping.⁶ Ignoring this solution, the exhibition attributes the virus problem to a genetic deficiency. We are invited to save Third World farmers by giving them a magic bullet – which would increase genetic uniformity.

A display entitled 'A potent mixture' contains soya beans, some of them genetically modified, though we are not told for what purpose. (The crop has an inserted gene conferring resistance to a herbicide – both of which are

sold by the same company.) We are told that most soya in processed food comes from the USA, in "an inseparable mixture of genetically modified and unmodified soya beans". Yet unmodified beans *are* separable; indeed, unmodified soya has been kept separate by specialist suppliers to some European food companies. The display of visually similar beans, captioned as "inseparable", forecloses the issue of segregation, thus adopting the stance of the biotechnology companies.

Unintended effects

Under the heading 'Technological fix?', we are told that genetic modification can produce weedkiller-resistant crops, "thus reducing the amount of chemicals required". Yet there is ongoing public controversy about how such crops might affect agrochemical usage. This display reports recent research showing that the

There is no neutral way to portray a controversy.

weedkiller-resistance gene may spread to some weeds through hybridization. Then comes "the moral of the story": that "vigilance is needed in crop management". In other words, the weed-control implications should be the responsibility of farmers alone, rather than be included within safety regulation. Thus the exhibition adopts the

After a potted history of agriculture, the 'explainer' invites volunteers (generally, children) to symbolically transfer genes across species.

> stance of the EU, the UK government and the biotechnology industry, while ignoring dissent from a large and growing number of EU member states and environmental NGOs.

> Finally, near the end, the exhibition acknowledges safety concerns about biotechnology. A panel depicts a

The panel text in turn promotes industry claims – namely, that biotechnology is a modest extension of traditional agriculture.

> Greenpeace protester wearing an 'X', symbolizing unknown effects. Adjacent is a mannequin papered over with regulatory documents and large-size key words (e.g. "human data", even though such data are rare in risk-assessment documents). We are reassured that "risk assessments examine all the potential effects". This is a misleading account, given that EU safety approvals have depended upon judgements that some

undesirable effects would be acceptable, despite protests from a number of member states.⁷

While downplaying problems from predictable effects, the exhibition includes an interactive display entitled 'Unpredictable effects'. Visitors drop a metal disc into a set of moving shelves, which symbolize the difficulty in predicting "knock-on effects" – literally, in this case, as the discs knock into each other and eventually fall to the bottom.

> Thus the ecological uncertainties are symbolically converted into a mechanical model; the 'unpredictable' is made to appear reassuringly familiar.

Adjacent to the exhibition is the 'Ingenious Food' show, whose backdrop includes an enormous tomato and fish, along with colourful playground-type ladder. After a potted history of agriculture, the 'explainer' invites volunteers (generally, children) to symbolically transfer genes across species. Other volunteers are invited to perform a blind-test of genetically-mod-

> ified and conventional tomato paste. After all, it's a matter of personal preference: you can find out which type you prefer "only by trying them". Our basic role in the controversy, we are told, is to make free choices in a free market.

In short, the 'Future Foods' exhibition imaginatively pro-

motes the views of its sponsors, by domesticating and naturalizing biotechnology. It does make some gestures towards public concerns, and offers visitors a 'comments book'. However, biotechnology is presented as environmentally-friendly, despite a long-standing public debate over what

this means.⁸ The exhibition implies that our most serious problems arise through genetic deficiencies which can, indeed must, be corrected by what are precise, familiar techniques for inserting designer genes. Within this framework, it ignores some

fundamental sources of our agricultural and food problems – the intensive monocultural methods which attract pests, the further commodification of crops as interchangeable raw materials, and the appropriation of the best land for cash crops (many of them not even directly for food). In short, the display focusses exclusively on enabling an inherently unhealthy system to survive a little longer.

Ordering things

London's Science Museum is no stranger to promoting the views of industry. In the early 1980s it opened a 'Nuclear Physics & Power' exhibition.

Although sponsored by the entire nuclear industry, it promoted the more specific views of the UK Atomic Energy Authority. The exhibition generally sanitized nuclear weapons, glorified the Pressurized Water Reactor, and naturalized nuclear power as if the technology were derived from the natural order. The Museum staff had sought to encompass wider views, but they were

constrained by management diktat and were ultimately threatened with disciplinary proceedings for publicizing their disagreements. The exhibition

design was also constrained by the 'object-centred' approach, which emphasizes description of objects on display, while leaving little scope to analyse power relations.⁹

Again, in 1989 the Science Museum opened 'Food for Thought', sponsored by the Sainsbury's supermarket chain, as part of 'Farming and

Museums Year'. In it they departed from the didactic, object-centred style of earlier ones, and exemplified the new paradigm of 'consumer orientation', whereby museums self-consciously compete for customers with other entertainments, for example through interactive displays. In 'Food for Thought', visitors were constructed as

The exhibition adopts the stance of the EU, the UK government and the biotechnology industry, while ignoring dissent from a large and growing number of EU member states and environmental NGOs.

prospective consumers who can indulge in pleasurable, sensory delights of diverse foods and thus freely choose their preferred products. By downplay-

One display tells us that most soya in processed food comes from the USA, in "an inseparable mixture of geneticallymodified and unmodified soya beans". Yet unmodified beans are separable.

> ing industry decisions about food production, the emphasis on consumer choice evaded issues about where the 'choices' come from.¹⁰

In all these exhibitions, the Science Museum has apparently followed the old saying, "He who pays the piper, calls the tune." Of course, the relationship is more complex than sponsors

giving orders. Museum staff may resist such pressure. We on the outside may not readily know about internal conflicts, especially given the selfcensorship endemic to commercial sponsorship.

On the other hand, curators devise new ways to promote a world-view as if it were simply the order of things. Exhibitions are designed to involve visitors as vicarious consumers or technologists. Without overtly

taking sides, science museums will tend to lend authority to a partisan account; simply by trivializing or ignoring real concerns they may transform them into

> non-issues. When a museum frames a controversy in such ways, sponsors buy cultural legitimacy for their account of reality,

Thus we should ask: Instead of domesticating a controversial technology, how can science museums educate their visitors for genuine participation in the controversy? And more importantly, how

can such a role be reconciled with commercial sponsorship?

Les Levidow

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The 'Future Foods' exhibition faithfully promotes the biotechnology industry stance, though this cannot be said of one sponsor's booklet, Food for Our Future. The booklet

mentions environmental concerns, e.g. that herbicide-resistance genes could transfer to weeds, and that herbicide-resistant crops could lead to increased herbicide usage. It then claims: "Supporters of biotechnology argue that stringent rules exist to safeguard against these possibilities ." (FDF," 1997: 20; see similar claim in its Web pages, http://www.foodfuture.org.uk). On the contrary, biotechnology supporters do not argue that stringent rules safeguard against such possibilities - nor even that they should do so. In practice, herbicide-resistant crops have been granted safety approval on the basis that such effects are either acceptable or irrelevant. We may well ask why the food industry exaggerates the remit of safety regulation.

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The Biotechnology Bubble

by Mae-Wan Ho, Hartmut Meyer and Joe Cummins

"Research scientists can now precisely identify the individual gene that governs a desired trait, extract it, copy it and insert the copy into another organism. That organism (and its offspring) will then have the desired trait ...". So we are told by the experts in a field which has received more hype and which has been laced with more promises than almost any other this century. Cancer, depression, obesity, laziness, good looks ... all can be acquired or suppressed merely by fiddling with genes. Here, the author shows that the very science on which genetic engineering is based is fundamentally flawed, that the promises are little more than hot air, and that those industries involved are gambling to an unprecedented degree with our health and that of other living things, while people who invest in them can, in the long run, only lose their money.

Biotechnology crisis-management

ne sign of big trouble in the biotech industry is when EuropaBio, a non-government organization representing the interests of the industry, launched its multi-million pound campaign to win over European consumers last summer by engaging the services of Burson Marsteller,' the leading consultancy firm for worldwide crisismanagement [see the Corporate Europe Observatory editorial in this issue]. Previous clientele of the firm included Babcock and Wilcox during the Three Mile Island nuclear crisis in US in 1979, Union Carbide after the Bhopal disaster in India

which killed 15,000, and oppressive regimes in Indonesia, Argentina and South Korea. According to a leaked document from Burson Marsteller, plans drawn up to change perceptions on genetic engineering advised the industry to stay quiet on risks of genetically-engineered foods, as they could never win the argument, but to focus instead, on "symbols, that elicit hope, satisfaction and caring". It also advised that

the best way of eliciting a favourable response to new products must be to use regulators and food producers to reassure the public.

Let the regulators reassure the public

And regulators have been most obliging, starting at the highest level. The Food and Agricultural Organization (FAO) and World Health Organization (WHO) issued a joint Safety Report on genetically-engineered foods, as the result of an expert consultation held in Rome in October, 1996. The Report sets international safety standards by WHO's Codex Alimentarius Commission, which will determine, not only the safety of genetically-engineered foods, but also world trade. It will be illegal for any country to ban imports of genetically-engineered foods, so long as the Codex considers them safe.²

According to the report, risk assessment is to be based on the "principle of substantial equivalence". A product assessed to be substantially equivalent is regarded as safe and fit for human consumption. But, substantial equivalence can be claimed in advance, in which case, subsequent risk assessment is most perfunctory. Furthermore, "substantial equivalence" does *not* mean equivalence to the unengineered plant or animal variety. The genetically-engineered food could be

It is clear that everyone is in it for the money. The risks can be dismissed by appealing to the benefits, and when the benefits are not forthcoming, the promises have to be kept alive. Biotechnology is the South Sea Bubble at the end of the millennium. compared with any and all varieties within the species. It could have the worst characteristics of all the varieties and still be considered substantially equivalent. It could even be compared with a product from a totally unrelated species or collection of species. Worse still, there are no defined tests that products have to go through to establish substantial equivalence. The tests are so undiscriminating that unintended

changes, such as toxins and allergens, could easily escape detection. For example, a genetically-engineered potato, grossly altered, with deformed tubers, was nevertheless tested and passed as substantially equivalent.

Risk assessment based on the principle of substantial equivalence is the stuff of farce. It is designed to expedite product approval with little or no regard for safety. It is a case of "don't need – don't look – don't see", effectively giving biotech companies *carte blanche* to do as they please, while serving, indeed, to diffuse and allay legitimate public fears and oppositions.

Meanwhile, the European Commission has set up a European Federation of Biotechnology Task Group on Public Perceptions on Biotechnology to deal with public resistance to biotechnology, which is seen to be the biggest problem for the industry. Generous research grants are given to support public understanding, and to professors who promote public understanding, one of whom is John Durant.

Dr Mae-Wan Ho heads the Bio-Electrodynamics laboratory of the Open University in Milton Keynes in the UK: Hartmut Meyer is a member of the Forum Environment and Development Working Group on Biodiversity in Germany: Joe Cummins is Professor Emeritus of Genetics at the University of Western Ontario, Canada.



Billions have already been invested, and

companies are desperate to recoup their

losses before the whole enterprise collapses.

Agricultural genetic engineering destroys biodiversity because ecological relationships are ignored.

Corporate scientists speak for the industry

John Durant is not just a Professor of Public Understanding of Science, he is also Chairman of the European Federation of Biotechnology Task Group, a member of the UK Advisory Committee on Genetic Testing and Assistant Director of the Science Museum in London. The Museum is currently mounting a major exhibition promoting biotechnology [see Levidow in this issue], which includes a woolly jumper knitted from the wool of Dolly the cloned sheep, designed by the winner in a children's competition. In a recent public debate,³ he denied that he was working to overcome public resistance to genetic engineering. But he did assure the audience that the technology was absolutely safe, so segregation and labelling of geneti-

cally-engineered products were unnecessary. He was also opposed to any moratorium on releases of genetically-engineered organisms, as it would slow down development and compromise the competitiveness of the industry in Europe.

Professor Durant is not alone. There is now a sizable clone of corporate scientists, not necessarily all working officially for the biotech corporations, who go about promoting and defending the industry in roughly the same manner. They dismiss all risks as non-existent or negligible, while offering caring promises of feeding the starving billions of the Third World, greener agriculture, cleaning up the environment, miracle cures for cancer and other diseases, gene therapy ... Some of us have heard those promises for nearly 30 years, and still, the only real success that they can come up with is genetically-engineered insulin. It has been an endless summer of hype and promises that have yet to bear fruit.

The biotechnology bubble

It is clear that everyone is in it for the money. The risks can be dismissed by appealing to the benefits, and when the benefits are not forthcoming, the promises have to be kept alive. Biotechnology is the South Sea Bubble at the end of the millennium.⁴ Billions have already been invested, and companies are desperate to recoup their losses before the whole enterprise collapses.

The biotechnology bubble may be about to burst. "Investors have been stunned more by the absence of profits in their investments than by medical progress in the sector"⁵. According to *Investor's Business Daily*'s rankings, the sector has hovered in mediocrity for more than a year. Within a

> week this March, biotech stocks slipped from 77th among 197 industry groups to 95th. German economist Ulrich Dolata reported⁶ that the original estimates of US\$100 billion in world markets for genetically-

kets for geneticallyengineered products by year 2000 is now revised downwards to \$48 billion, of which only \$1billion will be in food and agriculture. He also noted that the maximum number of jobs likely to be created in Germany, assuming all goes well, is 40,000, which does not take account of jobs eliminated or substituted by gene technology. However, he ended on a cheery note, and suggested that the sector may become more "dynamic" in the near future.

We very much doubt it would. Why? Because the current approach is entirely misguided by a crude, outmoded, reductionist view of organisms, and the technology is hit or miss, as well as dangerous.





Assessing the development of herbicide-resistance, Germany.

Reductionist science and hit or miss technology

This is what the public is told:

"Research scientists can now precisely identify the individual gene that governs a desired trait, extract it, copy it and insert the copy into another organism. That organism (and its offspring) will then have the desired trait ..." This description

is typical of literature supposedly "promoting public understanding", and neatly encapsulates the bad science of genetic determinism.

The Flavr Savr tomato was a commercial disaster and has disappeared.

It gives the highly misleading impression of a precise technology, implying that,

- Genes determine characters in linear causal chains, one gene giving rise to one character;
- · Genes are not subject to influence from the environment;
- · Genes remain stable and constant;
- · Genes remain in organisms and stay where they are put.

This is the most extreme version of the classical genetics which has dominated biology roughly from the 1930s up to the 1970s when genetic engineering began. It is so extreme that no biologist would *admit* to actually subscribing to it. But, why else would they suggest that by manipulating genes, practically all the problems of the world can be solved?

Genetic determinism goes counter to all the scientific evidence accumulated especially within the past 20 years, which gives us the new genetics. What is the new genetics of the present day *really* like?

- No gene ever works in isolation, but rather in an extremely complicated genetic network. The function of each gene is dependent on the context of all the other genes in the genome. So, the same gene will have very different effects from individual to individual, because other genes are different. There is so much genetic diversity within the human population that each individual is genetically unique. And, especially if the gene is transferred to another species, it is most likely to have new and unpredictable effects.
- The genetic network, in turn, is subject to layers of feedback regulation from the physiology of the organism and its relationship to the external environment.
- These layers of feedback regulation not only change the function of genes but can rearrange them, multiply copies of them, mutate them to order, or make them move around.
- And, genes can even travel outside the original organism to infect another – this is called horizontal gene transfer.

The new picture of the gene is diametrically opposite to the old static, reductionist view. The gene has a very complicated

> ecology consisting of the interconnected levels of the genome, the physiology of the organism and its external environment.⁸⁹ Putting a new gene into an organism will create disturbances that can

propagate out to the external environment. Conversely, changes in the environment will be transmitted inwards and may alter the genes themselves.

Genetic engineering profoundly disturbs the ecology of genes at all levels, and that is where the problems and dangers arise.

Genetic engineering is a crude, imprecise operation

First of all, we must dispel the myth that genetic engineering organisms is a precise operation. It is not. The insertion of for-

Genetic engineering involves transferring genes horizontally between species that do not interbreed. Horizontal gene transfer is naturally done by infectious agents such as viruses and virus-like elements that are passed from cell to cell, from organism to organism, many causing diseases including cancer and spreading drug- and antibiotic-resistance genes.

Natural agents are limited by species barriers, and all cells have mechanisms that break down or inactivate foreign genes. However, genetic engineers make artifical vectors for transferring genes by joining together parts of the most aggressive agents to overcome all species barriers. Most of the genes causing diseases are removed, but the antibiotic-resistance genes are left in so that cells carrying the vector can be selected with antibiotics.*

Artificial vectors and the genes they carry have the potential to spread horizontally to a wide range of

species, to recombine with their genes to generate new viral and bacterial pathogens. It is this very danger that persuaded molecular geneticists to impose a moratorium on genetic engineering in the Asilomar Declaration of 1975." But commercial pressures soon intervened. Regulatory guidelines were put in place, and commercial production began. Those guidelines are far from adequate in the light of recent scientific evidence as eight scientists have argued in a new report which links genetic engineering biotechnology to the recent resurgence of infectious diseases.⁹

* Genetic engineering makes use of artificial vectors for replicating and transferring genes. The gene to be transferred (transgene) is inserted into a vector containing one or more antibiotic-resistance marker genes which makes it possible to select for cells that have taken up the vector carrying the transgene. The vector carrying the transgene and marker gene(s) can either be replicated many times in the cell or become integrated into the genome. The integration is random and not controllable by the genetic engineer.

eign genes into the host cell genome is a random process, not under the control of the genetic engineer; it is done by means of artificial vectors for horizontal gene transfer (see Box 1).²⁸⁻¹⁰

This gives rise to correspondingly random genetic effects, including cancer.¹² Importantly, furthermore, the foreign genes are equipped with very strong signals, most often from viruses, called promoters or enhancers, that force the organism to express the foreign genes at rates 10 to 100 times greater than its own genes. In other words, the genetic engineering process, both by design and otherwise, completely upsets the first two levels in the ecology of genes – the genome and the physiology – with dire consequences.

Unsustainable and unwholesome

There are many signs of the problems caused in genetic engineering organisms. For every product that reaches the market, there are perhaps 20 or more that fail. It is particularly disastrous for animal welfare.

- The "superpig" engineered with human growth hormone gene turned out arthritic, ulcerous, blind and impotent.¹³
- The "supersalmon" engineered, again, to grow as fast as possible, with genes belonging to other fish, ended up with big monstrous heads and died from not being able to see, breathe or feed properly.^{14,15}
- The latest clones of the transgenic sheep Dolly are abnormal and eight times as likely to die at birth compared with ordinary lambs.¹⁶

Even products that reach the market are failing, including crops that have been widely

- planted.
- The Flavr Savr tomato was a commercial disaster and has disappeared.¹⁷
- Monsanto's Bt-cotton, engineered with an insecticide from the soil bacterium *Bacillus*

thuringiensis, failed to perform in the field in both the US and Australia in 1996, and suffered excessive damages from Bt-resistant pests.¹⁸

- Monsanto's 1997 Roundup-resistant cotton crops fared no better. The cotton balls drop off when sprayed with Roundup and farmers in seven states in the US are seeking compensation for losses.¹⁹
- The transgenic "Innovator" herbicide-tolerant canola failed to perform consistently in Canada. This has led the Saskatchewan Canola The "supersalmon"
- Growers Association to call for an official seed vigour test.²⁰
- A number of different viral-resistant transgenic plants engineered with a viral gene actually showed increased propensity to

generate new, often super-infectious viruses by recombination.²¹⁻²⁴

 There is widespread instability of transgenic lines; they generally do not breed true.^{28,25}

According to Bill Christison, a representative of family farmers from the United States, who attended a recent Conference in the European Parliament on genetic engineering biotechnology,⁶ transgenic crop failures are under-reported. That, plus the restrictive contracts on transgenic crops imposed by the biotech companies – which make



Isolated DNA can do nothing by itself.

it unlawful for farmers to save seeds for replanting – has drastically reduced uptake for 1998. For example, transgenic soybean, unlike transgenic cotton, has not been reported as having any problems, and it was anticipated that 30 per cent of soybeans planted in 1998 would be transgenic. This has now been revised downwards to around 25 per cent at most. One reason for this is that in Missouri, the transgenic crop is showing a five-bushels-per-acre disadvantage in yield compared with the non-transgenic.

It is important to realize that the failures are not just teething problems. They are very much the result of a reduc-

tionist science and a hit or miss technology. The transgenic foods created are unwholesome, because they involve stressing the developmental and metabolic system of organisms out of balance. There are bound to be unintended effects including

toxins and allergens, which current risk assessments are designed to conceal rather than reveal.² The major problem is the instability of transgenic lines.

Beware of transgenic instability

Traditional breeding methods involve crossing closely-related varieties or species containing different forms of the same genes, and selection is practised over many generations under

The "supersalmon" engineered, again, to grow as fast as possible, with genes belonging to other fish, ended up with big monstrous heads and died from not being able to see, breathe or feed properly.

The "superpig" engineered with human

growth hormone gene turned out arthritic,

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field conditions, so that the desired characteristics and the genes influencing those characteristics, *in the appropriate environment*, are tested and harmonized for stable expression over a range of genetic backgrounds. Different genetic combinations moreover will vary in performance in different environments.

This "genotype-environment" interaction is well-known in traditional breeding, so it is not possible to predict how a new variety will perform in untested environments. In many cases, new varieties will lose their characters in later generations as genes become shuffled and recombined, or as they respond to environmental changes.

This problem is greatly exacerbated in genetic engineering, First of all, completely exotic genes are often introduced into organisms. Secondly, the procedures for creating transgenic organisms inherently generate increased genetic instability. In The biotechnology bubble may

It is important to realize that the failures

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be about to burst.



One myth is that genetic engineering is a precise operation, but as experience has already shown us, that could not be further from the truth.

plants, the genes are often introduced into cells in tissue culture, and transgenic plants are regenerated from the cells after selection in culture.

