PLANET • PEOPLE

THE ecologist

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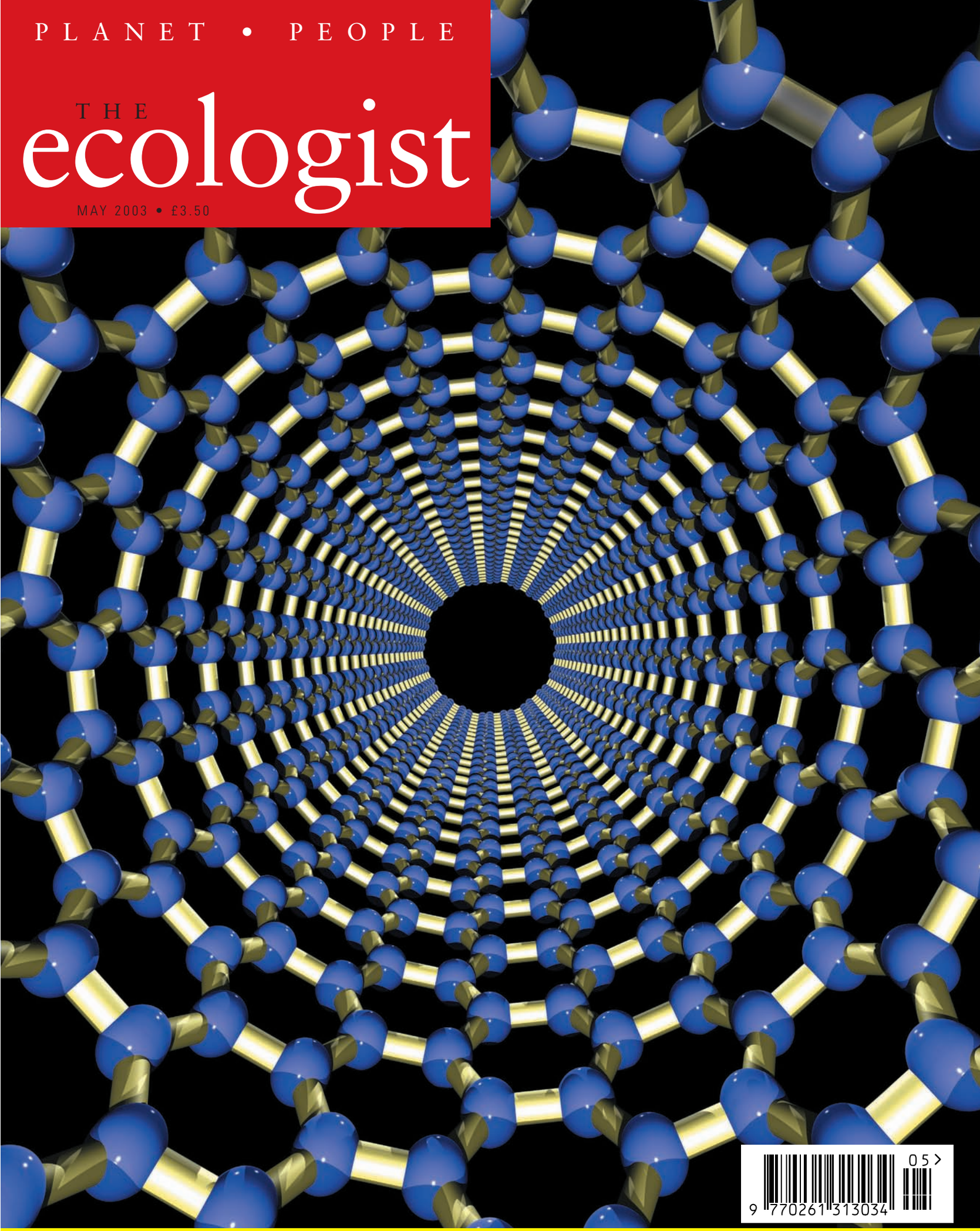

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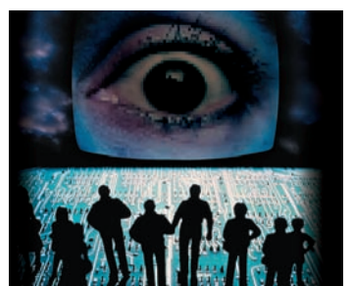

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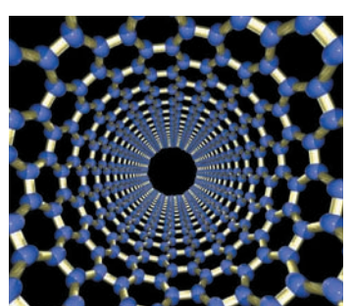

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Who's appeasing who?

If nearly half the people of America believe today that Saddam Hussein was directly behind events on September 11th, that can mean only one thing: America's free media is telling a whole bunch of porkies. The American public then can be forgiven up to a point for believing they're merely toppling a tyrant and punishing him for killing thousands of their own.

But do war supporters elsewhere really believe it's a coincidence that American troops headed straight for Iraqi oil fields the second war began, and that Rumsfeld went out of his way to warn Iraqi soldiers they would meet the same end as their leader if they set fire to Iraqi oil? Is it a coincidence that the prime commercial beneficiaries of reconstruction in Iraq include members of the Bush administration, and the corporations that funded his campaign?

It would be amazing to think so. The humanitarian and security arguments, the ones that our leaders have peddled for months, are well-known, and have always looked like weak excuses. But compare them with the case that oil is at this conflict's core.

We know that the US will have to import two thirds of its energy by 2020. We know that the oil-drenched Bush administration is totally uninterested in reducing America's dependence on fossil fuels. Control of oil supplies was therefore always going to be vital, and the path to achieving that control has always pointed one way.

Every day, America imports 2.6 million barrels of oil from Saudi Arabia's unparalleled reserves, and spends fortunes protecting them. The effect is that an unhealthy dependence has developed, with Saudi Arabia enjoying unusual, though tenuous influence over the US. But the cost to America of her growing dependence on Saudi oil can't be measured in dollars. For one thing, the presence of her troops on Saudi soil is probably the single greatest stimulus for anti-American radical groups like Al Qaeda, into which the Saudi Sheikhs pour funds to keep a lid on their frustrations.

America is in an embarrassing situation, protecting and providing custom to a regime that sponsors exactly the sort of terrorism Mr Bush tells us he's combating. But to make matters worse, China's thirst for oil is increasing dramatically, and many of the non-OPEC oil fields are nearing exhaustion. The prospect of the US diversifying its supply is becoming remote. And of course, there is the very real prospect that America's friendly but unpopular sheikhs will be toppled. It's a vulnerable position to be in, and according to Lutz Kleveman (*Ecologist*, April 2003), a number of high level US politicians are talking openly about invading Saudi Arabia and occupying her oil supplies.

The obvious alternative, besides moving away from a fossil-fuel based economy, is Iraq, whose gushing reserves are easy to access, good quality and second only to Saudi Arabia. With 112 billion barrels, Iraq harbours 12 per cent of the world's known reserves. And with a little investment, the 2 million daily barrels it currently produces as part of the UN food for oil programme could rise easily to 7 million barrels, equal to 10 per cent of global consumption, and at a cost of just $2 per barrel. For America's lagging economy, the resulting drop in prices would do wonders.

Certainly the oil connection hasn't been lost on BP head Lord Browne who speculated that unless Mr Blair is proactive in their interests, British companies will lose out to their American competitors. Nor, has it been lost on the Russians, whose state budget is almost entirely funded through sales of raw materials. They know that US control of Iraqi oil will flood the market and force a drop in prices, and therefore their budget.

Let's be honest about it. If resources aren't at the forefront of President Bush's mind then this conflict has got to be one of the most profound coincidences in history. And equating opponents of Bush or Blair with lack of patriotism is like being told by Lloyds that you hate Britain for joining Natwest.

China, Russia and India meanwhile must be licking their lips. All of them can now apply US logic in their pursuit of further territories. How hard will it be for China to 'prove' links between the benign Dalai Lama and the ever present, nitrogen-like al Qaeda? How hard for Russia to 'prove' Chechnya's longing for the bomb? Let's not even go to the tea shops of Kashmir.

The less obvious player is Mr Blair. Why would he risk his neck on all this? Despite what some of his friends claim, it's unlikely he's achieved anything remarkable in terms of tempering Mr Bush's gung-ho attitude. In fact, being more trusted than his American counterpart, he's made Mr Bush's ambitions appear almost reasonable. In real terms, he's semi-legitimised the war. What's more, his own arguments have changed so often, it's hard to believe he means them. The only plausible explanation is that like Bush, Blair is also a poker player, and has had a private viewing of Mr Bush's hand.

In the short term, it may be a shrewd move. But at the end of the day Britain has chosen to collaborate with the only country that threatens the very viability of our planet.

WINDOW DRESSING

At the end of your article about shrimp farming (March 2003) you write: 'tell your supermarket / favourite restaurant / fishmonger that you only want to buy shrimp that is produced in a way that does not involve human rights abuses or environmental devastation.'

Such hand-wringing to the distributors and suppliers of shrimp will not be of the slightest use; have we not already seen the standard industry response? Consumer disquiet about tuna fishing and its effect on dolphins: the industry response is to print 'dolphin friendly' on every tin of tuna. Public concern about deforestation: industry response is to stick a label on every bundle of wood just to assure the buyer that it comes from so-called sustainably managed forests. And those vegetables and that fruit being sold as organic: how does Joe Public know they really are as described?

The only effective answer involves a total boycott; anything less will simply ensures that industry writes creatively on its labels.

John Maloney, London, UK

PLAN COLOMBIA 1

Your article on Plan Colombia (March 2003) article is full of half-truths or indeed half-lies, gleaned from the publications of the Sunshine Project – 'an international NGO opposed to use of biological weapons'. I think not. This organisation, I would contend, has a more sinister agenda judging from their strident 'propaganda' which has been circulated at international meetings over the past few years. These pseudo-scientific documents are full of the spin and half-truths which your article propagates.

Fusarium oxysporum is a slime-spored fungus with absolutely no ability for airborne dispersal and which has never been implicated in human diseases such as asthma. There are numerous other species in dry-spored genera, such as *Aspergillus* and *Penicillium*, which cause bronchial-pulmonary problems and which are also much more dangerous to immuno-compromised patients.

The specific strain of *F. oxysporum* from coca has been tested since we were involved in this initial selection and screening of EN-4. It is safe, specific to the coca host and would be applied in granular rather than an aerosol form because it is a slime-spored soil fungus which attacks the roots not the aerial parts.

Labelling the genus Fusarium as a human health problem, on the basis that some species (not *F. oxysporum*) can invade predisposed animal tissue and also produce mycotoxins, is irresponsible journalism. Why not report that all commercial mycoprotein (ie Quorn) is also based on a Fusarium species (*F. graminearum*)?

Dr HC Evans DSc, Biological Control of Weeds and Plant Diseases, CABI Bioscience Ascot, UK

PLAN COLOMBIA 2

While biowarfare in the form of pathogenic fungi is still in the testing phase, Plan Colombia's aerial fumigation program is well underway. In an effort to eradicate the coca crops used to make cocaine, toxic herbicides are sprayed from above, hitting water supplies, staple crops and people. The fumigation campaign drives peasants deeper into the Amazon basin, which in turn leads to more rainforest deforestation.

Destroy the Colombian coca supply and production will increase in neighbouring Peru, Bolivia and Ecuador. Destroy every last plant in South America and domestic methamphetamine (speed) production will boom to meet the demand for cocaine-like drugs. If South America's rainforests are to survive the self-professed champions of the free market in the US Congress had better learn to apply basic economic principles to drug policy.

For the same reasons alcohol prohibition failed in the US, the drug war has been doomed from the start. Eradicating plants abroad and building prisons at home is not going to make the US 'drug-free'. Instead of wasting scarce resources waging a punitive drug war, the US should be funding cost-effective drug treatment. Prison cells are hardly ideal health interventions. Drug abuse is bad, but the drug war is worse.

Robert Sharpe, Drug Policy Alliance, Washington, USA

RESPONSE TO FSC

Informal discussions last year between the Rainforest Foundation and the Forest Stewardship Council (FSC) were, indeed, 'constructive'; FSC Staff and Board appeared to acknowledge that many of the problems identified by the Foundation were valid, and we were promised a full written response to the many concerns detailed in our 150-page report, *Trading in Credibility*. However, the FSC has so far produced only a one page response, including only a vague commitment to 'investigate problems where necessary'.

For the FSC to claim the concerns raised in the *Ecologist* article (Letters, April 2003) have 'no basis' is simply untrue. For example, despite the FSC itself recently finding serious failings on the part of one of its largest accredited certifiers, which resulted in the UK public being widely misled about the 'ethical acceptability' of certain wood panel products, the FSC has still failed to bring the certifier under control or to cancel the certificate concerned. In Ireland, the whole FSC 'process' has been a continuing shambles, which has resulted in the FSC certification of almost all the country's forestry operations, despite this being almost unanimously opposed by Irish environmentalists. Again, the FSC has failed to take any meaningful action.

The FSC's Executive Director recently attended a meeting in Indonesia at which representatives of local communities stated clearly that FSC-certified logging companies had abused their rights. The communities living in and around one FSC-certified logging area, which is inhabited by highly endangered Sumatran tigers, have recently repeated their demand that the certification is immediately cancelled – but the FSC has still failed to withdraw the certificate.

Until such problems are confronted by the FSC, and decisive action is taken, the public will continue to be misled into believing that the FSC provides a reliable guarantee that wood products carrying it's logo come from 'environmentally acceptable and socially beneficial sources'.

Simon Counsell, Director, The Rainforest Foundation UK

Society, Media & Culture

BURMA • Or Myanmar, depending on which side of the military regime you find yourself. If like the companies below you support the regime, enjoy your visit to Myanmar. If not, please boycott Burma.

While our travel press may be freed to avoid publishing the truth about Burma, the media in Burma enjoys no such liberties. The regime's Press Scrutiny Board orders articles even obliquely critical of official actions to be deleted. Unlicensed possession of a fax machine or modem is punishable by 15 years in jail. There is no public internet access in Burma, apart from a handful of expensive email accounts that pass through a central military server where messages can be delayed for hours while they are read by censors.

Examples of censorship include:

- Banned topics include everything from deposed dictators such as Slobodan Milosevic and Suharto to floods, plane crashes and train wrecks.
- The September 11 attacks were not mentioned on state television and only in passing by government newspapers. Police confiscated contraband videotapes of CNN's September 11 coverage and threatened vendors with arrest.
- When the national football team was knocked out of the Asian Tiger Cup in 2000, the newspapers were ordered not to report the results.
- A local film-critic's review of *The Man in the Iron Mask* was censored because he quoted the Musketeer slogan: 'One for all and all for one!' The censors felt that 'one' referred to the pro-democracy leader Aung San Suu Kyi and the 'all' to the Burmese people.
- While the population is unable to discover what its leaders are up to, their leaders are working hard to find out more about what their people are doing. IRIS Technologies is using Burma as a testing ground for its new e-passports which have biometric features. According to the *International Herald Tribune*, 'The company specializes in providing smart-chip technology for governments to identify and track their citizens movements.' What makes this contract particularly alarming is that the UN Special Envoy to Burma Tan Sri Razali is the chairman and 30 per cent stockowner of IRIS.

1948 Burma gains independence from Britain under U Nu, following assassination in 1947 of Aung San, father of the current pro-democracy leader Aung San Suu Kyi.

1962 U Nu ousted in coup led by General Ne Win, who inaugurates the 'Burmese Way to Socialism', nationalising the economy, forming a single-party state with the Socialist Programme Party as the sole political party, and banning independent newspapers.

1974 New constitution comes into effect, transferring power from armed forces to a 'People's Assembly' headed by Ne Win and other former military leaders.

1988 On 8 August 1988 the Burmese military kills tens of thousands protesting government repression in Rangoon.

1989 The State Law and Order Restoration Council (SLORC) declares martial law, arrests thousands of people, including advocates of democracy and human rights, renames Burma Myanmar.

1990 In a general election Suu Kyi's NLD wins over 450 seats, 82 per cent of the vote. The Junta wins less than 10. The Junta ignores the result and Suu Kyi is put under house arrest for first time.

1991 Aung San Suu Kyi awarded Nobel Peace Prize but not allowed to collect it.

1997 Slorc renamed State Peace and Development Council (SPDC).

2002 Aung San Suu Kyi released after nearly 20 months of house arrest. On day of her release, military attacks villages in Karen State, burning down a hospital, a workshop for the disabled, a school and seven houses.

2002 The SPDC signs a one-year, $500,000 contract with US PR firm, DCI Associates to 'normalise relations' between the US and SPDC.

THE DIRTY LIST

The Burma Campaign recently released a 'dirty list' of companies still profiting from business with Burma's repressive military regime, despite the fact that the country's pro-democracy leader and Nobel peace prize-winner Aung San Suu Kyi has repeatedly and explicitly asked them not to. The companies on that list are shown below.

- Abercrombie & Kent
- Adventures Abroad
- Airphoto InternationalLtd / Odyssey Guides
- Alexander Rose
- Andrew Brock Travel
- Aon Corporation
- Audley Travel
- Austrian Airlines / Lauda Air
- Bales Worldwide
- British American Tobacco
- Carnival Corporation
- Cordiant Communications
- Crown Relocations
- Daewoo International Corporation
- DCI Associates
- DHL
- Diethelm Keller Group
- Explorers Tours
- Hutchison Whampoa Ltd
- Highbury House Communications
- Hunter Publishing / Nelles Guides
- Iglu.com
- Insight Guides
- Ivanhoe
- Japan Airlines / Nikko Hotels International
- JJB Sports
- Kajima
- Kookai
- Kuoni
- La Redoute
- Lion Mining Finance
- Lonely Planet
- Lucy Wayne & Associates
- Marubeni
- Mccann-Erickson
- Mekong Travel
- Mitsui & Co Ltd
- New Horizons Travels and Tours Ltd
- Nippon Oil
- Norton Rose
- Oracle Energy Group
- Petronas
- Pettitts
- Pricewaterhousecooper
- Result
- Schlumberger
- Scott Dunn Group
- Sea Containers / Orient Express
- Silk Steps
- Sri Asia Tourism Service
- Standard Chartered Bank
- Steppes East
- Sumitomo Corporation
- Suzuki
- Tennyson Travel
- Timbmet
- Totalfinaelf
- Travelsphere Holidays
- Travel World Media Ltd
- USI Holdings / Unimix
- Willis Group Holdings
- Worldwide Journeys

In the past consumer pressure has made several companies pull out of Burma. All these companies deserve your call. For more information on Burma, its regime and the companies that support it, and for advice on how you can help – including specific campaigns against BAT and Lonely Planet travel guides – contact the Burma Campaign.

The Burma Campaign, Third Floor, Bickerton house, 25/27 Bickerton Road, London N19 5JT. Tel: 020 7281 7377; Fax: 020 7272 3559; email: info@burmacampaign.org.uk; website: www.burmacampaign.org.uk

28 THE ECOLOGIST FEBRUARY 2003

DAY 1: RANGOON
Morning – Arrive airport (upgraded by forced labour). Pick up Hire car (Daewoo and Suzuki both have factories here) and drive to Hotel (probable front for drug trafficking). Roam its unspoilt grounds undisturbed by locals, as tens of thousands were forcibly relocated to make way for hotels and to make the scenery appear more beautiful. (NB: Some were retained as forced labour to build your luxury leisure facility).
Afternoon – Explore Rangoon. Visit the famous Shwedagon pagoda, where in 1988 Aung San Suu Kyi gave her first public speech to over 500,000 people. The military responded by gunning down thousands. Or as the Bales brochure prefers: 'The atmosphere of this ancient site at sunset never fails to enchant.'

DAY 2: EXPLORING
Morning – Visit Martaban, famous for glazed pottery and the vast Yadana oil field being developed by Unocal, TotalFinaElf and Premier (see Day 3 for more).
Afternoon – Further on you can see Htam Hin in the distance, dramatically situated over a small ravine and high up a hill. One of 15 refugee camps along the Thai-Burma border, that house a total of 150,000 people in Htam Hin there are 8,000 living under plastic roofs and bamboo shelters. Unfortunately, as this camp is so close to the power station, no visitors are allowed. No one is allowed to leave either.

DAY 3: ALL CREATURES GREAT AND SMALL
Near Martaban we discover 'one of the richest forest floras of Indochina' (WWF) – host to 541 species of mammals, birds, reptiles and amphibians including three critically endangered species, six endangered species, 23 vulnerable species and 22 lower-risk/near threatened species. The Kitti's Hog-Nosed bat, the smallest known mammal species in the world; the Regal crab and the wild Asian elephant are found ONLY here. Unfortunately before clearing 200 sq km for the Yandana pipeline, research by Thailand's national petroleum authority, PTT – whose estimated PR budget was, incidentally, four times that for mitigating impact on wildlife – failed to find any of them. The findings of Total, UNOCAL and Premier's environmental impact assessments are, sadly, unpublished.

7 DAYS FROM £1999

INCLUDED IN THE PRICE
AIRPORT (UPGRADED BY SLAVES)
HOTEL (FUNDED BY HEROIN)
TOURS (UNSPOILT BY LOCALS)
NOT INCLUDED
50,000 CHILD SOLDIERS
VISIT TO NEW NUCLEAR REACTOR
MOST OF BURMA (OFF LIMITS)

'Until very recently this large, politically socialist and profoundly Buddhist country had voluntarily shut itself off from the rest of the world. Its gilded doors are now opened, eager to show its treasures to an appreciative world'
ABERCROMBIE & KENT TRAVEL

'Hard currency is our prime motivation. We also hope that a large influx of international tourists will raise global respectability and credibility for a military dictatorship with one of the world's worst human rights records'
THE RULING JUNTA (allegedly)

'The Golden Land – Experience the marvellous ancient monuments, charming peoples, dramatic scenery and colonial nostalgia of Burma (now Myanmar)'
BALES WORLDWIDE

'A trip for me to die for'
BURMESE CONSTRUCTION WORKER

'One of the few truly original travel experiences remaining in this much travelled world. Decades of social and economic isolation have preserved here many of the traditional features, physical and cultural, which have been lost in other Asian countries.'
MEKONG TRAVEL

'We have not yet come to the point where we encourage people to come to Burma as tourists'
AUNG SAN SUU KYI, PRO-DEMOCRACY LEADER

DAY 4: PAGODAS, CHURCHES, MOSQUES
Although Burma is predominantly Buddhist, there are Christians and Muslims too, each with their own distinctive practices. Stopping first by a typical Christian church, notice there is no cross on the roof (banned by the junta). Also you'll see no churches under 100 years old (banned by junta). Muslims get even more specialist treatment. Many mosques have been destroyed, with Buddhist shrines often built in their place, while Muslim nationals have to carry special ID papers and have travel restrictions placed upon them.

DAY 5: FIELDS OF MEMORY
Like Tuscan sunflowers or lavender in Provence, Burmese poppies provide a spectacular carpet of colour when in bloom. Beneath their petals lies an ancient secret still upheld today. Burma remains the world's number one exporter of opium.

DAY 6: VANISHING TRIBES
Morning – Visit Ho Ha village, where last year government soldiers executed three Palaung men after finding an old rifle villagers used for hunting.
Afternoon - After a brief stop for photos, visit the site where soldiers tortured a man in 2001 by setting light to his moustache and burning his mouth and another by holding a flame to his eye.
Evening Return hotel where, our tribal troupe will entertain you with a variety of traditional dances.

DAY 7: WHERE THERE'S SMOKE
Morning – Tour the British American Tobacco factory, a joint venture with the military regime who upgraded the facility using child labour. The workers you see earn 23p a day. It would take 85 years for one of them to earn what BAT Chairman Martin Broughton earns in one day.
Afternoon – Transit to airport. Fly home.
Thank you for supporting the military junta of Burma.

INSURANCE AND MEDICAL
Many travel insurance policies specifically exclude Burma from any coverage. Also bear in mind that the military regime spends only 43p a year on each person's health and education needs. Hence the country's medical infra-structure has all but collapsed.

Journeys of Extinction

'BURMA: SEEING IS BELIEVING' - THE BURMESE GOVERNMENT'S OFFICIAL TOURIST WEBSITE

SICK SOCIETY

The recent census figures show that reported limiting long term illness has risen since the last census from 12.9 per cent to 18.4 per cent in the East Midlands where I live. In Durham the rate is 24.5 per cent. This may reflect changes in reporting behaviours. I suspect it may reflect a change in the quality of our lives.

The Government is keen to highlight favourable statistics. This is why they prefer GNP to the Index of Sustainable Economic Welfare. The Government highlights life expectancy, which has continued to increase in general, thanks in part, but definitely to the benefit of, the pharmaceutical industry. However, just as ISEW peeked in the Seventies and then declined, giving a truer picture of the quality of our lives than GNP which has continuously risen, perhaps the rise in limiting long term illness, which had fallen for decades and which is now beginning to rise, is a reflection of the toxic burden that we and our environment our increasingly under.

Richard Eddleston, Nottingham, UK

BURMESE DISTORTIONS

The article on Burma (February 2003) is based on some half truths and broad generalisations, repeating a stagnated viewpoint. Distorted information includes: There are not 15 camps but less than 10 now. There are officially about 120,000 and an additional 10,000 refugees outside. It is not impossible to 'see' Htam Hin camp. There are regular visitors and people do go in and out.The Kitti's Hog-nosed bat and the Regal Crab are also found in Kanjanaburi province in Thailand. The Asian Elephant is found in the wild in Cambodia, Laos, Thailand, Myanmar. India, etc. Some congregations can and do build new churches (some are stopped also), but you can see many new churches. And many churches have crosses on the top.

Glen Hill, Coordinator, Swissaid-Myanmar Programme, Yangon, Myanmar

GLOBAL WARNING

I grew up in the Arctic and fear that we have grossly underestimated the rate of global warming, particularly the ocean warming, and the dire consequences we face for doing so. The scientists at Woods Hole Institute also predict that we will have an ice free Arctic passage near the end of this century. We who have lived up here plainly see that we have already lost some 50 per cent of the ice cap thickness and an extensive data set from the US/Soviet submarine war games confirms this. Our houses are sinking in the melting permafrost and for us this is not some qualitative analysis where tenure risk for being seen as an alarmist, outweighs the actual data.

I predict that we'll see an ice open Arctic in as little as 14 to 18 years. Not nearly enough time for the polar bear to take up garbage dump feeding as a lifestyle and survive. With a 100-year hang time on the emissions already up there, it's likely already to be too late.

Martin J Burger, by email

REAL FOOD

Sir John Krebs is right (though not in the way he means) with his comment: 'Organic food is no safer or more nutritious than conventionally grown food' (April 2003). Many times, organic products are not much better than non organic when farmers use the same tasteless hybrids instead of using old local varieties. Intensive organic farming is a great burden on natural resources (organic food grown out of season being as demanding as non organic) plus the shameless 'trafficking' of goods that could be produced in local farms in the name of cheaper (for the supermarkets, not the consumer) versions of a 'good for us' (but stressful on the environment) meal. Also, many organic foods are packaged in a very non-ecological way.

It is not only products free of chemicals that one should point to when talking organic but in season, local, tasty foods that help local communities as much as our health.

Athina Kyriakidou, Greece

CORRECTIONS

In the April Issue of the *Ecologist* we featured an article on dolphin deaths due to fishing in UK waters ('Hundreds of dolphins dying in UK waters'). We incorrectly printed the web address to sign the petition as www.wildliferush.org. It should have read www.wildlifetrusts.org

In the April Issue we featured an article by William Rivers Pitt, 'Be afraid'. We forgot to credit the website where the article originally appeared in a longer form – www.truthout.org

Please send all correspondence to Letters, *The Ecologist*, Unit 18, Chelsea Wharf, London SW10 0QJ, UK; or email: editorial@theecologist.org
The best letter each month will receive a year's free subscription to *The Ecologist*.
We reserve the right to edit or shorten letters where necessary.