The tissue culture technique itself introduces new genetic variations at high frequencies; these are known as somaclonal variations.26 That is because the cells are removed from the internal, physiological environment of the plant which, together

with the ecological environment, keep gene expression, genes and genome structure stable in the cells and the organism as a whole. Unilever used

- tissue culture techniques to regenerate oil palms for planting in Malaysia several years ago. This has now been abandoned as many plants aborted in the field or failed to flower.27
- The process of gene insertion is random and many secondary genetic effects can result, as mentioned earlier.
- The extra DNA integrated into the transgenic organism's genome disrupts the structure of its chromosome, and can itself cause chromosomal rearrangement,28 further affecting gene function.
- The integrated vector containing the transgene(s) and marker gene(s) has the potential to move out again or reinsert into another site. causing further genetic disturbances.2.8.9
- The highly mosaic character of most vector

constructs makes them structually unstable and prone to recombination.9 This may be why viral-resistant transgenic plants generate recombinant viruses more readily than nontransgenic plants (see earlier).

- The use of aggressive promoters and enhancers to boost expression of transgenes causes stress and imbalance to the physiological system, increasing instability, as already stated.
- · All cells have mechanisms which silence foreign genes.29 One common mechanism is methylation - a chemical reaction that adds a methyl group to the base adenine or cytosine in the DNA (there are four bases in DNA, adenine, cytosine, guanine and thymine) - as the result of which, the gene is no longer expressed.

Transgene instability occurs both in farm animals³⁰ and plants.31 The transgenic sheep Tracy, engineered to produce human alpha-antitrypsin at high levels in her milk, failed to reproduce a single female offspring that matches her performance. That is why cloning techniques that resulted in Dolly were contemplated. Much more is known about instability in plants. In tobacco, between 64 and 92 per cent of the first generation of transgenic plants become unstable. The frequency of transgene loss in Arabidopsis ranges between 50 and 90 per cent. Instability arises both during the production of germ cells and in cell division during plant growth. It can be triggered by transplantation or mild trauma.18

Transgenic lines, therefore, often do not breed true. A typical case32 is the supposedly non-allergenic rice produced in Japan,33 which turned out to be both ineffective and unstable. The transgenic plants of the second and third generations showed only 20-30 per cent reduction of the allergens. The project has since been abandoned.^{34,35} The instability of trans-genic lines create difficulties in quality control and traceability. It also raises serious safety concerns. A transgenic variety with a certain gene insert might be assessed safe, but may completely change in characteristics when the insert moves to another position in the genome.

At a seminar given by scientists working for the biotech industry during the Biosafety Meeting in Montreal in May, 1997, a delegate from West Africa asked, "How old is the old-

est transgenic line?" None of the scientists answered the question. There is, in fact, no data documenting the stability of any transgenic line in gene expression, or in structure and location of the insert in the

genome. Such data must include the level of gene expression as well as genetic map and DNA base sequence of the insert and its site of insertion in the host genome in each successive generation. No such data has ever been provided by the industry, nor requested by the regulatory authorities.

One does not have to be prescient to see that transgenic instability makes biotechnology a bad investment. What's more, it may well ruin our agriculture and food supply.

Agricultural gene technology destroys biodiversity

Agricultural genetic engineering destroys biodiversity because ecological relationships are ignored.

Broad-spectrum herbicides used with herbicideresistant transgenic crops,

such as glufosinate³⁶ (Novartis' Basta) and glyphosate³⁷ (Monsanto's Roundup), destroy plants indiscriminately, many of which are habitats for wild-life. They are toxic to animals and human beings. Glufosinate also causes birth defects and glyphosate is mutagenic.38 Yet, the European Commission has approved four transgenic crops which are resistant to these toxic herbicides.39

- Resistant transgenic plants can become weeds themselves or cross-pollinate with wild-relatives, creating resistant weeds.40
- Food plants are now being engineered to produce industrial chemicals and pharmaceuticals. These will surely crosspollinate and contaminate our food supply for years to come.2

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- Transgenic plants with insecticidal genes not only harm beneficial species directly, but also indirectly down the food chain, such as lacewings and ladybird-eating prey that have fed on transgenic plants.^{42,42} In a field trial of Bt-cotton in Thailand, 30 per cent of the bees around the test-fields died.⁴³
- Transgenic crops with insecticidal genes or herbicideresistance genes actually favour the evolution of resistances.⁸ In other words, they exacerbate the problem they are supposed to solve.

Pesticide-resistance, a major and persistent problem in intensive agriculture, has become a textbook example of the supposed power of natural selection to increase rare random mutations. That is a myth. In reality, pesticide-resistance has become a classic case of feedback regulation in the ecology of

genes of the new genetics. It is due to genetic changes that can occur among most, if not all individuals in pest populations in response to sublethal levels of pesticide. They do not have to wait for rare random mutations. This has been known for more than 10 years. The genetic changes are part and parcel of the physiological mechanisms common to

all cells challenged with toxic substances, including anti-cancer drugs in mammalian cells or antibiotics in bacteria.^{8,9} Similarly, resistance to herbicides readily arises in plants exposed to the herbicides.⁴⁴ So, using herbicides with resistant transgenic plants will also hasten the widespread evolution of herbicide tolerance among weeds, *even in the absence of cross-pollination*.

For all those reasons, agricultural biotechnology is a bad investment which will kill off wildlife, until nothing is left but pests and weeds. So much for the supposed benefits of

biotechnology in food and agriculture. What about human genetics and medicine?

The human genomania

It is time to expose some of the most outrageous myths that have been perpetrated, before dealing with the more serious propositions.⁸ The greatest myth is that the human genome project will uncover the genetic blue-print for making a human being, so

that one can recreate the whole human being from DNA sequences. In fact, the isolated DNA can do nothing by itself. Nor can one deduce from the sequences anything about the human being. There are at least 10,000 genes in the human genome, each with hundreds of variants. The number of possible combinations of genes, assuming only 10 variants for each gene is 10^{10,000}. For comparison, the total number of particles in the universe is 10⁸⁰. There is no doubt that each person is genetically unique, as mentioned before, and it is thus impossible to predict the life of the individual from the DNA sequence of the genome, even if one believes that genes determine our destiny. Furthermore, 95 per cent of the DNA in the genome is so-called "junk" DNA, because no one knows what it does.

For the same reasons, it is outrageous to suggest that there can ever be a completely "personalized medicine" that matches a person's DNA. The thoroughly immoral suggestion of cloning headless human embryos to supply organs and cells for custom-made transplantations is also highly impractical.⁴⁵ The technique, which made Dolly, involves transferring a nucleus from a cell of an adult to eggs from which the nucleus has been removed, and allowing the egg to develop into an embryo. The success rate is less than 1 per cent, so an army of human female donors will have to be lined up to provide "empty" eggs. There is much current doubt as to whether Dolly was in fact cloned from the nucleus of an adult cell.⁴⁶ Adult cells accumulate systematic and nonsystematic changes in the DNA which make it very unlikely to support normal development.⁸

The transgenic sheep Tracy, engineered to produce human alpha-antitrypsin at high levels in her milk, failed to reproduce a single female offspring that matches her performance. all the problems associated with making transgenic organisms. The technology for inserting genes into the genome is hit or miss; there has not been a single case of documented success in gene therapy.⁴⁷ On the contrary, severe, nearly fatal immunological reactions have developed to at least one gene

therapy vector,⁴⁸ while the dangers of generating viruses from gene therapy vectors cannot be lightly dismissed.⁸ Naked viral DNA is much more infectious than the virus itself,⁹ and there are many dormant viral sequences in all genomes with which gene therapy vectors – all derived from viruses – can recombine to generate new viruses.

What about mass-screening programmes for so-called single gene diseases? Sickle cell anaemia is a recessive condition among Afro-Americans, which means that an individual has to have two copies of the mutant gene to have the disease.

The investment in genetic medicine is bad in all senses of the word. It is a drain on public resources to the overwhelming benefit of the biotech corporations. At the same time, ever-dwindling public resources are being misdirected away from the real causes of deteriorating public health. Screening programmes for this condition have already resulted in individuals who are asymptomatic carriers of the condition (with only one mutant gene) being discriminated against in employment and in health insurance.⁴⁹ This is socially unacceptable and economically unsound, and has no scientific basis whatsoever, for the reasons already stated: it is impossible to predict a person's health from just one single gene when the

other genes are different.

Two cases should be described to illustrate the fallacy of genetic determinist thinking.⁸ The first is cystic fibrosis, a recessive condition like sickle anaemia, which requires two copies of the mutant gene to become expressed. The severity of the disease is extremely variable. Furthermore, there are now more than 400 variants of the gene identified, whose effects are largely unknown. The gene is extremely long, and many more variants are likely to be isolated. While the common variant results in cystic fibrosis in the north European population, it is not associated with the disease at all in the Yemenite population. In the latter population, clinical conditions diagnosed as cystic fibrosis are associated with a different gene altogether. The same goes for the so-called

British Biotech Shares Collapse

Chief scientist sacked for exposing drugs hype

British Biotech shares plummeted over the past year from 270p to 59p this April, just before they sacked Dr. Andrew Millar, its widely respected director of clinical research responsible for the Company's trials of cancer and pancreatitis drugs. Articles in *The Times* (April 20 and 23) disclosed that British Biotech is under investigation by the US Securities and Exchange Commission (SEC), and two UK investors, Perpetual and Mercury Asset Management, who between them own 20 per cent of British Biotech, are demanding a full explanation.

The same investors also asked their law firm to report on controversial shares sales made by British Biotech directors just weeks before bad news broke back in February 1995, on batimastat, which, up to then, was their leading cancer drug. Keith McCullagh, chief executive and Sir Brian Richards, British Biotech's co-founder and former chairman, made £1.2 million in the deals. A company spokesperson said the stock exchange had already investigated and cleared the share sales.

British Biotech's optimistic assessments of the prospects of a new cancer drug, marimastat, led to a huge increase in its shares at the end of 1995. The SEC began its investigation last July over some of British Biotech's press releases in 1995 and 1996, which may have violated US securities laws. The US Food and Drug Administration (FDA) had also expressed concern about the Company's account of its success with marimastat as long ago as September 1996. Dr. Millar himself had grave doubts about British Biotech's prospects for short-term success, so much so that he refused to take part in the City briefings last June. He had also discussed his concerns with Perpetual, which led to his suspension and eventual dismissal. Perpetual's worries were further fuelled when it learned that Jane Henderson, a Goldman Sachs analyst, was discouraged from speaking to Dr. Millar when she visited the Company's headquarters in Oxford this February.

Spokespersons of Perpetual reject British Biotech's claim that Millar was acting irresponsibly. It was Perpetual that approached Millar. Perpetual, and later, Mercury, agreed to be made insiders, allowing them access to price-sensitive information.

"We had an incredibly alarming meeting with Andy Millar," said Neil Woodford, a senior fund manager from Perpetual. "His concern was that the status of the trials was completely at odds with the grand strategy."

British Biotech had negligable revenues but is spending more than £50 million a year while its drugs have been suffering numerous setbacks.

Dr. Millar has told the US FDA that there needs to be an interim analysis of the data from trials of Zacutex, British Biotech's pancreatitis drug, as well as marimastat. But a spokesperson from British Biotech said they have no intention of conducting an interim analysis of the ongoing Zacutex study.

cancer gene, *BRCA1*. A certain mutation in the gene is associated with 40 per cent of breast cancers in women who have a family history of cancer – which make up only five per cent of all breast cancer cases in women – but has no association with familial breast cancer in men.

Genetic screening is most often limited to members of families which already have a history of the condition. But, couples have been subject to pressures to abort affected foetuses whether they want to or not. Enormous efforts are now concentrated into hunting for genes for every conceivable human condition – homosexuality, shyness, criminality, intelligence, alcoholism – where the connection with individual genes becomes more and more remote and dubious. It is all too easy to slide insensibly into what constitutes a harmful or undesirable gene, and to practise "therapeutic" abortions on that basis.

Can we afford to let genetic determinist science continue to dominate our social and health policies? The dangers of genetic discrimination and eugenics are real. From the 1930s to the 1970s and in some cases right up to the 1990s, tens of thousands of people, the majority of them women, have been sterilized by force in the US, Canada, Australia, Sweden, Denmark, Finland, Italy, Switzerland, Japan, Norway, France, Germany and Austria, on the basis of "undesirable" racial characteristics or otherwise "inferior" qualities, including poor eyesight and "mental retardation".⁵⁰

What about genetically-engineered insulin? Certainly, it

gives life support to those suffering from insulin-dependent diabetes. But that does not help the vast majority of diabetics that are controllable by diet, nor those that are independent of insulin.

The more general point is that debilitating genetic diseases which can be attributed to mutations in single genes constitute less than two per cent of all human diseases.⁵¹ How can this justify the current overwhelmingly biased investment in genetic medicine? The last issue of *The Ecologist* (Vol 28 No. 2, March/April) documents the dubious record of cancer research. Billions have been invested into cancer genes and the genetics of cancer, and still the rates of most cancers are increasing year by year. Tens of billions have been made in the "healthcare market" for diagnosing and treating cancer patients to little avail. At the same time, the impacts of environmental carcinogens and mutagens are consistently overlooked by the cancer research establishment. It is estimated that approximately one per cent of all genetic diseases are due to new mutations.⁸ Are these the result of environmental mutagens?

The investment in genetic medicine is bad in all senses of the word. It is a drain on public resources to the overwhelming benefit of the biotech corporations. At the same time, ever-dwindling public resources are being misdirected away from the real causes of deteriorating public health. It is disastrous from the social point of view in promoting genetic discrimination and eugenics.

Before the bubble bursts ...

Before the bubble bursts, we suggest that the biotech industry should

- Stop throwing good money after bad. Take stock of existing projects and discontinue those that have all the signs of going down a blind alley, which may include most projects on genetically engineering organisms.
- Stop wasting money on expensive campaigns to change public perception..
- Stop corrupting our scientists and support research scientists doing good research.

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- Invest in basic research to discover appropriate and safe ways to use genetic engineering technology.
- In the meantime, don't forget to look out for alternative investments into other technologies that are genuinely environmentally friendly and sustainable.

In fact, biotech companies would achieve the best public relations and serve their own interests by supporting a fiveyear moratorium on releases. This would create a breathing spell for stocktaking and for honest scientists to do the necessary research.

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MAIgalomania: The New Corporate Agenda

by Olivier Hoedeman with Belen Balanya, Ann Doherty, Adam Ma'anit and Erik Wesselius

The Multilateral Agreement on Investment is the latest, and by far the most impressive, attempt by large corporations and their associates in governments around the world to usurp near total control of the global economy. If passed, the world's largest and arguably most damaging corporations will be guaranteed decades of virtually unimpeded access into almost all sectors of the world's economies. What's more, the agreement, which will force the dismantling of any regional protections, environmental or otherwise, which are seen to hinder foreign investment, has been negotiated in almost total secrecy. Only recently have the details emerged, and non-governmental organizations around the world have organized in mass resistance to it.

ecrecy, haste and intrigue have characterized the negotiations around the Multilateral Agreement on Investment (MAI) - the latest plan of the economic globalization fraternity for dismantling barriers to investment all over the world

in the march for a progressively more open global economy. After a smooth first year and a half of negotiations, the MAI entered a far rockier phase in early 1997. Problems have since then multiplied with the highspeed emergence of anti-MAI campaigns in one OECD country after another and due to demands by some OECD governments for an increasing number of reservations and sectoral carve-outs.

The 1994 completion of the Uruguay Round and the creation of the World Trade Organization (WTO) was a great victory for Transnational Corporations (TNCs), which together with their governments lobbied for the removal of national barriers to the flow of goods and services. The next logical corporate challenge has been the creation of a treaty which, by dismantling barriers to investment, would provide investors with a so-called "level playing field" across the globe. The various provisions of this Multilateral Agreement on Investment - including key principles such as "non-discrimination", "no entry restrictions" and a ban on performance requirements - would ensure the most ideal investment conditions. It would grant TNCs extensive new powers while at the same time denying governments the right to control foreign direct investment in their

"Investment is a desirable and desired thing ... Nonetheless, governments still sometimes find it threatening, because free direct investment limits administrations' ability to control and shape their countries' economic destiny. This is a small price to pay for allowing private sector decision-makers to generate economic benefits worldwide. But it is a price that some governments still find difficult to pay' - EU Commissioner Sir Leon Brittan.

countries. The rules and regulations which hinder foreign investment and which would be dismantled under the MAI are often those that protect workers and jobs, public services, domestic businesses, the environment and culture.

The MAI is a child of the Organization for Economic Cooperation and Development (OECD), an intergovernmental organization made up of 29 of the world's richest industrialized

these corporate lobby groups have been directly or indirectly involved in the shaping of the MAI. The reason for their interest in a global investment treaty can be found in the percentage of corporate investment that increasingly flows in a southerly direction. Moreover, the countries of the South are where most protective regulations on foreign investment are still in place. Since 1995, governments all over the world have made some 600 changes in national investment legislation, 95 per cent of which have resulted in greater lib-

eralization.2 The MAI aims to increase and secure this trend. As William Witherell, a high level OECD official, has explained: "Although investment regimes have become much more open and welcoming in the recent past, there is no assurance that they will remain so in the years to come."3 EU Commissioner Sir Leon Brittan agrees: "Investment is a desirable and desired thing ... Nonetheless, governments still sometimes find it

countries, with headquarters in Paris,' but is intended as much for Third World countries as for the OECD states negotiating the agreement. It will be a "freestanding" international treaty, open to accession by non-OECD countries, which means that coun-

tries can sign on a take-it-or-leave-it basis,

allowing only time-limited reservations. The MAI is also designed as a benchmark

for negotiations on global investment rules

in other international fora, specifically the WTO. By negotiating the MAI without the

participation of Third World countries, the

OECD governments, notably the US,

Canada, Japan and the EU, have aimed to

ensure the "highest standards" of protec-

tions and rights for foreign investors. A total

of 477 of the world's 500 largest TNCs are

based in OECD countries and most of these are organized in groupings like the International Chamber of Commerce (ICC), the US Council for International Business (USCIB) and the European Round Table of Industrialists (ERT). All

threatening, because free direct investment limits administrations' ability to control and shape their countries' economic destiny. This is a small price to pay", he assures us, "for allowing private sector decision-makers to generate economic benefits worldwide. But it is a price that some governments in some sectors still find difficult to pay. That is a tragedy."⁴

Pre-cooked MAI

At their May 1995 conference, the OECD country ministers decided to initiate negotiations on a MAI, with the goal of completing an agreement by May 1997. Official negotiations kicked off in September 1995 in a negotiating group, chaired by Dutchman F. A. Engering, with representatives of all OECD states as well as the European Commission. The WTO was invited as an observer. The main building blocks of the MAI - including its all-encompassing definition of investment and the principles of national treatment, most favoured nation status, roll-back, standstill and so forth - were in place from the start of the negotiations thanks to a four-year feasibility study. The process of soliciting non-EU members started soon afterwards, in the first of a series of ongoing negotiations with interested countries.5 At least 10 non-OECD countries expressed interest in joining the MAI from the beginning, including Argentina, Brazil, Chile and most likely Hong Kong, Colombia and the three Baltic States: Estonia, Latvia

and Lithuania. Also Egypt is expected to join.⁶ Non-governmental organization (NGO) observers following the negotiations between the EU and the ACP countries (African, Caribbean and Pacific) about a revised Lomé Convention, report that the EU is pressuring these former European colonies to accept the MAI as part of a new Convention.⁷

Informal Encounters

Corporate lobby groups needless to say had direct input throughout the entire negotiation process. Also, as a matter of course, business interests were consulted during the preparatory phase. Collaboration existed not only with the OECD's Business and Industry Advisory Council (BIAC), which unites numerous business associations and has formal consultative status at the OECD, but also with individual corporate lobby groups such as the International Chamber of Commerce (ICC). Apart from the formal consultations carried out by the negotiating group with both the business and industry and trade union advisory councils (BIAC and TUAC, respectively), an "ad hoc group of BIAC experts ... meets with and advises OECD negotiators prior to each negotiation session".8 The negotiators made extensive use of the "expertise" of the ICC, for instance in shaping the dispute settlement mechanism. In fact the ICC's own court of arbitration is one of the three possible bodies that corporations can turn to for dispute settlement purposes.9

No less important than their direct influencing of the OECD process is the lobbying done by industry on a national level. The US Council for International Business, for example, has "regular meetings with US negotiators immediately before and after each MAI negotiating session".¹⁰ Similar close cooperation between industrialists and national negotiators has taken place in many other OECD countries, including Japan, Canada and the Netherlands. Corporate lobby groups like the ICC and the European Round Table of Industrialists (ERT) have used their political access at the highest political levels, including summits of global importance like the G-7, to stress the need for a speedy completion of the MAI and for keeping the agenda clear of labour and environmental demands.

Shared Agenda

The basis for the cosy consultations between governments and corporate lobby groups throughout the MAI drafting process is that the business agenda is wholeheartedly embraced by several of the most influential negotiating delegations. The ICC's April 1996 "Multilateral Rules for Investment" report leaves no doubt about the almost complete consensus between the MAI negotiators and industry.¹¹ The rules proposed in the report are basically identical to the first MAI draft that was completed nine months later.

Generally, economic or trade ministry officials represent their countries in the MAI negotiations in the OECD. In the Netherlands, the traditionally close connections between industry and economic and trade ministries were exploited to their full potential. The Dutch negotiators sided with industry in their mutual aim to get "as many obstacles as possible to foreign investment removed".¹² Astonishingly, in many countries, the MAI went largely unnoticed by other ministries – for instance those of environment, social affairs and culture –

until a very late stage.

Troubled Waters

The first draft of the MAI saw the light of day in early 1997. Until this time, the agreement had been sailing along quite smoothly, with the general public and even most elected public officials oblivious to its very existence. But both the complicated reservation process and the discovery of the MAI process by the NGO

Corporate lobby groups like the ICC and the European Round Table of Industrialists have used their political access at the highest political levels to stress the need for a speedy completion of the MAI and for keeping the agenda clear of labour and environmental demands.

> community have served to slow down, and perhaps even fundamentally disrupt, the charted course of the planned agreement.