Janet Hughes Appeal

In the last month our Janet Hughes appeal (March 2003) has raised a further £1,300. Thank you to everyone who has donated.

UK **The UK has one of the worst records in Europe for waste management and produces enough waste every hour to fill London's Albert Hall, a new report claims. The report by market research firm Key Note also estimates that if current trends continue UK household waste will double by 2020, adding a further £1.6 billion per annum to waste disposal costs.**

Only 11 per cent of waste in England and Wales is recycled, while 81 per cent is landfilled. This compares badly with The Netherlands, where 47 per cent of waste is recycled or composted, while just 19 per cent is landfilled. Currently, a mere 7.5 per cent of the UK's 600 million aerosol cans are recycled compared with around 65 per cent in Germany and 40 per cent in France.

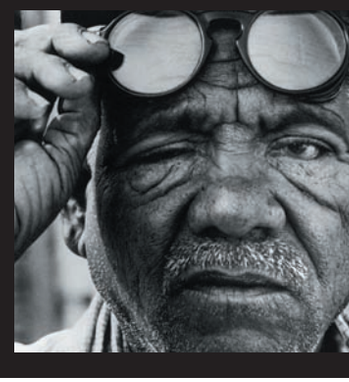
According to Key Note, the UK is one of the largest producers of waste products in Europe, producing 1.3 million tonnes of household plastics waste a year. And by mid-2002, around 900,000 fridges were stockpiled in the UK because of a lack of appropriate equipment to destroy them safely.

Key Note's report is available for £360. To purchase a copy, call the firm on 020 8481 8750.

US **Union Carbide has fulfilled its obligations to the victims of the Bhopal disaster and too much time has passed since the catastrophe to justify damages being awarded against the firm, a US judge has ruled.**

District judge John F Keenan dismissed a lawsuit seeking damages for those living near the site of the gas leak that killed thousands of Indians in 1984. About 4,000 people died within hours of the gas leaking from the plant. More than 20,000 were injured. The Indian government says that the death toll has since risen above 14,400.

Keenan threw out civil claims against Union Carbide and its former boss Warren Anderson. The judge rejected arguments made in a 1999 lawsuit that tried to revive legal claims relating to the accident. He noted that Union Carbide sold all of its shares in the 88-acre Bhopal plant in September 1994 and that it used the proceeds to build a hospital in the city.



'Proving the adage that no good deed goes unpunished, the plaintiffs are not satisfied by the hospital's existence,' Keenan wrote. 'This contribution goes far to satisfy any further obligation the defendants have to the citizens of Bhopal.'

For more information on Bhopal, go to: www.bhopal.net

US Activists are urging a global boycott of Starbucks to spotlight its continued use of GM foods in the US and its failure to offer fair trade and organic products on a regular basis.

Ronnie Cummins, the national director of the US's Organic Consumers Association, said: 'Despite repeated pledges, Starbucks is still loading up its coffee drinks with bovine-growth-hormone-tainted milk, and buying coffee and chocolate produced under exploitative labour conditions and, in the case of cocoa plantations in Africa, [by] workers who are actually slaves.

'We demand action from Starbucks and other coffee-house chains, not false guarantees and greenwashing.'

For more on Starbucks or to support the Organic Consumers Association's campaign, go to www.organicconsumers.org/starbucks or contact the association at 6101 Cliff Estate Rd, Little Marais, Minnesota 55614, US; tel: + (00 1) 218 226 4164.

BRAZIL The chances of survival for Brazil's last Indian hunter-gatherer tribe were greatly increased last month by the legal recognition of their lands. The demarcation – mapping out and marking on the ground – of the Awá Indians' land was the main objective of a 20-year campaign by Survival International.

Much of the Awá's rainforest has been invaded and many of the Indians have been killed by ranchers, loggers and settlers. Only 300 Awá remain. About 60 still live uncontacted in small nomadic groups. The EU- and World Bank-funded Carajás industrial project was responsible for much of the devastation.

Contact: Survival International, 6 Charterhouse Buildings, London EC1M 7ET, UK; Tel: (+44) (0)20 7687 8700; www.survival-international.org

US The tobacco industry has dismissed claims of fraudulent advertising and invoked free-speech safeguards in the US constitution to defend its pronouncements about cigarettes, *The New York Times* has reported.

The US Justice Department is currently demanding that the biggest US cigarette makers be ordered to forfeit $289 billion in profits 'derived from a half-century of fraudulent and dangerous marketing practices'.

The New York Times said the department has accused the industry of 'running what amounts to a criminal enterprise by manipulating nicotine levels, lying about the dangers of tobacco and directing their multi-billion-dollar advertising campaigns at children'.

Read the article at: www.nytimes.com/2003/03/18/national/18TOBA

UK The world's oldest industrial scale nuclear power station, Calder Hall in north-west England, is to close. Calder Hall was opened in 1956 at British Nuclear Fuel's Sellafield nuclear site. It is one of seven British plants using the costly Magnox technology that has been abandoned everywhere else in the world but still produces about 5 per cent of the UK's electricity. A 40 per cent slide in UK power prices since 1998, as market liberalisation exposed excess capacity, has left high-cost nuclear power in deep trouble.

The news to close Calder Hall came as the British Wind Energy Association announced that in one week in March consent was given for 120 offshore turbines with a total capacity of 397 megawatts. That's more than all the wind-power capacity installed in the UK throughout the 1990s.

'To me the question of the environment is more ominous than that of peace and war. We will have regional conflicts and use of force, but world conflicts I do not believe will happen any longer. But the environment, that is a creeping danger. I'm more worried about global warming than I am of any major military conflict.'

Hans Blix, chief UN weapons inspector in Iraq, 16 March

'Everyone at this company works for the general good, and I'm the general of that general good.'

Lee Raymond, CEO ExxonMobil (Esso), 15 March 2003

'Peoples of Egypt, you will be told that I have come to destroy your religion. Do not believe it. Reply that I have come to restore your rights.'

Napoleon Bonaparte, 1798; some 3,000 people died when Napoleon stormed Cairo

'Our armies do not come into your cities and lands as conquerors or enemies, but as liberators. Your wealth has been stripped of you by unjust men… The people of Baghdad shall flourish under institutions that are in consonance with their sacred laws… The Arab race may rise once more to greatness.'

General FS Maude, British commander in Iraq, 1917; UK troops killed up to 10,000 Iraqis in 1920

'Many Iraqis can hear me tonight in a translated radio broadcast. And I have a message for them. If we must begin a military campaign, it will be directed against the lawless men who rule your country and not you. As our coalition takes away their power, we will deliver the food and medicine you need. We will tear down the apparatus of terror. And we will help you to build a new Iraq that is prosperous and free.'

George W Bush, 17 March, 2003

ARGENTINA Residents of a town in Argentina's pristine Patagonian region have voted against a proposal by US-based Meridian Gold to dig an open-pit gold mine less than seven kilometres from their homes. Around 80 per cent of the citizens of Esquel (population 30,000) voted 'no' in a referendum on the proposal last month.

The site of the proposed mine is located just 28 miles from the Los Alerces National Park, home to an endangered species of tree known as the alerce. The alerce is a southern relative of the giant sequoia tree that can live for up to 3,000 years.

Impacts on freshwater supply also seriously concerned locals, as Meridian proposes to dump contaminated mine tailings and waste rock in a holding area that could leak into local aquifers and streams. The Willimanco lagoon, which provides drinking water to the people of Esquel, may be at risk if any seepage or acid drainage were to occur even years after the closure of the mine.

For more information, go to: www.mineralpolicy.org/intl/esquel/esquel.php

US The American Academy of Pediatric Dentistry (AAPD) has struck a $1m deal with multinational drinks company Coca-Cola. The partnership involves a research grant to 'support important clinical, basic and behavioural research' and 'create public and professional educational programmes, based on science, that promote improved dental health for children'. The AAPD told Reuters that Coca-Cola 'will have no say-so' as to the specifics of the research. The Center for Science in the Public Interest, however, criticised the deal, saying: 'The grant will make the AAPD a captive of Coca-Cola, making it extremely unlikely that the AAPD will take positions antagonistic to the company, like opposing soft-drink machines in schools or supporting labelling of the added-sugar content of foods.'

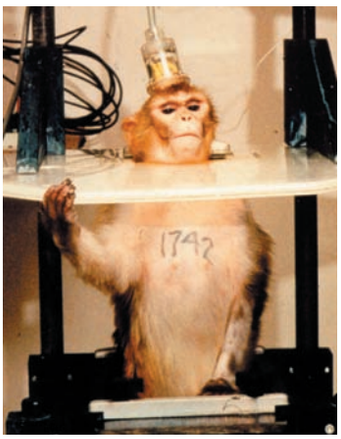
For more, visit: www.corpwatch.org /news/PND.jsp?articleid=5770

US Two of 18 environmental activists who have been sitting in redwoods in California's Humboldt County for almost a year have been forcibly removed by the Pacific Lumber Company (PLC). Following the issue of a temporary restraining order by Humboldt County Superior Court last month, PLC warned that it would physically remove the tree sitters. The activists claim that PLC has a record of ignoring measures to protect endangered species and water quality, and that these irregularities have led to landslides and the silting up of critical salmon-spawning areas.

ICELAND The world's first commercial hydrogen filling station opens in Iceland on 24 April. Iceland is aiming to be the world's first 'hydrogen economy', but as yet there are still only a few hydrogen-powered cars in the whole world. A study released last month by the Massachusetts Institute of Technology found that gas-electric hybrid vehicles will continue to be more environmentally beneficial than hydrogen-powered fuel-cell vehicles until at least 2020. At present most industrial hydrogen is produced using natural gas, an energy-intensive process that emits greenhouse gases.

UK The British Union for the Abolition of Vivisection (BUAV) has dismissed a Mori opinion poll that suggests an increase in public sympathy for animal experiments. The poll was commissioned by new pro-vivisection medical research group the Coalition for Medical Progress. BUAV campaigns director Wendy Higgins questioned the credibility of the poll, saying: 'The poll's questions contain highly leading provisos. For example, there *appears* to be higher support for animal experiments if no unnecessary suffering was involved. This premise is a nonsense, as the severe level of suffering lab animals endure is all but hidden from public view. Lab animals can be subjected to a catalogue of horrendous cruelties.'

For more information, contact BUAV at BUAV, FREEPOST, London N7 8BR; tel (+44) (0)20 7700 4888; visit: www.buav.org



IRAQ The timing of the war in Iraq threatens millions of birds that migrate every spring to northern breeding grounds. 'Iraq's two major rivers [the Tigris and Euphrates] are an important part of the route for many long-distance migrants, including pelicans and storks, and for shore birds that breed along the Caspian Sea and in central Asia,' said Phil Hockey, a migration specialist with the Percy FitzPatrick Institute of African Ornithology in Cape Town. 'A lot of the birds will be moving now, with the main movement time from the middle of March to the end of April.'

Long-distance migrants are unable to reach their breeding grounds in a single flight, Hockey said. He added that if their stop-over in Iraq was disrupted by the war, 'they could abort their migration or even starve to death'.

Iraq is a vital breeding area for the marbled teal, with about 40 to 60 per cent of the bird's global population breeding there. It may also be crucial for the slender-billed curlew, an extremely rare species that only numbers around 200 worldwide.

BOTSWANA **Survival International, which campaigns for the rights of indigenous peoples worldwide, was last month labelled a 'terrorist' organisation by a senior figure in Debswana – the Botswanan subsidiary of diamond giant De Beers.**

The accusation was made in a BBC interview by Dr Akolang Tombale, who is both permanent secretary in Botswana's Ministry of Mineral Resources and Water Affairs and deputy chairman of Debswana. Tombale also accused Survival of doctoring the government's mineral concession maps.

The maps show that since the eviction of the bushmen from the Central Kalahari Game Reserve most of the reserve has been parcelled out to mining companies so they can search for diamonds.

Survival International chairman Rafael Runco commented: 'These remarks clearly show that, rather than addressing the huge international concern at the forced removal of the bushmen, the Botswana government and Debswana are resorting to name-calling. The government ought to be allowing the bushmen back on to their land, rather than criticising the messenger.'

For more, contact: Survival International, 6 Charterhouse Buildings, London EC1M 7ET, UK; Tel: (+44) (0)20 7687 8700; www.survival-international.org

US A Californian air-quality regulatory agency is suing BP for $319m, alleging that the oil corporation committed thousands of emissions' standards violations at its Carson refinery in California.

The lawsuit, filed last month by the South Coast Air Quality Management District, claims that less than 20 per cent of the above-ground petroleum storage tanks at the refinery meet regulations designed to prevent the escape of gases that contribute to ozone formation.

According to the lawsuit, officials decided to inspect the Carson facility last June but BP repeatedly barred inspectors until a judge ordered the company to give them immediate access.

UK Coal power stations are preparing to burn olive residues, straw and wood chips to earn green certificates which are worth more than twice as much as the power they sell.

Fourteen coal power stations have registered to use biomass, including Ferrybridge in West Yorkshire and Fiddler's Ferry in Cheshire – both of which have been burning olive residues commercially since last September.

Last year the government created a guaranteed market for green power with the launch of its Renewable Obligation scheme. UK electricity suppliers have to provide three per cent of their power from green sources this year, and just over 10 per cent by 2010.

US 'As the first bombs rain down on Baghdad,' reported San Francisco-based Corpwatch in March, 'thousands of employees of Halliburton, [US] vice-president Dick Cheney's former company, are working alongside US troops in Kuwait and Turkey under a package deal worth close to $1 billion…

'While recent news coverage has speculated on the post-war reconstruction gravy train that corporations like Halliburton stand to gain from, this latest information indicates that Halliburton is already profiting from war-time contracts worth hundreds of millions of dollars.'

Read the whole article at www.corpwatch.org/issues/PID.jsp?articleid=6008

US The US federal Atomic Safety and Licensing Board last month rejected plans to store spent nuclear fuel in Skull Valley, Utah. The state of Utah had lobbied against the proposals to build the storage facility on the Skull Valley Goshute Indian Reservation just a few miles from the biggest bomb-testing and pilot-training area in the US. The board found that there was too great a danger of an F-16 crashing into the proposed development. The decision does not necessarily spell the end of the project, however. It could be overruled by the board's parent agency – the Nuclear Regulatory Commission – or it could be successfully appealed by the consortium interested in building the storage facility.

UK An activist from Trident Ploughshares was remanded last month to Cornton Vale prison near Stirling on a charge of malicious damage to a Tornado bomber aircraft at RAF Leuchars. Ulla Roder had entered a hangar at the Fife airbase and damaged an unguarded plane. Trident Ploughsares is the non-violent campaign group committed to disarming the UK's nuclear arsenal.

For more information or to read Ulla Roder's own account of her action, go to www.trident ploughshares.org

US A chemical found in food packaging and other plastics may cause miscarriages and Down's syndrome, according to a study published in the journal *Current Biology* last month.

Geneticists at Ohio's Case Western Reserve University found that exposure to small quantities of bisphenol A (BPA), a substance that mimics oestrogen, can disrupt chromosomal alignment in mouse embryos, killing them or causing birth defects.

BPA is used to make hard, clear plastics, such as baby bottles, containers used for storing or microwaving food, and dental sealants used to prevent cavities.

Organic foods fight cancer

Organic fruit and vegetables show significantly higher levels of cancer-fighting antioxidants than conventionally grown foods, according to a study published in the *Journal of Agricultural and Food Chemistry*. The study measured antioxidants in corn, strawberries and a type of blackberry called marionberries. It found that pesticides and herbicides inhibit production of phenolics, which act as a prophylactic in plants and are also beneficial to human health.

Free speech unreportable

US Supreme Court Justice Antonin Scalia banned broadcast media from attending a 19 March ceremony during which he received an award… for supporting free speech. 'That was one of the criteria he had for acceptance,' said James Foster, executive director of Cleveland's City Club, which gave Scalia its 'Citadel of Free Speech Award'.

Toyota to pay for environmental violations

Car manufacturer Toyota will pay $34m to settle US Clean Air Act violations involving 2.2 million vehicles manufactured between 1996 and 1998. Toyota, whose adverts flaunt the company's supposedly high environmental standards, will also spend $20m on a supplementary environmental project to 'retrofit' up to 3,000 public diesel vehicles so as to make them run cleaner.

Paul Newman's new partner – McDonald's

Multinational fast food giant McDonald's has formed a partnership with Paul Newman, the actor famous for his ethical stances and edible sauces. Newman has agreed to sell McDonald's a range of salad dressing similar to the bottled dressing made by his Newman's Own company so long as after-tax profits from the deal are given to charity.

Extremist, moi?

According to a recently leaked strategy memo for the US Republican Party, Republicans are being recommended to use the word 'conservationist' when they wish to describe themselves as environmentally friendly. This is apparently because the word 'environmentalist' has the 'connotation of extremism'.

Greenhouse gases affecting atmospheric pressure

Greenhouse gas increases may be altering wind and rainfall patterns in the northern hemisphere by changing the atmospheric pressure, according to a study published in the journal *Nature*. The research by the University of Victoria in British Columbia, Canada, suggests that pressure changes account for increased rainfall in the Pacific north-west and Britain, warmer winters in France and drier conditions in Spain.

Senate defeats US plan for Arctic drilling

The US Senate narrowly voted last month against opening the Arctic National Wildlife Refuge (ANWR) to oil drilling, thus defeating the centerpiece of president George Bush's energy policy. The Senate voted 52-to-48 to reject drilling in the refuge. Eight Republicans crossed party lines to vote against giving oil firms access to the ANWR, and five Democrats defied their party's leadership to vote in favour of drilling. Alaska Republican Ted Stevens, the leading proponent of the drilling plan, denied that the issue was dead, however. Stevens declared: 'There will be another vote another day.'

IMF – no clear proof globalisation helps the poor

The International Monetary Fund has admitted there is little evidence that globalisation is helping poor countries. A new study by the fund, *Effects of Financial Globalization on Developing Countries: some empirical evidence*, found economic integration may actually increase the risk of financial crisis in the developing world. An overview of the study, which was put together by the fund's chief economist Kenneth Rogoff and three other researchers, describes the conclusions as 'sobering'.

Investors chide drug giants

A group of investors from the US and continental Europe, with combined investments totalling £600 billion, has warned the global pharmaceutical industry that it must do more to help poor countries facing health crises. The investment companies, which include Henderson Global Investors, Schroder Investment Management, Jupiter and Isis Asset Management, accused firms of failing poor countries by concentrating on lucrative 'lifestyle cures' for sale to patients in rich countries over less profitable life saving drugs for the Third World.

US ExxonMobil (Esso) has asked other energy firms to work harder to help it combat the dirty reputation of the oil industry. Speaking at the annual National Petrochemical and Refiners' Association conference in San Antonio, Texas, the oil giant's vice president of public affairs, Kenneth Cohen, said: 'In truth our industry has not done nearly enough to communicate the essential role we play and how we go about providing energy and products that contribute to economic growth… and help improve the lives of millions of people around the world.'

RUSSIA Mayak nuclear reprocessing plant, seen by many as the most dangerous nuclear facility in the world, was last month granted a licence to operate for the next five years. From 1949 to 1 January, 2003, the plant in Russia's Ural mountains dumped liquid radioactive waste in nearby lakes in defiance of Russian environmental law. UN experts have declared the surrounding Chelyabinsk region to be the most radiation-affected place on Earth. According to the licensing documents, obtained by campaign group Ecodefense, Mayak has pledged to stop dumping radioactive waste within seven years.

For more information, contact Vladimir Slivyak or Alisa Nikulina at + (00 7) 095 278 4642; email: ecodefense@online.ru; or visit: www.antiatom.ru

CANADA Environmentalists including the Sea Shepherd Conservation Society (SSCS) and French actress Brigitte Bardot have attacked WWF Canada for not opposing the seal hunt in the east of the country. On its website, WWF Canada declares: 'We support the hunting and consumption of wild animals provided the harvesting does not threaten the long-term survival of wildlife populations. WWF has never opposed a sustainable seal hunt in northern or eastern Canada.'

Critics say, however, that the hunt is far from sustainable. The SSCS says: 'The seal hunt is not some Inuit or native subsistence hunt. It is a Canadian government subsidised slaughter, and the quotas set for 350,000 a year for three years are the largest ever established.

'Not since 1850, when unrestricted slaughter saw kills of a million seals a year, have there been numbers like this. There is nothing sustainable about these numbers, and the government has not produced one peer-reviewed scientific study to justify them.'

For more information, contact: the Sea Shepherd Conservation Society, 22,774 Pacific Coast Highway, Malibu, CA 90265, the US; tel (00 1) 310 456 1141; web www.seashepherd.org

US Major corporations with a history of making large donations to Congress managed to get a provision into the Homeland Security Act that seriously erodes public access to information about business.

In a report called *Agenda For Secrecy*, US NGO Common Cause found that three major business coalitions championed a secrecy provision that essentially denies the public information about a wide range of health, safety and environmental problems that may occur at chemical and nuclear power plants, utilities and other 'critical infrastructure' sites. Between 1998 and 30 June, 2002, the coalitions donated nearly $112m to federal candidates and political parties. Common Cause that lobbies against corruption in government.

To find out more, contact Common Cause at 1,250 Connecticut Avenue, NW 600, Washington DC 20036, the US; tel: + (00 1) 202 833 1200; or visit: www.commoncause.org

EU Secret documents relating to the proposed Global Agreement on Trade in Services (GATS) were leaked and published on the web last month, exposing the true nature of the EU's GATS agenda. The documents reveal that the EU aims, with the full cooperation of the UK government, to privatise state and not-for-profit service provision in the developing world.

The EU has sent 'requests' to 109 (mostly developing) World Trade Organisation member countries demanding trade access to water, energy, transport, telecommunications and news services. In some cases, these countries have already expelled European companies following government or public protest. Each of the requests included the warning 'member states are requested to ensure that this text is not made publicly available and that it is treated as a restricted document'.

For more information, go to www.gatswatch.org.uk
Read the leaked documents at: www.polarisinstitute.org

US A $100m lawsuit against pharmaceutical giant Bayer has brought to light internal documents suggesting marketing and PR concerns led to the firm disregarding disturbing research on the cholesterol drug Baycol. The drug was subsequently pulled in the US following dozens of deaths. Documents show that Bayer executives worried about studying possible side effects of the drug because any results would have to be reported to the US Food and Drug Administration.

For more information, visit: www.prwatch.org/spin/March_2003.html#1047013201

Bio-technology epitomises the issues and struggles defining today's world. Corporate corruption, weak science, false claims to help the poor – they're all linked to GM. *The Ecologist*, in association with industry watchdog the Norfolk Genetic Engineering Network, reports the key GM events and trends.

GM Politics & Propaganda

Monsanto & Cargill modify survey results

UK 'Farm', the new campaigning and membership group for working farmers and the public, has discovered that employees of biotech giants Monsanto and Cargill have been seeking to exert undue influence over Farm's website poll on GM crops. Following Environment Minister, Michael Meacher's statement in an interview in the March issue of *The Ecologist*, 'We have been feeding ourselves perfectly adequately, since overcoming problems of hunger in our early existence. GM is not necessary.' Farm put up the poll on its website asking the question, 'Do you agree with Michael Meacher,s comments that GM crops are not necessary?'

For the first few days, responses to the poll averaged out at about 90 per cent agreeing with Meacher, 10 per cent disagreeing. Latterly, opinion shifted gradually a little more against him – with around 82 per cent agreeing, 18 per cent disagreeing Then – in the space of a day – responses to the poll lurched violently away from the Minister, reducing from 80 per cent to 60 per cent to just over 50 per cent. On analysing those responding to the website poll, they discovered that 72 per cent of all the 'No' votes had come from Monsanto and Cargill IP addresses.

Government company accused of hiding sale of GM potatoes

CANADA Several hundred thousand pounds of GM Bt-potatoes were knowingly sold to unsuspecting buyers as 'regular potatoes' in 1999, by Spudco, the Canadian government potato company, according to officials involved. A former employee said they were told by Spudco senior managers, 'Don't say on the bill it's GM potatoes.'

Leading consumer groups condemn FSA

UK Three of the largest consumer groups in the UK, Consumers' Association, National Consumer Council and Sustain (the alliance for better food and farming) have joined forces to condemn the Food Standards Agency over its approach to the public debate on GM. Sheila McKechnie, Director, Consumers' Association, said: 'The FSA is failing in its remit to protect consumers. Our research shows that over half of consumers have concerns about GM, yet the regulator has failed to give any consideration to these concerns.'

Stopping GM planting is legal, says court

UK The magistrate at Sherborne Magistrates Court accepted the defence of all four 'Littlemoor'' defendants that they were acting reasonably by obstructing tractors being used to plant GM crops as they were seeking to prevent damage to property – ie all property: bee hives, maize crops, fields. The four were arrested under the charge of Aggravated Trespass and their solicitor has said the acquittal is a landmark legal victory.

GM Food & Safety

GM wheat – no one wants it

CANADA/US The Canadian Wheat Board, which sells Canada's wheat worldwide, surveyed its customers and discovered that 82 per cent of them do not want and would not buy GM wheat.

In the US, according to new research by an Iowa State University economics professor, there is a 'high risk' that the wheat industry will lose 30 to 50 per cent of its foreign markets for spring wheat, if Monsanto releases its controversial GM wheat in the next few years.

Exposure to pesticides lowered dramatically when young children go organic

US A study at the University of Washington, not surprisingly, found that children fed predominantly organic produce and juice had only one-sixth the level of pesticide by-products in their urine compared with children who ate conventionally farmed foods.

GM more expensive

EU The EU's Joint Research Centre (JRC) calculates that production costs for conventional oilseed rape would increase by 41 per cent and those for conventional maize by 9 per cent, if GM was commercialised in Europe, due to contamination problems.

GM Science & Technology

Biotech mass exodus

EUROPE Nearly two thirds of EU biotech companies have cancelled GM research projects over the past four years, mainly because of controversy over safety and labelling. 'Since European governments introduced a moratorium on the commercial growing of GM plants,' writes *The Independent*, 'the number of applications for field trials of new GM varieties has fallen by two thirds, while 61 per cent of private companies and 39 per cent of research institutes and universities said they had cancelled GM projects.'

GM crops boost pests

UK Researchers from Imperial College, England have shown in a forthcoming article in the journal *Ecology Letters*, that insect larvae can use an engineered toxin (Cry1Ac – present in genetically engineered Bt crops) as a supplementary food source. These crops could therefore have unforeseen nutritionally favourable effects, increasing the fitness of resistant insect populations.

For more on these and other stories, and for background information and exposés of all GM issues, go to www.ngin.org.uk

US-Monsanto boycott

PHILLIPINES The Kilusang Magbubukid ng Pilipinas (KMP), a coalition of peasant groups in the Philippines, has called for a boycott by farmers of all Monsanto products. Rafael Mariano, KMP chair, says the Boycott on Monsanto products will be one part of the civil disobedience campaign and protest actions against the US attacks on the Iraqi people. 'The US military campaign to topple the Iraqi leadership was for the benefit of US war industries like the US-based Monsanto, the proponent of the genetically engineered Bt-corn in the country and [former] manufacturer of Agent Orange,' Mariano said.

Protestors arrested

INDIA Indian police arrested nine Greenpeace activists during a protest against Monsanto. They were demanding the withdrawal of its transgenic seeds from the Indian market, an admission of Bt cotton failure, and compensation for farmers. Police also removed two women, who had chained themselves to the iron gates of the Monsanto Research Centre building in Bangalore. Monsanto's reaction was to try to oust all the media from the complex, and prevent them from getting pictures.

Nestlé boycott?

THAILAND The Anti-GMOs Network says it will campaign for a boycott of Nestlé food products, if the company does not adopt a GM-free policy in Thailand by April 30. They accused the company of 'double standards' in its dealings with Thai consumers, compared to Europe, where Nestlé has promised to sell only non-GMO products. Nestlé also stands accused of conspiring with companies such as Monsanto and Novartis to promote the use of GMO products.

The Ruddy duck has been targeted as the Saddam Hussein of European birdlife. Malcolm Tait wonders why every debate has to be dominated by extremes.

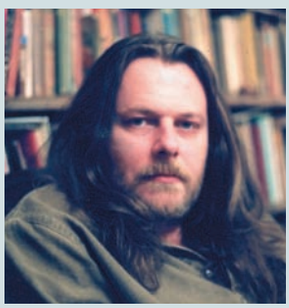
Ruddy by name, ruddy by colour and now, it would appear, a downright ruddy nuisance by nature. The ruddy duck, officially Britain's most hated bird, hit the headlines last month when the government announced its intention to exterminate it. The plan is to kill every goddamn last mother-ducking one of them.

The reason for the killing spree – announced, incidentally, without a second resolution – is to effect a case of ethnic cleansing. The ruddy duck, an American native, has managed to establish various feral colonies in Britain from a few individuals that escaped from wildfowl collections in the 1950s. This would not be a problem if it weren't for the fact that the ruddy duck is migratory and has been wintering in Spain, where it has met its close cousin the white-headed duck and forced its attentions upon it. The white-headed duck is one of the world's most endangered wildfowl, and this dilution of its bloodline could, some say, lead to its extinction.

So, 'something has to be done'. Separated as they were by the vast expanse of the Atlantic Ocean, the two species used to live similar but distant existences – each plying their natural trade in their own waters. Suddenly, they've been artificially brought together and something's got to give. As the ruddy duck, now seen as a weapon of mass destruction, is reasonably plentiful in North America, its British population is expendable.

Interestingly, the announcement of the plan to eradicate the duck came a few days after Tony Blair returned from his back-slapping visit to Spain where he elicited full support for the war against Iraq from Spanish president Jose Maria Aznar. You can imagine the conversation. 'Look, Jose Maria – may I call you Jose? – I'm truly grateful for what you're doing for George. Is there anything I can do for you in return?' 'Well, Tony, seeing as you've brought it up, there is a little matter of some ducks of yours…'

The situation is a classic case of conservation versus welfare. Bodies such as the Royal Society for the Protection of Birds (RSPB) and the Wildfowl and Wetlands Trust (WWT) support the massacre, but welfare groups like Animal Aid are fully opposed and have suggested that the ducks be flown back to America. One side takes the view that international conservation patterns are most important. The other wants to protect every individual creature. Each, however, is in basic agreement – something must be done.



Hawks and doves have the loudest voices in any argument, whether a few thousand duck lives are at stake or Saddam's tenure on the Iraqi presidency. The middle ground, the realm of discussion, diplomacy or careful management, is lost in the pitched shouting battle over the pros and cons, the fors and againsts. Yet it is from the middle ground that the most imaginative ideas often emerge.

By backing extermination, for example, the conservation groups have missed a trick. Following an experimental cull last year, there are only approximately 3,500 ruddy ducks left in the British wild – that's all. The WWT, from which those first few ducks escaped, could still organise a collection of the birds, pinion them (incapacitate their flight feathers, as is the case with all other ornamental ducks), and reintroduce them to their own sites: 10 here, a couple of dozen there. This would be manageable, particularly if an adopt-a-duck scheme were set up. With appeals, the cost could compare well with the estimated £5m that mass extermination will cost. Such a scheme would not only please the British public more than wiping out the species down to the last ruddy drake, duck and duckling, but it would help awareness of animal conservation *and* welfare issues. Everyone wins: the ducks survive, they're still kicking around in this country for people to look at, and their white-headed cousins would be left alone. And if a few still escape: well, we'd be ready this time.

The story of the ruddy duck is not the first of its type. (Nor is it likely to be the last.) The last British coypu – a huge rodent that established an East Anglian population of tens of thousands following a few escapes from fur farms – was shot in Norfolk in 1987. Grey squirrels have been a concern for decades as they steadily stomp their way into the habitats of their red counterparts – the Isle of Wight is the next red squirrel stronghold that is likely to fall. Hedgehog populations in the Hebrides ballooned out of control in the last 30 years, threatening the prospects of ground-nesting birds in the process. And goodness only knows what kind of havoc the rapidly colonising ring-necked parakeet might wreak as it stretches its range across the south of England.

The Wildlife and Countryside Link, a group that helps coordinate the efforts of voluntary organisations from Friends of the Earth and the RSPB to Butterfly Conservation and Plantlife, is currently working on a consultative policy for dealing with 'introductions' – species that man, not nature, brought to this country.

And not a moment too soon. At present, if we introduce a species that, like the little owl, mixes well with the indigenous stock then we 'ooh' and 'aah' over it. We watch it, but if (after even some dozens of years) it steps out of line, our first response is to put bullet holes in it.

Let's try to be creative. Let's try to find middle grounds. Let's talk more about how we handle introductions. To rejig a phrase that has recently been used a lot in the discussion of international events, let's try for jaw-jaw not ruddy war-war.

Malcolm Tait is a freelance journalist

If the current war is not against the Iraqi people, why are Tony Blair and Geoff Hoon willing to use cluster bombs? By Ros Coward.

The debris that normally concerns the ecologically-aware is the ever growing mountain of rubbish produced by our throwaway society. But there's another, more immediately lethal kind of litter that also speaks volumes about our lack of responsibility towards the Earth and its inhabitants. That's the litter produced by war – the munitions left behind post-conflict that continue to damage the land and its people long after the fighting is over.

Nothing has sounded more hollow than the so-called reassurances given by the UK and US governments as they began the Iraq war that their argument was not with the country of Iraq or its people but with its leader, and that reconstruction – not devastation – was their objective. If that was the case then how could they condone the use of cluster bombs – weapons that, like landmines, have a devastating long-term effect on communities and go on killing innocent civilians for decades.

Most military strategists now accept (even promote) cluster bombs as necessary elements in warfare. They enable armies to inflict maximum initial damage from the air rather than engaging immediately in close ground combat. Because they are meant to be combat weapons they evade UN treaties against the use of weapons like landmines that target civilians. But this evasion is sophistry.

Cluster bombs are vast containers that after exploding send out a huge number of what the military playfully call 'bomblets'. These bomblets scatter across areas the size of eight football pitches. Most bomblets are designed to explode on impact or contain devices that trigger on touch. Many do just that, inflicting horrific damage on armies and civilians in war situations. But many fail to explode immediately. In spite of the fact that modern military technology is meant to be so sophisticated that it could extinguish Saddam Hussein's cigar as he sits in his bunker, even official estimates admit a cluster-bomb failure rate of 5-10 per cent.

Unofficially, the estimated failure rate is much higher. In the last gulf war, roughly 47,000 cluster bombs were dropped containing 13 million bomblets. Since the end of the war there have been 1,924 recorded deaths from 'unexploded remnants of war'. In Kosovo, it is estimated that 3,000,000 were dropped, of which 30,000 failed to explode on impact, causing hundreds of deaths. In Afghanistan 14,000 unexploded devices were left behind and there have already been 150 deaths since the war ended there.

In many ways cluster bombs are even more devastating than landmines. Most victims are killed outright. Those who survive are horrifically injured. The force of the shrapnel from these weapons is such that bodies sometimes explode totally. Like landmines, children are most often the victims. The usually bright colours of bomblets are attractive to children and to people in devastated post-war societies hunting for valuable scrap metal. Like landmines, too, their legacy is enduring. It's shocking to think that while Vietnam is a remote cultural memory for US kids, children in Laos are still being injured by cluster bombs and large areas of land are still unusable.

The way cluster bombs blight land often goes overlooked. Large areas become no-go areas that can't be farmed. This hinders attempts of societies to reconstruct and become self-sufficient. The problem is not confined to a few unlucky nations; at least 80 countries are currently affected by landmines and cluster bombs. But while after the death of Princess Diana 146 countries rapidly signed the Ottawa treaty banning the use of anti-personnel weapons, cluster bombs are not covered by any convention. Countries that use them are under no obligation to clear land when hostilities cease.

In the run-up to the current war Landmine Action and the Diana, Princess of Wales Memorial Fund tried to persuade the UK government not to use cluster bombs and to support new international conventions forcing combatants to 'clear' areas after military action. Two UK ministers refused to rule out the use of cluster bombs in Iraq: Tony Blair and defence minister Geoff Hoon. Not only does the government refuse to rule out their use, but INSYS – the world's largest producer of the bombs – is a UK-based firm. When tackled by Landmine Action, INSYS replied that it was not responsible for the weapons' devastating effects, claiming: 'It's not the company that uses them.'

As this equivocation shows, the logic of war dehumanises and desensitises even the most supposedly decent people. These weapons are the deadliest kind of debris and last for decades. They leave behind no-man's land and intimidated communities long after the soldiers have gone and governments have changed. In these communities children will not be able to play, it will be impossible to resettle the land and there will be no agriculture. If attempts are made to clear these areas, there will be many deaths. All this happens in poor countries with no resources. And use of these weapons is increasing globally. No longer confined to the big military powers, cluster bombs are increasingly likely to be used in smaller scale conflicts.

If we needed more evidence of mankind's disregard for the future it is this readiness to use weapons that inflict damage for decades to come. It is evidence of cowardice and bullying, too. When the armies have gone, it's the innocent members of society – those trying to work and play on the land – who continue to be targets.

Ros Coward is a columnist for *The Guardian*.
To join the global petition against the use of cluster bombs, visit: www.clearup.org

NO WAR ON IRAQ

This war is already a humanitarian disaster. Many innocent Iraqi civilians have already died and there could be up to 2 million refugees.

War will increase the risk of using weapons of mass destruction. A nuclear attack on Baghdad could result in a death toll of millions. In addition there could be thousands of deaths if chemical and biological weapons are used.

War will result in devastating consequences and regional instability. Civil war, famine and epidemics, refugees, environmental degradation, economic collapse, political unrest.

War is costing our government an initial figure of £3.2 billion. Post war costs of between £1-4 billion per month to follow.

War is not an effective way of tackling weapons of mass destruction and is not the answer to ensuring Iraq's disarmament. Alternatives to war must be sought.

CND is actively campaigning for an immediate halt to the war and for the UN to have a leading role in the reconstruction of Iraq. For more information, please log onto www.cnduk.org

Membership rates

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CAMPAIGN FOR NUCLEAR DISARMAMENT

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HOLIDAYS We have five apartments, two wood cabins, three caravans and a yurt to rent. We offer vegetarian, full board, half-board, bed and breakfast or self-catering holidays.

WILDLIFE WEEKS From 1st March to 12th July, from 6th September to 29th November and at any other time on demand if you are a group of at least 6 people. We guide your exploration of the rich diversity of mammals, birds, reptiles, amphibians, butterflies, insects, flowers and fungi. We do not promise that you will see any beavers, orchids, chamois, jonquils, swallowtails, griffon vultures, praying mantisses, salamanders, wild boar, hawk moths, marmots or wolves...but along with a lot more wildlife, they all live on the farm or in the surrounding mountains and you will have a good chance of seeing at least some of them.

LIVING LIGHTLY From 6th September to 29th November we will also be running week-long investigations into living lightly. You can work out your ecological footprint and explore ways of treading more lightly on the planet – and probably improve the quality of your life and decrease your cost of living at the same time.

NGO CONFERENCES From the 4th January to 13th December we welcome anti-multinational pro-sustainability NGOs to use our facilities for meetings, conferences and forums. We have 21 bedrooms, 34 beds (17 of them double), and can also accommodate campers.

For more information see http://paulianne.free.fr.
Or contact Robin or Pam: concentropie@wanadoo.fr;
Paulianne, Luc-en-Diois, 26310 Drôme, France; or (33)4 75 21 37 43

Diverse cultural concepts of time and seasonal distinctions have been flattened by the globalisation juggernaut. By Jay Griffiths.

In parts of Indonesia there is one night a month, as the moon nears fullness, called the 'little pig moon'. The following night is the 'big pig moon'. These are the nights when the pigs and piglets get moonstruck. Squeakily overexcited, they bust out of their pens and go for a cavorting scramble in the fields. In the Americas the indigenous Natchez people traditionally had a 'watermelon month' and a 'nut month'. Similarly, the Lakota people had a 'moon when the chokecherries are ripe' (mid-August) as well as a 'moon of fatness' (what the West calls June) when all of nature was ripe with the fullness of time. The Ostiak people of Siberia, meanwhile, had the 'birch-sapwood month' and the 'salmon-weir month'. Across the world, peoples' names for months used to reveal their landscapes and animals, their lands of salmon and birches, of watermelons and chokecherries and piglets. Time fitted snugly to its own locale. But what do the coldly numerical '6/12/75' or '9/4/03' reveal except a global suburbia?

Time – 'the time', as the West dishonestly calls it in its now near-universal clock – is the subject of an invisible, stealthy globalisation. The result is suburban supermarket time – the same everywhere, with no specificity of season or climate. The thousands of diverse times known to indigenous peoples have been reduced to one dominant 'mono-time' that is Western, Christian, abstracted from nature and imposed across the world.

I recently read a fatuously perky recipe for summer pudding that began: 'Seasonality not being what it used to be, you can now make this recipe all year round.' Indeed we can. We can have chokecherries in November and strawberries at Christmas. Every month is now watermelon month. This is supermarket time, which also wants one, single year-round climate with air-conditioning and heating, no frost, no sunburn or thunder (seasonality not being what it used to be in the aisle of supermarket time) and no specificities of time or locale.

There is perhaps nowhere where time is fitted so sweetly to place as in the seas. There is the specific timing of water levels in particular rock pools during spring tides, and the critical sense of moment in the call of a running tide – an outgoing tide that sailors must catch quickly or face a 12-hour delay. Creatures of the sea also obey the timing of the ocean's call and the moon's sway. Tens of thousands of Olive Ridley turtles lay their eggs at one precise time – when the moon is in its first or last quarter and the seas are calm. Sea horses mate at full moon, and the male ones – rather delightfully – get pregnant. The palolo worm in the Pacific and Atlantic Oceans reproduces only during the neap tides of the moon's last quarter in October and November. And people can be sensitive to the seas' times, too. I once came across a Haida woman from the Pacific coast of Canada who described how part of 'her job, her purpose' was to gather herring roe as the fish spawn on kelp in February. 'My body,' she said, 'feels that it's time to spawn… I get a longing to be on the sea.'

But while the sea at its shoreline represents a specific feeling of the moment (the 'now' of events), the paradox of the ocean is that in its depths it is a symbol of the everlasting – Byron's 'image of eternity'.

The seas are known to be the source of all life. In the East the ocean is equated with the Tao, the primordial source 'informing at creation without being exhausted'. Affinities between the sea and time are found across all cultures. In English the word 'tide' is used for both seas and times – 'eventide', 'Eastertide', etc; it is etymologically related to 'time' – both words come from the same root, meaning 'stretch', 'extend'. Indeed, the first meaning listed for 'tide' in the *Complete Oxford English Dictionary* is 'time'. 'Current' also refers to both time and tide. So Otis Redding picked the right place for 'sittin' at the dock of the bay, wastin' ti-ai-ai-ime'; the sea is the creator of endless hours of time.

Time and the seas are politically connected, too. Because of Britain's maritime supremacy, Greenwich was used as the prestigious zero meridian and its time was blared out across empires of land. Greenwich Mean Time went global and this invisible imperialism of global suburban mono-time was imposed all over the world.

And today – as a result of global supermarket time, the air-miles that bring watermelons to Croydon and out-of-season cherries to Slough, and the increased use all over the world of air-conditioning and central heating to create a global, suburban, sameness of climate – the seas are changing. Witness the freak storm surges and rising sea levels of global climate change. The seas' seasons not being what they used to be, you can now have May all year round. But this represents the emptiness and not the fullness of time.

Jay Griffiths is the author of *Pip Pip: a sideways look at time* (Flamingo, £7.99)

THE EARTH SUMMIT • It cost £49m. Some 22,000 people turned up (not including the protesters outside). Of the 22,000, about 4,000 were from the press, 8,000 were representatives of business, voluntary organisations and civil society and 10,000 were delegates. The 10,000 delegates sat around, made speeches and debated. What did they have to show for it all? A 54-page 'Plan of Implementation' containing hundreds of commitments, objectives, promised actions and targets.

David Collins, a research engineer with leading think-tank Sustainability, has analysed the implementation plan to see how it stands up to close scrutiny. He has studied the 531 commitments contained within the document to see if they are Specific, Measurable, Achievable, Realistic and Timely in accordance with the Smart methodology so beloved by management gurus and their acolytes.

531

455

44

'You cannot say that from now on the whole sustainable development issue is marginalised. It is there and we have a document to work on.'
European environment commissioner Margot Wallstroem

'A mega summit is never a nice show because it is difficult to run and organise. There are limits on what you can do at a mega summit and you have to make allowances.'
European Commission president Romano Prodi

'If we prove capable of showing a pioneering commitment, we shall create a community listened to around the world.'
French president Jacques Chirac

'The next decade should be the decade of action.'
Danish prime minister Anders Fogh Rasmussen

commitments were made in the Earth Summit's Plan of Implementation

'We have plans to end the despair and offer hope. Now is the time to put those plans into action.'
US secretary of state Colin Powell

'I am in no doubt that our descendants will look back on this summit and say we set out on a new path.'
Margaret Beckett, UK secretary of state for the environment.

'You must not expect a conference like this to produce miracles but it must generate political commitment… Johannesburg is not the end of everything, it is a beginning.'
UN secretary general Kofi Annan.

contained either no date or no commitment specific enough to be measurable

8

would have been Smart commitments, except that they contain no binding implications; instead they include 'get-out' phrases such as 'aiming to achieve', 'where appropriate' and 'encourage the application'. One highly publicised commitment is to maintain or restock fish stocks to levels that can produce the 'maximum sustainable yield' by 2015. This commitment is followed by the phrase 'where possible'.

These phrases may not have been intended as get-out clauses. They may represent the incomplete agreement of government delegations on certain issues – a common feature of such political declarations. They may represent common, well-meant intentions to do more in a particular area. But, despite all the best intentions, if goals are not binding they are less likely to be met.

7

commitments were Smart and had not been previously announced elsewhere:

1 a strategic approach to chemicals will be developed by 2005

2 a report on the state of the marine environment (plus a process to continue reporting) will be delivered by 2004

3 an assessment of progress on forests and trees will be presented to the UN in 2005

4 there will be a full and comprehensive review in 2004 of the implementation of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States

5 destructive fishing practices will be eliminated by 2012

6 integrated water efficiency plans will be developed at national levels by 2005

7 the number of people who do not have access to basic sanitation by 2015 will be halved

40

contained *neither* a date *nor* a specific commitment

51

of the remaining commitments were phrased as things that 'should' be done, meaning that they are essentially wishes and not 'commitments'

10

of these were Smart commitments but had previously been announced at other global forums

8

7

5

of the seven Smart commitments were to produce yet more documents

2

and neither of the remaining two would have been necessary if the commitments made by governments in the 1970s and 1980s had been met

0

were Smart commitments to actions that would not have been necessary if we had acted on our former commitments – which we didn't

For all its obsession with international terrorism, Washington fails to see how the phenomenon is driven by its own model of globalisation – a model that is itself uniquely vulnerable to terrorist attacks. Fritjof Capra on security and sustainability.

they might be giants...

Since September 11, 2001, there has been a major perceptual change around the world. All of a sudden we have become acutely aware of our vulnerability. However, the roots of this vulnerability are still not discussed by our political leaders and are rarely mentioned in the media. More than a year has now passed since the terrorist attacks on the US, and in that time the broader context of the new international terrorism has been discussed in many careful studies by scholars and political analysts. And yet the Bush administration persists in portraying terrorism as the result of evil forces operating in a vacuum. In doing so, it perpetuates a climate of fear among the American electorate that prevents any substantial discussion of the US's serious social, economic and ethical problems.

There is no simple defence against terrorism. This is because we live in a complex, globally interconnected world in which linear chains of cause and effect do not exist. To understand this world we need to think systemically – in terms of relationships, connections and context. Understanding terrorism from a systemic perspective means understanding that its very nature derives from a series of political, economic and technological problems that are all interconnected. To understand the root causes of our vulnerability we need to understand the conditions that breed hatred and

violence, as well as the characteristics of a technological infrastructure that makes large-scale attacks a highly effective terrorist weapon.

Thinking systemically means realising that security, energy, agriculture, economics and climate change are not separate issues but different facets of one global system. It leads us to understand that the root causes of our vulnerability are both social and technological, and that they are the consequences of our resource-extractive, wasteful and consumption-oriented economic system.

Millions of people around the world see the US as the leader of a new form of global capitalism that has significantly increased poverty and social inequality. It has generated unprecedented wealth at the very top while forcing billions of people into desperate poverty. Consequently, the relationships between the rich and the poor are increasingly shaped by fear and hatred, and it is not difficult to see that many of the desperate and marginalised are easily recruited by terrorist organisations.

The main thrust of the WTO's free-trade rules has been to dismantle local production in favour of exports and imports. This has greatly increased the distance 'from the farm to the dinner table'. In the US, the average ounce of food now travels over 1,000 miles before being eaten. This puts enormous stress on the environment. New highways and airports cut through primary forests, new harbours destroy wetlands and coastal habitats, and the increased volume of transport further pollutes the air and causes frequent oil and chemical spills.

The dramatic increase of transportation and energy use has resulted in a highly centralised and inherently vulnerable network of supply lines. It is evident that an energy infrastructure consisting of gigantic pipelines, refineries, dams and nuclear plants is more vulnerable than a pattern of decentralised solar power. And a food system dominated by a few mega-farms with extravagant freight needs is much more prone to terrorist attacks than one featuring a multitude of small farms and local farmers' markets.

In the US, these vulnerabilities are exacerbated by misguided energy policies that have decisively shaped the country's foreign policy. Successive administrations have perpetuated an unnecessary dependence on oil. In exchange for unlimited access to this so-called 'strategic resource', the US has supported undemocratic and repressive regimes throughout the world – particularly in the Middle East. These policies continue to fuel anti-American hatred in populations that are deprived of basic human rights.

According to recent estimates by the United Nations Development Programme, every poor person on earth could have clean water, basic health services, nutrition and education for a cost of about $40 billion a year. Instead, the Bush administration launches a war in Iraq that will cost an initial $200 billion (and billions more for many years to come) in order to assure control of an unrestricted flow of Persian Gulf oil.

If we look only at the price Americans pay at the pump, oil is currently cheap in the US. But the military costs to protect each barrel of oil are actually higher than the cost of the oil itself; and when we factor in the environmental costs, the real price of oil becomes prohibitively high.

However, it is absolutely feasible with technologies available today that the US could completely sever its dependence on foreign oil. In fact, Amory and Hunter Lovins of the Rocky Mountain Institute estimate that the US would not need to import any Persian Gulf oil at all if it increased the fuel efficiency of its light vehicles by a mere 2.7 miles per gallon (mpg). To appreciate how easy this would be technologically, we need to realise that the average fuel efficiency of US cars sold in 2001 was 20.4 mpg, whereas today's super-efficient hybrid-electric cars achieve fuel efficiencies over 40 mpg. But instead of raising US fuel-efficiency standards, Bush and his oil men in the White House prefer to spend $200 billion of US taxpayers' money on a war that could kill thousands of innocent people.

A shift of energy policy from the current heavy emphasis on fossil fuels to renewable energy sources and conservation is not only imperative for moving toward ecological sustainability, it is vital to nations' security. More generally, we need to broaden the concept of security to include (besides energy security) food security, the security of a healthy environment, social justice and cultural integrity. As US ecologist and educator David Orr points out, systemic thinking implies a shift of emphasis from security through protection by police force and military power to security by design. A community designed to be secure is one that is ecologically and socially sustainable.

To ecologists the fundamental link between security and sustainability is not surprising, because sustainability means long-term survival. Over more than 3 billion years of evolution, nature's ecosystems have developed 'technologies' and 'design principles' that are sustainable in the long run and hence resilient and inherently secure. Natural selection has seen to it that vulnerable systems are no longer around.

The choice is clear. If we continue to favour an economic system dependent on fossil fuels, centralised technologies and vulnerable supply lines we need to protect it with a huge worldwide police force at enormous expense and risks to civil liberties. If, on the other hand, we shift to a decentralised world economy based on renewable energy sources, sustainable agriculture and regional food systems we can create communities that no terrorist can threaten and which threaten no one else. We have the necessary technologies to do so. What we need is political will and leadership ■

Fritjof Capra is a systems theorist and the author of *The Web of Life*

TELEVISION **Television, the drug of a nation – are you just a user, or have you become an addict? Answer the questions on the TV screen to find out**

TV ADDICTION C

1 Do you watch more T

2 Have you thought about cutting
Have you tried to cut down but found that you

3 Do you spend 'a great deal' of time w
(e.g. browsing TV gui

4 Do you skip social and/or work

5 Do you have any long-term psychologic
or made worse by TV watching? Have y

6 Do you find that TV needs to be more exciting
Do you find that you can watch TV for

7 Do you miss TV if you have
Do you watch videos or play comp

Answer yes to three or more of the

The average person in the UK watches 3.5 hours of TV a day. Watching TV consumes 40 per cent of our leisure time. That means that children born today will spend more of their lives in front of the box than at work.

Never before have people watched so much TV, but has habit turned to harmful addiction? *The Ecologist* has developed a questionnaire based on the standard criteria that psychiatrists use in this country to diagnose substance abuse. Check if you have a TV addiction problem. Or do you think you can handle it?

1 Do you watch more TV than you really want?

When asked, people say that TV is about as enjoyable as housework and cooking. TV isn't a great pleasure in our lives, it just seems to have a very low cost. According to David Burke of anti-TV campaign WhiteDot (www.whitedot.org), the TV model works like this:

- You think you are there to watch the programme, but in fact you are watching the ads
- You think it is free, but in fact it is costing you time and effort
- You get an illusion of togetherness, but really you are alone
- You don't necessarily enjoy it, but keep watching it hoping something worthwhile will happen

2 Have you thought about cutting down the amount of TV you watch? Have you tried to cut down but found that you just tend to end up watching the same amount?