> Governments submitted their "reservations" to the MAI in February 1997, and in addition to the sheer volume of national exceptions, governments had chosen to exempt some core, open-ended areas of the agreement. In some countries, the exemption process probably involved governmental actors who had previously been uninformed about the MAI, and who were now reacting with cold feet to the far-reaching provisions of the agreement. The following are some examples of the major core exemptions proposed by member states:

- The US demands an exemption for subsidies and for subfederal law, which would provide states and localities with immunity from the MAI.
- The EU asked for positive discrimination for investment within regional economic integration organizations (REIOs) like itself. The aim of this clause would be to ensure that the MAI would not prevent countries from changing their laws to match EU legislation. This could be of crucial importance for Central and Eastern European countries waiting for EU membership as well as for the future possibilities of harmonizing EU legislation.
- France and Canada requested that culture be carved out of the agreement entirely.
- The EU made noise about the need to ban secondary boycotts, such as the US Helms-Burton Act which penalizes

companies doing business with Cuba.

To add insult to injury, country-specific exemptions to the MAI now total a hefty 1,000 pages, with some governments exempting page after page of the key sectors of their economies.¹³ The serious impacts upon the treaty of these farreaching reservations, such as culture, and the daunting volume of the specific exemptions have served to unsettle the previously trouble-free MAI negotiations. A decision to postpone the deadline for the negotiations until May 1998 was taken at the April 1997 OECD Ministerial Conference, with ministers arguing that a "high standard" MAI required more time.

Public Explosion

The second, and simultaneous spanner in the MAI's works was the explosive reaction of the international NGO community after a draft text of the MAI was leaked at the beginning of 1997. Canadian and US NGOs were quick to put the draft text on their websites, and campaigning spread like wildfire to other parts of the world. NGO strategies have included public education, lobbying of government officials and parliamentar-

ians (many of whom first heard about the MAI from the NGO community), actions and street theatre, and, in October 1997, the organization of a global NGO strategy meeting on the MAI and a simultaneous informal consultation with the OECD. The consultation/strategy session

brought together representatives of development, environmental and consumer groups from over 70 countries, and resulted in a call for a major overhaul of the agreement.¹⁴ The NGO coalition organized a successful International Week of Action against the MAI in the middle of February 1998, in the week before the OECD's High-level Negotiation Session. The common NGO statement had meanwhile been signed by over 560 groups from all over the world. A recent development is the emergence of local campaigns for MAI-Free Zones. The first city council to announce its territory an MAI-Free Zone was Berkeley in California, followed by a local council in Tokyo.

NGOs and trade unions have successfully injected two new demands into MAI negotiations - the integration of labour and environmental standards into the agreement. For industry, these demands - taken in conjunction with the cumbersome reservation process - are intolerable. Recently, the OECD's Business and Industry Advisory Council (BIAC) began a new offensive after realizing that its dream MAI was on the verge of being derailed. At an official consultation between BIAC and the OECD MAI negotiating group in January this year, Herman van Karnebeek, chairman of BIAC's Committee on Multinational Enterprises (as well as of chemical giant AKZO Nobel and the Dutch branch of the International Chamber of Commerce), complained that: "We now hear of disturbing signs that many of the elements we were hoping for may not be possible. What then, we are beginning to ask ourselves, is in the MAI for us?" 15 OECD negotiators calmed BIAC members fears by asserting that liberalization remained at the top of their agenda, but that compromises were necessary in order to complete the MAI. "Remember, this is only the first step like the GATT in 1947." BIAC was consoled by an OECD official. "We are entering a process of historic dimensions."16

In March, a massive majority in the European Parliament approved a resolution full of fundamental criticisms of the MAI. The resolution stresses "the fact that the negotiations have hitherto been conducted in utmost secrecy, with even parliaments being excluded."¹⁷ The European Parliament states that the MAI "reflects an imbalance between the rights and obligations of investors, guaranteeing the latter full rights and protection, while the signatory states are taking on burdensome obligations which might leave their populations unprotected." The Parliament's resolution on the MAI demands a thorough analysis, accessible to the public, of the impacts of the agreement on legislation within the EU and ends by calling on "the parliaments and the governments of the Member States not to accept the MAI as it stands". The European Commission and the governments, however, are under no obligation to fulfil this request.

The public outcry against the MAI in France, making the issue front page news in February 1998, forced the French government to stiffen its resolve in demanding a carve-out for the cultural sector among others. Also for the US and Canada, the conflicts about the reservations and the heated public debate made the option of completing the treaty by the end of April 1998 increasingly unattractive. After the High-level Negotiation Session in February only the EU and the OECD secretariat still hoped for meeting the April deadline, because further delay

The ICC's April 1996 "Multilateral Rules for Investment" report leaves no doubt about the almost complete consensus between the MAI negotiators and industry. would be seen as a victory for the anti-MAI movements and would lead to a loss of momentum. By the end of March, the OECD announced it was seeking a new mandate for another year of negotiations.

What's in the MAI?

In sum, the MAI would require countries to open their economies wide to any interested investor, and TNC complaints about unfavourable treatment by the host country would be judged in unaccountable international courts. The main elements of the agreement are as follows:

- The MAI would encompass an extremely broad range of 'investments', defined in the preamble as "every kind of asset owned or controlled, directly or indirectly, by an investor". Not only direct corporate investment, but stocks, bonds, loans, debt shares, intellectual property rights, leases, mortgages and concessions on land and natural resources (including for instance logging concessions and patents on plant and animal genes) would be covered. The health, education, communications, cultural, banking, construction and social sectors would all be fair game for foreign investors; in fact, the only exempted sectors would be defence and police.
- The MAI is based on the principles of national treatment and • most favoured nation (MFN). In plain language, this would require governments to treat foreign investors as well or better than domestic investors, and thus would automatically favour transnational investment over that of smaller, domestic companies. Restrictions placed by countries on foreign investment in sensitive sectors - for example, publishing in Malaysia, Indonesia and Venezuela, forestry, fishing, mining and agriculture in a number of countries, as well as toxic waste in Colombia and highly polluting industry in Taiwan would be prohibited. Limits to foreign ownership of land would have to be removed and foreign investors would gain equal access to bid on any public services being privatized. National treatment under the MAI applies not simply to the text or intention, but also to the impact of a policy or law. The Finnish government has in its environmental review concluded that a large part of Finnish legislation could be challenged under the MAI because their impacts could be considered to be discriminatory to foreign investors.
- · The MAI would do away with so-called performance



requirements, measures designed to protect workers and communities. For example, government requirements for a minimum number of local people being employed in a foreign firm, (re-)investing a minimum amount in the local economy, the use of a certain percentage of domestic products, technology transfer and so forth would become illegal under the MAI.

- By banning restrictions on the excessive flow of capital in and out of countries, the MAI would increase speculative shortterm investments of the type that caused the 1994 Mexican peso crisis and recent stock-market crashes in South-east Asia.
- Unlike other multilateral treaties, the MAI would include a dispute settlement mechanism to allow investors to sue national and local governments for expropriation and, disturbingly, "measures having the equivalent effect". This dangerously broad definition in combination with the binding international arbitration, grants TNCs the power to challenge local and national legislation emerging from democratic political processes. A ruling of expropriation, which the MAI defines not only as loss of income but also of reputation, requires states to compensate financially the investor and/or to reform laws. The arbitration panel would consist of a few trade experts working behind closed doors, beyond public scrutiny. The ramifications of this provision

upon national environmental, health and safety regulations are enormous, as exhibited by an ongoing case under the NAFTA in which the US Ethyl company is suing the Canadian government for US\$ 250 million, claiming lost profits and reputation due to the banning of a toxic gasoline additive. The expanded

rights for foreign investors in the MAI could for instance be used by biotechnology corporations to enforce and consolidate market access. Governments wanting to restrict the patenting of living organisms or the marketing of genetically-modified products – such as Monsanto's soya bean or Novartis' maize – could be prevented from doing so by corporations using their new rights to fight "discrimination" and "expropriation".¹⁸

- The MAI also includes the dangerous provisions of standstill and roll-back. Standstill prohibits signatory countries from introducing new laws or policies which contradict the MAI – this would have a crippling effect on national environmental and social policy. Liberalization measures would become irreversible. Roll-back is the procedure by which countries will be forced to open up protected areas and remove laws considered in violation of the MAI. OECD countries have identified 1,000 pages of exemptions which would eventually have to be rolled back – ranging from the Dutch exemption for the profession of notary (still only to be carried out by Dutch citizens) to social services in the United States. The MAI draft outlines procedures, including new negotiating cycles, for dismantling legislation and policies that are incompatible with the MAI.
- The provisions of the MAI would contradict several international agreements signed by governments, including the Climate Convention and its Kyoto Protocol, the Basel Convention on Hazardous Waste and the Convention on Biological Diversity. The Convention on Biological Diversity, for instance, allows countries to control access to genetic resources and ensure that the local population bene-

fits. This and many other agreements impose various 'discriminatory' investment regulations in order to reach environmental and other legitimate goals. The MAI is obviously also in contradiction with the UN's Charter of Economic Rights and Duties of States from 1974 which provides every state with the authority to regulate foreign investment and the operations of transnational corporations in their territories.

 The MAI would in effect lock signatory countries into the agreement for a 20-year period. A country can withdraw from the MAI only after five years, and companies investing in that country are covered under treaty provisions for an additional 15 years.

Safeguarding environment and labour?

The MAI negotiators are busily decorating the agreement with wording on social and environmental standards in an attempt to neutralize the critique and improve the chances of getting the MAI through national parliaments. Whether these clauses would be binding or not is unclear: Korea, Australia and Mexico are fiercely opposed to any binding language on environment and labour, as are the major corporate lobby groups. The US delegation in particular has been in favour of adding additional language on environment and labour, proposing to

"We now hear of disturbing signs that many of the elements we were hoping for may not be possible. What then, we are beginning to ask ourselves, is in the MAI for us?" – Business and Industry Advisory Council use the provisions in NAFTA. European Union countries prefer an environmental "exception" similar to Article XX in the GATT. Both the NAFTA and the GATT clauses, however, have already proved insufficient to prevent environmental regulations from being challenged as barriers to the free flow of trade and investment. And

even a watertight environmental clause would not change anything about the more fundamental environmental threats emerging from the MAI: its aim of ensuring transnational corporations unlimited "equal access" to markets and natural resources all over the world.

The MAI would, for instance, allow transnational corporations "equal access" to primary forests. Currently corporations manage to lay their hands on timber concessions that threaten the world's last remaining primary forests, in countries such as Brazil, Suriname, Papua New Guinea, Congo and Cambodia. The MAI would institutionalize this access: everywhere where local companies are allowed to log, TNCs would have the right to do the same. Governments would no longer be allowed to impose conditions, such as measures to ensure that local communities benefit. The MAI would have similar dangerous effects in the mining sector. International investment in mining is booming and mining corporations have a clear interest in removing barriers and ensuring access to local mineral resources. Governments could no longer insist on partial local ownership, let alone limit mining to locals. Possibilities to counter the current high-speed extraction of natural resources - primary forests, minerals and oil reserves, biological diversity - would be severely limited by the MAI.

Corporate dominance

The MAI would subvert national and local priorities to the needs of foreign investors. The impacts would be the most devastating on poorer countries, which would have no chance to build up a balanced economy or break their reliance upon commodity export and resource extraction in the service of industrialized countries and their corporations. The MAI would remove the demands put on investors by Southern governments to ensure that local communities benefit from the investment. It would, moreover, ban most of the tools traditionally used by developing countries to protect local producers in strategic sectors, such as agriculture, media, health, education or banking.

The winners would obviously be transnational corporations, whose global economic dominance would be expanded further, at the expense of local producers; a dominance, we should note, which has already today reached disastrous proportions. The share of world GDP controlled by TNCs has grown from 17 per cent in the mid-60s to 24 per cent in 1984 and almost 33 per cent in 1995.19 In a parallel and related process, the largest TNCs are steadily increasing their global market shares. 50 per cent of all global foreign direct investment is made by just one per cent of the world's corporations. Continuous mergers and take-overs have created a situation in which almost every sector of the global economy is controlled by a handful of TNCs, the most recent being the services and pharmaceutical sectors. TNC tendencies towards mergers, relocations, automatization and centralization of production and distribution are recipes for job losses. This process would be further speeded up with the passage of the MAI.

A survey carried out in 1996 among affiliates of TUAC (the trade union advisory council at the OECD) showed that TNCs are "increasingly using the threat of delocalization to influence the outcome of collective bargaining, withholding information from unions and in some cases blatantly derecognizing them, while undermining environmental and health and safety standards."20 But the threat is based on a disturbing trend: TNCs relocating parts of their production to countries with lower wages and weaker environmental standards and enforcement. A recent review of the production patterns of 22 computer companies based in industrialized countries shows that they have moved half their manufacturing and assembly operations, involving highly toxic materials, to developing countries.²¹ The MAI would enormously increase the ability of corporations to relocate. The effect would be to make corporations even more footloose, thereby shifting the balance in bargaining power between corporations on the one hand and labour unions, citizens groups and governments on the other. The process of competitive deregulation between governments and the downwards pressure on wages and job security would be accelerated.22

Multifaceted Attack for Investment Deregulation

The MAI is not the only ambitious attempt to deregulate national and local investment rules. Over and above the MAI, the EU, the United States, Canada and Japan dream of a global investment treaty within the WTO. A first offensive to initiate negotiations on such a treaty - stimulated by the euphoria that followed the signing of the GATT - took place in 1995 and 1996. Fierce Third World resistance to the so-called Multilateral Investment Agreement (MIA) resulted in a compromise at the WTO's first Ministerial Conference, in Singapore in December 1996: the creation of a WTO working group on investment, within which the struggle continues. The resistant Third World countries - including India, Malaysia and Pakistan - are still fiercely opposed to negotiations on a WTO investment treaty, having learned a lesson from the Uruguay Round of the GATT - that the initiation of negotiations generates enormous pressure for the completion of far-reaching treaties.

Whereas the working group's report to the WTO Ministerial Conference in May 1998 is not likely to contain any controversial recommendations, the EU and others will push hard to have the final report to the WTO General Council – six months later – recommend that negotiations on investment begin by 1999 or

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the year 2000. The most likely strategy is the initiation of a new general round of negotiations to include worldwide liberalization of agriculture, investment and several other issues at the beginning of the new millennium. What makes an investment treaty within the WTO attractive to Northern governments is that it would cover over 130 countries and allow access to the WTO's dispute settlement mechanism – and in particular to its cross-retaliation provisions, which are a very powerful juridical instrument involving trade sanctions against non-compliant countries. Influential corporate lobby groups, in particular the European Round Table of Industrialists (ERT), have pushed hard for such a "GATT for investment" since the early 1990s.²³

Another increasingly outspoken proponent of deregulation, the United Nations Conference on Trade and Development (UNCTAD), plays a crucial role in moving Third World countries towards more neoliberal positions on investment. Recently, a number of OECD countries have funded UNCTAD's Investment Division to propose wording on development for the MAI which would make the agreement more attractive to Third World countries.

And with its far less subtle approach, the International Monetary Fund (IMF) continues to use every available opportunity to impose MAI-like rules on countries in financial crisis, such as recent examples of South Korea, Thailand and

Indonesia. As James Tobin, the Nobel Laureate economist who proposed a tax on all international currency transactions puts it: "It is hard to escape the conclusion that the countries' currency distress is serving as the opportunity for an unrelated agenda – including the obtaining of trade concessions for US corpora-

tions and expansion of investment possibilities."²⁴ Today, with the Asian economies more exposed, TNCs are buying out local companies at bargain prices, and at the same time gaining new market territory for themselves. In April 1998 the IMF demanded an expanded mandate to limit national governments' ability to control capital in and outflows. The proposed change to its bylaws would give the IMF powers to enforce full capital account liberalization on its member countries.

Activities on another front might be stepped up in the next few months: a trans-Atlantic free-trade zone, including fullscale investment deregulation, between the EU and the US.²⁵ Preparations have been underway for several years between the US government, the European Commission and corporate leaders in the Trans-Atlantic Business Dialogue (TABD). In early February, EU Commission Vice-President Leon Brittan announced that the aim is to start negotiations at the EU-US Summit in May 1998: another path leading to the same goal and with the same fundamental lack of public consultation, let alone a public mandate.

Turning the Tide

The deadline for the negotiations is likely to be extended by another year at the OECD's Ministerial Conference at the end of April 1998. Experience has shown that additional time serves only to multiply problems for the negotiators, as more and more negative impacts of the MAI come to light. Most recently, the European Parliament's queries about how the MAI would affect future possibilities for improving social and environmental policies within the European Union have brought problems with the MAI to the surface. The multiplying number of pages of reservations demanded by national delegations have placed the OECD's rosy picture of a "winwin" treaty in a more realistic light. That the negotiating governments are at last becoming wary of the impacts that the MAI will have on their societies is a clear indication of the fundamentally flawed character of the treaty.

Although the rigid economic model that MAI signatory countries will be forced into may enjoy strong governmental support today, it will likely attract growing critique over coming years as its social, environmental and political impacts become increasingly visible. Joining the MAI involves a 20year lock-in to a deregulated system in which countries are completely dependent upon the global economy, foreign investments and foreign investors: in other words, upon TNCs. Countries facing economic problems or other challenges will be barred from seeking new solutions. This is not only undemocratic, but also extremely dangerous.

Citizens' campaigns against the MAI are increasing in strength day by day and in country after country, and the media is at last taking notice of the treaty. The NGO plot to kill the MAI has been termed the "Dracula strategy": simply bringing public attention to a treaty that cannot stand up against the light. Thus far, the response from OECD governments to the increasing pressure has been the addition of non-binding language to the treaty's preamble and elsewhere,

Joining the MAI involves a 20-year lock-in to a deregulated system in which countries are completely dependent upon the global economy, foreign investments and foreign investors: in other words, upon TNCs.

but most NGOs recognize these as pseudo-solutions that do not change the flawed character of the MAI.

The OECD's haste in pushing the MAI through can also be attributed to the fear that the deregulation wave might be losing momentum. MAI negotiations started in 1995 at a time when OECD countries

were intoxicated by the signing of the GATT and the birth of the World Trade Organization (WTO). Since then, although many more steps have been taken on the path towards a deregulated world market without borders for goods or capital flows, there are also increasing signs of a backlash arising from Southern governments and from people all over the world. The financial crisis in Asia was a painful lesson for the many Third World countries which had been forced to scrap the very regulations that could have prevented such a crash. Some governments, including Thailand, have now started talking about the need to reintroduce regulation. Critique of the deregulation model has also recently come from surprising corners; financial speculators George Soros and the late Sir James Goldsmith, for example, have both repeatedly warned against the social and environmental dangers of unbridled economic globalization.

The next step includes voicing clearer alternatives, and advocating policies which reduce the current dangerous dependency upon transnational investment. Economic globalization and deregulation have created a vicious circle in which investment dependency forces workers, communities and governments into increasingly harsh competition on wages, taxes, environmental protection and anything else that might influence investment conditions. The fact that international competitiveness is becoming the single most important factor determining the health of a society is a scenario for disaster, and will unavoidably lead to a downwards spiral in social and environmental standards and delay or freeze desperately needed progress in these areas. It is in reaction to this economic dependency upon TNCs that OECD governments have developed the MAI in close co-operation with business lobby groups, and why they have tried to push it through before the public is clued in to what is happening. Finally, TNC dependency is what is stimulating an increasing number of Third World countries to queue up to sign the MAI, so that they can receive a stamp of approval for having a first-class investment climate.

There are no lack of policy options for reducing TNC dependency and putting economic diversity and prosperity of local communities first. These include community reinvestment rules, limits on company size to avoid unfair competition, subsidies for local production for local use, efficient taxation of TNC profits to ensure that the local economy benefits from their presence, regulation of capital flows, and numerous other currently unfashionable policy options. Of course, these are the types of measure which would be banned if the MAI survives. MAI entails the institutionalization of neoliberalism as the only option – the creation of a global economic constitution that is the equivalent of economic monoculture.

The struggle against the MAI has demonstrated the enormous necessity and potential for grassroots globalization on these complex, far-reaching issues. Information and strategies are being shared among an increasingly strong network of citizens, NGOs, workers, development organizations, women's movements and church groups. Although effective resistance to the MAI has arisen late for a variety of reasons, there is no doubt that NGOs are now catching up. With an increasingly clear common analysis of the dangers of corporate-led globalization, civil society is getting prepared to defend our local economies, our democratic systems and the common good.

This article is based on the report "MAIGALOMANIA", published in February 1998 by Corporate Europe Observatory (CEO), a research and campaign group based in Amsterdam. For more information, contact CEO: Prinseneiland 329, 1013 LP Amsterdam, The Netherlands. Fax: +31 20 6650166. Email: ceo@xs4all.nl / Website:http://www.xs4all.nl/~ceo/mai/ MAIGALOMANIA is available in Finnish, Dutch, Spanish and German from the Corporate Europe Observatory.

A draft text of the MAI is available on the website of the OECD: http://www.oecd.org/daf/cmis/mai/maindex.htm

References and Notes.

- Members include all EU states plus Switzerland, Norway, Iceland, the Czech Republic, Hungary, Poland, Turkey, Australia, the United States, Canada, Japan, South Korea, Mexico and New Zealand. The OECD's day-to-day function is that of think-tank firmly committed to economic globalization and unfettered, "free" markets. It produces a constant flow of studies concluding that the member countries need to go further with labour market flexibilization, privatization of public services and other neoliberal job creation strategies such as abandoning minimum wages. "The Dangers of the Multilateral Agreement on Investment", *Le Monde Diplomatique*, March 1998.
- 2. World Investment Report 1997.
- "An agreement on investment", William H. Witherell, Director for Financial, Fiscal and Enterprise Affairs at the OECD, in *The OECD Observer*, no. 202, October/November 1996, p.6.
- Sir Leon Brittan, European Commission Press Release: "Commission Launches Discussion Paper on Worldwide Investment Rules". IP/95/52, 19 January 1995.
- 5. Witherell, p.12. The bulk of these consultations were with the members of the OECD's advisory group on investment, which includes the Central and Eastern European countries, and in 'policy dialogue workshops' with South-east Asian and Latin American countries.
- Interview with Jan Huner, deputy of Mr. Engering, head of the MAI negotiations, 28/1 1998. Huner did not mention Slovakia, which has previously often been mentioned as a candidate.
- Under the 1975 Lomé Convention, the 70 ACP countries were allowed dutyfree exports into the EU as a form of aid. The Lomé Convention is now being renegotiated.
- 8. USCIB Investment Committee, USCIB website.
- 9. Cases would be facilitated by the International Chamber of Commerce's (ICC) Court of Arbitration, the World Bank's International Centre for the Settlement of Investment Disputes (ICSID) or the UNCITRAL rules (UNCITRAL is a UN agency which has developed rules for arbitration in international commercial disputes).
- 10. USCIB Investment Committee, USCIB website.