'Friends, Sienfeld, Cheers. The place where everybody knows your name. The best-selling programmes are always about friends or families. Big, fun groups of people who hang around together and tell jokes. TV is just selling back to us the kind of friends it took away from us in the first place. The people on TV are not your friends. They're not in the room with you. You are alone in the dark, staring at a plastic box. Jerry and Elaine, Kramer and that whole loveable bunch on Friends, none of them know you. They don't care whether you live or die' WhiteDot

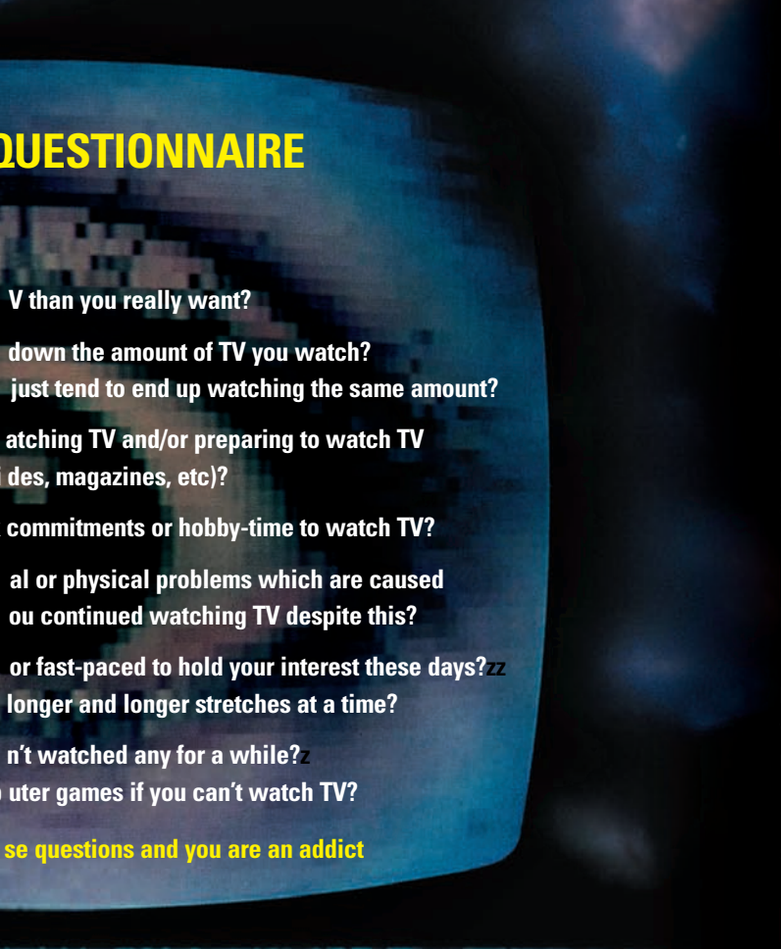
3 Do you spend 'a great deal of time' watching TV and/ or preparing to watch TV (eg, browsing TV guides, magazines, etc)?

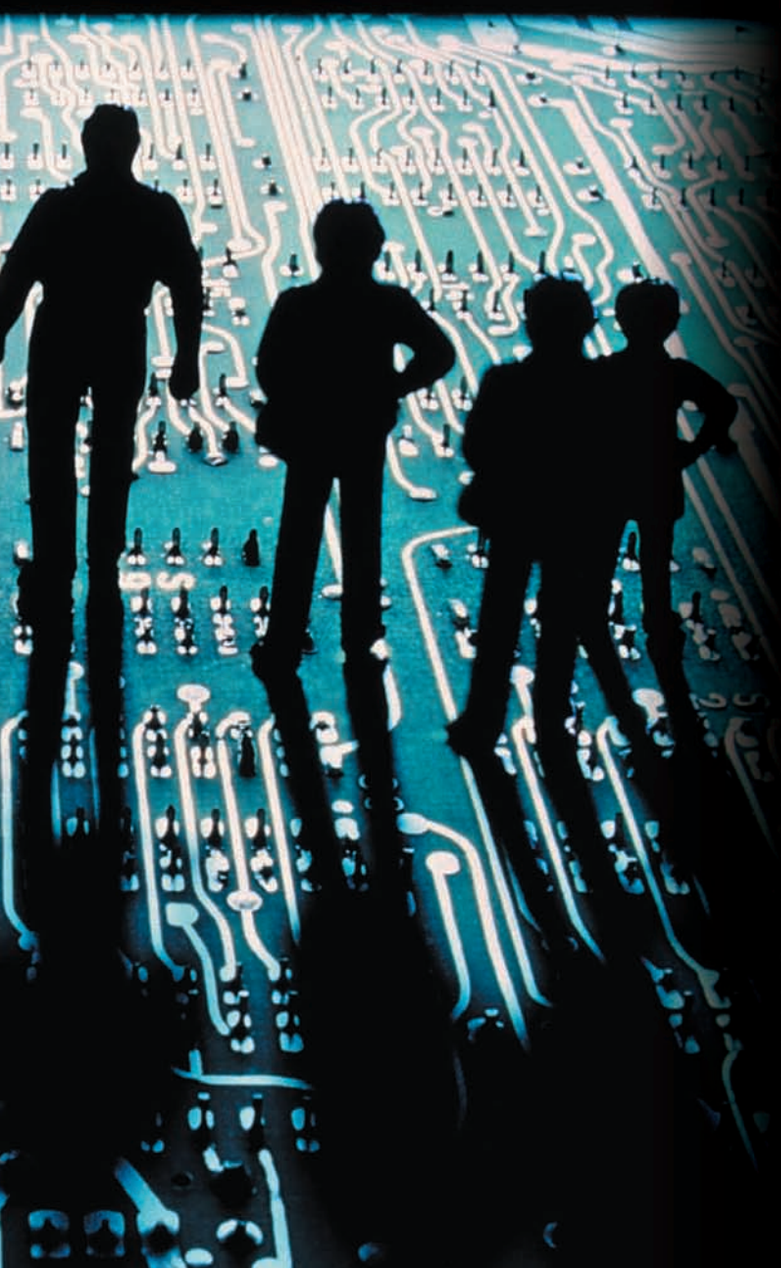
Watching an average of 3.5 hours of TV a day, means that over a 75-year life you will watch a total of 671,147 hours. That's 671,147 hours inside, sedentary and probably alone. We're better than this. We don't need TV. It's TV that needs us.

4 Do you skip social and/ or work commitments or hobby time to watch TV?

'Nothing – not low education, not full-time work, not long commutes in urban agglomerations, not poverty or financial distress – is more broadly associated with civic disengagement and social disconnection than is dependence on television for entertainment' Robert Putnam, *Bowling Alone*

Putnam's seminal study on social involvement found that, irrespective of effects of education, income, age, race, health, place of residence, work status and gender, heavy TV viewers had less friends, attended less social engagements, belonged to fewer community and religious organisations and were more distrustful of other people than non-TV-dependent individuals.





5 Do you have any long-term psychological or physical problems that are caused or made worse by TV watching? Have you continued watching TV despite this?

People who watch a lot of TV suffer comparatively more from insomnia, headaches and indigestion. In children, heavy TV watching causes obesity and can impair language development.

Like the connection between smoking and cancer, there is a hard-to-prove but intimate connection between TV and materialism, fear and discontent. The images bombarding us from TV can't help but make us unhappy with ourselves physically, and materially. At Arizona State University professor Doug Kenrick conducted experiments that found that women shown a succession of pictures of female models become less happy; and men shown such pictures become less content with their wives. TV means that we compare ourselves to the rich and famous, rather than our neighbours.

6 Do you find that TV needs to be more exciting or fast-paced to hold your interest these days? Do you find that you can watch TV for longer and longer stretches at a time?

Psychological research shows that heavy viewers watch more TV but find it less rewarding. As we watch more and more TV our attention span drops; to keep viewers interested there is a need for a faster and faster rush of images and sounds exploding off the screen.

TV reduces individuals' ability to concentrate, and may tap into deep-seated natural instincts to respond to rapidly changing lights. For every minute we watch our metabolic rate sinks lower and lower, thus reducing our willpower to turn our sets off.

7 Do you miss TV if you haven't watched any for a while? Do you watch videos or play computer games if you can't watch TV?

In 1995 19 per cent of US adults said they 'could not survive' without a TV. Despite its negative effects, TV has come to be considered a necessity. In 1995 the ratio of Chinese who owned a TV to the number who had hot running water was 84:1.

TV doesn't satisfy, but it does keep you hanging on craving for another fix. Like all addicts, TV viewers make excuses to other people and themselves – 'I just use it to relax', 'I *want* to switch off'. TV is a drug – a sedative that stops people causing trouble in the hours between work and sleep. It allows an increasingly consolidated global media to place thoughts inside your mind; the machinery of capitalism is plugged directly into your brain to feed you propaganda, advertising and discontentment.

'It is a medium of entertainment that allows millions of people to listen to the same joke at the same time and yet remain lonesome' **TS Eliot**

Even when turned off, TV sets create 'attentional holes' in rooms. Chairs and sofas are focused towards the TV, pointing people sitting in them away from each other.

The diagnosis is shockingly clear – we need to kick the TV habit to become healthier, happier and better connected people. Fortunately, all these things can be done at the press of a single button: the 'off' switch.

SOURCES

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'Impact of the introduction of television on crime in the US: empirical findings and theoretical implications', KM Hennigan, et al, *Journal of Personality and Social Psychology* (42, 461-479)

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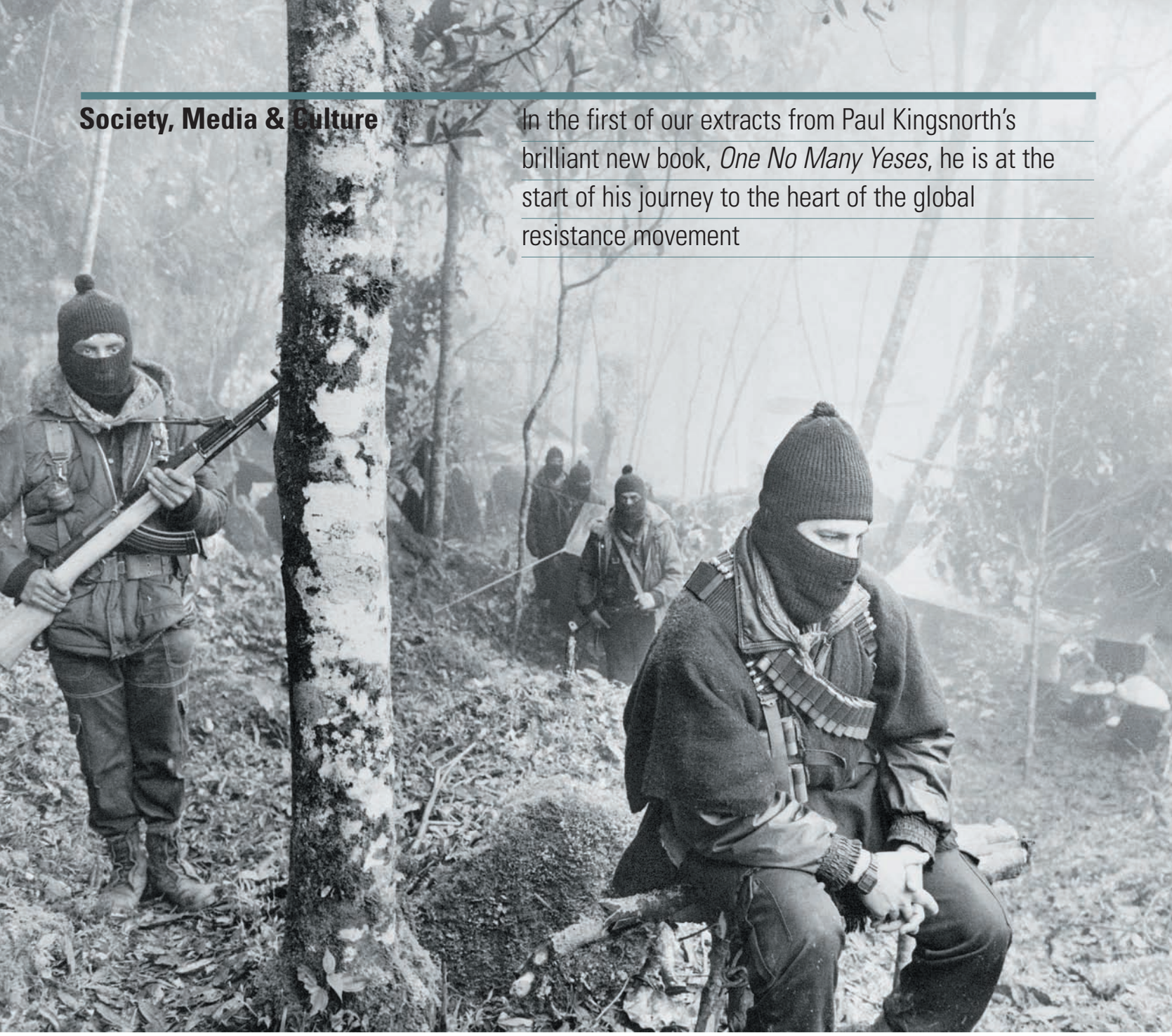
In the first of our extracts from Paul Kingsnorth's brilliant new book, *One No Many Yeses*, he is at the start of his journey to the heart of the global resistance movement



Opening a crack

'I

in history

I stood in the central plaza where the biggest political movement of the 21st century emerged from the rainforest remnants of southern Mexico on 1 January, 1994, and was carried down darkened, cobbled colonial streets by 3,000 pairs of black leather boots at precisely 30 minutes past midnight. The owners of the boots carried rifles and the odd AK-47 or Uzi. Those who had drawn short straws carried fake wooden guns.

Three thousand faces, hidden by black woollen ski masks, bore the distinctive features of the Mayan Indians of Central America; a people outgunned, outcompeted, pillaged, slaughtered or simply passed over since the Spanish *conquistadores* first arrived on their shores in the 16th century. Now, half a millennium later, here in Chiapas, Mexico's poorest and southern-most state, 'the ones without faces, the ones without voices' had come to make the world listen.

By the time the rebels began carrying furniture out of the Municipal Palace and using it to build barricades across the streets, to check the expected approach of the Mexican army, the plaza was thronging with locals, drunks, tourists and curious spectators. Then, as these onlookers watched, a small group of guerrillas raised a flag in the middle of the elegant square – a black flag, printed with four red letters: EZLN.

As they did so, a masked figure emerged onto the balcony of the Municipal Palace. In his hand he held a piece of paper. It was a declaration of war against the Mexican government; one which, on that same morning, would be read aloud to the people of six other towns in Chiapas that this 'EZLN' had also claimed as its own.

'We are the product of 500 years of struggle,' the man read as, in the background, more gunfire and palls of smoke indicated that a rebel column was storming the police headquarters. 'We are the inheritors of the true builders of this nation... denied the most elemental preparation so *they* can use us as cannon-fodder and pillage the wealth of our country. They don't care that we have nothing, absolutely nothing... There is no peace or justice for ourselves and our children... But today we say: "*Ya basta*! Enough is enough!"'

Days later

It didn't last. That day, around 3,000 Zapatista soldiers took control of seven towns in Chiapas. The government responded swiftly and decisively: 15,000 troops poured into the state; helicopter gunships bombed Indian villages, killing 150 people; specialist assault teams hunted down the Zapatista units. The guerrillas retreated from San Cristobal barely 24 hours after they had arrived. Within 12 days the government, responding to an unexpected surge of national support for the masked rebels, declared a ceasefire and the EZLN melted back into the rainforest from whence it had come.

As revolutions go it was, shall we say, unimpressive. In less than a fortnight, it seemed, the 'Zapatistas' had been crushed along with their insurgency. An ignominious end to yet another ignominious revolt: the latest in a long line of guerrilla uprisings that Latin America just couldn't seem to grow out of.

And yet. As the truth about these Zapatistas – a grassroots peasant army that named itself after the followers of the slain hero of the original Mexican revolution of 1910, Emiliano Zapata – began to emerge, so did something curiously different. These, it seemed, were no ordinary *guerrilleros*.

For one thing, they claimed that they had no desire to seize state power. Unlike so many Latin American revolutionaries before them, their aim, they said, was not to grab 'power' on behalf of 'the people' but to dissolve power down to the level of communities – to take back what they claimed had been rightly theirs, before governments and private economic interests stole it from them. 'Power is not taken,' they would later be heard to say. 'It is constructed.'

Their language, too, was new. Where was the talk of 'the proletariat', 'the bourgeoisie', Marx, Lenin, Mao, permanent revolution? Why, instead of appealing to 'the workers' to rise up and join them, were they calling ▶

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250,000 Zapatista supporters converge on Mexico City to promote the Indigineous bill of Rights

on something called 'civil society' to stand between them and their government's soldiers? Why did they speak not of a dictatorship of the proletariat but of a rebirth of democracy? Why was their uprising directed not just at a government, nor even the usual capitalist stooges, but at an apparently innocuous regional trade treaty?

Why did their spokesman, this Marcos character, who spoke in poetry, stories and riddles, describe his homeland as 'an object of shame dressed in the colour of money'? And why were so many people beginning to describe what had happened that January day in the green high-sided canyons of Chiapas as 'the first post-modern revolution'?

The answers to these questions would take a while for the world to figure out. When it did so, this tiny indigenous rebellion in an overlooked part of Central America would provide the spark that lit a bigger rebellion all across the world. The Zapatistas would become the unwitting, but not unwilling, forgers of a truly global insurgency against history's first truly global system.

We are all Zapatistas

It's a few days into our stay in Chiapas, and Ryan has agreed to let Lucy and I tag along on one of Global Exchange's 'reality tours' of some of the Zapatista communities. The idea is to wake people up to the ongoing low-intensity war in Chiapas, to spread the word and to further some kind of mutual understanding. As an introduction to some of the realities of Chiapas, and of Zapatismo, it's just what I need.

Thus it is that we are piling into a cramped minibus with a dozen reality tourists, for an hour-long journey to Oventic, one of the key Zapatista bases in Chiapas. Our companions include an affable teacher from 'Noo Joisey', a 20-something Californian witch, an Irish priest and an overweight neoliberal economics professor from the US Midwest.

After an hour's journey along twisting, mountainous roads our minibus pulls up outside a makeshift gate, which gives way to a long dirt track leading down a hill with a collection of wooden buildings strung out along it. We squeeze out and stand by the side of the road, gazing at the surrounding forests encircled in ribbons of mist. Next to the gate is a wooden building covered in murals. Murals, as I am to discover, are to be found in every Zapatista community, and this building is plastered with the faces of four icons that appear in almost all of them: Marcos, Emiliano Zapata, Che Guevara and the Virgin of Guadelupe, the ancient vision of a brown-skinned Virgin Mary that appeared to a shepherd boy near Mexico City in 1531 and laid the foundations for Mexican Catholicism. In Zapatista murals, the Virgin wears a ski mask.

Ernesto, Ryan's colleague at Global Exchange, is negotiating with a black-masked man who has arrived to greet us. He hands over our passports and a letter of introduction. The man disappears, then returns and we are officially welcome to Oventic. We are ushered into the mural-swathed building, which turns out to be a shop and café.

After a spot of lunch, we are given a tour. First stop is the clinic, a vast, concrete building covered in a stunning array of murals – Mayan dragons, masked faces, guns, fire, plants entwining themselves around windows, children holding hands. *¡Pueblos Unidos!* reads one wall. *Democracia, Justicia y Libertad* reads another. Inside, we gather round as the doctor, a young, dark-haired, white-coated man called Nastacio, tells us how short they are of supplies and how hard it is to work here. He grew up in a nearby village and believes strongly, he tells us, in what Zapatismo stands for.

'We are training our own doctors and health professionals to work in the autonomous communities,' he says, 'because we want to be able to keep our people healthy. But it is very hard to attract people here. You can see that we have no money. We have some medicines, but not enough. And none of us are paid.' He says it not as a lament, simply as a fact. 'Sometimes,' he goes on, 'people bring us corn, tortillas or beans in exchange for treatment or medicines. Which at least means we can eat.' He smiles.

Further down the track is a school. We are led into a classroom and sit down on small wooden desks, scratched, ink-stained, tatty, like any school anywhere. The room is dusty and lined with what look like home-made bookshelves crammed with books about Latin American history, sociology, politics and revolutionary theory and practice. Only the graffiti on the desktops give away where you are: instead of 'I love Ricky M', the scratched slogans say '*¡Zapata Vive!*' and 'EZLN' (Ejécito Zapatista de Liberacion National – the Zapatista Army for National Liberation).

At the end of the room, behind the teacher's desk, in a semi-circle, sit eight men who have been awaiting our arrival. They wear cowboy hats or baseball caps, cowboy boots or sandals, and every one of them, without exception, wears a mask. The masks perform two practical functions: in the case of the guerrillas in the forests, they keep the worst of Chiapas's cold mountain winters at bay; and in the case of the Zapatistas in villages like Oventic, they make it harder for the police, the state, the paramilitaries or unfriendly observers to identify the wearer. And upon those unseen faces, say the Zapatistas, can be sketched the features of anyone, anywhere, who rises up to resist oppression. Behind the masks, they say, they are us – we are all Zapatistas, and we are everywhere.

In the school, through one of those masks, we are being treated to a lecture by a representative of the EZLN Education Commission. He is explaining to us that this is one of the Zapatistas' first autonomous schools, in which they will be propounding a 'revolutionary, popular system of education'. 'We want to construct an example for humanity,' says the man. 'A people without education is one without history; a dead people. We will not have these teachers who sit behind their desks with their minds in New York or Mexico City educating our children to make money at the expense of their people. We will provide a revolutionary education for our own people. The government says we have weapons here, and they are not wrong. Education is a very dangerous weapon; it wakes up minds, and consciences.'

Asserting the dignity of women

Before we pile back onto the bus we have an appointment at the women's co-op. A group of women have been waiting patiently all this time to introduce us to their work. The 'Society of Women for Dignity' is one of many projects in Zapatista communities run by and for women. Female artisans from different communities bring their wares to sell at the scheme, and any money they make is divided up equally between all the co-op's members.

'It is important to us to organise as women,' says their spokeswoman. She seems nervous, which is probably not surprising. 'For a long time we had no way to do this. It has been hard work, but we have come together as women to assert our dignity and it ▶

The North American Free Trade Agreement (NAFTA) was sold to the people of Mexico in the early 1990s as a treaty, which, by removing unfair trade barriers, would bring jobs, development and growth. The real impact was very different. Millions of jobs were lost as economic sectors collapsed, their government support removed. A steady stream of US and Canadian companies moved their operations to Mexico to take advantage of its cheap labour. NAFTA also allowed private corporations to sue governments if they felt they were getting in the way of their 'investor rights'; which they began to do. The US waste-management company Metalclad, for example, successfully sued the Mexican government for almost $17 million when it was prevented from siting a toxic waste dump in an ecological reserve. But it was in agriculture that NAFTA caused the most devastation.

NAFTA began to phase out government support for vulnerable crops and opened the country's markets to mass-produced imports from the USA and Canada. Within a year, Mexico's production of corn fell by half as cheap imports, many of them below market price, flooded the country. Meanwhile, the price of corn in the shops rose. Record profits were recorded by some agribusinesses in the USA as millions of peasants in Mexico lost their land. The hundreds of varieties of the ancient maize plant, which originated in Central America, began to disappear, replaced by a handful of intensive chemically raised hybrid varieties grown on the vast prairie farms of the USA.

has made us proud.'

The position of women in Zapatista communities is an example of how Zapatismo has striven to fuse traditional Mayan culture with newer ideas – and how they are prepared to reject aspects of that traditional culture that are no longer acceptable to them. The deeply male nature of traditional Chiapas is one such aspect, and was rejected in the EZLN's Women's Revolutionary Law. The law, drawn up by women, applies to all Zapatista communities and explicitly grants women the same rights as men in all things – including decision-making, marriage and armed combat (up to a third of the Zapatista guerrillas are said to be women). Talk to any woman in any Zapatista community, I found, and she will tell you that the law, though patchily enforced, has led to a marked improvement in their lives – and a new confidence in their dealings, as equals, with the traditionally dominant men.

Outside again, a village leader has something to say to us before we go. He is an old man in a checked shirt and he wears no mask. He bows slightly beneath the weight of his words. Tiny, peeping chicks scratch around his feet.

'You must know,' he says simply, 'that we are suffering here. You have seen, now, how we are. Life is hard, but we struggle. We must struggle because there is nothing else. But we know that there are Zapatistas elsewhere in Mexico – that there are Zapatistas all over the world. Like us, they struggle, and they will not give up. We are everywhere. All we ask of you, now, is that you take our word; that you speak it and sing it and breathe it wherever you go. That is all.'

Back in the minibus, accelerating down the hillside back towards San Cristobal, the neoliberal professor is unhappy. He has a kind of quixotic smile-frown on his face and is sweating gently through his T-shirt.

'Now, you see,' he is saying to anyone who'll listen, 'that women's co-op is not going to survive if it goes on like that. It's not operating efficiently. Did you see what they do? Every woman contributes different amounts of work, different skill levels, different products, and yet they divide up the remuneration equally. That means that the harder-working and more skilful women are subsidising the less talented ones.'

'I think that's the idea,' says his wife, who seems to have made an art out of looking embarrassed.

'Well, they don't understand basic economics, that's all. It's not going to survive long-term. You can't subsidise under-achievers.' The man is straight from central casting, and he's making me feel ill.

'Look,' I say, 'it's deliberate, isn't it? It's community support, small-scale industry, cooperation, mutual aid. I thought you economists liked private initiatives. What alternative do you suggest? Perhaps the faster workers could take the money and run? Or do they need to set up a benefits system to dole out cash to the ones left behind?'

'Well, I don't think that would be ideal,' he replies. 'If they were to ask me, I would say that what would really benefit them would be a nice, clean *maquiladora* just on their doorstep…'

'What's a may-kee-adora?' asks the teacher from New Jersey.

'A sweatshop,' says a sharp old woman from New York, who has been eyeing the professor with increasing distaste. The professor looks pained.

'Well, that's a derogatory term, but in any case… they could work for a daily wage, perhaps making sneakers or shirts, or whatever, for export to the States. Under Nafta [the North American Free Trade Agreement] they would get very favourable rates. They'd earn money from export, and that would allow them to develop and…'

'Who's got a cigarette?' demands the woman from New York. 'I need a cigarette.'

'I really don't like smoking,' says the professor, looking pained again, 'particularly not in enclosed spaces.'

'Yes,' says the woman from New York. 'I know.' ■

The state of Chiapas is paradoxically the poorest and the richest state in Mexico. It is the top producer of coffee in the country, growing 36 per cent of Mexico's total coffee production. It produces 55 per cent of Mexico's hydro-power (from a series of vast dams, many built on requisitioned Indian land) and almost 20 per cent of the country's total electricity. It produces 13 per cent of the country's maize, 5 per cent of its oil, and 12 per cent of its natural gas. What remains of the heavily deforested Lacandon jungle, in the south of the state, is trumped in terms of Latin American biological diversity only by the Amazon. Chiapas, by any standards, is extraordinarily resource-rich.

Meanwhile, its people are extraordinarily poor, even by the standards of a nation in which 40 per cent of people live below the poverty line. Thus it is that in the state which produces almost 20 per cent of Mexico's electricity, more than a third of homes have no electricity at all. 30 per cent of the population is illiterate, rising to 49 per cent in some rural areas. Almost 40 per cent live on an income of less than US$3 a day; 19 per cent simply have no income. Diseases of poverty, from river blindness to malaria, are rife. Education is sparse, health services often non-existent. 'There are seven hotel rooms for every thousand tourists,' noted Subcomandante Marcos, sharply, in 1992, 'while there are only 0.3 hospital beds per ten thousand Chiapaneco citizens.' Worse, he said, 1.5 million people in Chiapas had no medical services within reach and 54 per cent of the population suffered from malnutrition. 'The tribute that capitalism demands from Chiapas,' wrote Marcos, 'has no historical parallel.'

Extracted from *One No, Many Yeses*, Paul Kingsnorth's book on the global resistance movement. The book is published by Simon and Schuster. To order a copy at the special price of £9 (including p&p), call 0870 787 1091 and quote reference SS015.

Little understood and little mentioned outside of scientific circles, Nanotechnology will change the lives of everyone on this planet forever. This special report brings nanotechnology into the open, explains what it is, what the risks are, and who stands to benefit. Most importantly of all, it is a call for public involvement in deciding the direction its development should take, before it is too late.