Action

There are many ways to fight the MAI and its clones in other international fora. The first steps are coalition building, locally, nationally and internationally, with others in various movements that would be affected by the MAI (which means just about anybody) and informing the public, for instance through fact sheets and briefings, information events and through the media. In many countries the MAI has still not been covered extensively (or at all) by the media nor has there been any substantial parliamentary debate on the issue. Actions that could help to bring the MAI into the debate and act as spanners in the wheels:

- asking parliamentarians to inquire about the impacts of the MAI
- putting pressure on government ministries whose policy fields will be impacted but which are not involved in the negotiations (e.g. environment, culture, development)
- warning local governments which would be handcuffed by the MAI.

Friends of the Earth US has published the excellent campaign guide "License to Loot – the MAI and How to Stop It". It can be ordered at FoE US, 1025 Vermont Avenue, N.W. Suite 300, Washington, DC 20005.

One of the major UK campaign groups working to stop the MAI is the World Development Movement, 25 Beehive Place, London SW9 7QR.

- ICC Commission on International Trade and Investment Policy, Document n. 103/179 Rev., 30 April 1996.
- Report to the Dutch Parliament, November 1995, Secretary of State for Economic Affairs Van Dok-van Weelen, p. 4 (our translation).
- According to Dutch negotiator Marinus Sikkel at public hearing on the MAI in Utrecht, the Netherlands, 3 February 1998.
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- 15. Chairman's Opening Remarks, 15 January 1998, p.1.
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Learning To Live With Nature: The Lessons of Traditional Irrigation

by Edward Goldsmith

Modern irrigation schemes in tropical areas are, almost without exception, social, ecological and economic disasters. They necessarily lead to the flooding of vast areas of forest and agricultural land, the displacement of hundreds of thousands of people and the spreading of waterborne diseases like malaria and schistosomiasis. In addition, they are badly run, poorly maintained and the irrigated land is soon salinized or waterlogged, while the reservoirs, where the water is stored, rapidly silt up. The remarkable traditional irrigation systems that they have replaced, on the other hand, not only worked perfectly, but also satisfied all social and ecological imperatives.

he ancient civilizations of Sumeria, Babylonia, Egypt, Ceylon and Cambodia, for example, were justifiably famed for their irrigation works. Some of those ancient irrigation systems still survive today, to bear proud witness to the engineering skills of those who constructed them.

Throughout the twentieth century, the construction of dams has continued to be favoured by governments, planners and investors as a relatively cheap and 'efficient' method of generating electricity and irrigating land. But, today, the stakes are higher than the ancients could ever have imagined. Advances in concrete technology and the development of vast earth-moving machines – some weighing up to 2,000 tons – have enabled modern Man to build dams of a size and com-

plexity that would have been unimaginable just a few centuries ago.

The statistics speak for themselves. In Egypt, the Aswan High Dam is seventeen times heavier than the great pyramid of Cheops. In Ghana, the Volta Dam holds back a reservoir the size of Lebanon – at 8,500 square

kilometres, this vast area of water covers 5 per cent of the country.¹ The proposed Bakun Dam in Malaysia will be twice as high as the Aswan High Dam, and will flood an area of rainforest and tribal homeland the size of Singapore.² China's notorious Three Gorges Dam on the Yangtze river will, when completed early next century, have resulted in the forced resettlement of 1.2 million people.³

As the ambitions of the dam builders get bigger, so the environmental and social costs imposed by their vast schemes become clearer. The serious and lasting damage done by the construction of huge hydro and irrigation projects has been known for decades. Twenty years ago, hydrologist Dr Raymond Nace issued a stern, and largely-ignored, rebuke to his colleagues at a conference on water-development schemes. "Three sins beset water planners and their advisers," he told the conference; "faith in science and technology; worship of bigness; and arrogance towards the landscape. The belief that technology can solve any water problem ... is wrong. It seems essential that a new frame of mind, some new perspective, be applied to water planning".⁴

Twenty years on, Nace's "new perspective" seems as far away as ever. But if we want to see the development of a "new frame of mind", what needs to be done? What principles need to be applied to water development schemes in the future? To answer these questions, it is not enough to examine only those features which have caused modern irrigation schemes to fail: more important is an understanding of the features which made traditional irrigation societies succeed, and often flourish for thousands of years.

Traditional irrigation lessons from the past

To this day, we can see surviving examples of traditional irrigation schemes, some of which are still in use after thousands of years. The obvious question to be asked when examining them is: why have they lasted, when so many are already failing, only

China's notorious Three Gorges Dam on the Yangtze river will, when completed early next century, have resulted in the forced resettlement of 1.2 million people.

modern hydro-power projects are already failing, only decades after their construction?

Perhaps one of the best examples of sophisticated traditional irrigation known to us is that associated with the qanats of Iran. 'Qanats' are underground conduits, which collect water from an aquifer on the slope of a hill and exploit the land's natural gradient to transport the water underground to the agricultural areas below. Qanats were first developed in Iran, but their use spread to India, Arabia, Egypt, North Africa, Spain and even to the New World.

What is astonishing is the number and length of these qanats. There are some 22,000 of them in Iran, comprising more that 170,000 miles of underground channels.⁵ Equally astonishing, much of that network was still functioning, just a few decades ago, sometimes thousands of years after the chan-



The Victoria dam on the Mahaweli River in Sri Lanka, funded by the UK's overseas development agency drowned some of that country's most fertile land and displaced 30,000 people.

The ganats "tap the groundwater potential

only up to and never beyond the limits of

natural replenishment and, as a

consequence, do not unbalance the

hydrological and ecological of equilibrium

of the region." - Gunter Garbrecht

nels were originally built. Indeed, until relatively recently, qanats still supplied 75 per cent of the water used in Iran for both irrigation and household purposes.

Most of the area that qanats serve to irrigate is arid and rainless. Without an effective and – crucially – sustainable form of irrigation, such as is provided by the qanats, the development of agriculture across much of Iran would have been

impossible. As H. E. Wulff put it: "They have made a garden of what otherwise would have become an uninhabitable desert."⁶

A particularly important feature of the qanats, as pointed out by Gunter Garbrecht, Chairman of the Working Party on History of the International Commission for Irrigation and Drainage, in 1983, is that they "tap the groundwater potential only up

to and never beyond the limits of natural replenishment and, as a consequence, do not unbalance the hydrological and ecological equilibrium of the region."⁷ In other words, they harness nature but do not overtax it. By contrast, in modern irrigation schemes the amount of water extracted is determined by man, rather than nature; a situation which, more often than not, leads to major problems.

The traditional irrigation system of the Chagga people of Kilimanjaro in Tanzania is another example of the sustainable harvesting of water. The Chagga have practised irrigation agriculture since time immemorial. Their myths, traditions and religion reflect its importance to their culture and way of life. Early European travellers who visited the area were hugely impressed by the complicated network of irrigation furrows, or 'mfongo', which collect water from the streams of Kilimanjaro and transport it over long distances to the fields below. Modern engineers have marvelled at the Chagga's irri-

gation works, admitting that they themselves would require highly complicated equipment to achieve the results which the Chagga have achieved with the simplest of technology.⁸

It is only possible to understand the success of the Chagga's irrigation system, as the ethnologist Fidelis Masao points out, through "an understanding of their sociopolitical organization and

their rituals."⁹ The Chagga are organized into clans, which are powerful and cohesive social units. Different clans specialize in different crafts; some, for example, are experienced in toolmaking, others in furrow-surveying. The procedure for building a new furrow involves prayers, ancestral offerings and fasts while the work is carried out. The maintenance and repair of the furrows is run by a board of elders, who direct the community to this work. The Chagga, through their belief systems and high level of social organization, have constructed an extraordinarily sophisticated irrigation system, with the most





The majority of irrigation projects in operation today are used to grow cash crops for export, and this has been the case ever since large dams began to be constructed.

basic of tools, which has lasted for centuries and fulfilled their society's needs.

A much more extensive system of traditional irrigation can be seen in Sri Lanka. The island is covered with a network of thousands of man-made lakes and ponds, known locally as 'tanks'. Some are thousands of years old; and almost all show a high degree of sophistication in their construction and design. Many of the smaller tanks still survive and continue to provide the basis for irrigation agriculture in the dry zone of the island.

Many of Sri Lanka's larger tanks are today silted up and abandoned, while many of the smaller tanks continue to be used for irrigation. It would seem that one reason for this is that larger tanks were often built by the State and in particular by kings, for largely ornamental purposes or simply for personal aggrandisement. The small, village tanks, on the other hand, were

constructed by local people to supply their water needs. Sir Edmund Leach, at one time Professor of Anthropology at Cambridge University, argues that although the larger tanks may have been the work of a state bureaucracy, the smaller tanks were constructed and maintained at local level. "From time immemorial, normal repair work to the village tanks has been the ordinary work of ordinary people," he writes.10 This must surely be a major reason why they survived for so long - their upkeep is in the hands of the local community, whose needs they still cater for.

The traditional Ceylonese village was dominated by three associated features: the temple, the paddy fields and the tank. Tanks were vital to village life. Often, several types of tank were built: for example, an irrigation tank for the fields, a storage tank for emergencies, an erosion control tank to catch the silt from the inflow of water and prevent the other tanks silting up, and a mountain tank to provide water for slash-and-burn agriculture." The tanks would be connected to each other and to the fields by a system of canals and ditches. Like the ganats of Iran and the furrows of the Chagga, Sri

Lanka's tanks provide the villages with only the level of water that the ecosystem made available, and no more.

A final example of successful traditional irrigation practices comes from ancient Mesopotamia. Irrigation has been practised along the banks of the Euphrates for thousands of years, in difficult and largely unfavourable flood conditions. Local inhabitants practised irrigated basin agriculture as successfully as conditions permitted throughout much of the turbulent history of the area - the principal weapon against salinization being alternate-year fallowing. Such fallowing allows the water table to fall after harvest, a process encourage by evapo-transpiration from the wild plants that take over once the land is temporarily abandoned. It is unlikely that there is a better means of preventing soil salinization in the area. Indeed, J. C. Russell has described the traditional fallowing system as "a beautiful procedure for living with salinity ... the rural villagers understand it in that they know how it works, they know how to do it and they insist on it."12

The contrast between this form of irrigation and those that occurred later in Mesopotamia's history could not be greater. At some time during the third millennium, there seems to have been a massive increase in irrigation works in the Euphrates valley; not, it seems, to improve the irrigation system of the local tribespeople, but to satisfy the requirements of a burgeoning urban society. The construction of vast canals to supply water to the cities led to seepage, flooding, over-irrigation and a rise in the groundwater level, and was apparently responsible for the increased salinity of the soil which begins to appear in the temple records of the period. Partly as a result of this environmental disaster, Sumerian civilization began to collapse, and many of its cities dwindled to ruins. Adams and Jacobsen, in their study of Mesopotamian irrigation, stated categorically "that growing soil salinity played an important

part in the break-up of Sumerian civilisation."13

While the above examples of traditional irrigation practices are extremely varied, their common feature is their ability to harness the power of nature while working within its limits. Unlike the vast dams of the twentieth century, they work with the landscape and its ecosystems, rather than in opposition to them, and-

Modern engineers have marvelled at the Chagga's irrigation works, admitting that they themselves would require highly complicated equipment to achieve the results which the Chagga have achieved with the simplest of technology.

> they are constructed and run by local communities who know and rely on the land, rather than by distant bureaucrats from the cities and towns. Primarily for these reasons, such traditional methods of irrigation have often lasted for millennia.

> So, if this is what makes such traditional schemes work, and stand the test of time, what can be learned from them? What aspects of traditional irrigation practices need to be applied to modern water developments to ensure their sustainability?

Size: a critical factor?

One of the most striking features of traditional irrigation systems is that they operate on a very small scale. By contrast, most modern irrigation schemes cover large areas of land and are geared towards maximum production. In that respect, it is hardly surprising that their ecological impact is greater than that of traditional systems. The point was well made some years ago by the hydrologist Dr Desmond Anthony: "Experience has shown ... that the extent and degree of modification (of ecological systems) and the magnitude of the

resultant impact are usually *directly proportional to the size of the project*, and are related to the nature of the environment and its sensitivity to modifications of the kind brought about by construction, operation and maintenance of such projects."¹⁴

Robert Goodland, who has conducted a number of studies of the environmental effects of large dams in the tropics, is of the same mind. Indeed, in his opinion, "the size of hydro projects is almost exponentially related to environmental impact."¹⁵ That general rule, he says, is true of "the area of fertile soil removed from annual protection by flooding; the number of people displaced, and houses, infrastructure lost to the reservoir; and the opportunities for the proliferation of aquatic disease vectors (eg: malarial mosquito, schistosomiasis snail) and nuisance organisms (eg: water hyacinth, gnats)." He points out that large reservoirs "trigger or exacerbate the perils of induced seismicity" and "produce less fish per unit volume than small reservoirs." Moreover, "water quality deteriorates gravely in large reservoirs while remaining acceptable in small ones."

For those reasons alone, says Goodland, dams should be as small as possible. Yet, despite the environmental advantages of building small dams, small-scale irrigation and hydro-

power schemes are rarely favoured over large-scale schemes. One reason, undoubtedly, is that largescale projects earn greater kudos for politicians and engineers alike: the more grandiose the scheme, the more prestige accrues to those involved in building it. The construction of the Aswan High Dam in the 1950s, for example, was driven as much by the Nasser regime's desire to make its mark on modern

Egypt as by any necessity for the construction of such a vast project. Such political considerations continue to play a significant role in dam-building schemes to this day.

So too, as William Ackerman pointed out in his study of the environmental problems associated with man-made lakes, small-scale dams are frequently seen as being 'uneconomic'. Thus, he writes: "From the viewpoint of power generation and large-scale water-storage, only relatively large and deep reservoirs are economically attractive. One horsepower is generated by dropping one cubic foot of water per second through a height of 3.34 metres. Thus there are obvious advantages to constructing power dams with as much 'head' as possible. Similarly, for water storage, the approximately parabolic shape of most lake basins ensures that each increase in the height of a dam progressively increases the storage benefits. In consequence, major reservoirs are usually made as extensive as possible, and thus they tend to be in the largescale range."¹⁶

Why small is not enough

But even supposing that, in future, only small-scale dams were to be built, would that enable us to avoid the problems associated with today's 'superdams'? The answer is undoubtedly a guarded 'no'. Small is certainly preferable to big – and on that point we should be quite clear – but smallness does not, in itself, provide a foolproof insurance policy against ecological damage. Indeed, the record makes it quite clear that even small-scale projects can cause significant ecological and social harm. In some cases, the damage done is the result of poor design; in others – as in the first of the following three examples – it arises from the very fact that the schemes involved are small-scale. Thus:

- According to John Hunter, the small dams which have been built in the Volta Valley provide a more suitable breeding ground for the black flies which carry the disease onchocerciasis, or river blindness. "In many areas," he reports, "the construction of small dams has already augmented the spread of river blindness, rather than the reverse."¹⁷ The reason is clear – the more dams there are, the more spillways there will be, and hence more breeding places for the black flies.
- In Jamaica, bad design led to the failure of a series of small dams which had been built across various shallow valleys in order to convert modest creeks into irrigation reservoirs. Because the subsoil of the region is particularly porous – a fact which the dams' promoters somehow failed to take into account – the water simply leaked away from the reservoirs, leaving the dams high and dry.
- Meanwhile, in eastern Nepal, a small hydro-dam silted up so quickly that the turbines stopped functioning. According to 'far-away economic experts', the dam was supposed to

Traditional irrigated practices work with the landscape and its ecosystems, rather than in opposition to them, and they are constructed and run by local communities who know and rely on the land, rather than by distant bureaucrats from the cities and towns. have repaid its initial investment within fifteen years: in just five years, however, it had become a "millstone of modernity around the Nepalese neck".

Seasonal versus perennial

Even the small-scale irrigation schemes built today aim at replacing seasonal irrigation with perennial irrigation. Such perennial irrigation, however, invariably entails

higher social and ecological costs - whatever the size of the scheme involved.

Perennial irrigation schemes create a permanent (rather than a temporary) niche for the vectors of the principal waterborne diseases - thus inevitably causing an escalation in the incidence of those diseases. That problem is exacerbated by the fact that perennial irrigation drastically increases the amount of time that local farmers must spend in the irrigation waters - and, hence, the amount of time that they are exposed to the vectors which those waters harbour. It also increases the moisture level of the atmosphere and the soil, and the vegetative period of crops, thus providing a permanent niche for pests. We have seen, above, the example of the spread of riverblindness caused by dam-building in the Volta Valley, but perennial irrigation is also a significant factor in the spread of the deadly malarial parasite, which is transmitted to humans by the anopheles mosquito. The introduction of modern, perennial irrigation schemes has greatly favoured both the incidence and lethality of malaria, which remains one of the most widespread and deadly diseases in the world. Flooded rice fields, drainage and irrigation canals and the reservoirs themselves all provide year-round breeding grounds for the anopheles mosquito. In this way, perennial irrigation has greatly hampered the fight against disease.

Although perennial irrigation makes possible several harvests a year, that achievement quickly turns sour where the soil becomes too poor to support the extra demands being made upon it. In that respect, it is important to note that very few soils – and in particular the organically poor soils of the tropics - can be used to produce two to three identical crops a year for very long. Indeed, if multi-cropping is carried out over any significant period of time in such regions, it can only lead to the degradation of agricultural land - which in turn must lead to a reduction rather than an increase in agricultural yields.

Equally important, multi-cropping and perennial irrigation tend to raise the water table, inevitably giving rise to all the attendant problems of waterlogging and salinization, which often prove the undoing of major dam schemes. Salinization is caused by a rise in the salt content of the water in the soil, which in turn is caused or exacerbated by perennial irrigation schemes. Perennial irrigation has the effect of raising an area's water table, with the result that water held below ground which is generally more saline than rainwater and surface

water - rises, and is drawn to the surface by capillary action. This results in waterlogging of the soil and, as the water evaporates and is 'breathed' into the atmosphere by plants, the salinization of

the soil, which effectively 'kills' it (when the concentration of salts in the soil reaches just one per cent, that soil becomes toxic to plant life18). In the dry tropics, the problem is particularly acute, since there is not enough rainfall to flush out the salts which accumulate in the soil. The problem is exacerbated by the evaporation of water from the vast reservoirs held behind modern dams. John Waterbury calculated that evaporation rates at the Aswan High Dam reservoir increased its salt content by a full 10 per cent.19

The effect of salinization and waterlogging can be devastating for the land: a few of the many examples from around the world should suffice to reveal the extent of the problem. In Pakistan, 25 million acres of the 37 million acres under irrigation were already estimated to be salinized, waterlogged or both by the mid-1980s.²⁰ In Egypt, problems of salinization and waterlogging have been described as "grave". According

to Waterbury, waterlogging alone is estimated to have reduced the country's agricultural productivity by at least 30 per cent although it is claimed (perhaps optimistically) that drainage will restore productivity.21 In India, the amount of land devastated

by water and salt has been variously estimated at between 6 million and 10 million hectares. In Madhya Pradesh, affected areas are referred to as "wet deserts".22

For all the above reasons, the very principle of perennial irrigation is unacceptable - on whatever scale it is carried out. That stark reality is tacitly recognized by traditional irrigation agriculturalists. Indeed, for them, irrigation is invariably seasonal and, moreover, it is limited to the shortest possible period. Thus, in the majority of traditional irrigation societies, we find that half the potential agricultural land is allowed to lie fallow on alternate years, thereby ensuring that irrigation is carried out for a short season every other year.

It goes without saying that such an apparent 'waste' of good land is considered intolerable by those who manage today's modern irrigation systems. Indeed, the very idea of 'fallow lands' and 'alternate-year irrigation' goes against all the canons of the modern market system, geared as it is towards increasing production apparently regardless of long-term ecological costs.

The preservation of forests

A further essential feature of traditional irrigation agriculture is that it is practised in areas where part at least of the natural forest cover has been allowed to remain intact. Such forests are particularly important in the uplands and in the watersheds of the river whose waters are abstracted. Indeed, deforestation is by far the most important cause of the recurrent and ever more destructive droughts that today afflict vast and highly populous areas of the Third World.

It contributes to such droughts in a number of ways. Firstly, it reduces rainfall. Thus, in Amazonia, 75 per cent of the precipitation is estimated to be derived from the transpiration of trees in the area, which means that once the Amazonian forest is cut down, one can expect a significant reduction in rainfall throughout the region." It appears that the Harrapan Desert in

forest whose rainfall was also In Madhya Pradesh, affected areas are referred to as "wet deserts".

largely self-generated, so that once the trees were cut down, rainfall was reduced to nearzero.24

Pakistan was once a vast rain-

But the recurrent droughts

fruit of the summer's rain

till winter, while the light winter rains were treasured

there till the June monsoon

came again. Even as late as

the epic period, it was a

hero's derring-do to

wander through the forest-

are not necessarily the result of reduced rainfall. Droughts are regularly reported in areas where there has been no recent reduction in rainfall. Such droughts are simply the result of a lowered water table caused by deforestation, excessive water abstraction, or else they are due to the reduced water-retaining capacity of an overtaxed soil.

The general desiccation caused by deforestation in India was eloquently described by E. Washburn Hopkins nearly a century ago:

"All that great bare belt of country which now stretches south of the Ganges - that vast waste where drought seems to be perennial and famine is as much at home as is Civa in a graveyard - was once an almost impenetrable wood.

Luxuriant growth filled it: self-irrigated, it kept the

The very principle of perennial irrigation is unacceptable - on whatever scale it is carried out.

> world south of the Nerbudda, which at that time was a great, inexhaustible river, its springs conserved by the forest. Now the forest is gone, the hills are bare, the valley is unprotected, and the Nerbudda dries up like a brook, while starved cattle lie down to die on the parched clay that should be a river's bed."24

The deforestation of upland areas is even less tolerable, since forested uplands attract a great deal of rain, and it is in the uplands that the sources of the rivers that water the plains beneath are situated. This is undoubtedly so, for example, in Sri Lanka, where the water required for the vast water-development schemes being built today is unlikely to be available

* The vast volume of water that is continuously being exchanged between the forest and the atmosphere, over an area of something like two million square miles, serves as a massive cooling system for the entire planet, which means that Amazon deforestation must seriously affect world climate.

now that the uplands have been deforested. One might add that, already, the autumn monsoon – which blows from the south-west and which used to collect moisture from the forest uplands and deposit it on the dry zone beyond – now falls on denuded mountains. Hence, the autumn rains have largely vanished from the north-east of the island.

Deforested slopes are, in the tropics in particular, very rapidly eroded, and the soil which is washed off them raises the river beds, causing floods which can be as devastating to agricultural production as are the droughts to which the same areas have become so prone during the dry season.

What is more, the forests can provide water in perpetuity – not just temporarily – and at no social and ecological cost. On

the contrary, they provide other equally precious benefits. For instance, they harbour a wealth of wildlife. They are a source of all sorts of wild fruit and berries, of humus for the fields and of timber for building houses, as they are of the herbs required for traditional medicines and for vegetable dyes. Seen from the point of view of the wider area, they also generate oxygen and absorb carbon

dioxide and generally exert a stabilizing influence on climate. In addition, all these benefits are free and thus available to all – not just to the urban elite which alone benefits from the building of large dams.

Water: balancing consumption with availability

A further characteristic of traditional irrigation systems is that those who operate them do not draw off more water than is guaranteed by the natural rate at which their water supplies are replenished. In other words, they do not try to extract more than the 'safe yield' of their aquifers and surface waters.

To that end, traditional societies have historically sought to prevent any increase in the demand for water. In his study of irrigation agriculture in medieval Valencia, for example, Thomas Glick shows how all new developments which might have placed a strain on the region's

"water budget' were strenuously resisted.²⁵ So too, the anthropologists Robert and Eva Hunt noted the general tendency within traditional irrigation societies "to resist new (water) uses" – even where that entails refusing to open up new lands or to plant new crops.²⁶

In arid lands, such restraint is clearly axiomatic if water supplies are not to be overtaxed and if the long-term availability of water is to be assured. That simple axiom, however, is one which modern industrial society – with its emphasis on growth – has preferred to ignore. Instead, it has hoodwinked itself into believing that water should not (and, indeed, does not) place a constraint on Man's activities. The philosophy is simple enough: if water is not available locally, then Man's ingenuity will ensure that it is supplied from elsewhere.

In that respect, it is worth considering the history of agricultural development in the US Southwest – a history which illustrates perfectly the conflict between what might, respectively, be called the 'ecological' and the 'industrial' views of water demand and water supply. Thus, in the late 1880s, ecologically-minded people – notably John Wesley Powell, who later became Director of the US Geological Survey – began to warn that the arid Southwest must learn to live within its water budget if future shortages were to be avoided. Emphasizing the natural limits of the arid West's water resources, Powell wrote: "Only a small portion of the country is irrigable. The irrigable tracts are lowlands lying along the stream. These lands will maintain but a scanty population."²⁷

That eminently 'ecological' view of water supplies was not to the liking of Powell's contemporaries. Indeed, as the historian Henry Nash Smith observes, Powell "was asking a great deal: he was suggesting that the West should submit to ratio-

"Now the forest is gone, the hills are bare, the valley is unprotected, and the Nerbudda dries up like a brook, while starved cattle lie down to die on the parched clay that should be a river's bed." – Washburn Hopkins nal and scientific revision of its central myth" – the myth, that is, that there was enough land and water available for everyone's needs.²⁸ Perhaps it was inevitable,

Pernaps it was inevitable, then, that Powell lost his battle to make the farmers of the Southwest see sense. His recommendation that the West should tailor its development plans "to fit the limits of its natural resources" was rejected by the US Congress,

"with senators and congressmen from the region itself providing the stiffest opposition."²⁹ At the 1893 International Irrigation Congress, held in Los Angeles, Powell was greeted with catcalls and boos. He was, however, undeterred. "You are piling up a heritage of conflict and litigation over water rights," he warned his detractors, "for there is not sufficient water to supply the land."³⁰

By rejecting Powell's advice, the American establishment effectively chose to turn a blind eye to the "nature of land, water and climate" in the Southwest. Underlying that intransigent denial of ecological realities was the growing belief that

The philosophy is simple enough: if water is not available locally, then Man's ingenuity will ensure that it is supplied from elsewhere. the natural world was something to be shaped at Man's whim to satisfy his immediate requirements. With the development of modern science – and in particular, the belief that technology can free Man from previous ecological constraints – that attitude has become more and more firmly

entrenched. Even well-established hydrological principles have been abandoned where they reflect the need to limit water demand. In the mid-1960s, for example, the US Geological Survey (USGS) simply dropped the notion of 'safe yield'. By way of explanation, H. E. Thomas of the USGS wrote: "wholesale depletion (of groundwater) may be economically feasible in the long view if it results in building up an economy that can afford to pay for water from a more expensive source."³¹

It is a view which is hard to swallow. What happens when the "more expensive source" is depleted? Even supposing that another (presumably even more expensive) source of water is available, it can surely only be a question of time before the economy becomes dependent on a source that is so expensive that no-one can afford to buy its water – at which point, the whole economy simply collapses. It is a situation which has already almost been reached in the US Southwest. Thus, though many billions of dollars have been spent on numerous





Some of Sri-Lankas 'tanks' are thousands of years old; and almost all show a high degree of sophistication in their construction and design.

water-development schemes in the area (California has the dubious privilege of possessing almost one tenth of the world's large dams), irrigation agriculture in the Southwest can – in the view of many experts – only continue on any significant scale if the Federal Government is willing to subsidize such mammoth schemes as the Peripheral Canal and the North American Water and Power Alliance. Fortunately, both of these vast projects were vetoed as being too expensive. Even if the money were available from the Federal coffers, who would be able to afford the water?

Village Elders versus distant bureaucrats

If traditional irrigation systems run so smoothly, it is largely because those who manage them are not members of an alien bureaucracy imposed on local farmers by the State. Instead, they are closely integrated members of the very community which farms the land: consequently, their own personal interests largely coincide with those of their fellow farmers. Furthermore, the knowledge they employ in designing and operating their local irrigation system is knowledge which has been handed down from generation to generation. It therefore reflects the *total experience* of running an irrigation system in the specific geological, biotic and climatic conditions under which the society must operate. Finally, those who manage a traditional irrigation system have a vested interest in its success: if they fail to do their job properly, then it will not only be their neighbours who suffer, but their own families as well.

By contrast, modern irrigation schemes are invariably run by distant bureaucracies whose officials are uninvolved and uninterested in the daily life of the communities they oversee. Moreover, the tendency for bureaucracies to seek to perpetuate themselves has frequently meant that senior officials have ridden roughshod over local environmental and social considerations. So too, in the pursuit of short-term political gains, and in the desire to expand the influence of their own departments, those same officials have shown themselves singularly susceptible to lobbying by powerful commercial pressure groups. Inevitably, one finds that the latter's financial interests are then often put above those of the local communities which a particular irrigation scheme is intended to serve.

What is true of the upper echelons of a bureaucracy also tends to be true - though to a lesser extent - at the local or regional level. The inability of local bureaucrats to manage irrigation works with the same degree of equitability and efficiency displayed by traditional irrigation societies is legion. And is there any wonder? Unlike those who manage a traditional irrigation system, the bureaucrats in charge of a modern irrigation scheme are unlikely to have any practical experience of agriculture in the region: nor are they able to draw on the storehouse of information which a traditional society builds up by farming the same land year after year. Carl Widstrand, in his 1980 study of conflicts over water resources, pointed out that the assumptions underlying the development of largescale irrigation works "are never based on sound knowledge." Indeed, "the peasant has very much more knowledge of local conditions than the local administration ... (this) creates an instant conflict between the cultivator, who knows his environment and who knows how to manipulate it, and the government extension, who does not understand that the peasant lives by his wits and not by his hands alone."32

Instead of genuine local knowledge, the local bureaucrat must rely on a few vague generalities gleaned from textbooks written by academics who rarely have any knowledge of local conditions. Even where that general knowledge is supplemented by feasibility studies carried out prior to the setting up of a scheme, the hapless bureaucrat is still in an unenviable position – for such studies rarely give any real indication of the problems involved in irrigation agriculture, their primary function being to justify decisions which have already been taken at a higher political level. The result is frequently a cynical shell-game, in which bureaucrats pass their brief period 'in the field' by passing the buck for failures from one department to another, whilst doing their utmost to claim credit for any successes. Therein lies the path to promotion.

Nor should we be surprised by such naked opportunism. It makes little difference to a bureaucrat whether a new irrigation scheme fails or succeeds. If it fails, it is likely that the bureaucrat will have moved to another post long before the failure can be blamed on him: he is not accountable – and it will not be he who suffers the consequences of failure. Unlike the peasants who must make their livelihood from the land they farm, the bureaucrat's income is assured – and with it, his sustenance.

Food for local consumption rather than export

Perhaps the most important feature of traditional irrigation agriculture is that it is geared to producing food for local consumption rather than for export to some distant land. Indeed, it is only by eschewing the export market that irrigation schemes may fulfil the purpose for which they are overtly designed: namely, to serve the interests of local people. It is also the only way in which it is possible for irrigation agriculture to be effective and sustainable.

To produce enough food to feed itself, a society need not of necessity devastate its environment. Once, however, it becomes geared to producing food for export to a highly competitive – and at times seemingly insatiable – world market, such devastation is unavoidable. Indeed, to export successfully, agricultural activities must be undertaken by vast, capital-intensive enterprises, and society must be willing to subordinate long-term social and ecological considerations to the overriding goal of short-term economic competitiveness. Otherwise, such enterprises simply would not survive.

The majority of irrigation projects in operation today are used to grow cash crops for export, and this has been the case ever since large dams began to be constructed. Vast areas of the Third World have been turned over to the production of such crops. In the Philippines, for instance, over half the country's prime agricultural land is now used to grow cash crops.³³ So,

too, almost half of all the farmland in Central America and the Caribbean is used to raise cattle or crops for export.³⁴ Since the end of the Second World War, the expansion of cash crops for export has been phenomenal. In just ten years – between 1955 and 1965 – the production of export crops worldwide grew twice as fast as the total agricultural growth rate of the Third World.

Under such circumstances, the dams that store the water for irrigation schemes cannot be small. Everything con-

spires to make them bigger and bigger. Nor can irrigation schemes possibly be seasonal: perennial irrigation is essential if vast stretches of water-intensive monocultures are to be multi-cropped year after year.

Nor, too, can forests be preserved. Put bluntly, there is no room for them. Moreover, exporting their timber provides an essential source of the foreign exchange needed to finance capital-intensive development schemes.

Nor can the over-use of water be avoided. All the water that can be made available must be abstracted in the interests of economic competitiveness and of maximizing economic activity.

Nor, of course, can exportoriented irrigation schemes be managed by local communities. Widstrand, for example, notes the failure of 'wateruser associations' in the Third World and the high death-rate of government-introduced cooperatives in East Africa. But should we ever have expected such schemes to succeed? Why should peasants will-

ingly associate themselves with projects designed to export food, grown on the only land available to them for producing the wherewithal to feed themselves and their families, in exchange for money which will be spent by an urban elite on expensive imported goods? To expect peasants to co-operate in such a venture is surely absurd.

The need for a new 'world view': The Ecological Approach

Inevitably, the conflict between the 'ecological' and 'industrial' views of water supplies in the US Southwest raises more general questions about our attitudes towards both nature and economics. Can we really take the view that it is justifiable to jeopardize future water supplies in the interests of economic growth? Is it really 'economic' to expose vast numbers of people to malaria or schistosomiasis in exchange for the hydro-electricity or irrigation water that a dam provides? Where, too, is the 'economy' in transforming good agricultural land into a salt desert for short-term increases in agricultural yields?

Clearly, our ideas of what is 'economic' need serious rethinking. The point is well made by Robert Goodland: "Economics exclude consideration of ... adverse consequences – frequently referred to as 'externalities' – from customary

It makes little difference to a bureaucrat whether a new irrigation scheme fails or succeeds. If it fails, it is likely that the bureaucrat will have moved to another post long before the failure can be blamed on him: unlike the peasants who must make their livelihood from the land they farm, the bureaucrat's income is assured – and with it, his sustenance. evaluations. The time-frame of economic thinking is so short-sighted, and the perspective of economic vision so narrow, that such criteria frequently act to the detriment of the environment." He goes on to note: "In the final analysis, anything environmentally unsound can never be economically healthy."³⁵

Sooner or later, all social and economic costs must be translated into economic costs – be it in terms of higher health bills or diminishing agricultural returns. By incurring such costs, we are

effectively signing post-dated cheques against future generations – cheques which one day will be presented for payment. When that day comes, it is unlikely that we will have put enough money aside to meet the debt we have built up – indeed, we will probably have forgotten that we even 'signed' the cheques in question. The only outcome of such shortsighted behaviour is ecological and social bankruptcy – and such must eventually be the fate of all countries that place day-to-day economic and political considerations above the long-term health of our physical and social environment.

That inexorable truth is again well-illustrated by the history of the 'Dustbowl Years' in the United States. On basic ecolog-

Is it really 'economic' to expose vast numbers of people to malaria or schistosomiasis in exchange for the hydro-electricity or irrigation water that a dam provides? ical grounds, the fragile soils of the southern plains should never have been put under the plough – a fact which was recognized by the Mexican government as far back as 1825 when it decreed that its plains should only be used for ranching. John Wesley Powell (among others at the US Geological Survey) was also of the opinion that ranching

offered the only sustainable means of farming the southern plains. To the American government, however, ranching smacked of feudalism: it suggested an 'undemocratic policy' which would result in the setting-up of 'great land-owning barons' whose interests could only conflict with those of the small homesteader. Even religion was used to justify the popular view that the plains should be cultivated: God, it was claimed, intended "not cattle but wheat" to be raised on the plains.

The plains were thus cultivated – and the great dustbowls of the 1890s and 1930s were the inevitable consequence. When, in 1936, the Great Plains Committee (under the chairmanship of Maurice Cooke) reported on the ensuing tragedy, it vindicated the warnings of Powell. "Nature", the committee wrote, "has established a balance by what, in human terms, would be called the method of trial and error. The white man has disturbed this balance – he must restore it or devise a new one of his own." The Great Dustbowl, the committee insisted, was a wholly man-made disaster, the result of a series of mis-

guided efforts "to impose upon the region a system of agriculture to which the plains are not adapted."³⁶

Significantly, Cooke and his colleagues went on to criticize the prevailing attitude "that Nature is something of which to take advantage and exploit – that Nature can be shaped at will to Man's convenience." They went on to comment: "in a superficial sense this is true – felling of trees will clear land for cultivation, planting of seeds will yield crops, and applications of water where natural precipitation is low

will increase yields. However, in a deeper sense, modern science has disclosed that fundamentally *Nature is inflexible and demands conformity* ... we know now, for instance, that it is essential to adjust agricultural economy on the Plains to periods of deficient rather than of abundant rainfall, and to the destructive influence of wind blowing over dry loose soil

Living things are not arranged in a random manner. Nature is not totally malleable as those who wish to transform her would have us believe. She is, on the contrary, highly organized – and maintaining that organisation is critical to

her proper functioning. Once degraded by over-exploitation and pollution, Nature cannot hold her own.

rather than primarily to a temporary high price for wheat or beef – that *it is our way, not Nature's, which can be changed.*"

Herein lies the crux of the matter. Living things are not arranged in a random manner. Nature is not totally malleable as those who wish to transform her would have us believe. She is, on the contrary, highly organized – and maintaining that organization is critical to her proper functioning. Once

degraded by over-exploitation and pollution, Nature cannot hold her own. Cut down forests and overtax the land, and soils will become eroded: pollute rivers, and fish will die: upset the natural balance between potential pest and predator, and pest epidemics will break out; destroy the habitat of wildlife, and species will pass into extinction. Indeed, the whole gamut of ecological ills which now beset the Earth should be seen as but the symptoms of a degraded Nature which, under pressure from industrial Man, can no longer continue to

function properly. If those ills have, historically, been avoided by traditional societies, it is above all because they recognized the simple axiom that "it is our way, not Nature's, which can be changed."

This article has been edited by Paul Kingsnorth.

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NAFTA: Four and a Half Years Later

Have the Promised Benefits Materialized

Lori Wallach and Robert Naiman

The American public as well as Congress itself were hoodwinked both by the Bush and Clinton administrations into believing that the North American Free Trade Agreement (NAFTA) would bring all sorts of benefits – not only to the US, but also to Mexico with which it made the agreement. Four and a half years later, it is becoming apparent that the promised benefits are totally illusory, except, of course, to the transnational corporations who were its real promoters, and whose immediate interest it was always designed to serve.

In 1993, the United States Congress passed the North American Free Trade Agreement (NAFTA) by 14 votes, in spite of considerable public scepticism and the lobbying efforts of a coalition of environmentalists, church-groups, trade unions, and consumer organizations such as *Public Citižen*.

The Clinton Administration went out of its way to persuade Congress's 435 members that the agreement would increase American exports to Mexico, thereby enhancing its trade surplus with that country, provide higher wages for American workers and create 200.000 new American jobs per year.¹ Congress and the public were assured that this would lead to

better relations with Mexico on the delicate issue of immigration. It would also favour democratic governance in that country by reducing unemployment and stimulating middle-class consumer demand, which in turn would give rise to greater social and economic stability. The administration also assured everybody that the agreement would lead to much more

thorough border inspection, reducing the shipping of contraband and unsafe food over North American borders and that it would greatly improve environmental and health conditions in the notoriously polluted US-Mexico border region.

Four and a half years have passed since NAFTA went into effect, so we are now able to review to what extent these promises were justified and whether the US Congress took the right decision in passing that historic agreement.

A study undertaken by the economic policy institute and *Public Citizen* reveals that they were not. The effect of the agreement has been almost entirely negative, except for multi-

national corporations and large investors, who have been the beneficiaries.

Broken Promises:

NAFTA has not created the promised trade surplus with Mexico

As it happens, within a year of the agreement's implementation, the previous US trade surplus with Mexico had turned to a deficit. By 1995 this deficit had reached \$15.4 billion and the figure leaped to \$17.5 billion. This was explained away by the promoters of NAFTA as a consequence of the collapse of

Proponents claimed that NAFTA would create 200,000 jobs annually in its first two years. According to their method of analysis, however, NAFTA has cost the US at least 400,000 jobs. the peso in December, 1994, and the ensuing economic crisis. Yet, trade deficits with Mexico had already been increasing for two months prior to the devaluation and the continued trade surpluses of Mexico's other major trade partners – China, Japan and the European Union – were also conveniently overlooked. Though US exports to

Mexico had increased

between 1991 and 1993 by an average of 11.9 per cent, from 1993 – after the passing of NAFTA until 1996 – both fell to 10.9 per cent, while imports from Mexico grew by 82.7 per cent (over twice the rate of US exports). The growth of socalled Mexican exports, however, did not necessarily increase the welfare of Mexican workers. One explanation is that what were counted as Mexican exports were in fact mainly due to an increase in exports from mainly US-owned factories in the Maquiladora free-trade zone of the border area. Here production mainly consists in assembling components imported from the US into finished products that are then immediately reexported to the US without substantially affecting the main Mexican economy.

NAFTA has effectively reduced the number and quality of US jobs

Proponents claimed that NAFTA would create 200,000 jobs

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annually in its first two years. This prediction was based on the assumption of an increasing US trade surplus with Mexico, using a US Commerce Department formula that estimates jobs per billion dollars of net exports. However, according to this method of analysis, NAFTA has *cost* the US at least 400,000 jobs². But, vague economic estimates need not be relied upon when a wealth of experiential data provides conclusive evidence. As of April 15, 1998, the number of US workers certified by the US Department of Labour as having lost their

jobs because of NAFTA (under the narrowly defined NAFTA Trade Adjustment Assistance [NAFTA TAA]) had reached 170,395. These figures, representing 2,601 firms in 48 states, are only the tip of the NAFTA job-loss iceberg,³ as not only are service workers officially excluded from the programme, but many employees who could apply, prefer to turn to more generous, less administratively-constipated

programmes. According to the Florida Department of Agriculture, for example, over 100 state tomato processing and packing plants closed after the agreement's inception with a loss of 40,000 jobs. Only one of these companies is registered in the NAFTA TAA programme records. Similarly, in December 1996, employees of 'Guess' Clothing Company were sent packing when 1,000 jobs were shunted from Los Angeles to less labour-costly areas, including 800 to Mexico. None of these job losses appears in the records of NAFTA's TAA.