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By manipulating the structure of materials at the atomic level, it is possible to engineer new materials with entirely new properties never before identified in nature. Welcome to nanotechnology.

seeing is be

The growth of technology in the last half century has been driven by our ability to work at an increasingly small scale. Computers became more powerful the more we were able to pack onto ever smaller chips. In agriculture, where once we had crossbred individual animals or plants, biotechnology enabled us to manipulate the genes themselves. Now nanotechnology takes us to an even smaller scale – to the level of the atom, the building block of everything that exists.

The implications of nanotechnology are huge. By manipulating and exploiting the structure of materials at the atomic level, it becomes possible to engineer new materials with entirely new properties never before identified in nature.

In 1959 physicist and Nobel laureate Richard Feynmann declared that 'the problems of chemistry and biology could be greatly helped if our abilities to see what we are doing and to do things on an atomic level were ultimately developed – a development which I think cannot be avoided'. At that time, however, the magnification of the best electron microscopes in the world was still about 100 times too crude. It took a further 23 years for Feynmann's prediction to come true.

On 10 August 1982 US patent 4,343,993 was issued to IBM for the invention of the Scanning Tunnelling

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Microscope (STM). In an STM a fine electrically-conductive needle is scanned just above the surface of an electrically-conductive sample. The distance between the tip of the needle and the sample is kept constant at only a few angstroms (an angstrom is 10 times smaller than a nanometre (nm), which itself measures a billionth of a metre; see box opposite). When a tiny voltage is applied through the needle electrons 'jump' across the space between tip and sample. Though very small, this flow of electrons can easily be detected. As the tip moves along the surface of the sample, its position is constantly adjusted to ensure the distance and the electrical current remain constant. These adjustments trace the surface features of the sample. When the features are graphically displayed on a computer screen, we are able to 'see' the individual atoms and molecules that make up the sample.

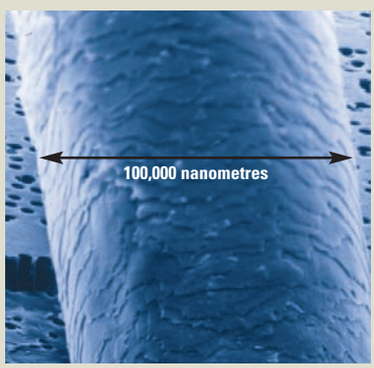
But an STM is not just a device for looking at atoms. By increasing the voltage while the tip is positioned exactly over an atom, the atom can be made to stick to it. If the voltage is then lowered, the atom can be released in a new location. In 1989 IBM researchers at the Almaden Research Center in San José, California, used an STM to pick up, one by one, 35 atoms of xenon (a chemically inert gas) and arrange them on the surface of a nickel crystal. Not surprisingly, the scientists chose to write the letters I, B, M with their xenon atoms. The logo spanned less than 3nm.

Since the early 1980s STMs have evolved into Atomic Force Microscopes (AFMs) – the prerequisite tool that researchers now use to observe and manipulate matter at the nano-scale. Rather than maintaining a constant distance between electrically-conductive tip and sample, the tip of an AFM is attached to the end of a highly sensitive cantilevered arm and actually touches the surface of the sample. (The force of contact is very small). As with the STM, the tip scans the sample's surface to generate an image, but the AFM records and measures the small upward and downward movements of the arm that are needed to maintain contact with the sample. The tip 'feels' the surface the way a finger might stroke a cheek. AFMs cost anything from $50,000 to $1.5m.

Manipulating matter is not just a parlour trick for bored researchers at IBM, however. The arrangement of atoms and molecules defines the properties substances exhibit. For example, depending on the way atoms are bonded together, carbon can be either graphite or diamond (see diagram overleaf). In graphite the molecules are arranged in sheets. It is this structure that makes a pencil work; sheets of molecules are left on the page when you write. Diamond is arranged in an interlocking lattice of molecules, making it remarkably hard.

Until 1985 diamond and graphite were thought to be the only forms of carbon occurring in nature. But

A nanometre is one billionth of a metre. It is at this most minute of scales that nano-technology works. To give an idea of what this means, this photograph shows an enlargenent of a single human hair.



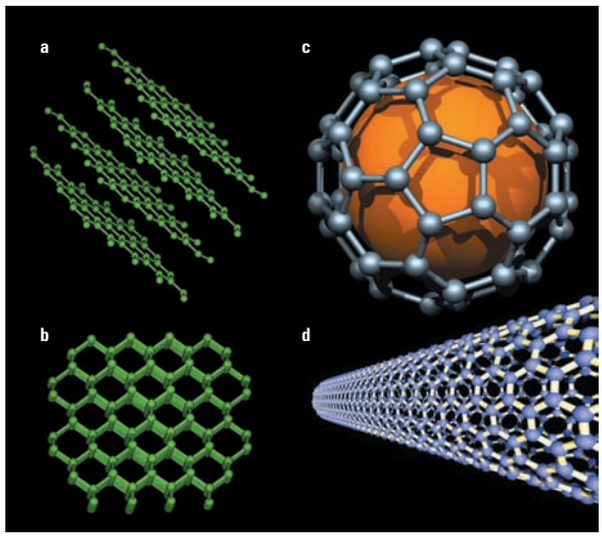
Four different forms of carbon:

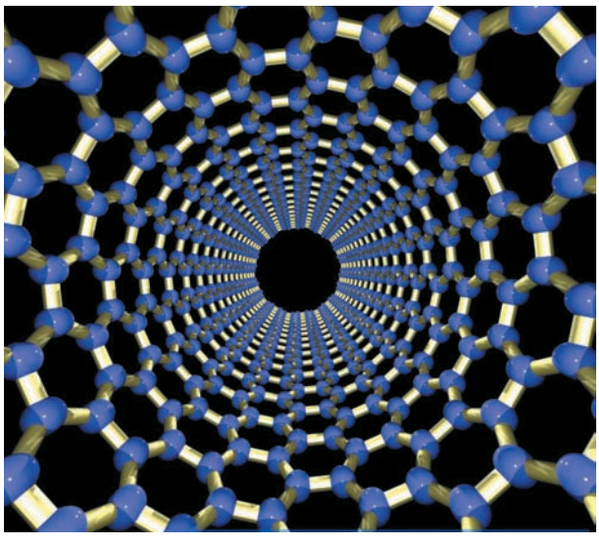
a In graphite the molecules are arranged in sheets.

b Diamond is arranged in an interlocking lattice of molecules, which makes it remarkably hard.

c Buckyball molecules are spherical in shape and are made up of carbon atoms arranged like the pentagons and hexagons of a football.

d Nanotube molecules bond together to form tubes.



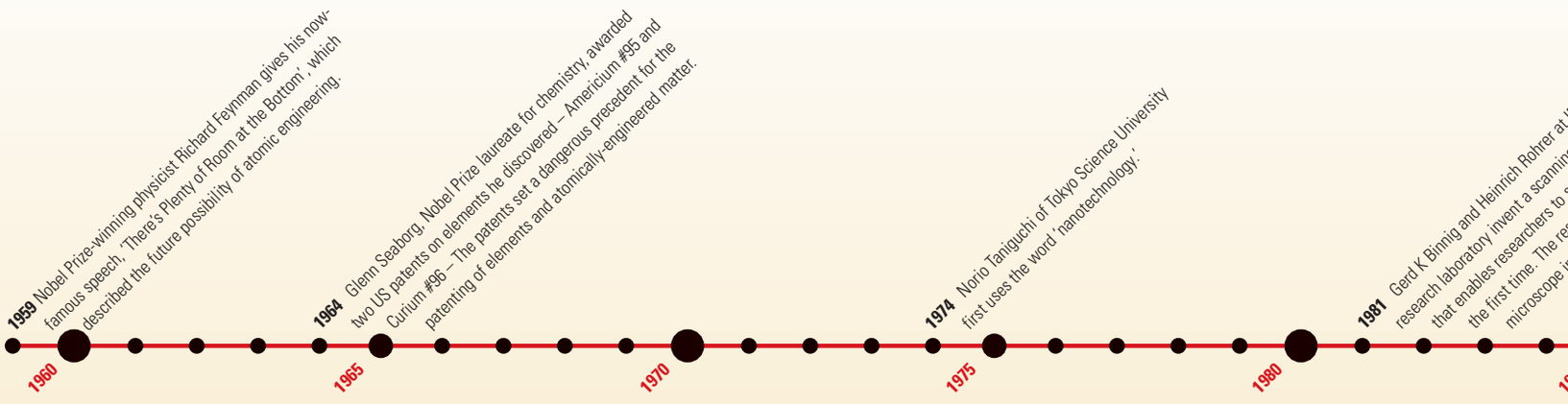


that year scientists discovered a third form in which the molecules are spherical in shape and are made up of 60 carbon atoms arranged like the pentagons and hexagons of a football. These balls, which are approximately 1nm wide, are called buckyballs after R Buckminster Fuller – the inventor who promoted the geodesic dome as the ideal architectural structure.

Six years later another form was discovered – nanotubes (see above). Nanotube molecules bond together to form tubes that are either hollow like straws (known as single-walled) or rolled up inside each other like posters (known as multi-walled). In its nanotube form, carbon is 100 times stronger than steel and six times lighter.

Nanotubes also display another property not found in other forms of carbon. At sizes less than about 50nm certain substances begin to display properties that they do not exhibit at larger scales. This is known as the quantum effect. In carbon and diamond the individual molecules bond to each other to form the larger structures that we see in our pencils and engagement rings; the quantum effect does not apply. In nanotubes, however, carbon molecules remain in an ultra-fine soot of nano-sized particles. As a result, nanotubes conduct electricity better than copper and can also act as semi-conductors.

The quantum effect is already being used commercially. Zinc oxide is the active component of zinc oxide suncream – the thick white cream that sportsmen and women daub on their faces. The original suncream contains zinc oxide particles that are larger than the wavelength of the sun's rays. Therefore, the rays reflect off the zinc oxide cream making the latter appear white. Scientists have now developed a suncream using nano-sized zinc oxide particles that are smaller than the wavelength of sunlight. The suncream now appears transparent when applied to the face. It is the same suncream with the same ingredients, but simply because the particles are smaller it has new properties.



Sources: 'A Few 10-9 Milestones', Gary Stix, *Scientific American*, September 2001; *Nanotech: the tiny revolution*, CMP Cientifica, July 2002; *Our Molecular Future*, D

Nanotechnology is not just a vision of the future; products using it are already on the shelves. The following is a list of soon-to-be and already commercially available nano-products

TITANIUM DIOXIDE NANOPARTICLES

Sunscreen and cosmetics: Consumer brands include L'Oréal, Lancome, Mibelle

Self-cleaning glass: Activ Glass by Pilkington

ICT: NanoChromics technology – paper-like flat display screens developed in a joint venture between high-tech Irish firm NTera and pharmaceuticals multinational Merck

Clothing: German chemicals firm BASF's Ultramid fibres laced with titanium dioxide nanoparticles for UV-protected sportswear

ZINC OXIDE NANOPARTICLES

Sunscreen and cosmetics: Z-cote sunscreens available from brands such as Dermatone, Australian Gold and Terrasport; and Zinclear, produced by ANT (Advanced Nano Technologies) and used in sunscreens including Wet Dreams, Bare Zone and Wild Child

ALUMINIUM OXIDE NANOPARTICLES

Scratch-resistant coatings: Produced by Nanophase in, for example, scratch-resistant plastic opthalmic lenses

ALUMINIUM NANOPARTICLES

Ordnance: Explosives, rocket propellants and military guns used by Nasa and the US nuclear weapons laboratory Los Alamos

SILVER NANOPARTICLES

Antimicrobial bandages/ wound dressings: Containing nano-crystalline silver, British firm Smith and Nephew's Acticoat is sold around the world

LITHIUM TITANATE NANOPARTICLES

Rechargeable batteries: Produced in a joint venture between NTera and Altair Nanotechnologies – an offshoot of US firm Altair

LANTHANUM NANOPARTICLES

Swimming pool cleaner: Nanocheck – patented by Altair for algae prevention, swimming pools, fish tanks and fish farms

CARBON NANOTUBES

Tennis rackets: The VS Nanotube Drive produced by French nanotechnology company Nanoledge for sports equipment firm Babolat

NANOCLAY PARTICLES

Tennis balls: Using Air D-Fense technology, Wilson's Double Core ball

HYDROXYPATITE NANOCRYSTALS

Synthetic tooth enamel (fillings): Produced by BASF

MAGNESIUM OXIDE NANOPARTICLES

Bioweapon decontamination nanoparticles: Produced by US firm Nanotek with funding from the US military

TEFLON NANOPARTICLES

Stain-resistant clothing: Produced by US multinational DuPont and used in clothes from Dockers, Ralph Lauren, London Fog, Regatta, Marks and Spencer and J Crew

NANO-TEX NANOPARTICLES

Stain-resistant/ non-wrinkle fabrics: Nano-Tex (a subsidiary of US textiles concern Burlington) nanoparticles are used in and by brands and firms that include Lee Performance Khakis, Gap, Eddie Bauer, Savane, Croft and Barrow, Levi's Dockers, Elbeco, Haggar, Bremen Trousers, Sleepmaker and Dreamyland

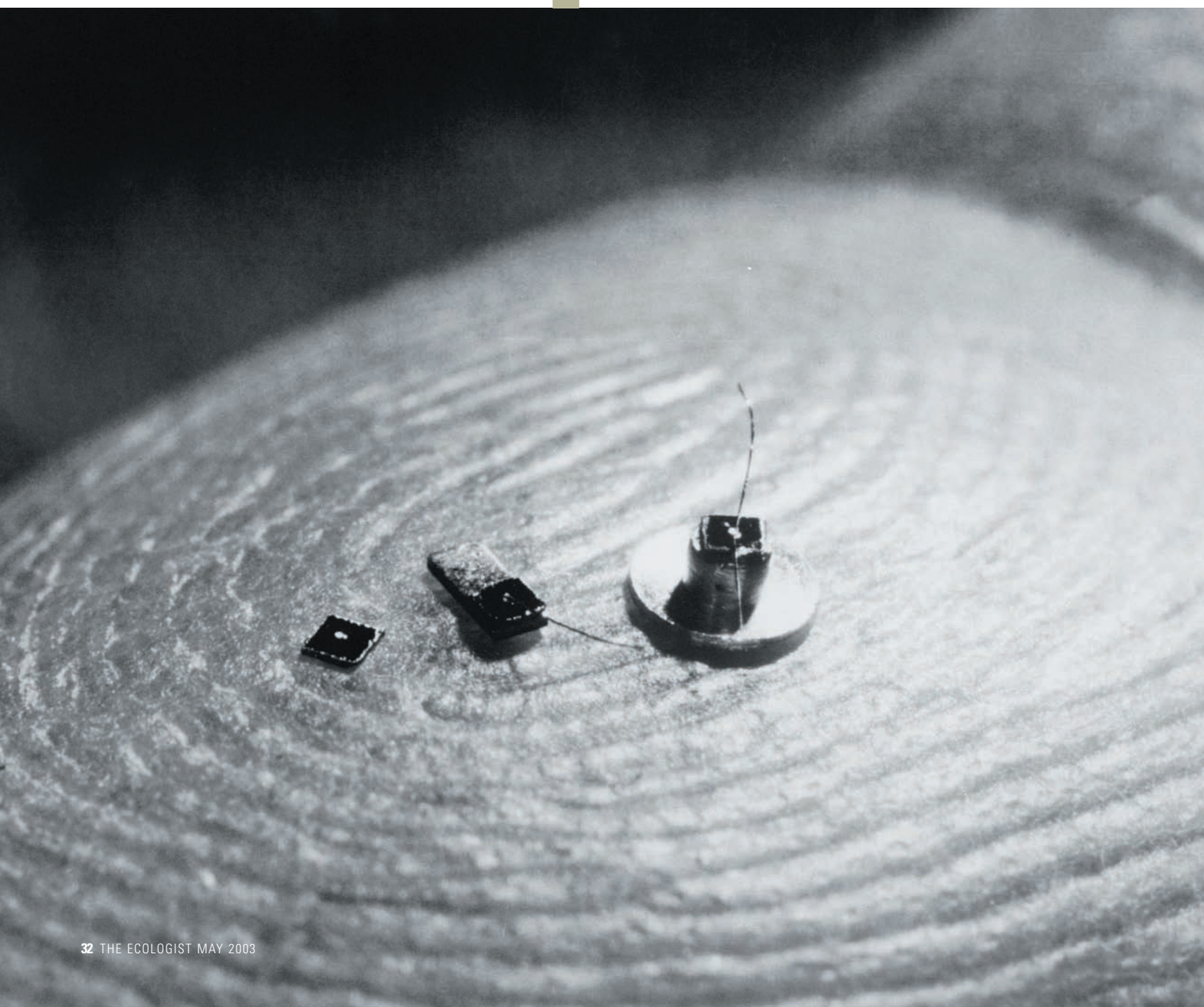
NANO-LIPOSOMES

Cosmetics: Used in L'Oréal brands including Helena Rubenstein, Lancomme, L'Oréal Plenitude, Future E, Mabelline and Biotherm

Douglas Mulhall, Prometheus Books, 2002; and the Action Group on Erosion, Technology and Concentration (the ETC Group)

No more disability. Brain implants to boost intelligence. Ageing counteracted. The next stage of evolution or a nightmare we can never wake up from? Jim Thomas on 'converging technology'.

future perfect?



We're getting used to converging technologies these days. Perhaps you can still call a spade a spade but a phone, for example, is no longer just a phone. It also serves as camera, internet browser, answering machine, text communicator, tracking device, personal diary, calculator and alarm clock; and it's shrinking. From personal organisers to scanfax photocopiers, our modern technologies are being snapped together into smaller, lighter, all-in-one configurations that erase old functional boundaries. Driving this convergence is the ability to digitally encode and process data – whether visual, audio or text. By reducing diverse forms of information into a single language of zeroes and ones, technologists have established a basic unity that allows different devices to 'talk' to each other via the ubiquitous computer processor. In his acclaimed novel *Snow Crash*, cyberculture writer Neal Stephenson compares this new digital unity to the biblical symbol of human hubris the Tower of Babel. What made the construction of the Tower of Babel possible was that its builders spoke the same language. As God recognised, because people spoke a single language 'nothing that they [proposed] to do [would] be impossible for them'.

In early February, before a Los Angeles audience of high-tech scientists, government officials and corporate decision-makers, Wall Street wunderkind Josh Wolfe of venture capitalist Lux Capital again invoked the Tower of Babel – this time breathlessly describing the new terrain of nanotechnology. Chemists, computer programmers, neuroscientists, biotechnologists and engineers, Wolfe explained, are finding a common language to realise a fundamental and powerful technological convergence that will dwarf today's digital convergence. Wolfe believes that – unlike the Old Testament Tower of Babel – this convergence will last, and he isn't the only one willing to bet big money on it. Leading Fortune 100 companies in partnership with the US government are actively accelerating this nano-enabled convergence – an event eagerly awaited by futurists yet viewed with uneasiness by a handful of scientists and civil society organisations.

The key insight about nanotechnology with respect to technological convergence is that it isn't really a technology; it's a scale – the nano-scale (one-billionth the size of a metre), at which atoms and molecules, the building blocks of all matter, operate. That simple fact – that all substances are qualitatively the same at the nano-scale, that life and non-life, mind and matter are all made up of atoms arranged in different ways – has caught the imagination of some of the world's most senior technologists and the world's most powerful government.

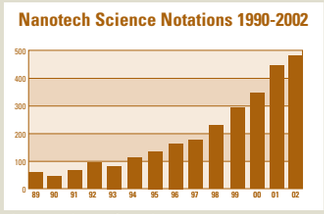
Every big thinker on the coming convergence uses a different acronym for it. Bill Joy, founder of Sun Microsystems and known reverently in California's Silicon Valley as 'the other Bill', worries about the coming together of GNR (genetics, nanotech and robotics). Corporate environmental consultant Douglas Mulhall enthuses about Grain (Genetics, Robotics, Artificial Intelligence and Nanotech). While Massachussets Institute of Technology artificial intelligence guru Ray Kurzweil simply calls it 'the singularity' – the point at which our technologies become the driving force in human evolution.

The US government has come up with its own abbreviation. Dubbed NBIC (Nano-Bio-Info-Cogno), the goal of the 21st century's version of the Apollo Project is to wire together biotechnology, IT and cognitive neuroscience into one megatechnology by mastering nano-scale engineering. If successful, it will massively enhance the capabilities of existing technologies ranging from genetic modification and nuclear weaponry to pharmaceutical drugs and brain

CORBIS

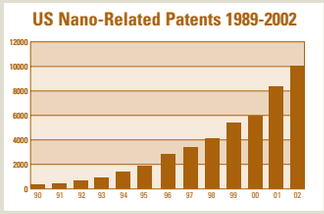
Three key measurements indicate the speed at which the field of nanotechnology is growing.

PATENTS



Back in the late 1980s, there were about 60 patents that made reference to 'nano' in their applications. Nearly 445 nano-related claims were granted during the year 2001; the number of such patents was expected to exceed that level by the end of 2002. Tellingly, among those most aggressively filing for nanotech-related patents are the US Navy and the US Army.

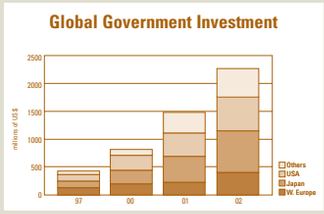
CITATIONS

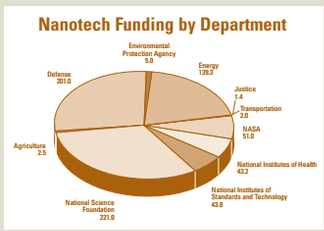


A database of citations provided by ISI Citation Index tracks all references to key words in peer-reviewed English language scientific publications. The scientific literature in 1987 included about 200 'nano' references. In 2001 there were roughly 7,700 nano citations. In just the first six months of 2002 there were over 6,000 nano citations.

Equally importantly, references to nanotechnology have moved beyond the conventional scientific press to popular science and business media. In September 2001, for example, the journal *Scientific American* devoted its entire issue to nanotech. In December 2001, *Chemical and Engineering News* also featured nanotechnology as its cover story. Daily newspaper *USA Today* now has a nanotechnology reporter. And virtually every issue of *Technology Review* features a nano-science breakthrough. With increasing regularity the business press is talking nano, and centrefold spreads making references to nanotech are commonplace.

STATE FUNDING





Nanoscientists in the US are described as being 'giddy' about the federal commitment to nanotechnology. US government spending on nanotechnology totalled $463m in 2001, topped $600m in 2002, and will hit $710m in 2003. In 2002 Japanese government spending on nanotech pulled ahead of the US. The EU comes in a close third. Global government expenditures in 2001 exceeded $1 billion, and more than doubled to almost $2.5 billion in 2002. How this expenditure is being apportioned says a great deal about the future of nanotechnology.

CORBIS

The list of companies involved in nanotechnology includes many of the world's most powerful multinationals. At the forefront is IBM, which has already committed $100m to research and development on nano-electronics. It is joined by ExxonMobil, chemicals giant Dow, Xerox, US technology corporation 3M, Alcan Aluminum, Johnson & Johnson, Hewlett-Packard, Lucent, Motorola, pharmaceuticals firms Eli Lilly and Aventis, DuPont, Sony, Toyota, Hitachi Mitsubishi, NEC, Toshiba, Philips, L'Oréal, BASF and Bayer.

The economic and legal might of these companies gives them control over the direction that nanotechnology takes. A case in point is nano-scale plastic catalysts. In the early phases, more than 3,000 patents were granted to a host of companies. However, when all the bargaining and litigation had finished it was Exxon Mobil and Dow that walked away with technological control.

The interest that the giant corporations are showing in nanotechnology is reflected in the growth of investment in the field over recent years:

- US venture capital investment in nanotechnology has grown from a modest $100m per annum in 1999 to $780m in 2001, and will be $1.2 billion in 2003;

- By 2015 the US National Science Foundation predicts: annual sales of $340 billion for nanostructured materials and processes; $600 billion in annual electronics and informatics revenues; sales of about $180 billion in pharmaceutical applications, with half of all pharmaceutical production dependent on nanotechnology; and annual global nanotech-related sales to exceed $1 trillion, with atom technologies the dominant factor in the sectors of electronics (from computers to telecommunications), pharmaceuticals, energy and materials manufacturing.

implants, while also enhancing the technological capabilities of the US itself – a strategic bid to bolster military and commercial muscle through technological advantage.

Spearheading the NBIC initiative is Mihail Roco of the US government National Science Foundation (NSF), and promoting it to industry is Newt Gingrich – previous Republican speaker of the House of Representatives and honorary chairman of the industry research and lobbying association the NanoBusiness Alliance. As head of the National Nanotechnology Initiative, Roco successfully secured the US's biggest government commitment to technological research since the space programme, uniting the military, Nasa, leading high-tech companies and the NSF under a single vision.

As Roco emphasises, the logic of NBIC lies in 'the material unity of the nano-scale.' Since everything operates from the bottom up (beginning with atoms that combine to form all larger structures), he argues, we can control events on the macro-scale if we can manipulate events at the nano-scale.

For example, at the nano-scale scientists can already artificially synthesise DNA molecules. DNA controls the formation of proteins, which may ultimately determine the health and behaviour of entire organisms. The behaviour of individual organisms largely determines collective behaviour and, hence, the behaviour of society itself.

According to this hierarchical view, every substance, and every natural or cultural system is the working out of molecular processes at different levels. By seizing control of the molecular world through nanotechnology, we can affect every other realm of human experience, including natural phenomena. Neurons could be re-engineered so that our minds talk directly to computers or to artificial limbs. Viruses could be re-engineered to act as machines or, potentially, as weapons. Computer networks could be merged with biological networks

to develop artificial intelligence or surveillance systems.

Jim Spohrer, chief technology officer at IBM, explains that the coming convergence will allow scientists to simultaneously manipulate the basic units of all NBIC technologies – bits (IT), atoms (nanotechnology), neurons (cognitive science) and genes (biotech). It all adds up to a little BANG (Bits, Atoms, Neurons, Genes) theory enabling a godlike level of control over knowledge, matter, mind and life. But who gets to be master of the universe?

Visions of the future

The US government's NBIC strategy came to light in June 2002 with the publication of a 400-page document titled *Converging Technologies for Improving Human Performance*. The report (the result of a workshop held in Washington in December 2001) was written by 80 leading technology thinkers from the triple helix of industry, academia and the government. These thinkers included representatives from Hewlett-Packard, IBM, arms manufacturer Lockheed Martin, Nasa, the US's Defense Advanced Research Projects Agency (Darpa), the departments of commerce and energy and the NSF.

Workshop participants attempted to explore ways that converging technologies could enhance the physical and cognitive capabilities of humans, both individually and collectively. Punching numbers on a calculator can enhance cognitive ability, for example, but implanting a device that could turn the brain into a calculator would be more effective. A facelift can 'enhance' human performance according to the NBICers, but fine-tuning metabolism to stop ageing altogether would take enhancement to a new level.

The benefits of technological convergence were presented in a way that could prove irresistible to a public expected to spend $2.3 billion this year just to get its teeth whiter. No doubt it would be useful to look more closely at the benefits promised by NBIC (doubled life-expectancy, unfailing memory, wrinkle-free ageing, massively expanded intellect, etc) and debate if they are laudable or merely creepy. Though few of us, of course, would insist on the virtues of disease, senility or death.