On the other side of the coin, NAFTA proponents can only identify a few thousand specific NAFTA-created jobs. We

In February 1997, it was found that 89 per cent of the companies that had made specific promises to create jobs under NAFTA had failed to meet their jobcreation promises. Instead, research revealed that many of these companies had actually laid off thousands of US workers.

tried to find more NAFTA jobs. In February 1997, a study compiled by Public Citizen⁴ found that 89% of the companies that had made specific promises to create jobs under NAFTA had failed to meet their job-creation promises⁵. Instead, research revealed that many of these companies had actually laid-off thousands of US workers in order to relocate to Mexico. Corporate proponents such as Allied Signal, General Electric, Johnson & Johnson, Kimberly-Clark (formerly Scott Paper), Lucent Technologies (formerly AT&T), Mattel,

Proctor & Gamble, Siemens, Whirlpool, Xerox and Zenith oiled a smooth passage for NAFTA's implementation by assuring everybody that they would create more jobs or at the worst maintain existing employment levels in their factories. Three years down the line, all eleven companies had accumulated sorry redundancy records. Allied Signal, for example, had laid off 1,125 US workers in eight states to relocate factories to

Mexico under NAFTA. General Electric shed 2,608 jobs in six states for the same reason.⁶ An analysis of job losses directly attributable to NAFTA across the US reveals the diversity of sectors of the economy in which job losses have occurred.⁷

Since NAFTA, Real Wages Have Declined

Under Chapter 11 of the NAFTA agreement, investors are granted new rights and protections for shifting employment from one NAFTA country to the next.⁸ NAFTA promoters were keen to assure the US that increased trade under NAFTA would not only guarantee new jobs, but a greater percentage of high-wage, high-skill employment.



Under NAFTA, every day 5,000 trucks cross the Texas-Mexico border - a major increase from pre-NAFTA traffic.

iba Taylor, Panos Pictures.



Clinton-Gore Administration officials claimed that NAFTA would lead to a much-needed clean-up of the serious environmental problems accumulating along both sides of the US-Mexican border. Three and a half years later, not only had there been no significant changes in pollution-control facilities, but the Maquila work-force has risen by 60 per cent.

However, in the United States, Canada and Mexico, real median wages have declined since the implementation of NAFTA.⁹ Between 1993 and 1996 there was a 4.1 per cent decline in real median wages in the US, while in California, the state with the largest economy in the US, real median wages fell 3.1 per cent.

US data reveal that American workers who have lost their jobs to cheaper employees across the border, are largely reemployed in the lower wage service sector.¹⁰ In fact, the US Labour Department predicts that over the next decade the top

four job-growth categories will be cashiers, janitors, retail sales clerks, and waiters and waitresses.¹¹

Faced with disgruntled staff, US companies increasingly point out the insecure ground upon which their employees stand. A report commissioned by the Secretariat of the NAFTA Commission for Labour Cooperation found that, since the implementation of NAFTA, the number of US companies

threatening to shift their plants and employment facilities to Mexico in response to staff turbulence and unionization has tripled. The Clinton Administration attempted to stifle the study, which was eventually featured in the January 27, 1997 edition of Business Week and released directly by its author.¹²

Environment

Clinton-Gore Administration officials claimed that NAFTA would lead to a much needed clean-up of the serious environmental problems accumulating along both sides of the US-Mexican border.¹³ One reason was that less factories would be tempted to relocate in the Mexican border Maquiladora free-trade zone, to which 2,000 companies had moved, despite inadequate facilities for coping with the toxic waste generated by such an industrial concentration and the sewage from the already dangerously crowded slums where the workers live. Three and a half years later, not only has there been no significant changes in pollution-control facilities, but the Maquila workforce has risen by 60 per cent.¹⁴

In response, Public Citizen and an allied Mexican group,

An increased volume in toxic waste production and disposal has resulted in diminished water quality and a greater incidence of environmentally-related disease. For example the number of babies born with deadly anencephaly, i.e. with an exposed or missing brain, has continued to rise. RMALC, conducted an extensive study into the deterioration of the region.¹⁵ It was not a surprise that the increased volume in toxic waste production and disposal had resulted in diminished water quality and a greater incidence of environmentallyrelated disease. Tuberculosis and hepatitis, for example, had soared on both sides of the border,¹⁶ whilst the number of babies born with deadly anencephaly, i.e. with an exposed

or missing brain, had continued to rise.¹⁷ In the Nogales border region, which already had the world's highest incidence of Lupus, even more people are now afflicted.¹⁸

NAFTA Threatens the Health and Safety of American Families

NAFTA's passage has greatly increased the volume of dangerous goods moving over the border, tainted food and illegal drugs entering the United States and illegal hand guns entering Mexico. The reason is that the amount of goods crossing

NAFTA'S BROKEN PROMISES



the border has dramatically increased, whilst NAFTA requirements have limited inspections, as has the inadequate funding.

For instance, between 1993 and 1995, fruit and vegetable imports from Mexico increased by 45.2 per cent and 31.4 per cent respectively. Yet, in May a Government Accounting Office (GAO) study¹⁹ revealed that fewer than one per cent of the 3.3

billion trucks entering the US each year are inspected. At the busiest border crossing in the country, a supervisor admitted that "staff were inspecting less than 0.1 per cent of the passing vehicular traffic." Even when over-burdened inspectors examine the contents of a

vehicle, contraband, including a new flood of cocaine, heroin and marijuana is often missed because inspectors are limited to reviewing paperwork and examining some trucks. Despite such obvious shortcomings, NAFTA importers "have put pressure on the US Animal and Plant Health Inspection service to carry out

its increased inspection responsibilities more quickly."²⁰

Mexico has also had a troubling record of violations of US pesticide residue tolerances. A study by the non-governmental organization,

Environmental Working Group²¹ (EWG), analysed nearly 15,000 US Food and Drug Administration (FDA) records monitoring the use and abuse of pesticides between 1992 - 1993. It focussed on 42 fruits and vegetables, comprising 96 and 83 per cent of domestic fruit and vegetable consumption, respectively. EWG found that crops from Mexico contained

high levels of illegal pesticide residues. 18.4 per cent of imported strawberries, for example, were found to be contaminated. FDA had set their official contamination figure at 10 per cent. There are many cases of 'pared down' FDA reports. Thus, whilst publicly the FDA reported that 4 per cent of crop imports from Mexico contained illegal pesticides, internal

records indicated that the rate

was actually 7.4 per cent -

Unsafe Trucks Threaten Border Communities

Under NAFTA, every day

5,000 trucks cross the Texas-

safety standards. Whereas the

US truck trailers are legally

bound to use front brakes,

Mexican trailers are not. Also,

while truck drivers in the US

must rest every ten hours,

Mexicans may stay on the road

for up to 13.23 Not surprisingly,

nearly twice as much.

Fewer than one per cent of the 3.3 billion trucks entering the US each year are inspected.

> Mexico border – a major increase from pre-NAFTA traffic. Of these, over a quarter carry a dangerous load; including explosives, jet fuel, industrial chemicals, agricultural chemicals such as pesticides and toxic wastes of all sorts.²² The threat of toxic waste spillage, amongst other potential hazards, is increased by Mexico's lax truck

In 1996, over half of the population could be considered "extremely poor", as opposed to less than a third in pre-NAFTA 1993.

> of the one in 200 Mexican trucks checked by US inspectors, half failed to comply with accepted safety standards.²⁴ This is not likely to be remedied in the near future since NAFTA provides neither the finance not the regulatory incentives required.

> In December 1995, the Clinton Administration postponed a NAFTA requirement to allow Mexican trucks to travel freely

On January 1, 1994, the day of

NAFTA's implementation, the Zapatista

movement rose in revolt against the

Mexican government and the NAFTA,

which the poor Mayan peasants described

as their "death sentence".

throughout the border states. Despite the lack of inspection capacity or funding, the temporary freeze may now be lifted. By the year 2000, foreign trucks will be allowed unimpeded access across the United States,²⁵ despite a regulatory system which has been described by the General Accounting Office (GAO) as "less than comprehensive".²⁶

Failed NAFTA "Environmental" Institutions

In a later report, *Public Citizen* documented the spectacular failure of the NAFTA-created North American Development Bank (NAD Bank) to clean up environmental conditions in the border area. After three and a half years of existence, the Bank had failed to provide a single direct loan. One reason is that the most polluted border towns could not afford the Bank's

high interest fees. In any case, the funds at their disposal, (about \$2 billion) is far too little. The Sierra Club estimated in 1993 that at least \$20 billion would be required to have some impact on the environmentally devastated region.

Since the imposition of NAFTA, the North American Commission on Environmental Co-operation (CEC) – the socalled NAFTA side agreement –

has failed to enforce a single environmental law in the area. In fact, it has simply refused to hear many of the cases presented. Worse still, it is currently involved in suppressing a well-documented report on NAFTA's damaging environmental impact in the border area.

Mexico's Economy in a State of Crisis.

Whereas both the US and Canadian economy have been damaged by NAFTA, it is Mexico's that has suffered most.

By 1996, the Mexican foreign dept had increased by \$30 billion; a figure which puts the so-called peso "bail-out" into clear perspective. Corporations desiring to profit from the post-devaluation \$4-a-day labour costs in the Maquiladora border zone pushed up the local workforce over 60 per cent.²⁷

Yet in NAFTA's first year, before the devaluation, earnings in Mexico as a whole dropped by an average of 12 per cent.²⁸ By 1996, after the devaluation, real hourly wages stood at half their 1980 level.²⁹ 40,000,000 people – nearly half the population – living on less than \$5 a day.³⁰

According to a study carried out by Mexico's National Autonomous University, in 1996, over half the population could be considered "extremely poor", as opposed to less than a third in pre-NAFTA 1993.³¹ Not surprisingly at least one million people have joined a movement – El Barzon, that opposes NAFTA. El Barzon is comprised mainly of middle-class entrepreneurs, whose independent retail and manufacturing trades have been damaged. According to El Barzon, over 8 million Mexicans have sunk into dire poverty since the agreement came into effect, and 20,000 small independent Mexican businesses have been forced into bankruptcy. This toll only adds to the hundreds of peasant farmers displaced from their land by reversal of the land-reform policies dating from the Mexican revolution and Mexico's acceptance of subsidized corn from the US.

Political and Social Unrest Grows as The Mexican Economy Deteriorates

NAFTA supporters claimed that the agreement would foster social and economic development in Mexico, and promote democracy,³² but the Mexican people thought otherwise. On January 1, 1994, the day of NAFTA's implementation, the Zapatista movement rose in revolt against the Mexican government and the NAFTA, which the poor Mayan peasants described as their "death sentence".³³ In response to the uprising, the military resorted to brutality, murdering and torturing their Mayan prisoners³⁴. National protests ensued.

Shortly after the Zapatista revolt, a series of political assassinations occurred. The presidential candidate, Luis Donaldo Colosio, and the second ranking official, José F. Ruiz Massieu, were both killed. Massieu's brother, and former Mexican deputy attorney general, was arrested in the US, on allegations of links with drug traffickers and of attempting to cover up his brother's assassination. The former Mexican President Carlo

Salinas – the main Mexican architect of NAFTA – fled the country in 1995 and his whereabouts are still a mystery. Ninety per cent of the Mexican population believe that he should be tried for treason.³⁵ His successor, President Zedillo, has aroused little more sympathy. In an August 1996 opinion poll, two out of three Mexicans believed that govunder his leadership.³⁶

ernment corruption had increased under his leadership.³⁶

Last year, Catholic Church officials' warning of an impending paramilitary attack were ignored by the government. On December 22, 45 Tzotzil Indians were massacred by a terrorist group linked to the ruling Institutional Revolutionary Party.³⁶ In every respect, NAFTA proponents' promises of peace and prosperity have rung hollow. The toll can be counted in Mexican lives.

NAFTA Meets Growing Opposition

A 1997 poll, conducted by the *Wall Street Journal* and National Broadcasting Corporation (NBC)³⁸ found that only



28 per cent of the people questioned felt that NAFTA had had a beneficial impact on the US. 43 per cent believed that NAFTA had caused direct harm. Results from a 1996 poll undertaken by the Bank of Boston revealed that, after a closer acquaintance with NAFTA and GATT, 52 per cent of its

respondents felt that the costs of "free trade" were too high. Only 27 per cent were still favourable to the trade deal.

Mexican polls reflect an even less favourable reaction to NAFTA. A 1996 survey, organized by the Mexican newspaper *REFORMA*, found that 67 per cent respondents

believed that NAFTA had brought little or no benefit to Mexico. According to a separate study, also undertaken by *REFORMA* over two-thirds of the population believed that they have been personally damaged by the economic impacts of NAFTA.

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Conclusion

NAFTA has not simply failed to provide the promised benefits but has led instead to widespread poverty, unemployment, social dislocation and environmental disruption. The few beneficiaries have been corporations – mainly transnational

A 1997 poll, conducted by the Wall Street Journal found that only 28 per cent of the people questioned felt that NAFTA had had a beneficial impact on the US. corporations – who necessarily benefit from deregulation that reduces their costs and the free market that they largely control. As NAFTA's real life effects have been understood, a significant shift against public and political acceptance of the NAFTA model has occurred. Indeed

the most prominent theme underlying the US Congress's November 1997 rejection of the "fast track" trade authority was a refusal to allow more of the same failed trade status quo. The fast track rejection was a referendum on NAFTA. NAFTA has proved a total failure and must be reversed.

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Our Sterile Future

THE FEMINIZATION OF NATURE: Our Future at Risk by Deborah Cadbury

Penguin Books, London, 1998, 266pp, £7.99 (pb), ISBN 0 14 026205 9

eborah Cadbury has been producing scientific programmes for BBC television for 17 years. One of her productions includes a brilliant but highly disturbing awardwinning BBC Horizon programme Assault on the Male which links the current decline in male fertility to synthetic oestrogen-mimicking chemicals. This excellent book is based on her extensive literary research and on references to the work of several internationally known research scientists including Dr Richard Sharpe, Professor John Sumpter, Professor John McLachlan, Professor Niels Skakkebaek, Professor Ana Soto, Dr Theo Colborn and Professor Luis Guilette.

Professor Niels Skakkebaek published a paper in 1992 showing that male sperm counts have fallen 50 per cent in the last 50 years. Since then, other researchers came to similar findings. The result of all these studies is that male sperm counts are indeed falling by something like two per cent a year. Other studies indicate that at the same time there has also been a significant decline both in male sperm mobility and in percentage of normal sperm. If this trend is to continue at its present rate, it will not be too far in the future before Western nations will be facing widespread problems with male fertility. Several surveys show already that the number of couples seeking treatment for infertility had increased considerably in the past twenty years. In Britain, for example, about one in six couples are known to suffer from infertility problems. Although these are traditionally viewed as a female problem, the latest findings show that in about 40 per cent of cases it is the male partner who is responsible.

Reviews

This highly readable and well-referenced book unravels this frightening phenomenon in detail. The process of foetal development in the womb is one of the greatest marvels of nature, so complex that scientists have scarcely begun to unravel the biological relationships and the cascade of events that needs to occur to ensure the baby's organs form correctly and end up in the right place. The development of the reproductive tract is no exception.

A whole series of hormonal cues have to occur at the right time to orchestrate the events that lead to the birth of male or female. The human foetus always starts life as a female. If it is to become a boy, then at about six weeks the male hormones trigger a series of events which instruct the growth of the male reproductive tract whilst female ducts begin to regress and are eventually re-absorbed. This process of masculinization requires the presence of Sertoli cells which are responsible for the formation of the male reproductive tract. The same cells are also vital for sperm and testosterone production as well as for governing the descent of the testes.

In The Feminization of Nature: Our future at risk, Cadbury explains how man-made synthetic chemicals with oestrogenic activity are able to suppress the growth and multiplication of the Sertoli cells in the womb fixing their numbers early at a low level, consequently hindering the male reproductive capacity in later life. To appreciate the dangers of synthetic oestrogens, the book emphasizes the fundamental biochemical differences between the action of natural female oestrogens, plantderived oestrogens (phyto-oestrogens) and chemicals with oestrogenic activity.

Similarly, ever-increasing research evidence is linking foetal exposure to these synthetic chemicals with clearly noticeable birth malformations in males, including undescended testes and other genital deformities, and also with hormonally triggered cancers. These are known to include breast, prostate and testicular cancers, which only reach their pathological state in adulthood when they come under additional hormonal influences. In a clear and precise step-by-step style, Cadbury unravels how exposure to these hormonedisrupting chemicals during foetal development are known to be responsible for the following: Firstly, they can lead to structural changes obvious to the naked eye at birth, such as reproductiveorgan malformations. Secondly, they can produce permanent changes on the foetal brain growth and development which can be expressed in later life as a reduced intellectual capacity and lack of social adaptability. Thirdly, they can produce delayed effects, only visible under the microscope, such as changes in cell structure and growth leading eventually to cancer formation. And finally, at a more fundamental level, they can alter the genetic material in the way that cells lose their ability to express themselves as nature intended, leading to hormonal and other reproductive complications.

With the help of hundreds of references, Cadbury names all the known synthetic chemicals which have so far been found to possess oestrogenic activity. These include several pesticides and insecticides, particularly DDT and its metabolites. Also industrial chemicals, especially those used by the plastics' industry including nonylphenols, octylphenols, bisphenol A, polychlorinated biphenyls (PCBs), phalatates and dioxins. She explains for which industrial purpose each chemical is used and which has been associated with what type of biochemical action. Some have an ability to bond to oestrogen receptors, some hinder oestrogen activity, some act as anti-androgens, whereas others have an ability to disrupt other hormonal functions.

Her book, though based on scientific findings, is uncomplicated, lively and easy to follow. It is, in a sense, a detective story. It begins with Lake Apopka's alligators, from where Cadbury takes the reader, chapter by chapter, to the present problems associated with human reproduction.

The most worrying message of this concise and readable but highly disturb-

Tuula E. Tuormaa is a researcher and writer on clinical ecology and nutritional medicine.

ing book is that we can only blame ourselves for this catastrophe. The chemicals with which we are now destroying ourselves are used in most modern products which we consider an essential part of our everyday life. To get rid of phalatates, for example, we would lose half the items in our house, including our washing machine, fridge, freezer, television, telephone, etc. It looks as if we have unwittingly struck the ultimate Faustian bargain. In the balance on the side of the countless luxurious products of modern living, we not only have to fear the final extinction of the human species but also an insidious erosion of the human intellect.

The manufacturers will continue to use these chemicals until governments

Corporate Usurpation

THE CORPORATE PLANET: Ecology and Politics in the Age of Globalization by Joshua Karliner

Sierra Book Clubs, San Francisco, 1997, 298 pp, \$16.00, ISBN 0 87156 434 3

J oshua Karliner's book joins a growing genre of critiques of the spread of global capitalism, including *Global Dreams* by Richard Barnett and John Cavanagh, David Korten's *When Corporations Rule the World*, and *One World*, *Ready or Not* by William Greider. While it covers some of the same ground as these works, its particular focus is on corporate impact on the environment.

This is a fine effort. Karliner approaches his task with diligence and determination. With few exceptions, every time I came to a passage about which I had reservations, I found those reservations addressed in succeeding paragraphs or pages.

After a tour d'horizon of the destruction of the world's environment by rampant 'globalization', the book proceeds to a discussion of 'corporate environmentalism', and a more detailed examination of two categories of global corporate actors – Chevron and the oil outline a comprehensive strategy forcing them to switch to less dangerous materials. Unfortunately, governments are not prepared to do anything of the sort until scientists can give them definite proof of how dangerous these chemicals really are. For their own convenience, and to protect vested interests, governments like to believe that science is all about facts, proof and certainty, whereas to the majority of scientists, most 'facts' are flexible, based often on a number of presumptions. Indeed, as countless studies have shown, science is no more 'objective' than are one's feelings towards one's siblings, and since most research funding comes from industry, it would be naive to suppose that released results would conflict with

the interests of industry.

Thus, lack of certified 'proof' will always leave room for governments, industrialists and manufacturers or anyone with vested interests, to 'play the trump card of uncertainty'.

By ignoring the ever-mounting evidence on which Cadbury's book is based, we not only inadvertently load the dice against our survival but also the survival of other species. The longer we are prepared to ignore the evidence, the sooner we will reach the point of no return. *The Feminization of Nature* is essential reading for anyone concerned with these vital issues and the survival of our future. Highly recommended!

Tuula E. Tuormaa

industry and Mitsubishi and Japan's other giant global corporations. This is followed by chapters on the environmental impact of the World Bank and free trade, and corporate efforts to manipulate and deceive through advertising and public relations. The final chapter is Karliner's attempt to tell us what we need to do to undermine corporate power and save the planet.

It is doubtless impossible to write a 'perfect' book on such a vast, complex, rapidly changing subject, with many of the most significant aspects hidden from public view, and so Karliner's work is not without its limitations. Thus, on page 201, he writes that "fighting corporate-caused problems chemical by chemical, forest by forest, shoreline by shoreline or even national law by national law *may* ultimately be a losing battle" (emphasis applied) when elsewhere in the book he gives ample evidence that such fighting "*is* a losing battle."

He offers the campaign against Nestlé over deceptive marketing of infant formula, as an illustration of a successful struggle against corporate power, even though he is aware of the ultimate vitiation of that campaign by Nestlé. Rather than being a success, the infant formula campaign underscores just how difficult it is to win lasting victories without challenging the basic foundations of corporate power.

Citizen agitation over South African operations of major global corporations is described as an example of successful resistance to corporate power on page 203. The campaign for divestment of South African holdings by large corporations may well have succeeded because, in the global scheme of things,



the South African market is not that significant. But whatever the impact of popular campaigning on corporate behaviour the South African divestment effort had, at least in the USA, that window of possibility is being rapidly closed by corporate pressure on the US Securities and Exchange Commission to limit sharply those efforts by socially concerned shareholders to raise such issues through resolutions offered at corporate annual meetings.

On page 162, Karliner observes that, in connection with the attempt to establish a nylon 6,6 facility in Goa on the West Coast of India, DuPont "won a remarkable clause in its investment agreement that absolved it from all liability in case of an accident." What

Ward Morehouse, Co-director of the Program on Corporations, Law and Democracy, is author of *The Bhopal Tragedy and Abuse of Power: The Social Performance of Multinational Corporations.*

actually happened was that the Indian Factories Act was amended in 1987 (after the Bhopal disaster) to absolve the original manufacturer from the duty of care imposed in Section 7B of the Act. The Act may well have been amended in response to pressure from nervous multinationals, but because of this amendment it was not even necessary for DuPont to seek special protection.

Karliner notes that strong resistance by local residents eventually caused DuPont to pull out of Goa altogether. But it is indicative of just how hard it is to fight the concentration of power in the hands of giant global corporations when DuPont simply shifted its plans from Goa to the southern Indian state of Tamil Nadu. And having learned its lessons from the debacle in Goa, it carefully infiltrated and effectively bought off potential opposition before it even set foot in that state. There was local opposition, much of it focussed on the safety issue, but it was not sufficient to stop DuPont from coming in.

In another minor slip, Karliner translates the name of the largest organization of victims (Bhopal Gas Peedit Mahilla Udyog Sangathan) as the

The Word From "Neptune"

POWERS AND PROSPECTS; Reflections on Human Nature and the Social Order

by Noam Chomsky

Pluto Press, London, 1996, 256pp, £40(hb), ISBN 0 7453 1107 5, £13.99(pb), ISBN 0 7453 1106 7.

oam Chomsky continues to lead the strange double life that has been his lot over the last 30 years. Revered as "the greatest living intellectual" for his work in linguistics, the US media dismiss Chomsky as "the Great American Crackpot" for his critique of US domestic and foreign politics. It is commonplace for the media to deride Chomsky's political views as "absolute rubbish" or "fresh in from Neptune". And yet anyone who saw BBC2's 'The Big Idea' in February 1996 will doubtless recall the gory spectacle of Chomsky making intellectual mincemeat of one Andrew Marr (then Chief Political Correspondent of The Independent).

Powers and Prospects - Reflections

"Bhopal Women's Gas Disaster Victims Association". It is more accurately rendered as the "Bhopal Gas Disaster Women Workers Association", reflecting the origins of BGPMUS around the issue of economic rehabilitation. This is a distinction with difference. The active members, especially the militant ones, see themselves not as disabled wards of the state but as aspiring to be economically self-supporting with a full measure of human dignity.

The book reads easily, without being breezy, moving from concrete illustrations of how giant global corporations are affecting the lives of ordinary people to more abstract discussion of underlying issues. A minor caveat: access to the end notes would have been greatly facilitated if they included running heads referring to the pages in the body of the book.

Karliner gives us a sharp critique of voluntary codes of conduct and other well-intentioned but misguided efforts to make corporations do a little less harm. The ultimate task in ending corporate rule is vitalizing democracy, and through it, democratic control of and relocalization of the economy.

That said, like the genre of critiques

of globalization mentioned above, Karliner's analysis of our predicament is more convincing than his prescription. Perhaps his three-pronged agenda for struggle – local, national and international "democratization" – is as much as can be said at this stage of the game. One of the lessons we have learned in the Program on Corporations, Law and Democracy to which Karliner refers is that there are no easy, short-term answers in the struggle to end corporate rule and build truly democratic institutions. Those answers will come only as a product of struggle.

Yet that circumstance confronts us with a real dilemma highlighted by Karliner's important book. While it seems we must drastically change our time horizons in the fight against global corporations from a few years to decades, if not portions of centuries, Karliner offers at the same time persuasive evidence that struggles with such time horizons may be too late to prevent the greed and lust for power of those institutions from destroying our frail biosphere, and rendering life impossible.

Ward Morehouse

on Human Nature and the Social Order adds another controversial volume to Chomsky's already tottering pile on language and politics. The chapters on linguistics provide arresting glimpses of how the whole of human nature can sometimes be seen in tiny grains of language. Chomsky informs us that when we say "brown house" we mean that the house has a brown exterior; this being, apparently, only one example of how the Western mind tends to think of objects as their exteriors. When we say "I climbed the mountain", we all know that we actually mean we went up the mountain. This sentence therefore remains appropriate, even when we are still on the mountain, going down. Chomsky insists that his training as a linguist has not assisted his political writing. And yet the study of language clearly does teach us to approach the commonplace and 'normal' as mysteries to be investigated. In this world, common-sense phrases and ideas become little packages waiting to reveal secret and unsuspected truths. It is exactly this ability, in heaps, which helped Chomsky to win the 'George Orwell Award' twice for exposing political doublespeak.

As never before, this book reveals the



contrast of styles in Chomsky's work. As a linguist, Chomsky is cool, calm and humorous. The political chapters, by contrast, boil with barely restrained moral outrage and passion. Significantly for his critics, however, the same basic rules of logic and reason are adhered to throughout.

A powerful section covers the British and US role in organizing and supporting Suharto's murderous military coup of 1965, which resulted in the slaughter

of some 600,000 people. A "boiling bloodbath" for Indonesia, deemed "a ray of hope [for the West] in Asia"; the British Ambassador to Jakarta had earlier suggested that what Indonesia really needed was "a little shooting".

Chomsky presents here a timely review of the Western-backed massacres in East Timor following the illegal Indonesian invasion of December

David Edwards is author of *Free to be Human* (Green Books, 1995), also published under the title *Burning All Illusions* (South End Press, 1996). He has published articles and book reviews in Z Magazine, The New Internationalist, Red Pepper, The Ecologist, Resurgence, New Humanist, The Contemporary Review, The Edinburgh Review, Cygnus Book Club, New Zealand Rationalist.

City and Forest: Oil and Water

RAINFOREST CITIES

by John Browder and Brian J. Godfrey

Columbia University Press, New York, 1997, 428pp \$22.50(pb) ISBN 0 231 10655 6

Ten years ago, when filming at the port of Belem in the mouth of the Amazon, I saw a huge stack of mahogany timber being loaded into a freighter. It had 'London' stamped all over it. There I began to understand the disturbing dependence of mega-cities on an increasingly global hinterland. Meanwhile, in the local hinterland of Belem, I saw where the mahogany planks had originated from; a town called Paragominas. With some 500 saw mills, it is the 'saw mill capital' of the world. Not surprisingly, *Rainforest* 1975. The full extent of the horror remains largely unknown in the West. To date, more than a quarter of the population has been killed, with, Chomsky writes, "half the remnants driven by 1979

Just as the Indonesian assault reached its peak of near-genocidal ferocity, media coverage in the West reached flat zero.

into closed camps where they suffered famine comparable to Biafra and Pol Pot's Cambodia, the second highest infant mortality rate in the world, destruction of 90-95 per cent of livestock ..." death squads, rape, torture, and so on. The Western response is revealing: "The invasion and subsequent atrocities were accompanied by a sharp decline in attention. Media coverage reached flat zero in 1978, when the Indonesian assault reached its peak of near-genocidal ferocity, while President Carter – of human rights fame – sent new deliveries of arms to expedite the slaughter."

In August 1975 Australian Ambassador to Jakarta, Richard Woolcott, advised that Australia

> approve the invasion of Timor because favourable arrangements to gain a share of East Timor's oil "could be much more readily negotiated with Indonesia than with Portugal or an independent East Timor." This,

Woolcott noted with fetching honesty, was "a pragmatic rather than a principled stand", because, after all, "that is what national interest and foreign policy is all about."

As one Timorese priest put it, "Timor's petroleum smells better than Timorese blood and tears." Chomsky, as ever, remains one of the few people willing to put the true value of all three in their proper perspective.

David Edwards

Cities lists it as Amazonia's fastest growing town. With an annual 17 per cent growth between 1970 and 1991 it is by now approaching 100,000 people, most of whom depend on the timber mills for their living. Paragominas itself sits like a spider at the centre of a road network that stretches deep into what used to be virgin forest. Where the tarmac ends and the mud track starts is where the growth of Amazonia's cities begins.

What characterizes these frontier towns is that they all depend on extraction - of timber, gold or iron ore. In the Amazon, even cattle-raising is an extractive industry in that it relies on the easily depleted fertility of former rainforest soils. Travelling in Para or Rondônia one can see a rapidly changing landscape characterized everywhere by the transformation of primary forest into a degraded landscape The tools for this transformation are chainsaws, bulldozers and fire - vast fires set to clear forest, on a scale equal to the recent fires in Indonesia, blanketing hundreds of thousands of acres with smoke clouds.

Rainforest Cities is probably the first book to describe and analyse the emergence of a contemporary urban tropical landscape. It emphasizes that the outcome of this vast experiment is quite uncertain. In a sense the title of the book itself is a contradiction in terms: there are no cities in the rainforest. Wherever urbanization occurs, the forests have receded – cities there have emerged as predatory organisms devouring the forests. But, as the history of Amazon rubber boom and bust earlier this century demonstrates – their future is shrouded in uncertainty.

The book discusses the role played by Amazon cities in the globalization processes, funnelling resources across the planet, to primary urban centres such as London, Tokyo or New York. But the story has many intriguing features: Amazonia's own bustling towns are strikingly similar to the frontier towns of Hollywood's Wild West, places of intense local enterprise inhabited by settlers who have the gritty determination to make a place called home. But they are also places where the gunslingers are never far away.

Despite the violence, the frontier always beckons. Millions of people have migrated into the Amazon as a result of Brazilian government policies, following the new roads and settling their families for a new life, however uncertain. The economy of Amazonian cities is not only driven by global or even national capital but also by local exchange and trade. Despite gunmen, malaria, infertile soil and hostile world opinion, millions of people will do their damnedest to stay – the total number of

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settlers in the Brazilian Amazon currently amounts to just over 10 million.

Rainforest Cities is a scholarly book, perhaps too scholarly, since it is primarily concerned with wrestling with theories of urbanization, rather than with its social and environmental realities facing people. The authors are determined to develop a theory of urbanization in an unlikely, tropical setting. "We find rainforest city systems in Brazilian Amazonia to be irregular and polymorphous across the region, with functions articulated differently within the national economy."

The book offers some very useful sta-

tistics. The surprising thing about the current status is that the human population of the Amazon Region of Brazil, according to government statistics, is nearly 60 per cent urbanized, with two multi-million cities, Belem and Manaus, dominating the picture, and with a dozen cities of hundreds of thousands, such as Boa Vista, Santarem, Maraba and Rio Branco and Macapa making up the middle ground.

In my view the book has some considerable failings: for instance, the devastating impact of in-migration and urbanization on the indigenous population barely gets a mention. and the book also ignores the role indigenous people and mixed race *caboclos* play in the culture of Amazon cities – by the rich variety of the crops and the medicines they grow which are there in the markets for all to see.

Nevertheless, as a pioneering book of over 400 pages of dense text, *Rainforest Cities* deserves a place on the bookshelf of anybody interested in urbanization and its impacts on Planet Earth. It will always be regarded as the first book of its kind, and any future authors will need to quote from it.

Herbert Girardet

Symptoms of the Global Economy

THE GLOBALISATION OF POVERTY; Impacts of IMF and World Bank Reforms by Michel Chossudovsky

Zed Books/Third World Network, London and New York, 1997, 280pp. £15.95/\$25.00 (pb), ISBN 1 85649 402 0; £42.50/\$59.95 (hb), ISBN 1 85649 401 2

hen Chomsky provides a 150-word cover endorsement, a book merits some attention, and *The Globalisation of Poverty* proves no exception. It deserves to be read, re-read and passed on to a wider audience. By comparison, other works in the 'new economics' genre are mere attempts to re-arrange the deckchairs on the *Titanic*. Here, Chossudovsky provides a valuable analysis of the causes of poverty, placing the reality of the lives of millions of people within the global economic and military context.

The stark opening statement of the final chapter on Bosnia-Herzegovina indicates that "Western public opinion has been misled." It is followed by a measured, meticulously documented account of the destabilizing macro-economic policies imposed from outside the country by the international financial institutions.

"What is at stake in Yugoslavia are

the lives of millions of people. Macroeconomic reform destroys their livelihood, derogates their right to work, their food and shelter, their culture and national identity."

Chossudovsky's description of the cold-blooded dismantling of Yugoslavia's system of socially-owned enterprises and supporting welfare system must be read to be believed. Within a legal framework overhauled by Western lawyers and consultants, bank-ruptcies were engineered in the name of 'free enterprise'. And yet:

"The social and political impact of economic restructuring in Yugoslavia has been carefully erased from our social consciousness and collective understanding of 'what actually happened.' Cultural, ethnic and religious divisions were highlighted, presented dogmatically as the sole cause of the crisis when in reality they were the consequence of a much deeper process of economic and political fracturing."

On its own, the chapter on Yugoslavia would be remarkable. However, it is preceded by factual analysis of the real causes of famine in Somalia, the "economic genocide" of Rwanda, the International Monetary Fund (IMF)'s "indirect rule" of India, the "aid consortium's tutelage" of Bangladesh, the post-war economic destruction of Vietnam, debt and "democracy" in Brazil, IMF "shock" treatment in Peru, debt and the illegal drug economy in Bolivia and the "Thirdworldization" of the Russian Federation. Throughout, the work the author makes frequent reference to World Bank and other international sources. For example, the deregulation of the grain market in Vietnam, under World Bank guidance, led directly to



famine and child malnutrition. In a 1993 document entitled *Vietnam, Transition to Market Economy* the World Bank noted that:

"Vietnam has a higher proportion of underweight and stunted children [of the order of 50 per cent] than in any other country in South and South East Asia with the exception of Bangladesh ... the magnitude of stunting and wasting among children appears to have increased significantly ... it is also possible that the worsening macro-economic crisis in the 1984-86 period may have contributed to the deterioration in nutritional status."

Moreover, the grim effects of the 'economic reforms' being introduced by the international financial institutions are not limited to the Third World and Eastern Europe. Versions of these programmes are starting to appear in the

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rich industralized countries, notably in Anglo-American societies.

In its entirety, the book can and should be read by all with an interest in world peace and the causes of poverty. The terminology and methodology adopted by the Bretton Woods institutions are explained in the initial chapters as the author outlines with exemplary clarity the processes through which the IMF and World Bank collaborate with global business and financial structures. The work is referenced throughout, with frequent and illuminating subtitles, and is not at all daunting in its presentation. As Chomsky comments, there is "nothing inevitable" about the growing inequality within and between countries. However, it takes a book of this calibre to place Rupert Murdoch's action in forcing HarperCollins to withdraw from publication of Chris Patten's memoirs in context. The struggle for economic democracy must now move beyond permitted tinkering with isolated symptoms of a fundamentally flawed system. There is no simple 'technical solution'. Chossudovsky leaves his conclusion in the air, floating the concept that the struggle must be broad-

based and democratic, "encompassing all sectors of society at all levels in all countries, uniting in a major thrust, workers, farmers, independent producers, professionals, artists, civil servants, members of the clergy, students and intellectuals." While the global economic system feeds on division, the author calls for unity in a common purpose to eradicate the causes of mass poverty and endemic warfare. Having completed his task, he hands responsibility over to the reader.

Frances Hutchinson

Diversity; the basis of food security

THE LIFE INDUSTRY, BIODIVERSITY, PEOPLE AND PROFITS

by Miges Baumann, Janet Bell, Florianne Koechlin and Michel Pimbert

Intermediate Technology Publications, 103-5 Southampton Row, London WC1B 4HH, 1996, 214pp, £11.95, US\$18.95 (pb), ISBN 1 85399 341 X

ne of the aims of the 1992 Earth Summit in Rio de Janeiro was to establish the first global action plan for a sustainable future of our planet. The resulting Convention on Biological Diversity aims to conserve biodiversity and at the same time facilitate a just and equitable sharing of benefits arising from the use of biodiversity. Most of the Earth's biological diversity is located in countries in the South, while the North and its private industries are increasingly using Southern countries as reservoirs of biological and genetic resources to develop new crops, drugs, biopesticides, oils and cosmetics.

The rapid rise of genetic engineering biotechnology in recent years has led to a new class of patent claims by Northern corporations on genetic and intellectual resources that belong by right to communities in the South. These "patents on life" include plant varieties cultivated and used by indigenous communities for thousands of years, as well as genes and cell lines obtained under false pretext from indigenous peoples themselves.

What are the likely impacts of these

trends on the self-determination of peoples and their human rights; on biodiversity, the relationship between science and society, the growth of the biotech industry and developments in North and South? Can the conflicting perspectives be reconciled? And if so, under what conditions? This book is the result of a conference that set out to explore and debate these issues.

No one knows what the actual biodiversity of the Earth is in terms of the number of species. Estimates range from 5 million to 25 million, but so far, only 1.5 million animals and 300,000 plant species have been identified. The bulk of biodiversity is in the tropics, so a mere 7 per cent of the Earth's surface holds between half and three-quarters of the world's biodiversity. A 15-hectare plot in Borneo supported more tree species than the entire United States, while a tiny island off the coast of Panama contains more biodiversity than in all of Great Britain.

Most traditional livelihoods depend on a high degree of biodiversity (Bell and Pimbert). For example, Mexico's Huastec Indian communities cultivate some 300 different plants in a mixture of small gardens, agricultural fields and forest plots. In a typical Indonesian village, 100 or more different plants species are used, for food, medicine, building materials, fuel and so on. Biodiversity is the basis of food security. In Peruvian communities, farming is fully integrated within the natural ecosystem with its myriad of interrelationships that buffer the system against environmental exigencies.1 Diverse systems can maintain a high productivity even when populations of individual species suffer wide fluctuations.2

Unfortunately, such diverse ecosystems are increasingly being destroyed and threatened by industrialization and



the intensive agriculture of the Green Revolution. It is estimated that we are losing between one and 50 species a day.

Yet, food security has worsened for the majority of the world's inhabitants. The monoculture crops of the Green Revolution are unsustainable. Not only do they require high inputs in terms of fertilizers and water, but are notoriously vulnerable to pests, disease and environmental exigencies. The potato blight wiped out the entire crop in Ireland in 1845. In 1970, the corn blight devastated 15 per cent of the American crop, and two years later, 30-40 per cent of the 40 million hectares of wheat from Kuban to Ukraine failed to survive the harsh Russian winter. And still today, losses due to insect pests account for some 20 to 30 per cent of total production in agriculture.

Large-scale monocultures also make it easy for giant transnational food corporations to monopolize food production and distribution, effectively to feed the rich at the expense of the poor. Industrial countries with 26 per cent of the world population, consume 80 per cent of energy and 40 per cent of its food; they also produce 68 per cent of all the industrial wastes and 38 per cent of all the gases that are thought to cause global warming.

Recognition of the world's shrinking biodiversity has prompted local and international communities to take action for conservation. This involves both *in situ* conservation of natural ecosystems in the native countries, and *ex situ* conservation in gene banks, botanical gardens, arboreta, plantations, zoos, tissue culture and crytopreservation

facilities. With the rise of genetic engineering biotechnology, genes themselves, including those of human beings become the focus of conservation at the expense of ecosystems, organisms and human beings. Genes and plant varieties are now being

patented by scientists and corporations in the North, and there are already moves to exploit varieties held *ex situ* in gene banks, botanical gardens and arboreta, while negotiations are still going on in the Convention on Biological Diversity.

The patenting of human genes is opposed by all indigenous peoples and by many public interest groups in the North. "The Human Genome Diversity Project (HGDP) is a manifestation of the commodification of the sacred ...

Because science has been used as a magic tool to control nature for so long, people have lost their sense of communion with the earth, their sense of belonging to nature ... The questions that the HGDP tries to answer are those of the dispossessed. That is why they ask, 'Where do we come from?' and 'Where are we going?' ... That is why the HGDP is irrelevant to indigenous peoples. It focusses on issues that are unimportant to us. We know who we are. We know where we have come from and why we are here." (pp. 145-7). "The HGDP starts from the premise that indigenous peoples are endangered. The main reason for this is because of the genocide and ethnocide that has been committed through colonialism. It is highly insulting to us that people claim to be concerned about our endangered position, yet they are more interested in collecting our genes than addressing the main causes of why we are endangered, such as poverty, militarization, and the fact that our rights to self-determination are not recognized ..."(p. 147).

As Goodman states, "The HGDP has the markings of violently reductionist science with a mechanistic and overlydeterministic approach to human biology. There is no built-in effort to examine interactions between genes, or between genes and the environment. In fact there is no discussion of gathering contextual information that would make this possible." (p. 156). And it has not

"It has not escaped our notice that The Human Genome Development Project is business disguised as science."

> escaped our notice that "The HGDP is business disguised as science." According to RAFI, blood samples collected by the HGDP will be stored at the American Type Culture Collection in Washington D.C. In November, 1992, this repository held 1,094 human cell lines, more than one-third of which are the subject of patent applications.

> In order to counteract the claims of Trade Related Intellectual Property Rights by Northern corporations, many Third World countries are favouring a

community-based *sui generis* legal system to protect their biodiversity from further piracy (Colchester), which would at the same time safeguard their knowledge system and way of life, both inextricably involved in creating and maintaining diverse ecosystems through the ages.

Some Northern corporations are setting up bilateral agreements with the governments of Third World countries involving some form of benefit-sharing in return for allowing corporations to prospect for genetic resources. But tough questions remain as to whether the benefits are equitable, what form they should take, how they are determined, and which parties are appropriate for negotiating with the

> prospector. And most of all, how biodiversity may, thereby, be conserved.

> Biodiversity is not simply the number of species that exist. It is about indigenous ways of life, of cultures that have established a myriad of relationships, practical, aes-

thetic and spiritual, with ecologicalagricultural systems through the ages. Vandana Shiva sees biodiversity prospecting as the first step towards accepting the dominant system of monoculture and monopolies, and thus towards accepting the destruction of diversity. "Can the planet afford to have biodiversity and the traditional lifestyles that conserve biodiversity swallowed up as raw material for a globally-organized corporate culture which produces only uniformity?" (p.127).

MA IN ENVIRONMENTALISM AND SOCIETY

The School of Social Sciences offers this course on the philosophy and practical implications of environmentalism. It is available full-time one year or part-time two years.

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School of Social Sciences and Law Oxford Brookes University Gipsy Lane, Headington Oxford OX3 0BP Tel: 01865 483750



Genetic engineering biotechnology is hailed as the next revolution that will correct all ills: yields will be increased to feed the growing masses of humanity in the Third World, pesticide use will be reduced, the environment cleaned up, and so on, all of which are either outright lies or promises that can never be fulfilled. At least part of the reason is because it is based on the latest version of the reductionist science that has been responsible for the destructiveness of the Green Revolution. This reductionist science has ceased to make contact with reality in its persisting efforts to reify the gene, which has no simple location or interpretation according to scientific findings in the new genetics (Kollek).