What is chilling about the possibility of a singular future and what society must debate is the possibility of an ever-widening gulf between the improved and the unimproved. Whatever benefits convergence may bring, they will neither be cheap nor equitably distributed. What will happen to those who remain unimproved? Will physical enhancement become a legally enforceable social imperative? A recent US court decision allowing prison officials to forcibly medicate a death-row inmate to make him sane enough to execute underlines the complex issues involved in the notion of 'enhancement'. And US Supreme Court rulings claiming that the Americans with Disabilities Act does not apply to persons with correctable impairments suggest that the rights of the disabled will be further eroded as disability becomes further marginalised as a social concern. So, how long before democratic dissent is viewed as a correctable impairment as well? After singularity makes possible the construction of an even higher Tower of Babel, what happens to diversity?

Jim Thomas is European Programme Manager for the ETC Group – the Action Group on Erosion, Technology and Concentration

'There are three, although I have a feeling that under some future unified theory they will turn out to be just one. The first is, of course, information technology… The second is biotechnology… And the third is nanotechnology.' *Then-chairman and CEO of Monsanto Robert Shapiro, when asked what he believed were the world's most promising future technologies*

The future is close at hand…

- A researcher at Rensselaer Polytechnic Institute in New York state is currently stuffing proteins inside carbon nanotubes that will then be incorporated into materials to make them 'self-healing'. Protein-filled nanotubes may, for example, be incorporated into the plastic that makes up an airplane wing. If the wing becomes damaged and the nanotubes break apart, the released proteins could act as an adhesive and repair the damage.

- A complex working nano-machine with a biological engine has already been built by Carlo Montemagno at Cornell University (Montemagno is now at the University of California at Los Angeles). With his team of researchers, Montemagno extracted a rotary motor protein from a bacteria cell and connected it to a 'nano-propeller' – a metallic cylinder 750nm long and 150nm wide. The biomolecular motor was powered by the bacteria's adenosine triphosphate (the source of chemical energy in cells), and was able to rotate the nano-propeller at an average speed of eight revolutions per second.

- Giant steps are already being taken in the direction of nano-scale robots. Researchers at the Massachusetts Institute of Technology (MIT) Bio-instrumentation Laboratory have developed hundreds of three-legged robots, each the size of a thumb. The robots are equipped with onboard computers, bio-sensors and scanning tunnelling microscopes, and are capable of measuring and assembling structures on the molecular scale. Only 32mm high, the microbots (dubbed 'NanoWalkers' because they are able to make 4,000nm-sized manoeuvres per second) are designed to respond to infrared signals allowing each of them to act (independently or collectively) on myriad tasks. The tiny machines are capable of executing 48 million instructions per second. MIT predicts it will soon have over 100 microbots hard at work on separate but related tasks in an enclosed card-table-sized chromium-coated chamber. The chamber's chromium surface provides an energy source for the robots, which will receive their marching orders from a master computer in the chamber's ceiling. In the near future MIT scientists anticipate that the micro-army will have the power to manipulate individual molecules and even re-arrange atoms. With an ability to make 200,000 measurements per second, the machines may initially be used to analyse chemicals and to assist in the development of new pharmaceuticals. However, there is no obvious limit to their job description. They can also assemble and repair fellow microbots, and could eventually construct still tinier 'nanobots'.

Nanotechnology has the power to affect every aspect of life on the planet. Here, the *Ecologist* presents developments taking place now or in the near future. In response, some of it's leading critics analyse the

Promising the World,

'The importance of nanotechnology to the future of mankind cannot be overstated. Nanotech's promise is clean industries, cures for disease, nearly unlimited energy supplies, a continuance of Moore's Law and perhaps the end of hunger.'

Mark Modzelewski, Executive Director of Nanobusiness Alliance.

'Nanotech accelerates a technofix trend that looks to technology as the solution to the world's most pressing problems, overriding issues of safety, security and equity. Potential productivity gains through genetic engineering are touted as the answer to hunger, though distribution and access rather than production is the problem. ICTs (Information and Communication Technologies) are being promoted as the means to bridge the information divide, when resources and opportunities to use that information are absent. Now, nanotechnologies will similarly offer governments even broader opportunities to avoid enacting necessary social, political and economic change. Nanotech threatens even further to divert funds, knowledge and political will away from the research necessary to address society's problems in a systemic manner and from policies and practices that will tackle the root causes of hunger, the misery of most human livelihoods and the degradation of the environment.'

Patrick Mulvany, Senior Policy Adviser, Intermediate Technology Development Group.

NANO-FOOD DEVELOPMENTS

In 2000, Kraft Foods, the $34 billion food and beverage giant launched the NanoteK consortium, focussing on:

- novel products tailored to each consumer's taste buds. For example, latent nanoparticles inside a clear, tasteless drink could be activated with a domestic microwave to produce whatever taste the consumer desires;
- personal food products that recognise an individual's nutritional or health profile (allergies or nutritional deficiencies);
- packaging to detect and alter a consumer's vitamin deficiencies.

Meanwhile Rutgers University is developing:

- 'nutraceutical' foods that use proteins to deliver drugs to targeted areas of the body;
- food packaging that changes colour and alerts the consumer when the food inside starts to spoil.

NANO-AGRICULTURE DEVELOPMENTS

- Nano-sensors will be sprinkled on crops or soil to monitor temperature, water, salinity, nitrogen and disease;
- Nanoparticles will be used as chemical delivery systems for pesticides and as alternatives to existing agricultural chemicals. Clemson University in South Carolina is developing bioactive nanoparticles that bind with bacteria in industrially farmed poultry meat, aiming to reduce their ability to infect humans.

WHAT ARE THE RISKS?

All of these developments ignore the systemic problems with the way we treat food and farming. No attempt is made to address consumption patterns or animal welfare issues – improved efficiency and profitability are the only aims. The parallels with GM foods should also trigger alarms. What, for example, will happen when materials never before found in nature enter the food supply and the environment?

'The US already has fewer farmers than prisoners. With their farming knowledge replaced by sensors what farmers are left will be little more than prisoners, farming according to the dictats of computer models and agribusinness corporations.'

Jim Thomas, European Programme Co-ordinator, ETC Group

Nanotechnology will increase the corporate control over agriculture with molecular breeding combined with nanosensors to control inputs like irrigation, fertilisers and pesticides making the farmer irrelevant to farming. Synthesising molecular alternatives to natural products will displace millions from primary production and rob the Third World of economic options. It will accelerate the existing trends of patent monopolies over life -- making a handful of corporations 'life-lords'. Most importantly, nanotechnlogies and the molecular vision of life will undermine more holistic systems for food and health.'

Vandana Shiva, Director, Research Foundation for Science, Technology and Ecology, India.

the many claims of its promoters and outlines some of the major risks that nanotechnology poses in their various fields of expertise.

or costing the Earth?

DEVELOPMENTS

Faster drug delivery

Researchers at MIT have affixed gold nanoparticles to strands of DNA. When the gold-plated DNA is exposed to a magnetic field, the strands break apart. When the magnetic field is removed, the strands re-form. The researchers have effectively developed a switch that will allow them to turn genes on and off. The goal is to speed up drug development, allowing pharmaceutical researchers to simulate the effects of a certain drug that also turns genes on or off. The lab has recently licensed the technology to a biotech startup, engeneOS, which intends to 'evolve detection and measurement in vitro into monitoring and manipulation at the molecular scale in cells and in vivo.' In other words, to stop testing in test tubes and start working in living bodies.

Artificial cell creation

Robert Freitas is developing an artificial red blood cell able to deliver 236 times more oxygen to tissues than natural red blood cells. The artificial cell, called a 'respirocyte', measures one micron across and has a nanocomputer on board, which can be reprogrammed remotely. Freitas predicts his device will be used to treat anaemia and lung disorders, but also will enhance human performance in sport and warfare. Among the risks, Freitas lists overheating, explosion and 'loss of physical integrity'.

Faster, more accurate diagnosis

A Stanford University chemist is developing a glucose sensor using a single carbon nanotube, to be implanted into diabetic patients.

More efficient drug delivery methods

- Researchers at Florida University have created a nanocapsule gel to deliver drugs into the eyes through soft contact lenses.
- Powderject has developed systems that deliver nanoparticle drugs through the skin at high velocity while SkyePharma is already bringing inhalable nanopharmaceuticals to the market.
- L'Oreal has pioneered similar techniques in cosmetics. Since 1995 its products have incorporated nanocapsules containing vitamin E which is delivered deep into the wearer's skin

Improved imaging

Cambridge University researchers are designing nanoparticles that bind to cancer cells. When a laser shines through the affected organ it picks up the nanoparticles creating a clear image of the cancer.

RISKS

The vast cost of undertaking nanotech research will necessitate most of the effort going into profitable medicines – ie medicines for the lifestyle conditions of the rich over the life threatening illnesses afflicting much of the world's poor. As with food, nanotechnology seeks the answers to life's problems in technofixes rather than addressing the root causes in society itself.

'Ultrafine particles (UFPs) are particles less than 1/10,000th mm in size. During our evolution, there were few UFPs of any relevance to health in our environment, mainly harmless soluble salts windblown from the sea. Now we are subjected to large quantities of UFPs from various combustion sources, and in addition, the nanotechnology industry is starting bulk production of UFPs for a wide range of applications, from drug delivery to sunscreen creams.

When materials that are normally harmless are converted into ultrafine particles, they tend to become toxic. The smaller the particles, the more reactive and toxic they generally become. This is unsurprising, because that is exactly how catalysts are made, to enhance industrial chemical reactions.

UFPs can get past the lung's defences into the spaces where gas exchange between the air and the blood takes place. The scavenger cells that mop up particles have difficulty in recognising UFPs as being 'foreign' and anyway they can be overwhelmed by too many particles.

There is evidence that UFPs can also gain entry to the body by ingestion and through the skin. In addition, there appears to be a natural 'passageway' for nanoparticles to get into and then subsequently around the body, through the 'caveolar' openings in the natural membranes which separate body compartments. These minute openings are thought to be involved in the transport of 'macromolecules' such as proteins, including, on occasion, viruses. They also happen to be about the right size for transporting UFPs. The pharmaceutical industry is exploiting this effect, to improve drug delivery to target organs, particularly the brain, which is protected by the very restrictive 'blood brain barrier'.

Chemists can apparently design UFPs that can hoodwink certain body membranes into allowing 'piggybacking' of novel chemicals on UFPs across these membranes. However, this means that when environmental UFPs (such as from traffic pollution) gain unintentional entry to the body, this same mechanism can deliver them to vital organs. The body is then 'wide open' to any toxic effects that they can exert.'

Professor Vyvyan Howard, department of human and cell biology, University of Liverpool

NANO-VISION

'Nanotechnologies have the potential to produce plentiful consumer goods with much lower throughput of materials and much less production of waste, thus reducing carbon dioxide build up and reducing global warming. They also have the potential to reduce waste, converting it to natural materials which do not threaten life.'

Lester Milbrath, Research Programme in Science and society, State University of New York.

DEVELOPMENTS

NanoSensors – Nanomix Inc is engineering nanotube-based sensors to detect gas leakages in chemical plants and refineries. They claim each sensor will cost 10 times less than conventional gas detectors and operate for a year on watch batteries.

Renewable Energy – In Japan photo-reactive nanocrystals are being developed for more efficient solar cell production. Researchers from the US Department of Energy have succeeded in embedding photovoltaic nanorods in plastic, creating moldable solar plastic cells. In time, developers hope to produce thin film 'solar wallpaper' or nanosolar paint that can be invisibly sprayed or applied to any surface transforming roads or building exteriors into vast energy generators. Researchers at Clemson University are embeding carbon nanotubes in plastics to produce 'Piezzoelectric' materials that generate electricity when flexed – such materials could be woven into sails to produce electricity as they flap in the wind. NEC is developing fuel cells based on carbon 'nanohorns' (like nanotubes) for incorporation into laptops and fuel cells from the start of 2004.

Rice University is developing methods that use the reactivity of nanoparticles to clean contaminants, especially biological contaminants from water. A number of small companies including Nanoscale already have products that promise to filter or destroy anthrax. Envirosystems sells a nanoemulsion called Ecotru – marketed as an environmentally friendly disinfectant.

Molecular recycling and biomimicry – By mimicking natural processes developers hope to produce synthetic materials that break down more easily in nature. Nano-visionaries such as Eric Drexler foresee a day when molecular nanobots will disassemble toxic waste and dispose of it safely or use its components to build new products.

Averting catastrophe – Technologist Douglas Mulhall argues that the real environmental threat in a nano-world will no longer come from human activity but from natural disasters such as earthquakes, asteroids and tsunamis. He argues that environmentalists should campaign now for new nanotechnologies to eradicate these natural events – for example nanobots to detect and dissolve asteroids or artificial ocean reefs to prevent tidal waves hitting America.

RISKS

Given the similar claims made for technologies such as nuclear power, synthetic plastics and GMOs, environmentalists are understandably wary when promised 'nano-electricity too cheap to meter' or 'better living through nano-chemistry'. There are three main areas of concern.

Toxicity

'At the nanoscale the properties of matter become different because of quantum effects, so they display new effects, perhaps becoming more chemically reactive. In part, these new properties are why companies are so interested and have or will soon use nanoparticles in sunscreens, cosmetics, coatings, explosives, batteries, antimicrobial bandages etc. But if they're different, why would we expect their environmental and toxic impacts to be the same as the 'safe' bulk product? Well you wouldn't. Is there any environmental and toxicological data on effects? Basically no. And there's no regulation that says you need to look. Just like with BSE, "no evidence of risk" is being taken to mean "evidence of no risk". We don't know for sure whether nanoparticles are dangerous or not. But we should find out before huge amounts of them are out in the environment.'

Doug Parr, Chief Scientific Advisor, Greenpeace UK

Nanobiosafety

Nanobiotech researchers are redesigning DNA, viruses, bacteria and even prions to grow nanowires, construct molecular mechanisms or develop medical implants and sensors but, as we know from escaped genes and superviruses, life, especially at the molecular level, has the ability to evolve in unpredictable ways affecting human and natural populations. Supposedly precise genetic engineering is usually accompanied by unpredictable secondary effects and short strands of synthetic DNA intended merely as scaffolding in nanomachinery could theoretically become incorporated into viruses and living organisms.

Grey Goo and Green Goo

The most persistent environmental fear expressed concerning nanotechnology was popularised by Bill Joy, founder of Sun Microsystems. Technically it is known as 'Global ecophagy by omnivorous replicators' but is usually characterized as 'the grey goo problem'. In this scenario out of control self-replicating nanobots could spread like blowing pollen, replicate swiftly, and reduce global ecosystems to dust or 'goo' in a matter of days. Like viruses, dangerous nanobots could easily be too tough, small, and rapidly spreading to stop. While many in the nanotech establishment dismiss molecular nanobots as science fiction many of the recent breakthroughs in nanobiotech point to the emergence of hybrid biomechanical nanomachines that will use biology rather than mechanics to self reproduce. In fact the larger problem may turn out to be 'green goo' rather than 'grey goo' as these half natural nanobiomachines slip out of human control.

DEVELOPMENTS

In March 2002, the US Army created the five year $50 million Institute for Soldier Nanotechnologies (ISN) at the Massachusetts Institute of Technology. The ISN is a huge undertaking, staffed by 150 researchers, including 35 MIT faculty members from eight different departments and several industrial partners to bring the nanotech research closer to a reality. Chemical giant DuPont brings years of experience in fibres and polymer materials. Arms manufacturer Raytheon will handle systems integration.

- One of the primary goals is to enhance the performance of the individual soldier. Developments include Nano-equipped warriors of the future with the ability to leap over 20 foot walls, fight with superhuman artificial limbs, and wear uniforms that make them invisible, invincible and provide automated first-aid on demand. Already they have developed 'exomuscles' as strong as human muscles capable of being flexed and stiffened on demand.

- Another immediate goal is reducing soldiers' weight load from 145 to 45 pounds. The Institute is currently developing a molecular 'chain mail' no heavier than paper.

RISKS

Every new war brings the same claims of more focussed weaponry, bringing less unintended death to civilians. But still the friendly fire and the collateral damge take their toll on the victims and the Earth. Nanotech will only serve to make the mighty mightier and ensure that it becomes ever harder for the rest of the world to challenge that power.

Furthermore, many of the technologies developed for use by the military will fast find their way into peace time uses, for example:

'By facilitating the minaturisation of remote camera design, nanotechnology will make it possible to place undetectable video cameras, microphones and transmitters almost anywhere. The development of portable, microfluidic platforms allows for small samples (eg tissue) to be analysed quickly and inexpensively. Use of this technology by employers and insurance companies to discriminate represents a significant threat to personal freedom.'

Michael D Mehta, PhD, director of the Sociology of Biotechnology Program through the College of Biotechnology.

DEVELOPMENTS

The US National Nanotechnology Initiative recently held seminars on 'Converging Technologies for Improving Human Performance'. A host of leading politicians, academics and military, industrial and technological leaders predicted that nanoscale technologies would one day usher in an era of 'sightless who will see... lame who will walk... infertile couples who will be able to conceive children'.

- Dr Carlo Montemagno, a leading nanotechnology resesearcher at the University of California Los Angeles is designing molecular connections that will allow neurons in the brain to communicate with silicon wires.

- At the University of Lund in Sweden, nanotechnology researchers are designing bionic hands that can be directly activated by the brain.

- US Navy researchers at the University of Wisconsin have designed night vision devices that interface with nerve cells in the tongue, allowing Navy Seals to 'see' through the tongue in watery environments. Unlike every other part of the body, the tongue has no dead layers of skin, the saliva conducts electricity well, and only requires 3 per cent of the voltage of normal skin. The device transmits information to the tongue via 100 different microscopic metal points.

- Those on the wilder edges of the nanotech community, including 'transhumanists' such as Eric Drexler of The Foresight Institute, Ray Kurzweil of MIT or Ralph Merkle of Zyvex, argue that nanotechnology will usher in 'radical life extension', bringing the dead out of cryogenic stupor or improving what they see as our woefully inadequate bodies.

RISKS

'The National Nanotechnology Initiative approach seems to treat 'disabilities' as a medical/technological problem – a subnormal deviation to be eradicated and improved upon. It does not see disabled people's 'set of abilities' as a legitimate variation intrinsic to humankind. Nor does it value disabled people as valid human beings in their own right to be recognised and supported by society.

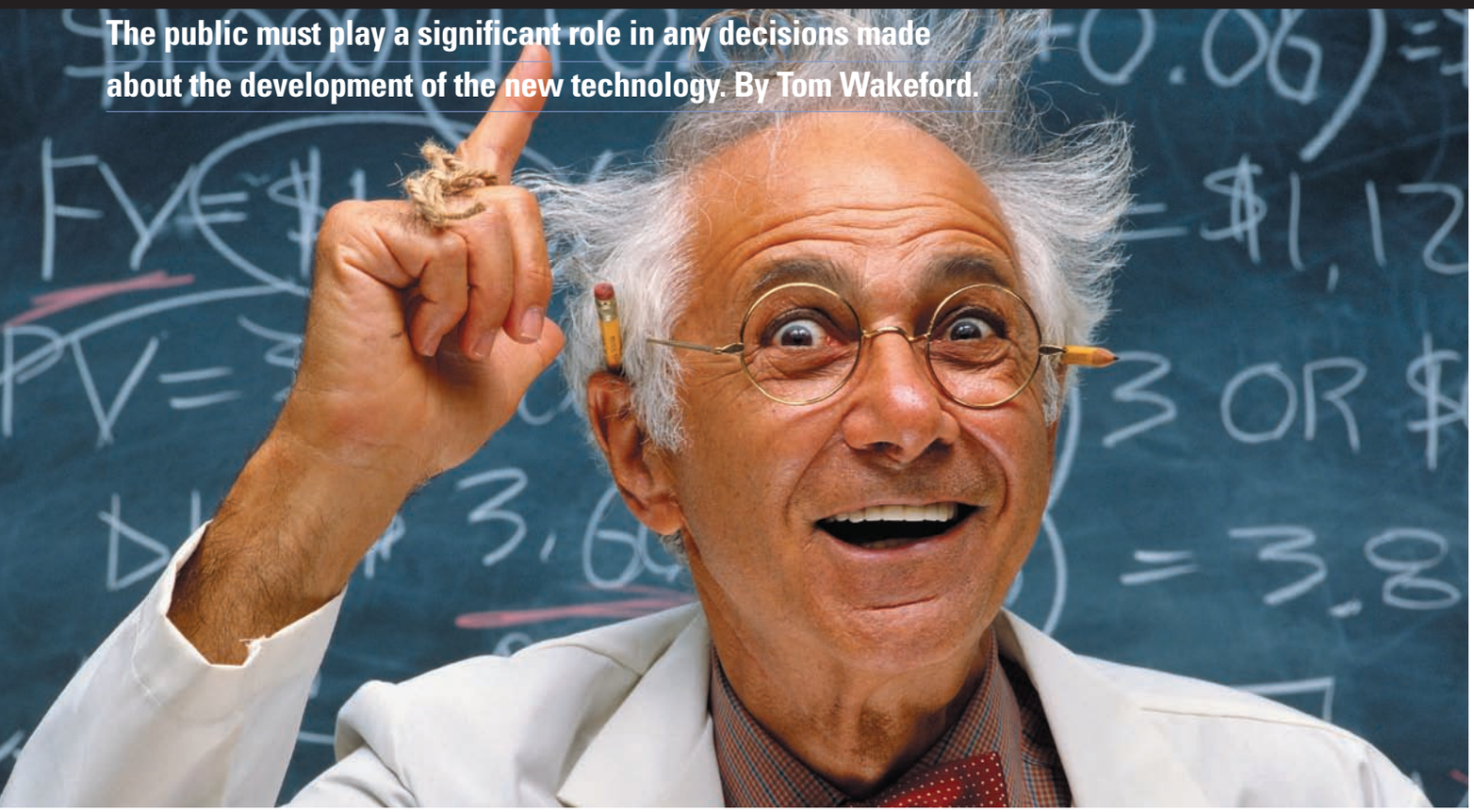
This approach narrows human diversity in general. As we create a technological rat race of escalating abilities what is 'normal' will shift towards a 'bionic norm' that all people will be expected to adhere to. Three recent USA incidents seem to support this conclusion. In 1998 the US Supreme Court set a dangerous precedent by ruling in two separate instances that a disabled person can't be seen as a disabled person with human rights protection under laws such as the American with Disability Act if a techno/medical fix is available. Furthermore, in 2002, a deaf mother who did not want to give her deaf child irreversible cochlear implants because she saw deafness as a culture and not as a defect had her child removed from her by child welfare.'

Gregor Wohlbring, Executive Director, International Centre for Bioethics, Culture & Disability

'Even a safe and benignly governed nanotechnology, if developed in the ways its proponents hope for, would overwhelm the scale of human life. If growing and making really are replaced by pushing the buttons on the side of a universal assembler, then there will be no need for us (a fact acknowledged by those techno-utopians who predict a "fast-forwarding of evolution" to a "post-human" world.) On such a planet, the spiritual and ethical and moral ideas that have grown up in the course of human development would be drained of meaning too.'

Bill McKibben, author *Enough – genetic engineering and the end of human nature*

The public must play a significant role in any decisions made about the development of the new technology. By Tom Wakeford.



who's in control?

When asked whether the UN's sanctions regime was worth the deaths of 500,000 Iraqi children, Madeleine Albright, then the US ambassador to the UN, replied: 'Yes, I think it is worth it.' When questioned about the paltry compensation paid to victims of the Bhopal chemical disaster, Dow Chemical's former CEO Michael Parker replied: '$500 is plenty good for an Indian'. For those at the top (the few who benefit) the price probably is worth paying. But what of the millions of Iraqis whose families have been torn apart, or the 200,000 now chronically ill survivors of Bhopal, or the thousands of Ukrainian farmers still unable to plough their radiation-scarred land 18 years after Chernobyl. Do they think the price of oil, or pesticides or nuclear power is worth paying? Were they even asked?

Of course not. No one ever is. We only ever get to decide whether technologies are worth it once we have realised they are not. Think DDT or thalidomide or CFCs. All only removed once the damage was done. The same is happening with the development of nanotechnology; except the consequences of it's going wrong will make a few thousand mutilated babies or a gap in the ozone layer look like a nanodrop in the ocean.

Engineering consent

The introduction of new technology goes something like this. First the technology is developed behind closed doors. Then the public is excited and won over with breathless pronouncements of wondrous advances and life-improving panaceas. After this, and only afterwards, regulatory regimes are set up and *adapted* to fit an already packaged product. Given the investments made in developing the technology, it is impossible to re-design it – even when potentially deleterious social or ecological effects have been identified. Already, nanotechnology has reached stage two: L'oréal adverts promise consumers more youthful skin thanks to new 'nanosomes'; they neglect to mention the possibility that nanoparticles could enter our bloodstream or vital organs.

The push for GM crops was a classic example of this three-stage process in action. Throughout the 1990s massive investments were made in optimising herbicide- and insect-resistant GM crop varieties before any realistic analyses had been made of whether they would benefit farmers or the land. By the mid-1990s, attempts to ensure consumer acceptance were made via a subsidised GM tomato puree that came out cheaper than its non-GM equivalent; the plan was to get us all used to the idea that GM could be part of our daily diet. Finally, the corporations developing GM pushed for – and in many countries secured – favourable regulatory regimes that would ensure farmers and consumers took most of the risks while multinationals made most of the profits.

By the time the public had any say on GM, the genie was already out of the bottle. The result? Protests and crop-pulling once the seeds had already been sown, rather than a reasoned discussion about the direction people wished a future technology to take. The recent leaks revealing that the government has already decided to approve the commercial growth of GM crops prove that its public debate on the issue currently taking place in the UK is nothing but a PR exercise.

In contrast to this use of public participation as a rubber-stamping

procedure for decisions that have already been made, a number of recent British and Indian projects have taken an entirely different approach. These projects illustrate how specialists and non-specialists could work together to determine mutually acceptable goals for the research and development of new technologies.

Citizen Foresight

Following an open brainstorming session, Citizen Foresight (a research tool set up by scientists at the universities of East London and Sussex) asked members of the UK public to list a series of options for the future of food and farming. Instead of being given a remit to focus on particular technologies like GM crops, the 12 panel members were allowed to set the agenda for the debate. They decided what the criteria would be by which the desirability of different options could be judged. They were also allowed to ask for extra witnesses to address issues not anticipated by the oversight panel. Among the unanimous results was a proposal for a complete re-structuring of the UK farming system to promote cheaper, locally produced organic food. GM foods were viewed as unnecessary and not worth the risks to public health.

GM rejected in India

Similarly, the 'Prajateerpu' process in India used a scenario workshop model to enable a jury of marginal farmers from Andhra Pradesh to choose between three contrasting 'visions' for the future of food and farming in their region. The options were illustrated by short documentary-style videos, which were followed by statements from 'witnesses' in support of each vision. While the information provided was clearly framed by the organisers, the jury was able to make an independent decision after extensive deliberations. Consequently, the small or landless farmers were able to critique the whole system of money-lending and coercion that led them into chemically-based agriculture and debt. Their rejection of GM was an inevitable consequence of their preference for a self-reliant agricultural system over one controlled by foreign multinationals.

Regulating God

Jim Watson was one of the original pair of scientists credited with 'discovering' the structure of DNA 50 years ago. When asked whether scientists were really the best people to regulate projects with huge social and ethical implications, he recently said: 'If scientists don't play God, who will?' Yet at the Royal Society's People's Science Summit in March Nobel laureate Sir Paul Nurse (the director of the RS's Science in Society committee) suggested that genetic technologies ought to be subject to democratic regulation. Nurse said that the opinions of non-scientists could be vital in stopping worrying developments such as DNA birth certificates.

A single dramatic lesson arises from almost every process that involves ordinary people, rather than just scientists, in setting agendas. It is that democratic deliberations tend to move attention away from providing quick technological 'fixes' for problems towards the practical delivery of social justice with existing technologies.