Genetic engineering agriculture produces crops that are even more genetically uniform than conventionally bred monocultures, and hence even more vulnerable to pests, diseases and environmental exigencies. That is because transgenic lines are literally selected genetic clones of one originally transformed plant or plant cell. Transgenic lines are now engineered to be resistant to broad-spectrum herbi-

The Cell from Hell

AND THE WATERS TURNED TO BLOOD

by Rodney Barker

Simon & Schuster, New York, 1997, 330pp, US\$24 (hb), ISBN 0 69984 83126 0

This true account of an environmental nightmare reads like a spellbinding whodunnit. Just as Rachel Carson's *The Sea Around Us* opened readers' eyes to the dangers of our "effluent society" almost fifty years ago, *And the Waters Turned to Blood* – a biblical reference to the first recorded red tide – is a frightening scientific adventure, far more disturbing and thought-provoking than any fiction.

Beginning in the 1980s, dead fish by the thousands were found in the rivers and estuaries of North Carolina, some stripped to the bone and others with hideous lesions. Soon the local fishermen became victims of the invisible killer, afflicted by open sores that would not heal, or stricken with nausea and

Gard Binney is an occasional writer on environmental issues.

cides that will kill species indiscriminately. Worse still, it is an inadequately researched, hit or miss technology that has been rushed prematurely to the market, and carries inherent dangers of genes spreading and recombining out of control. After several years of intense debate at the Convention of Biological Diversity, an internationally binding biosafety protocol was finally mandated in Jakarta, in November 1995.

This immensely informative volume is required reading for everyone concerned about where the world is heading at the end of the millennium. The book ends on a cheerful, upbeat note, as the European Parliament, which has banned genetically-engineered bovine growth hormone until the year 2000, also voted on 1 March 1995 to reject the patents Directive. It was hailed as "a vote for conscience over capital". Pat Mooney calls for science and politics to work together to strengthen the community - indige-nous, rural and urban - to give self-determination and the power of innovation back to the people.

But intense lobbying by biotech

interests has subsequently reversed the vote on the patents directive. Similarly, efforts to dilute and undermine the biosafety protocol have been going on ever since it was mandated.

If you read this book, you will see, if you don't already, why the future of our planet, the future of humanity, and so much of what it means to be human, are all hanging in the balance. That is why so many of the authors are campaigning against patents on life and genetic engineering agriculture. In June this year, Switzerland will be voting in a referendum to reject both. Let us support them in whatever way we can.

> Mae-Wan Ho Biology Department Open University, UK

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respiratory diseases. All along the eastern seaboard of the United States a mysterious and deadly aquatic organism, a dinoflagellate called *Pfiesteria piscicida* (fishkiller), threatens to unleash an environmental nightmare upon a largely unaware population, lulled into complacency by an establishment in denial of scientific evidence.

The unicellular animal can assume a variety of different guises; it can also masquerade as a plant or lie dormant for years awaiting a suitable prey. Armed with a voracious appetite and vast reproductive powers, the microscopic animal moves through coastal waters to kill fish and shellfish by the million and to poison people, producing a plethora of symptoms such as pain, disorientation, vomiting, memory loss and immune failure. People can be hurt just by inhaling its toxic vapours.

It was only when the scientists studying these microscopic monsters began to display symptoms of what was at first taken for Alzheimer's disease or multiple sclerosis, that state officials reluctantly conceded that they might be facing a terrifying plague upon the waters. But instead of launching a non-prejudicial investigation, they targeted the messengers, Dr JoAnn Burkholder and her colleagues – dedicated research scientists confronting medical, political and corporate powers with a vested interest in the status quo. Against overwhelming odds, and constantly impeded by foot-dragging bureaucrats and envious academics competing for scant public funds, the Burkholder team finally succeeds in locating the source of the scourge. It turns out that the illegal effluence from pig farms along the state's waterways had revived the dormant dinoflagellates and triggered the outbreak of the lethal aquatic chain reaction.

In Rodney Barker's scathing indictment of establishment inertia in the face of an imminent threat to marine life and human health along America's Atlantic coast, the reader will find a microcosm of the larger ecological dilemma now facing us all over the globe: the willingness to put shortsighted commercial and political gain ahead of the irreparable damage we are inflicting on our biosphere. Thus North Carolina's pig farmers become an apt metaphor for the greed of global corporations elbowing each other for position at the communal trough of non-renewable resources.

Gard Binney



Letter Forum

Neil Broom, in questioning neo-Darwinism, has "taken science back by over 100 years".

What a stain on an otherwise respectable journal. I talk of course about the uninformed, science-free, speculative, opinionated, and blatantly unbalanced article by Neil Broom (*The Ecologist*, Vol.28 No.1) entitled 'The Selfish Gene: a crude and naive fabrication'. I defy you to find a single scientific argument in the entire paper. This particular style of reporting is a disgrace.

In respectable scientific journals it is the norm to present an alternative theory whenever there is a degree of contention, but the author clearly does not have any alternative. The author at many points explicitly mocks the suggestion that life evolves through natural processes, and you cannot defend an article that openly states supernatural causes as a means of explanation. The author openly admits that Darwinism is the foundation of modern biology, yet by publishing this nonsensical article, you are giving credence to his suggestion that the whole of biology is flawed. I suggest that you leave biological comment to biologists in future.

By mocking chemistry as the means of creating life, the author again only leaves the supernatural causes of life, and you cannot possibly justify allowing the religious and superstitious motives of the author to pass as science. Again the only objection the author can provide is one of innuendo and disdain, and to draw a completely inappropriate analogy which you have allowed to pass unchallenged, and incorrectly supposes that Huxley and scientists actually believe that typing monkeys would produce the works of Shakespeare.

The author's objections seem merely to be against Dawkins' presentation and use of analogy, yet you have allowed these stylistic objections to pass as scientific comment. The author implies that Dawkins is inconsistent in his own mind (page 24), or worse is deliberately trying to mislead the reader by choosing his analogies (of, for example, whether a gene has motives or not), yet it should be obvious to you and any intelligent reader that there is no contradiction, and Professor Dawkins is not confused about whether a gene has motives or not. The intelligent reader is quite capable of spotting an analogy without Neil Broom needing to point it out, and analogy is undeniably a very valuable means of description.

You have allowed Mr Broom's assertion that genes being 'intelligent' masterminds of life is the underpinning neo-Darwinism (The Ecologist Vol.28 No.1, pp.24-25), yet the mistake is entirely Mr Broom's. You must surely be in no doubt that neo-Darwinism denies any intelligent motives of a gene, yet you allow Mr Broom a page or two of print to argue against this completely false accusation. To deny that genes are selected against each other is to deny the established science of DNA reproduction, and to deny reductionism is to deny that genes exist. It was never suggested by Dawkins that genes can function alone, yet you have allowed yet another unfounded accusation (p.25) to slip through and appear as a credible objection.

I have absolutely no idea how you could permit Broom's metaphysical assertion that "idea" and "striving" (p.26) are essential ingredients for improvement, particularly given that he has spent two pages (pp.24-5) citing objections to "motive" and "mastermind" for genetic evolution (incidentally the only kind there can be). You accepted his only (mistaken) objection to evolution (p.26) that there can be no criteria for success, superiority and survival under neo-Darwinism, concluding the existence of a higher force. As an ecologist, I'm sure you see the effects of adaptation (or otherwise) every day, as a criterion for success.

Broom has no grasp of the application of computers to genetics, and it would appear obvious that the referees did not either. Living systems are examples of objects, yet you have permitted this vacuous objection (p.27). You also permitted Broom to say that genetic computer models can model nothing (except the most "child minded" things), yet genetic algorithms are some of the most powerful techniques for solving many difficult problems in computer science and artificial intelligence, and many hard mathematical problems. Given only fluid dynamics, there is no question that a genetic algorithm could design the shape of a Spitfire, so yet another half column of your magazine is factually incorrect. 'Biomorphs' is merely a model, but contrary to what you have published, it does illustrate the role of genes and natural selection. Genetic algorithms undermine Broom's entire premise that "idea",

"recognition" and "purpose" are essential ingredients for evolution, because a genetic algorithm entirely materialistically solves real practical problems for which no prior solution is known.

The author has completely misunderstood his subject matter. The question is simply this: is evolution blind or isn't it? Dawkins supposes that it is, and presents a way of looking at things in an interesting way that one would not normally do. There is no contentious science there, and nothing that warrants a blatant and unmitigated attack of the nature that you have sponsored.

Laid bare, Broom's premises are

- idea, intention and direction are essential ingredients of evolution,
- genetic change is not random but guided,
- there is no physical means for life to emerge,
- there is a spiritual force present in living things, absent in inanimate

objects,

- there is no natural selection between genes,
- genetic computer algorithms can never be of practical use,
- understanding the components of a system (reductionism) is an invalid activity,
- understanding the physical processes of a system (materialism) is equally invalid,

all of which are trivially false, and what you seem to have forgotten, can all be shown to be false through scientific experiment.

I have no idea how your referees could accept this paper, but you have now opened the possibility for other articles to cite this nonsense as scientific fact, and have taken science back by over a hundred years. Very badly done.

Calum Grant 77 Panton Street Cambridge, CB2 1HL

"... dead horses are flogged."

Neil Broom's hatchet job on Richard Dawkins starts so well, with an excellent sketch of the rationale behind the evolution of life. It is a shame that things went so badly awry, and for so many pages, thereafter. Neil Broom seems astonished that both stability and instability can each be driving forces at work on evolving systems. I find it difficult to understand how he fails to appreciate that natural selection will tend towards stability. The fact that the instabilities of the real world, and real systems within it, provoke changes is also probable, if not inevitable. Coupling these two to provide a model in which natural selection - the forces of the (unstable) changing environment acts upon far more stable biochemical systems to produce evolving replicants, defies no laws of nature or science.

Broom's criticism of Dawkins's reference to crystal formation mechanism is disingenuous. This was not presented to explain but to illustrate natural selection. To linger on the Shakespeare-generating monkeys is to climb the wrong tree. To quibble about the difficulty of getting apes to type and be supplied with the necessary stationery tends to take a poor argument and lock it into a padded cell. The dynamic, fluid approach to changes in the information content of not-quite-perfectly replicating molecules drives a flow of variation through the natural changing sieve of the real world. Fitness for purpose within the prevailing environmental conditions allows certain gene sequences to prosper. The 'typing monkey' analogy needs a world in which play-writing genes are not lethal to immature monkeys, or in which sonnets help attract mates.

Dead horses are thoroughly flogged with Broom's implication that the neo-Darwinist approach calls for deliberate intent on the part of the genes, citing Dawkins's use of terms such as "discovered", "construct for themselves" and "ensure their own continuation". It is apparent to anyone reading any of the books (which *The Ecologist* helpfully illustrates throughout the feature), that these phrases aid an appreciation of what is happening – while the dangers of taking these literally is clearly signalled throughout.

Broom's service to the reader is to lucidly explain much of the fundamental common-sense of Dawkins's approach. His mistake in doing so is to completely miss the point of it.

Kit Strange World Resource Foundation Bridge House, High Street Tonbridge, Kent.

"... Dawkins is on our side."

When I first read Darwin while still at school in 1939 it seemed obvious to me that if humans were an evolved species, this must apply to our whole nature and behaviour, not just our physical characteristics; and that in consequence humanity needed to rethink politics and philosophy and psychology, indeed all the fields of thought and action to which other ideas of how we began made by God on the seventh day, or whatever - were deemed relevant. Not much progress seemed to have been made; it was obviously taking some time for the implications to be taken on board, but I assumed they would be in my lifetime.

It was obvious that many people resisted the idea that they were 'just animals', but I could see no reason for people to alter their view of what people are *like* (which surely we get from introspection and observation) just because of a change of view as to how the human race got to be the way it is. If people seemed sometimes to have a divine spark, as well as sometimes doing the things the Nazis were doing, that was the way we had evolved.

Now, even though fewer people believe in the literal accuracy of the religious accounts of our origins, the irrational resistance is still strong, as shown by the way Neil Broom, in his attack on Dawkins strains to get a Creator back in somehow, via the ideas of design, purpose, or spirituality. Their pre-existence is taken to be selfevident, without any need for any attempt to say how they got there; and only those blinded by 'reductionism' fail to see them.

Broom criticizes Dawkins for not offering chemical details of how some replicating process started, and dismisses the analogy with crystal formation as "inappropriate" without saying why. Surely Dawkins is not in the business of asserting golden truths of this kind. (Creationists are, sharing a dogmatism if not much else). He is simply suggesting an origin of life which does not postulate a pre-existing design whose own pre-existence would still need accounting for. He is just acting as a philosopher wielding Occam's razor. Sometimes Broom's thinking seems wilfully perverse, as when he attacks Dawkins' use of Huxley's 'monkeys with typewriters' analogy on the ground - among others - that someone would have had to design the typewriters. You do not destroy an argument by attacking a point which is not at all integral to it but only an illustrative analogy. But Broom has failed to see that Dawkins isn't arguing that "pure chance operating over mega-time represents the ultimate creative force behind the development of complexity in the biological world" (Broom's paraphrase). Dawkins is saying that if it were blind chance, the odds would indeed be impossibly long. The analogy of the monkeys is useful because few people really make sense of long odds expressed in long rows of noughts, but anyone who has played Scrabble knows it's pretty rare for a seven-letter random sequence to make any word at all, so the analogy calling for the sequence to extend to the works of Shakespeare gives some feel for the odds against complex life evolving by chance. But when survival by natural selection comes into play, the odds shorten. Dawkins' biomorphs are an

attempt, and a brilliant one for those who are trying to follow his argument instead of throwing things at it, to illustrate the 'designing' power of a system of replication (yes, such as crystals have), occasional 'error', and selection from the results.

I doubt if Dawkins anywhere says anything much like Broom's paraphrase about pure chance over mega-time being the "ultimate creative force". If there were an "ultimate creative force", that begs the whole question the debate is about.

One more example of Broom's method of attack. He seizes on Dawkins' use of "half-cocked" and "half an eye" in colloquial-language illustration of an argument which Dawkins has set out very fully, goes on to explain laboriously that Dawkins is really referring to "an eye that sees to a level of acuity or focussing that is some fraction of the quality of sight achieved by the fully developed eye". I dare say Dawkins would accept that might define one stage in the evolution of eyes, but he doesn't see the need to spell it out every time he wants to refer to the idea that even slight capabilities can have survival value so they get built in. But in the next couple of lines Broom makes a metaphysical point about the difference between "achieving systems" and "nearlyachieving" systems. Again, Broom's criticism is entirely to one side of the real chain of argument.

Unfortunately this is not just an academic argument. Creationists are all too ready to seize on any criticism of Dawkins and other clear thinkers to justify clinging to Creators who, having designed the world in the first place, must be capable of redesigning it to make room for human folly, or creating it all over again if we destroy it. Specific Creators can endorse any sort of notion as a fundamental law over-riding mundane considerations of keeping the world in good working order, and tend to endorse notions which serve the selfish interests of the nation or group who believe in them.

Dawkins is on your side, and mine as an *Ecologist* reader from the first issue. Humans are an evolved species, capacity for ethical behaviour, 'spiritual dimension' and all. In natural selection operating on human groups, a tendency to behave ethically within a group probably conferred survival advantage. There's no sharp separation between the social and the genetic; our behaviours have been evolving over 'mega-time' in a way all mixed up with the genes within the individual animal. But it all developed in small-group living, human and pre-human. A process which has enabled us to survive so far may not go on working now, with the weakening of separate local groups capable of evolving separately. and with behaviour patterns becoming global so that a destructive pattern will no longer 'burn out' just its own locality leaving a neighbouring group with better behaviour patterns to take over. For the first time, our survival depends on whether we can arrive at a sustainable way by thinking and planning. And the more clearly we realize, with Dawkins, that we've really got to work it out ourselves with no help from a 'designer', the more likely we are to succeed. We need Dawkins' talents to help us understand what might be the way forward, not endlessly having to refute Creationists and others who cling to archaic beliefs that somehow our species is different and guided from somewhere outside the whole evolutionary process.

Roy Cattran 2 Donnington Road

Penzance, Cornwall TR18 4PH

Neil Broom responds:

Judging by the rather heated tone of the three correspondents Cattran, Grant and Strange, my paper has obviously served to cast insult at *the* 'sacred cow' of naturalism.

What is indeed curious is that I am accused by Mr Cattran of being a 'Creationist' (implying, I suspect, that I am a believer in instant creation, a young Earth, and anti-evolutionist into the bargain!) without my ever hinting at such a position. I get the distinct impression that the moment one expresses even the slightest doubt about neo-Darwinian doctrines one is immediately branded as being antiscience, and an irrational, raving, loony, literal creationist. These are indeed dangerous times.

I would therefore like to state right here that I am not at all against evolution per se. That life has probably unfolded or evolved from quite primitive beginnings over a vast period of time (yes, megatime indeed!) – does seem to be an entirely reasonable conclusion to draw from the scientific evidence available to us.

But I do not accept the widely held

neo-Darwinian explanation, particularly as popularized by Richard Dawkins, as to how this evolution might have occurred, and for the reasons very briefly summarized in my article. Contrary to Mr Cattran's accusation, I was careful to point out that Dawkins does clearly emphasize that neo-Darwinism is not a theory of pure chance (see The Ecologist Vol.28 No.1, line 16, p.24) - he catches many of his critics out on this point - but my main contention is that his so-called natural selection is anything but purely material. It really is an intensely 'valueladen' term. By Dawkins' own admission, it means "aiming for the top" in the context of his recent metaphor "Climbing Mount Improbable". Surely, in a purely material universe, 'aims' (aspirations) are totally irrelevant, simply nonexistent. This is just one example of how Dawkins' approach is so misleading.

Grant also makes several accusations. I am guilty of "mocking chemistry". I "mock" the idea of life evolving by natural causes, without offering any scientific alternative. But my purpose in writing the article was not to offer an alternative, rather to point out that the current naturalistic dogmas appear riddled with holes. It is the Cattrans, Grants, Stranges and Dawkinses of this world who, by holding to the conviction that life is explicable in purely material terms, are obliged to front up with scientifically convincing scenarios. I am under no more obligation to provide a 'better' alternative than is a bank manager obliged to find more funding in order to sort out a client's financial recklessness which has landed him in desperate overdraft. His job is to point to the error of his client's ways - and cut the flow of cash before his plight worsens!

Grant also says I have completely misunderstood my subject matter. Apparently the only scientifically valid position is: evolution is blind and Dawkins has shown us the way through the darkness. If this is so, then Dawkins has a duty to science to purge his writings of the faintest hint of purpose and intentionality. "Aiming for the top" must go, and so must all of his other metaphors where they imply the operation of a 'personal' element in his declared materialism.

Grant purports to criticize my article as lacking science. His own apparent grasp of science may be glimpsed in his assertion "[g]iven only fluid dynamics, there is no question that a genetic algorithm could design the shape of a Spitfire ..." Considering our vastly incomplete understanding of fluid dynamics, his confidence is somewhat surprising. So let's see him do it! And we should expect not merely the "shape" of a Spitfire – but something that models substantially a real, 'live', functioning Spitfire – if his analogy is to have any merit.

Metaphors can be useful (I certainly used them in my article) but

when they trick the reader into thinking something has been accounted for when it hasn't, they must be discarded in the interests of integrity.

Has my article really served to take science back into the dark ages of

superstition and ignorance? Mr Grant seems to think so. I personally think there is a far greater threat to the intellectual integrity of science when its practitioners remain slavishly loyal to a particularly dogmatic brand of physicomaterial reductionism which then *cannot* be expressed without employing the language of purpose and intentionality. If these practitioners are unwilling to refrain from using this language, then it's time they re-

examined their basic assumptions.

Grant's attempts to list my premises is very largely a caricature, as a careful read of my article will show. Specifically item 2 on Grant's list is, in fact, seriously discussed in Edward Goldsmith's recent article in *The Ecologist* (Vol. 27 No.5). His item 5 is unfortunately put, but more to the point, I never said there was no selection. Rather, I argue that selection is much more than a purely material process. For example, if, as is

I am under no more obligation to provide a 'better' alternative than is a bank manager obliged to find more funding in order to sort out a client's financial recklessness

> claimed in the neo-Darwinian evolution of the eye, selection is made to act on those changes that improve spatial resolution or visual acuity, this cannot be purely material. It is profoundly goal-centred. The neo-Darwinist, to be true to his naturalistic cause, must get rid of this very idea of 'improvement' – it's a totally invalid password!

In fact the letter by Strange unwittingly demonstrates what was perhaps the main point in my article, namely neo-Darwinians' incessant use of the language of purpose while claiming that selection can occur devoid of intentionality. Strange, in his second paragraph, repeatedly uses terms such as "fitness for purpose", "... gene sequences to prosper", "... sonnets help attract mates." These expressions are exceedingly intent or value-loaded, thereby implying a quality that transcends the purely material.

Finally, I do confess to being a theist – and unashamedly so. But I don't think this need in any way detract from the quality of science that I strive to practise. I stand as a tiny, insignificant speck in the vast community of scientists, but proud to be 'down-wind' of some of the world's greats such as Galileo, Newton,

Kepler, Faraday etc. who saw no conflict between their belief in a transcendent Being and the science they pioneered. My theism is, I believe, totally irrelevant to the category of criticism I have raised against Richard Dawkins in my article.

Neil Broom

Author of the offending article – The selfish Gene: A Crude and Naive Fabrication.

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Across the world, non-Western ways of living are under threat from the consumer monoculture. In both North and South, viable rural economies are collapsing, centuries-old skills and knowledge systems are disappearing, communities are being uprooted.

ISEC's Farm Project in Ladakh, or "Little Tibet", provides an almost unique opportunity to understand the pressures facing a traditional land-based culture as it confronts the global economy.

Living and working as part of a farming family, you will help to raise the status of rural life, thereby strengthening the Ladakhis' sense of cultural identity. At the same time, you will be challenged to rethink some of the basic assumptions underlying industrial society.

This is an entirely non-profit programme. Participants pay only a fee to cover administrative costs. Summer months only. Minimum stay one month

For more information, write to: The International Society for Ecology and Culture (ISEC) Apple Barn, Week, Dartington, Devon TQ9 6JP, UK 850 Talbot Avenue, Albany, CA 94706, USA