As the independent Genetic Futures Jury (GFJ) points out, it is not that lay people are 'anti-science' but that they see new technologies as diverting attention and resources away from solving problems best tackled with existing technologies. The GFJ was set up (by scientists) to promote the involvement of citizens in science. It was asked how we should respond to the geneticisation of society and nature. By the time they reached their verdict, the exclusively lay members of the jury had become holistic experts in the analysis of the future of genetics. They might not have had all the specialist knowledge of scientists, but they were able to synthesise it in a way that compared well with the practices of parliamentarians. What we need in the new nanotech age is an acceleration of such democratic initiatives, with the active involvement of scientists and decision-makers. This should be done at a global, as well as local, level.

If such an approach were adopted, scientists in 50 years time might view Watson's 'playing-God' remark the same way that we now view Thatcher's 'no-such-thing-as-society' comment. Only when we have developed proper mechanisms for bringing science under genuine democratic control will we be able to start a rational discussion about what role, if any, nanotech should play in our future.

Tom Wakeford leads the DIY citizens' jury project at the Policy, Ethics and Life Sciences Research Institute at the University of Newcastle.

An open public debate is the first imperative, followed by:

1 A moratorium

'In the absence of any kind of laboratory protocol for handling nanotech materials, the only sensible course of action is to call for a total moratorium' Pat Mooney, executive director of the Action Group on Erosion, Technology and Concentration

2 A global nano-safety protocol

Following the example of existing conventions for controlling potentially harmful materials, a nano-safety protocol based on the precautionary principle should govern safe handling, transfer, use and development of nanoparticles, nano materials, nano devices and nano-biotechnology.

3 An international convention for evaluation of new technologies

A UN body should be empowered to assess new and emerging technologies from a societal perspective, considering threats to democracy, livelihoods, culture and the environment.

4 Labelling

Given that nanoparticles are being used without any consumer knowledge, consumers should be able to avoid these novel particles if they so choose. Learning from the experience of GMOs, nanoparticle producers must also make available the means to identify and track their products should they need to be recalled.

5 Liability

Who will be held responsible if a commercially released nanoparticle turns out to be damaging to health, the environment or traditional livelihoods and culture? A strict regulatory system needs to be established now.

6 No patents on matter

The possibility of nano-patents means that the molecules and elements that make up the universe could one day come under legal monopolistic control. Clear rules need to be established to nullify any such nano-patents.

7 Arms control

Jurgen Altmann of the University of Dortmund in Germany and Mark Gubrud of the University of Maryland in the US have proposed that bioweapons and conventional arms agreements need to be strengthened to consider nanotech weaponry.

8 Clean production criteria

Does nanotechnology have any place in clean production systems? And will organic standards prohibit atomic modification as they have already prohibited genetic modification.

By rendering our skills, intelligence and labour redundant, nanotechnology is incompatible with meaningful human existence. By Bill McKibben.

More than enough

Let's assume for a moment that nanotechnology works out just as its proponents hope it will – that in the course of the next few decades we develop the power to easily manipulate matter at the atomic level, and that we also develop safeguards to keep it from spinning out of control. This is both the best-case scenario and the worst-case scenario. Because in its advanced conceptions nanotech is simply too powerful a technology to allow human meaning to exist in its shadow.

Its proponents see a day, not far off, when 'universal assemblers' will be able to deconstruct matter and produce finished products more or less at the touch of a button: feed dirt in one end of your magic machine, set the programme and a steak will pop out the other end. 'A potato is disassembled atom by atom and the information is recorded in an outrageously powerful nano-computer data bank,' the editors at *Nanozine.com* explain in a cheerful essay titled *Nanotechnological Pursuit of Happiness*. 'One can broadcast this information to the other side of the Earth or to a moon of Jupiter. Then, with the right feed stocks (carbon, oxygen, hydrogen, etc) and a few trillion nano-assemblers, one can reconstruct an exact copy of a potato.' In the words of inventor Ray Kurzweil, the technology will 'solve humanity's material needs'. Eric Drexler, the father of nanotech, puts it this way: 'The closest thing we have seen to this type of transformation was the Industrial Revolution, and that comparison somehow doesn't seem adequate.' Others have gone further: it's the biggest deal since the invention of fire, they say, since we figured out how to farm.

Or maybe even bigger.

All those other transformations, right up through the Industrial Revolution, have involved figuring out new ways to accomplish the work of survival. But nanotechnology is about abolishing the work of survival – about replacing human effort once and for all. 'People will have fewer and fewer attributes to sell,' predicts British Telecom's official futurist Ian Pearson. '[But] production and output could greatly increase… so we could all have a better quality of life without having to work.'

But can you have a better quality of life without having to do work? The futurists speculate that we will spend our time pursuing literature and painting (or maybe playing video games). Even here, they are happy to report, the new technologies will be a great aid. In a volume published a few years ago by the Massachusetts Institute of Technology, a man called Tom McKendree offered a sweeping view of the coming era of 'nanotech hobbies'. Model railroaders, he said, 'could build a working replica – small but visible – of the entire US railroad network'. For needleworkers, who like 'the pleasant calming effect' that stitching produces in their souls, 'nanotechnology could [remove] some of the petty annoyances. A piece of cloth could have a pattern printed directly on it that faded away at each stitch or sounded a gentle alarm if one mis-stitched a thread'. Once we've perfected nano-medicine, McKendree added, thrill seekers would be able to engage in 'hand-to-hand combat using medieval weapons; this activity could be quite realistic, down to producing wounds that would today kill a person'.

I don't know for sure what this world would feel like. What it would mean if we were 'seamlessly articulated with intelligent machines' or if the 'realm of the born and the realm of the made... become one.' I can imagine what a cat feels like stretched in the late afternoon sun, but I can't quite channel what it would be like to inhabit a 'warm, energised, super-sensual morphing device of graceful complexity and beauty.' It's like imagining you are a car, trying to sense the asphalt against your rubber, the fluid coursing through your brake lines. Try as I might these seem to me deadening, muffling technologies, without even the promise that accompanies some of the talk of genetic engineering. They would cut us off even more fully than we already are from the rest of the natural world.

Look: there are technologies too powerful to coexist with a human future. We either rein them in or we bow off the stage. Nuclear weapons were one; there was no way to contemplate a human future in which they were regularly employed. And nanotechnology may be another, though it comes wearing a big shiny smile. Human meaning is produced by human effort. I have a neighbour who grows organic potatoes. His operation is called 'Golden Russet Farms'. All year he works to figure out how best to do it – when to plant, when to water, when to pick. He is not rich, but he is powerfully engaged. Deeply happy, I think. Meaning is already in somewhat short supply in the Western world. Sometimes we have to manufacture it by running marathons. But we cannot live without it. Otherwise we might as well be robots.

The proponents of this kind of work anticipate the disappearance of humans with ill-disguised glee. They speak of a 'post-human future', of 'fast-forwarding our evolution'. They talk frankly and openly of the world they foresee. It's worth taking them seriously and asking if it's a world we really want, or if – like King Midas – we may find ourselves someplace where it's impossible to live the lives we need to live.

Bill Mckibben is the best-selling author of *The End of Nature*. His new book, *Enough: genetic engineering and the end of human nature* (Bloomsbury, £17.99), comes out in the UK this month.

MAGAZINES

Small Times – the trade magazine of the nanotech industry (also covers Mems – Micro-Electronic Mechanical Systems)

The Wolfe Report – a joint publication of *Forbes* magazine and Lux capital; regular and pricey overview for investors of what's happening in the nanotech sector

Other magazines that regularly follow nanotech developments include *Red Herring, Wired, Scientific American, New Scientist, Forbes, Nature* and *Technology Review.*

NON-FICTION

Engines of Creation, K Eric Drexler
The book that popularised nanotechnology and introduced Drexler's theories of self-assembling molecular manufacturing and nanobots
(Anchor Books, 1987)

Nanosystems: molecular machinery, manufacturing and computation, K Eric Drexler
Technical companion to *Engines of Creation*
(John Wiley, 1992)

Unbounding the Future, K Eric Drexler and Christine Petersen
Essentially an update of *Engines of Creation*
(Quill, 1993)

Nanotechnology: molecular speculations on global abundance, edited by BC Crandall
A Drexlerian collection of essays and lists imagining what nanotechnology might one day achieve
(MIT Press, 1996)

The Age of Spiritual Machines, Ray Kurzweil
MIT artificial intelligence guru speculates that the combination of nanotechnology, robotics and artificial intelligence will give rise to a shift in human evolution
(Available online; Penguin, 2000)

Our Molecular Future, Douglas Mulhall
Self-proclaimed nano-ecologist argues that by harnessing the convergence of genetics, robotics, artificial intelligence and nanotechnology humanity can overcome ecological collapse, asteroid hits, tsunamis and other natural disasters
(Prometheus Books, 2002)

Nanotechnology: shaping the world atom by atom, Mihail Rocco
General introduction from the US government
(Available online at: www.nano.gov)

NBIC (Nano-Bio-Info-Cogno): converging technologies for improving human performance, Mihail Rocco, Newt Gingrich, et al
Collection of over 80 essays and presentations examining the possibilities of NBIC convergence
(Available online at: www.wtec.org/Converging Technologies/)

The ETC Century: erosion, technological transformation and corporate concentration in the 21st century, Pat Roy Mooney
How nanotechnology is driving the erosion of human rights, rural livelihoods, the environment and democracy
(Dag Hammarskjold Foundation 2000; available online at: www.etcgroup.org

Atomtech: technologies converging at the nano-scale, the ETC Group
The first comprehensive report by a civil society group to critically examine the current developments in nanotechnology
(Available online at: www.etcgroup.org)

ELECTRONIC NEWS SOURCES

Small Times online (www.smalltimes.com) – daily features, news and an extensive archive

Nanodot (www.nanodot.org) – newswire run by the Foresight Institute, which anyone can post to

Nanogirl News (www.nanoindustries.com) – weekly news roundup by Gina 'Nanogirl' Miller

TNT Weekly (www.CMP-cientifica.com) – European consultancy that also runs the European NanoBusiness Association; regular weekly nano-industry news

Nano Apex (www.nanoapex.com) – news website on nanotechnology and Mems

Nanotechweb (www.nanotechweb.org) European-based news website with weekly email roundup

Betterhumans: www.betterhumans.com – 'trans-humanist' site that closely tracks nanotechnology news

ENVIRONMENTAL WARS • Whichever side wins, there is one loser in every war – the Earth.

GREENLAND

In 1968, a B-52 carrying four nuclear bombs crashed near the Pentagon's Thule Air Force base in northern Greenland. In a 1991 study, Danish researchers found levels of plutonium in shellfish up to 1,000 times higher than pre-crash levels.

CANADA

The US military built a network of radar sites in Northern Canada between 1953 and 1958.The sites are now contaminated with carcinogenic polychlorinated biphenyls (PCBs), petroleum, radioactive waste and solvents.

PANAMA

The US military left firing ranges in the Panama Canal Zone littered with thousands of unexploded rounds. A July 1998 Pentagon report found that the US Army Corps of Engineers dumped tons of soil from a project to widen the canal onto 92 acres in Panama 's Empire Range, damaging the rain-forest ecosystem. A 1997 study for the US Army also discovered the carcinogen TCI in the ground water – at 20 times the level acceptable under US federal law.

ISLA DE VIEQUES, PUERTO RICO

The use of bombs, depleted uranium and chemical weapons has resulted in a cancer rate 26 per cent higher than the rest of Puerto Rico. The US Navy, which occupies 26,000 of the island's 33,000 acres, has also contaminated the soil, destroyed its coral reefs and emitted toxic heavy metals into the marine environment.

COLOMBIA

Large-scale herbicide spraying under the 'Plan Colombia' – ostensibly for coca eradication – has caused 'serious human health effects; large-scale destruction of food crops; and severe environmental impacts in sensitive tropical ecosystems', according to a 2002 report of the *Aerial Spraying Review*, an environmental publication. There is also evidence that the Pentagon-sponsored fumigation campaign has caused a 'loss of agricultural resources, including fish kills and sickness and death of livestock'. Border areas of Ecuador have also been contaminated.

THE MILITARY IS THE WORLD'S BIGGEST POLLUTER

- The US Department of Defence (DOD) generates 750,000 tonnes of hazardous waste a year, more than the five largest chemical companies combined.

THE MILITARY IS THE LARGEST CONTRIBUTOR TO CLIMATE CHANGE

- Together, the world's militaries consume as much petrol as Japan – the world's second largest economy – and produce an estimated 10 per cent of global air pollution. Approximately one quarter of the world's jet fuel is consumed by the armed forces.
- The world's military forces are responsible for the emission of more than two thirds of ozone-depleting CFCs and Halon.

NUCLEAR WEAPONS ARE AN ENVIRONMENTAL CATASTROPHE

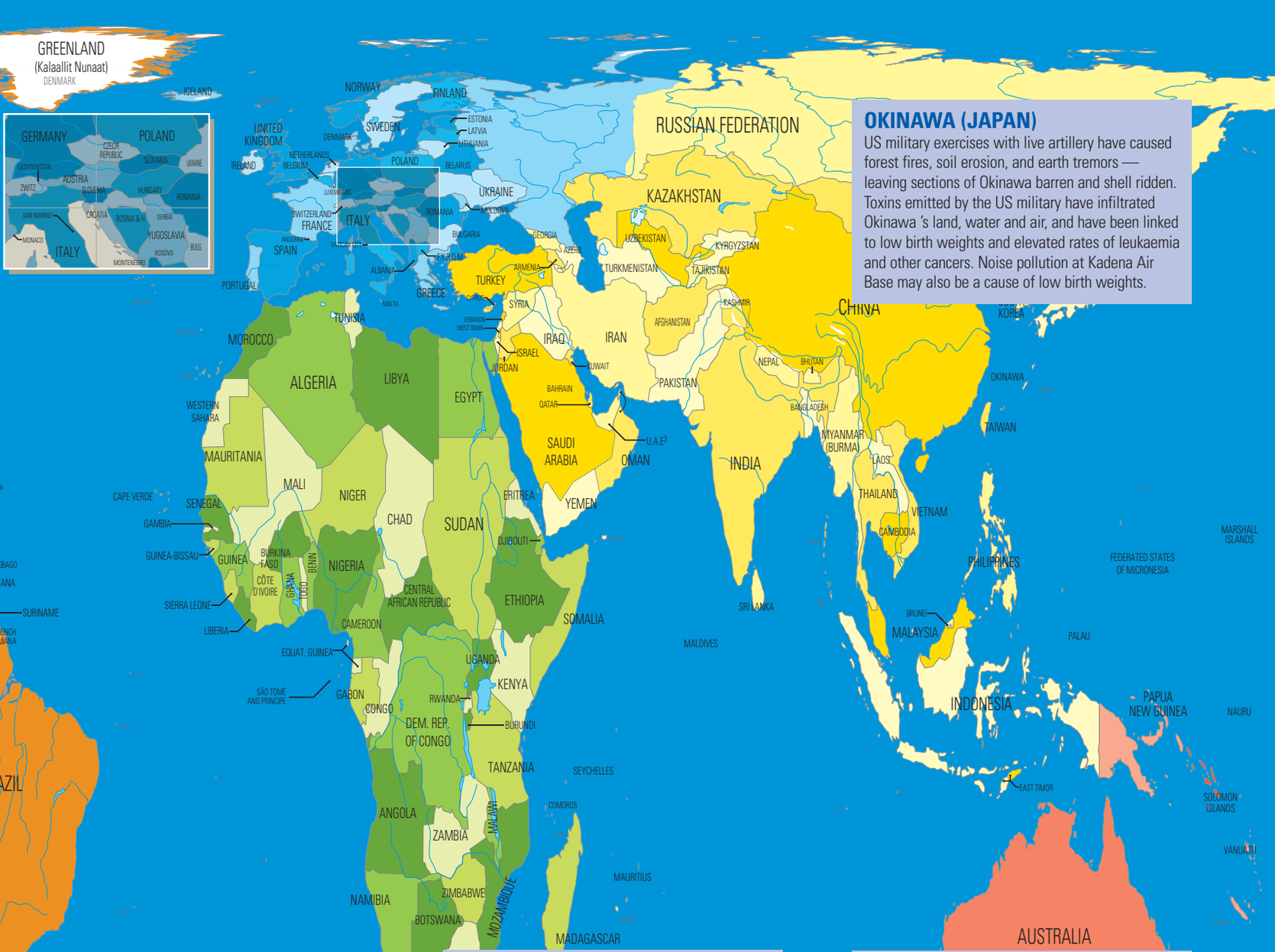
- There are 400 metric tons of weapons grade plutonium in the world today; most of it in the US and former Soviet military stockpiles. The ever present threat of nuclear war aside, plutonium has a radioactive half-life of 24,000 years. One millionth of an ounce of inhaled plutonium oxide dust will cause lung cancer in humans.
- As a result of naval accidents, at least 50 nuclear warheads and 11 nuclear reactors litter the ocean floor.

MONEY SPENT ON THE MILITARY IS MONEY BETTER SPENT ELSEWHERE

- In the 1980s, the Ethiopian government spent an annual average of $275 million on waging war in Eritrea & Tigre. An annual expenditure of $50 million a year on tree planting and soil conservation would have reversed desertification in the country and thereby helped to prevent the deaths of over a million people in the 1985 famine.

MILITARIES ARE ROUTINELY EXEMPT FROM ENVIRONMENTAL REGULATIONS

- The US Environmental Protection Agency lacks clear authority to oversee DOD practices [further more, the majority of US bases are sited on 'federal reserves', not covered by regulations] and has no authority to police overseas facilities. The Pentagon is currently lobbying for statutory exemption from the Clean Air Act, Marine Mammal Protection Act, Endangered Species Act, Migratory Bird Treaty Act and federal toxic waste laws.



OKINAWA (JAPAN)

US military exercises with live artillery have caused forest fires, soil erosion, and earth tremors — leaving sections of Okinawa barren and shell ridden. Toxins emitted by the US military have infiltrated Okinawa 's land, water and air, and have been linked to low birth weights and elevated rates of leukaemia and other cancers. Noise pollution at Kadena Air Base may also be a cause of low birth weights.

AFGHANISTAN

Many Kabul residents were found to have symptoms consistent with uranium exposure (joint pains, flu-like illnesses, bleeding mucous membranes, etc), in a study carried out by the Uranium Medical Research Centre (UMRC) in late 2002 to examine the effects of US bombing on the city. One quarter of the Kabul newborns examined had health problems consistent with uranium, including lethargy, skin rashes, and enlarged heads.

PHILIPPINES

The former site of Clark Air Base has contaminated the groundwater. The US military also dumped hazardous waste in a municipal landfill in a residential area of Mabalacat. The power plant at the Subic Bay Naval Base emitted untreated pollutants directly into the air.Toxic waste from the destruction of excess bombs and ammunition were poured into local streams. In addition, most of the sewage generated at the Subic Bay base was discharged each day, untreated, directly into the bay.

SERBIA

After the US military bombed a petrochemical complex in the suburbs of Belgrade in 1999, the destroyed plastics factory and ammonia production unit released toxins such as chlorine into the air.

INDOCHINA

Nearly 30 years after the end of the US war in Southeast Asia, many of the affected ecosystems have still not recovered, according to the Environmental Conference on Cambodia, Laos and Vietnam (Stockholm, 2002).Ten per cent of southern Vietnam's forests (including one third of the coastal mangroves, which play a vital role in the coastal ecosystem and fish habitats) were destroyed by the 72 million litres of herbicide the US military dropped during the Vietnam War era. Arsenic and dioxin in the herbicides are expected to pose a health threat long into the future. Since 1975, 50,000 civilians have been killed by the landmines and other weapons the US military left behind. The US's vast bombing campaign also left millions of large unusable bomb craters.

IRAQ

US bombing of oil facilities in January 1991 caused spills of 6 to 8 million barrels of crude oil, killing about 30,000 marine birds. For nearly a year afterwards, oil well fires spewed toxic soot. The bombing also poisoned Iraqi water supplies. In addition, according to Iraq's Ministry of Health, depleted uranium from US weapons has contaminated the soil and plants in southern Iraq, causing cancers and deformities associated with uranium exposure. The environmental costs of the current war will not be known for some time to come.

SOUTH KOREA

Oil from the Yongsan 8th garrison's base has contaminated the soil and water. Asbestos has been found around the Camp Indian base. In May 1998, a ruptured pipeline at the Mt Rackun military base polluted a large section of a South Korean forest conservancy area. US military drills and manoeuvres have also damaged farmlands and destroyed crops. Oil discharged by the US Army has polluted the Sankogos River, contaminated farmland, and destroyed crops. Off the coast of South Korea, the US military has used small islands as bombing ranges, creating noise pollution for nearby villages. The ammunition left behind has also injured residents.

Considering its estimated 25,000-plus uses – for producing food, fuel, medicine, paper, plastics and even dynamite – the most wasteful thing you could probably do with hemp is smoke it. Jake Bowers describes hemp's potential to transform agriculture and the plant's demonisation by huge and competing industrial interests.

seeds of ho

CORBIS

In a scrubbed-out cow shed at the end of a rutted track in East Sussex, a seed packed with all the potential to transform British agriculture and save the planet is slowly taking root. Where cows once crapped and chewed the cud, Henry Gage is hunched over a lap-top germinating his plan to free one of the most 'dangerous' plants on the planet. This year Gage plans to grow 1,000 acres of hemp (Cannabis sativa L) across Britain. Yet Gage is no home-grown drugs baron but an energetic young farmer, and he doesn't want us to smoke his crop but eat it.

WONDER WEED

Hemp poses little threat to you or I, but the plant's incredible versatility could have an explosive effect on a vast array of unsustainable industries. Gage's crop is the same plant as the cannabis consumed by recreational drug users, but it contains so little THC (tetrahydrocannabinol – the psychoactive chemical in cannabis) that you'd need to smoke a joint the size of a telegraph pole to get stoned. In fact, considering hemp's estimated 25,000 other uses (for producing food, fuel, medicine, paper, plastics and even dynamite), the most useless thing you could do with the crop is smoke it. Yet huge industrial interests created and perpetuated the myth that one of the world's most useful plants is one of the most dangerous. But now the serrated green leaves of the plant are beginning to cut through the hysterical haze that has engulfed hemp for over 60 years.

Gage explains that hemp truly is a wonder weed with a huge potential to help British farmers diversify and convert to organic agriculture. 'It grows freely on almost any ground without the use of pesticides or herbicides,' he says. 'It needs minimum attention from the farmer, and leaves the fields where it is grown virtually weed free for the next crop.' He describes society's continuing irrational fear of the plant as 'cannaphobia'.

At the relatively young age of 27, Gage doesn't seem like your average farmer. He says he didn't even consider working the land until he heard about hemp. But with access to a 1,000-acre family farm in Sussex, he started the firm Mother Hemp with his friend Sarah Yearsley in 1998. Five years on, the pair have yet to turn a profit, but have become an unofficial hemp marketing board. Finally, however, their emotional and financial investment may be about to yield economic fruit.

As holder of Britain's second commercial hemp licence, Mother Hemp will this spring be licensing farmers to grow a highly nutritious variety of hemp called Finola. Unlike Britain's other commercial hemp licensee, which largely produces hemp fibres for the interiors of expensive German cars, Mother Hemp's produce will be available on the shelves of British food shops.

Attempting to persuade Britons to overcome their collective cannaphobia and eat hemp might seem like a PR job from hell, but Mother Hemp is well-armed. Its most powerful weapon, hemp-seed oil, turns out to be one of the most nutritious oils on the planet.

Yearsley says: 'While hemp-seed oil is relatively new to the modern Western pallet, it has been used as an inexpensive substitute for butter

in most eastern European countries, particularly Russia.' Recent clinical trials on Finola, conducted by nutritionist Dr Jayce Callaway at the University of Kuopio in Finland, found that hemp-seed oil relieved eczema and helped combat flu. 'Hemp-seed oil is an exceptional source of the essential fatty acids (EFAs) that we must obtain from our daily diet because, like vitamins, we can't produce them on our own,' says Callaway. 'Judging from the fatty-acid profile of hemp-seed oil, numerous anecdotal reports and the results of our clinical investigations, I'd have to conclude that this is probably the healthiest oil on the market.' Ironically, given the plant's narcotic associations, hemp-seed oil may even help keep you happy. Nutritionists are increasingly recommending EFAs omega-3 and omega-6 (found in high quantities in fish and hemp-seed oil) to help combat clinical depression.

So, if hemp is more of a benefit than a threat to public health, why is its cultivation still strictly licensed under Britain's Misuse of Drugs Act?

REEFER MADNESS

The answer lies in 1930s America, and it has nothing to do with hemp's narcotic or nutritional properties. The forgotten history of hemp provides an instructive lesson in how powerful industrial interests have always sacrificed sustainability at the altar of profit to set society on an environmentally destructive course. Hemp activists say the plant's prohibition started in the US (and spread throughout the world) because of the threat the plant posed to the unsustainable, but highly profitable, plastics, textiles and paper interests of media magnate William Randolph Hearst and the US government's chief munitions and textiles manufacturer DuPont.

No man has done more to document this forgotten history than cannabis activist Jack Herer through his best-selling book (now in its 11th edition) *The Emperor Wears No Clothes*. The book records in painstaking detail how hemp was one of mankind's most significant crops from 8,000 BC until the beginning of the 20th century. Up to the late 19th century, for example, the majority of all twine, rope, sails, rigging and nets were made from hemp fibre. Herer claims that the plant's importance to the British was so great that Napoleon invaded Russia in 1812 primarily to stop the Russians selling hemp to the British navy. Hemp has had many other interesting footnotes in human history – both the Magna Carta and the American Declaration of Independence were written on hemp paper.

Herer says hemp's use declined at the beginning of the 20th century because of a 'lack of mechanised harvesting and breaking technology needed for mass production'. But in 1916 the US Department of Agriculture (USDA) reported that new technology would soon be developed to make hemp the US's number-one crop. The USDA reported that one acre of hemp in annual rotation over a 20-year period could produce as much pulp for paper as 4.1 acres of trees being cut down.

William Randolph Hearst

Dupont

'In the 1930s when the new [harvesting and breaking] machines became state of the art, available and affordable,' says Herer, 'the Hearst Paper Manufacturing Division, Kimberley Clarke and virtually all other timber, paper and large newspaper companies stood to lose billions of dollars.'

But the resurgence of hemp in the late 1930s didn't just threaten forestry and publishing interests. Its strong natural fibres were also ideal for producing textiles, plastics and even explosives. DuPont had just patented nylon, as well as processes for making plastics from oil and coal, and new highly polluting techniques for making paper from wood pulp.

'According to DuPont's own corporate records and historians,' explains Herer, 'these processes accounted for 80 per cent of the company's railroad car loadings over the next 60 years. If hemp had not been made illegal, 80 per cent of DuPont's business would never have materialised.'

So, in 1937 hemp was made illegal in the US, when the Marijuana Tax Act effectively removed it from the market. But before hemp was outlawed it needed to be demonised. That's where William Randolph Hearst, the subject of Orson Welles's film *Citizen Kane*, came in. Hearst used his chain of newspapers to spread anti-hemp propaganda despite several contemporary official British and US reports concluding that cannabis smoking was safe.

'In the 1920s and 1930s Hearst's newspapers deliberately manufactured a new threat to the US and a new campaign to have hemp outlawed,' says Herer. 'For example, a story of a car accident in which a "marijuana cigarette" was found would dominate the headlines for weeks, while alcohol-related car incidents made only the back pages.'

Herer says this theme of cannabis-related crime was repeatedly burned into the minds of Americans through the use of ▶

hysterical headlines like 'Reefer madness' and 'Marijuana – assassin of youth'. Throughout the 1930s, Hearst's network of tabloids ran sensational stories about 'marijuana-crazed negroes' raping white women and playing a type of 'voodoo satanic music' now known simply as jazz. Hearst's long-running campaign would seem laughable today if it weren't for the enduring cannaphobia it helped to create. The Hearst Corporation, owner of Britain's National Magazine Company and publisher of *Cosmopolitan* and *Esquire*, has proved equally resilient.

THE GREAT HEMP FIGHT BACK

But if hemp's resurgence was (quite literally) nipped in the bud by industrial interests in the 1930s, it is now finally waking from its Rip-van-Winkle years. Across the world, farmers, environmentalists and entrepreneurs are coming together to promote it as a panacea plant for many of industrial society's environmental problems. Hemp is now in agricultural production in Australia, New Zealand and across the EU. Britain is the only EU country that still requires licences for hemp cultivation.

In France hemp fibres are combined with lime to make a lightweight plaster with environmentally friendly insulating and pest-resistant properties. The French also use hemp to make cigarette papers and bibles. In Germany, where hemp cultivation was legalised in 1996, a multi-million euro hemp-product market includes environmentally friendly paints, detergents, foods, body-care products, papers and textiles. In Hungary, Romania and Poland farmers are producing an ever increasing amount for export for use in rope, textiles and building materials. China, by far the world's largest consumer and exporter of hemp, has been cultivating the plant for over 6,000 years. The annual output of Chinese hemp linen alone is currently worth over 10 billion yuan (about $1.2 billion).

John W Roulac, author of *Hemp Horizons: the comeback of the world's most promising plant*, says: 'The world is slowly moving toward a carbohydrate economy that relies on plant materials and away from a petroleum economy. Hemp fits well into this resource shift, and can transform our over-reliance on petroleum-based products and services.

'Imagine a crop more versatile than the soya bean, the cotton plant and the Douglas fir tree put together, one whose products are interchangeable with those from timber or petroleum, one that grows like Jack's beanstalk with minimal tending. There is such a crop: industrial hemp.'

Roulac has been described as a 'new age Johnny Appleseed' in the US. As founder of the hemp food business Nutiva, he not only sells and eats hemp foods but wears hemp clothes and writes books about the plant. Hemp cultivation is illegal in the US, but not in Canada where it is flourishing and from where Nutiva imports the seed used to manufacture its products. Just as the rest of the world is giving hemp a break, prohibition is intensifying in the US. Last year, the US Drug Enforcement Administration (DEA) declared hemp foods containing even trace amounts of THC illegal.

'The US government has a long history as a "market enforcer" for fascist corporations that choose to eliminate competition rather than compete in a free-market economy,' comments Roulac. 'Tens of millions of Americans realise the greatest terror threat we face today is from a handful of corrupt Americans who run roughshod over civil society.'

With their livelihoods under threat, hemp businesses have joined forces to sue the DEA in the hope of overturning the ban. The case is currently before the US Court of Appeals and should be resolved this year. But some individuals aren't prepared to wait for the US government to become more enlightened.

A SIOUX REBELLION

On the Pine Ridge reservation in South Dakota, Oglala Sioux farmer Alex White Plume has become the first person in over 40 years to grow industrial hemp in the US. Hemp cultivation may be illegal in America, but White Plume says that Pine Ridge 'is not part of the US'. In 1998, the Oglala Sioux tribal council voted to legalise hemp. Tribal members say that because the Oglala Sioux tribe is a sovereign nation, its laws should apply on the reservation. Initial attempts at hemp cultivation were stopped when armed federal agents destroyed and removed the crop. For the Oglala Sioux, the fight to cultivate hemp has now become

synonymous with the long struggle for native sovereignty

White Plume's home lies just 10 miles north of Wounded Knee, where in 1890 US army soldiers massacred between 150 and 300 Oglala Sioux men, women and children. The 7,000-square-mile Pine Ridge reservation is home to 18,000 descendants of the Oglala Sioux pushed out of South Dakota's Black Hills after gold was discovered there. The unemployment rate on the reservation is 80 per cent.

'I was going to be the first Indian millionaire,' White Plume says wryly. But in 2000 and 2001 the federal authorities destroyed his crop. Last year, however, he finally succeeded in harvesting and selling his crop before federal agents could remove it. 'Before, I have always had to stand by helplessly,' he says. 'I felt like our grandfathers at Wounded Knee watching helplessly while our people were killed. But I do not want to be helpless anymore.' White Plume has a $1 bill bearing the portrait of another US hemp farmer – George Washington – on his wall.

Given hemp's contribution to US history, you'd think the Bush administration would be a little kinder to the plant. Hemp activists love to point out that when George Bush Snr bailed out of a US Air Force plane over the Pacific Ocean during WWII, the parachute that saved his life was made from hemp. Not even the wonder weed, it would seem, has made an entirely positive contribution to world history.

With the notable exception of the US the world is finally beginning to embrace hemp for its environmental benefits. 'But none of these hemp benefits will occur,' warns Roulac, 'without increasing the market demand for hemp products. People need to vote with their money and help jump-start hemp commerce.'

Such a vote would prove that even the most powerful industrial interests on earth cannot keep a good weed down ■

Jake Bowers is a freelance journalist.

Agricultural Benefits
Pest resistance
Weed suppression
Elimination of pesticides
Pollen isolation
Soil improvement with crop rotation

Whole Plant
Biomass fuel

Cell Fluid
Abrasive fluids

THC
(from Flowers and Leaves of medical hemp only – THC levels in industrial hemp are too low)
Treatment for: glaucoma, insomnia, multiple schlerosis, cancer, anorexia

Industrial Products
Agro-fiber composites
Compression moulded parts
Brake/Clutch linings
Caulking

Textiles
Apparel; Nappies; Fabrics; Bags; Work clothes; Denim; Socks; Shoes; Fine textiles

Technical Textiles
Twine; Rope; Nets; Tarpauline; Carpets; Bed covering; Geotextiles

Hurds & leaves
Animal bedding
Mulch
Mushroom compost

Building Materials
Fiberboard
Insulation material
Fiberglass substitute
Cement Blocks
Stucco and mortar

Paper
Printing paper
Fine and speciality paper
Technical filter paper
Newsprint
Cardboard and packaging

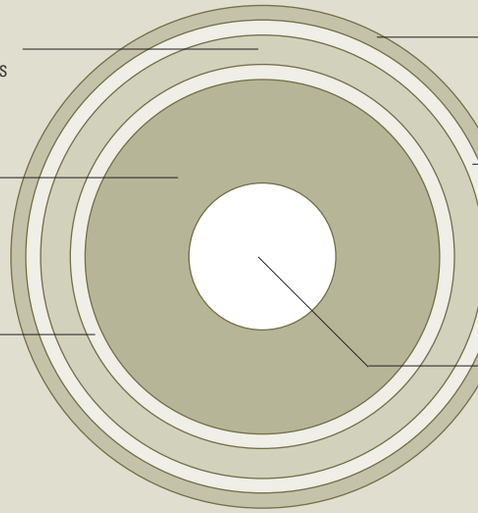
Foods
Porridge/ granola
Birdseed
Flour
Cheese substitute

Seed Cake
[after pressing seeds for oil]
Animal feed
Protein-rich fibre

Personal Hygiene
Soap; Shampoo; Bath gels; Cosmetics

Technical Products
Oil paints; Varnishes; Printing links; Fuel; Solvents; Machine part lubricants; Putty; Coatings

Foods
Salad oil
Food supplement [source of EFAs]



HEMP WEBSITES:
Food: www.motherhemp.com; www.nutiva.com **Fibre:** www.hemcore.com Textiles & paper: www.bioregional.com www.livingtreepaper.com. **Clothing:** www.ecolution.com www.minawear.com **Medicine**: www.gwpharm.com.

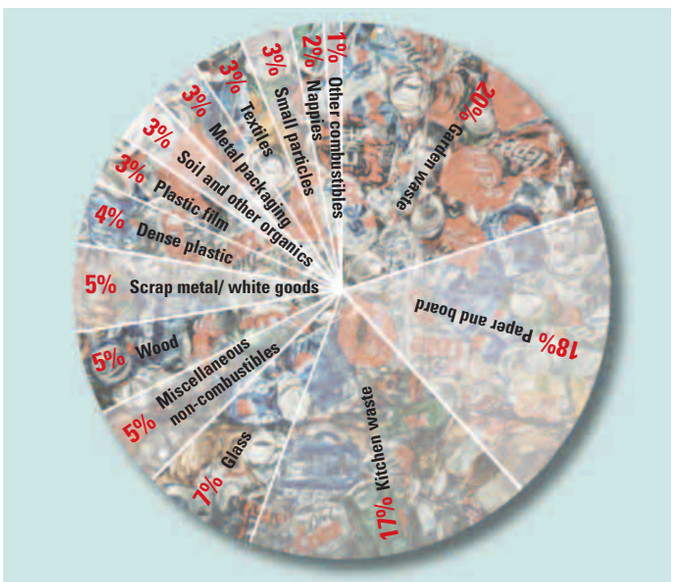
WASTE RECYCLING • Recycling UK waste would provide jobs, cut polluting emissions, lead to lower council tax bills and preserve raw materials. So why won't the government get behind it? Matilda Lee reports.

Waste is increasing by about 3 per cent each year in England – faster than the growth in GDP. We may not see it, but ours is a mounting waste problem: we now produce enough waste in one hour to fill the Albert Hall. In November 2002, the government published a review of its waste strategy and admitted that recycling levels in England were 'well below those in most other EU countries'. The government's report recommended doorstep recycling for all, and said that by 2020 municipal waste 'will double… and cost £1.6 billion a year more (at current prices) to manage and dispose of'.

We currently use over six billion glass containers and 23,000 tonnes of aluminium foil packaging each year, as well as 500 million plastic bags a week. Most of these materials are used once and put in the bin. It's time to clean up our act.

WASTING AWAY

How the average household's one tonne of waste a year adds up:



RECYCLING TARGETS

In 2000 the government's waste strategy announced the aim to recycle 30 per cent of English domestic waste by 2010 and 33 per cent by 2015. These targets were described by the House of Commons Environment, Transport and Regional Affairs Select Committee as 'depressingly unambitious'. The committee said the strategy was a 'woefully inadequate… underfunded compromise'. If the UK continues increasing recycling by a pathetic 1 per cent a year, it risks having to pay daily fines of up to £400,000 for significantly failing to meet EU landfill regulations.

What's stopping the UK from recycling then?

Limited provision of doorstep recycling schemes
Of recycled household waste, only 30 per cent comes from doorstep schemes.

Zero political will to recycle
Responsibility for waste management is split between different tiers of local government. This causes conflict between collection and disposal authorities.

Few financial incentives to divert waste from landfills
The UK's landfill tax is £13 per tonne. Denmark's is £34 per tonne. The Netherlands is £45 per tonne.

Incinerators encourage waste maximisation
Incinerator companies require local councils to sign long-term contracts guaranteeing a steady stream of waste.

RECYCLING INITIATIVES THAT WORK

Austria...

has already met the EU's Landfill 2016 target through mandatory doorstep collection schemes for households and strict rules and differentiated taxes on landfills. The total amount of waste sent to landfill was reduced from 63 per cent in 1989 to 32 per cent in 1996.

Edmonton, Canada

81 per cent of Edmonton's population now participates in a kerbside recycling scheme and the city boasts one of North America's largest composting plants. Only 30 per cent of waste is sent to landfill (in 1998 the figure was 86 per cent). They've also increased composting rates to 50 per cent from nearly nothing in 1998.

New Zealand

45 per cent of the country's local authorities have set a zero-waste-to-landfills goal by 2015. Each authority has enacted its own programmes to achieve the zero-waste target. These include: a doubling of the landfill tax; kerbside collection schemes; city-run compost plants; waste education in schools; waste-minimisation initiatives; compost worm farming; and resource-recovery centres.

WHAT CAN YOU DO?

Support the UK's Municipal Waste Recycling Bill 2003
To ensure the bill isn't watered down as it passes through Parliament, please send your name, full address and email details to Camilla Freeman at Friends of the Earth, 26-28 Underwood Street, London N1 7JQ. Or email: CamillaF@foe.co.uk. Please label post and emails with the words 'Joining Recycling Campaign'. For more information, visit:www.foe.co.uk/campaigns/waste.

78 per cent of the UK's waste goes to landfill

Which currently produces up to 25 per cent of all UK methane emissions, a greenhouse gas 21 times more powerful than carbon dioxide. Landfills have been associated with a rise in birth defects in nearby communities, and are also a major threat to ground-water quality in neighbouring communities. What's more, the Environment Agency warned last year that space for burying waste in the south east of England could run out within seven years.

9 per cent of UK waste is incinerated

The by-products of which include dioxins and furans (highly toxic compounds), lead, mercury, cadmium, chromium, arsenic, particulate matter, benzene, phenols, polyaromatic hydrocarbons, as well as a slew of acid gases. High-tech incinerators with filter systems can stop some of these from getting into the air, but only by turning them into toxic fly-ash, a hazardous waste. Britain's 12 incinerators regularly breach safety standards, with 546 breaches made in 1999 and 2000.

Recycling aluminium can save massive amounts of energy

And creates 95 per cent less greenhouse gases than producing aluminium from raw materials.

Waste Watch calculates that recycling bags, rather than making them from virgin polythene, reduces energy consumption by two thirds, produces two thirds less sulphur dioxide and 50 per cent less nitrous oxide, uses seven eighths less water, and also reduces carbon dioxide generation.

45,000 jobs would be created

If the UK recycled just 30 per cent of its waste, Waste Watch reports. A US study found that recycling creates 400-600 jobs per million tonnes of waste and composting 200-300 jobs – substantial gains on the landfill (40-60) and incineration (100-290) figures.

CORBIS

Economics

When the Argentinian economy collapsed the country's fat cats and bankrupt politicians melted into the woodwork, leaving the workers of Argentina to sort out the mess. Ben Backwell reports from Buenos Aires on their astonishing rise from the economic rubble.

cooking-pot revolution

Buenos Aires, 21 March: Curious onlookers gather in the busy Avenida Callao as a group of men and women begin to pull down the hoardings in front of the giant Bauen Hotel. Two policemen look on from the other side of the road, but do nothing. The 224-room hotel has been closed for over a year, and those clearing the building's entrances are its former doormen, telephonists, maids and event organisers.

After a year of fighting unsuccessfully in the courts for compensation and the months of salary they are owed, the Bauen's workers have decided to form a cooperative and reopen the hotel under their own control. On its facade are hung various banners: one says 'occupy, resist and produce – hotel recovered by its workers'; others belong to the informal neighbourhood assemblies and the National Movement of Recovered Enterprises (MNER). 'Imagine the quantity of meetings and conferences we could host here,' says one of the Bauen's workers as she walks through its empty corridors.

Seizing the day

Since Argentina's financial system and economy collapsed in December 2001, such scenes have become quite common. More than 160 factories and other enterprises have been occupied by their workers and are now being run as cooperatives. These form the backbone of a new, emerging social economy: peasants and farmers are producing organic food, charcoal and other goods; while unemployed groups are involved in artisan projects, bread factories and vegetable gardens. Alongside all this productive activity there has also emerged a web of distribution networks, markets and retail centres.

The factories and enterprises occupied include the enormous Zanon ceramics plant in the barren Patagonian province of Santa Cruz, the Brukman textile factory in

urban Buenos Aires, the IMPA aluminium plant, various health clinics, pizzerias and restaurants and small workshops producing everything from high-quality books and catalogues to ice cream, mozzarella cheese and biscuits. Some 10,000 people are now working in these cooperatives.

Usually, the occupations come about either as a result of the outright bankruptcy of the companies concerned, or because the firms owe months of salary to their staff or have begun to sell off key parts of equipment as a prelude to shutting themselves down.

Snowed under with a pile of unpaid debts, the management of the Brukman plant left a meeting called to discuss unpaid wages and simply disappeared. Then, just days before the 'cooking pot revolution' that led to the resignation of Argentine president Fernando de la Rua on 20 December 2001, Brukman's almost entirely female workforce decided to camp out in the plant until management showed up again. After two weeks of waiting the workers began telephoning Brukman's wholesalers to check whether they were still interested in purchasing the plant's products (mainly men's suits). Brukman's machines were soon back in action and sales were supplemented by 'solidarity buying' of everything from school uniforms to aprons by Buenos Aires's neighbourhood assemblies. The 50 workers quickly restored their wages to their 1995 level and paid off the plant's outstanding electricity debts. A month later, after it had become clear that the factory was doing nicely without them, Brukman's owners reappeared and attempted to retake control of the plant. They were, not surprisingly, shown the door.

Brukman worker Celia says: 'The problem for the owners is that we have already tasted the forbidden fruit. We know how much materials cost, how much is sold, how much is earned. We know how to run a factory.'

In accordance with the model outlined above, the occupation of the Zanon factory came after months of unpaid wages and machines running at a fraction of capacity and the lay-off of most of the plant's staff. Production has since partially recovered, and the plant's 270 workers are being paid regularly. Zanon has also become the first occupied factory to take on new workers – 20 people from local unemployed organisations.

Fighting the law

While the act of taking over a factory or business can be exhilarating, the associated problems can be daunting. The occupiers often face endless legal challenges from former owners and creditors; of the latter there are as many as 400 in the case of Zanon. Because of Argentina's complex and often corrupt legal system, this can lead to dawn raids by riot police which can then lead to major stand-offs as the workers mobilise political and legal pressure to overturn occupation orders.

Workers spend so much time fighting off such challenges that they barely have time to work. The experience of living and sleeping within the workplace and the constant fear of invasion have taken a heavy toll psychologically on the Brukman workers, for example. Their attempts to head off eviction have involved mobilising thousands of people on two occasions, and workers chaining themselves to machinery and factory gates.

Legal problems can effectively leave occupied plants in limbo. 'As we are not legally registered as a company, a lot of big clients won't buy from us for tax reasons,' says Kiko from the Zanon plant.

While some worker-occupiers like those at Zanon and Brukman are campaigning for the government to take over their plants (but with 'worker control' remaining intact), most have happily formed themselves into cooperatives. Some have managed to get legislation passed that effectively puts them in control of their plants. Article 17 of the Argentine constitution stipulates that the government can expropriate property and transfer it to the cooperatives when it is in the 'public interest' to do so. And the MNER is pressing for the introduction of a law that will stipulate that companies that go bankrupt will pass automatically to their workers.

In addition to these legal battles, workers who take over factories hardly ever have any working capital with which to invest in raw materials and maintenance or to pay salaries. At the Bauen Hotel the management took the computers, telephones, curtains and most expensive ▶

pieces of furniture before they left. At Zanon the workers need to invest a large amount of money in repairing one of the plant's main kilns.

On top of this, the slump in Argentina's economy continues unabated. While the newly occupied businesses save on high salaries and dividends paid to management, there is no guarantee that they will do any better commercially under workers' control than they did previously.

A new social solidarity

It is here that Argentina's social economy comes into play. The workers at the Zanon factory are producing special lines of 'Mapuche' ceramic tiles. The tiles are named after the indigenous tribe that lives on lands around the surrounding province, and are based on traditional indigenous patterns. Zanon's sales are now being managed from Buenos Aires by the *Madres de la Plaza de Mayo* human rights group. The *Madres* have been campaigning for 20 years for information about relatives who disappeared during Argentina's military dictatorship of the 1970s and 1980s. They now aim to take advantage of their extensive international contacts to export Zanon ceramics to the world. They also have a team of legal advisers who are trying to lift the various court orders that weigh upon Zanon. In March the *Madres* scored their first success when they agreed a wholesale deal for Zanon with Argentina's Easy DIY chain.

'We have an agreement to sell Easy 140,000 square metres of ceramics that is worth about 1.5 million pesos a month,' says Sergio Schoklender from Rebellion and Hope – a kind of management consultancy for social enterprises set up by the *Madres*. 'Our next aim is to start exporting through the international contacts that the *Madres* have.' Another two Zanon product lines, called 'Stones of the South' and 'Factory without Bosses', have also been launched.

But their are more radical experiments also underway. Towards the back of an occupied pizza restaurant in the run-down neighbourhood of Parque Avellaneda some 30 people sit huddled in a circle. They are members of the Commission for a Social Economy – a coordinating group that brings together delegates from dozens of Buenos Aires neighbourhood assemblies.

Alberto from the Nuñez Saavedra assembly says: 'What we are attempting to do is identify different links in the productive process that are in the hands of the social movements, and then build bridges between them and create new enterprises to fill the missing links.'

One of the social economy commission's tasks is to carry out inventories of supplies to occupied factories to determine whether they can be provided by other occupied plants or neighbourhood and unemployed groups. Where alternative supplies cannot be immediately arranged, a feasibility study is carried out to see whether a new cooperative can be formed to produce the goods. Some of the initial projects for new production include a cooperative to make solar panels and a scheme involving previously unemployed workers to refurbish old and broken computers for use in social enterprises.

'The idea is to articulate the production of the different groups so that instead of buying supplies from a big capitalist company the enterprises can supply themselves through cooperation,' says Alberto.

Embryonic forms of this kind of organisation can already be seen at work. Peasants from the Mocase peasant organisation in the state of Santiago del Estero provide charcoal and yerba mate (a South American herb) to unemployed groups in the impoverished suburbs of Buenos Aires. These goods are then used in communal kitchens. Mocase receives some money and goods in kind in return. The Brukman factory supplies school uniforms for needy children. The Chilavert press prints newspapers, radical posters and pamphlets for most of the Buenos Aires social movements. An enormous bread factory is being recovered by local assemblies and patients of the crumbling Borda mental asylum. The factory can produce around 25,000 kilogrammes of bread per day – enough to supply most of Buenos Aires' communal soup kitchens. And a group of neighbourhood assemblies, sympathetic doctors and former staff occupied the Portuguesa Clinic in September 2002 and found nearly all of its equipment (including a fully equipped intensive care unit and operating theatre) intact. The idea is to put the clinic in action again and use it as the basis for a new system of healthcare for workers in

the occupied enterprises. These workers are currently without any kind of coverage at all.

The social economy commission intends to take things one step further. It is creating a special solidarity 'brand' and logo that will identify goods that have been created by cooperatives and social movements. The brand will testify to the quality of the goods and the decent working conditions in which they were produced.

As well as being distributed through the neighbourhood assemblies and barter, the produce will be sold in occupied supermarkets like the Tigre and Cayetano stores in the industrial city of Rosario and Buenos Aires province, respectively. The commission recently took over a large empty building and passageway in the bustling Palermo neighbourhood of Buenos Aires, and neighbourhood assemblies and unemployed groups are now selling their goods there at a weekend 'solidarity market'. The commission is also attempting to set up a wholesale market in the capital for organic vegetable producers from the suburbs and surrounding countryside. And it already distributes a 'solidarity bag' with food products from a series of different social enterprises.

In addition, the commission has created a sophisticated website that will attempt to provide an online inventory of social enterprises' output and supply needs in a bid to bring about an ever higher level of integration between the two.

More complicated is the search for resources for the new projects that need to be put into action so as to cement the social economy. As many of the participants in the social enterprises have been unemployed or unpaid for months, there is almost no scope for investing even in the minimum of raw materials needed to begin production. This is despite the fact that unused buildings and machinery are widely available. Argentina's private, foreign-owned banks are unlikely to lend to cooperative enterprises with no commercial or legal history. Local interest rates are prohibitive. And the government demands political favours at election time in return for any loans or grants it may issue.

The social economy commission is currently discussing setting up an investment fund that would guarantee a lower but stable return on investment, and which could plough money into different enterprises according to need. The aim is to attract investment to the fund from sympathetic Argentinians both inside the country and in the large diaspora in Italy and Spain.

Clearly, the social movements do not intend to allow their enterprises to become miniature versions of the companies which they have supplanted. Nor do they intend to make decisions on purely market considerations. Indeed, many of the new enterprises make little sense outside of the context of social upheaval and change that led to their formation.

'It's the difference between selling fake Nikes or leather shoes made by the unemployed groups,' says Alberto. 'All this will only make a difference if it is informed by a profound spirit of transformation.'

Or as Jorge Muracciole from the Espacio de Proyectos assembly puts it: 'There is no point forming a cooperative just so that small groups of people can make money. What we are trying to do is produce new practices, new forms of cooperation, that will allow people to work outside of relationships of dependency.' ■

Ben Backwell is a freelance journalist based in Buenos Aires

MORE THAN HONEY • They build masterfully constructed homes, have a brilliantly regulated social order, are essential to sustaining the environment and are playing a vital role in sustainable development projects. Bees and development, by Kate Atkins

Annoyed with the marginalisation of the beekeeper's role in genuine sustainable development, Nicola Bradbear and Helen Jackson founded Bees for Development in 1993 – an organisation devoted to promoting global understanding of the benefits of beekeeping. Ten years on, Bradbear and Jackson's project remains central to spreading awareness of beekeeping's potential to improve livelihoods and ecological sustainability at a grassroots level.

'Small-scale [beekeeping] projects do not tend to attract government or donor support… [so] beekeeping [is] ignored,' explains Bradbear.

Since it spans forestry, horticulture, agriculture, natural environment, animal husbandry and entomology, beekeeping cannot be easily classified into a single sector of development aid. Consequently, apiaries have not been well-endorsed by aid projects in the past.

Even worse, bees are commonly treated as pests and are often blasted with insecticide in the summer.

Minimal input needed

Beekeeping equipment does not need high-tech materials and can be easily made from natural resources already used locally. People are experimenting with baskets to make hives in Gambia, while other more traditional methods use clay in Bangladesh, bark in Zambia and cow dung and ash in Ethiopia. And protective clothing can be put together cheaply from old sacks.

When they are not reliant on external manufacturers, beekeepers can replace equipment without extra expenditure – no matter how small their profits are.

And as bees can live almost anywhere, people with no land can rely on bees feeding off wild plants and still harvest the honey.

Whats more bee colonies are attracted by empty hives, so keepers rarely need to spend money on buying their bees.

Extra source of income

Beekeeping is low-maintenance. Bees do not need to be fed, and honey only has to be collected once or twice a year – in early and possibly late summer. So, little time is needed to generate money from keeping hives.

Secondary products (which generally produce far better returns than straight honey) of beekeeping can be made locally and range from soap and lip balm for export in the Philippines, to candles for local churches in Ethiopia and honey beer in Tanzania. Organic honey still generates a large proportion of the income in Zambia.

PRIORITISES THE ENVIRONMENT

As Helen Jackson says: 'Bees are central to biodiversity.' They pollinate flowering plants that provide other herbivores with food. In 2000, for example, a massive tree-planting scheme in Cape Verde relied on bee pollination for its success. This then encouraged more bee colonies to inhabit the forests and different species of fauna were in turn able to thrive there.

There is an economic incentive for beekeepers to protect their local environment. Pesticides and fertilisers poison bees and hence reduce the income from honey for keepers. In 1997 France lost 70 per cent of its honey harvest when insecticide-treated sunflower nectar poisoned honeybees. Farmers who keep bees are less likely to use harmful chemicals.

All the family is involved

The whole family can both participate in and benefit from the maintenance of apiaries. Apiculture is of symbolic importance in many societies. Beekeeping is frequently almost exclusively a male occupation, but the materials beekeeping yields are often used by women in the manufacture of secondary products. And older community members often play a vital part in educating younger generations in the beekeeping arts. In Mali there is a belief that only old men are able to ward off any negative supernatural effects on beekeeping.

BEE NUMBERS

150 million	years in which bees have been producing honey
45,000	bees can live in a single hive
30,000	number of bee species
11,400	strokes of a bee's wing per minute
80	percentage of insect crop pollination performed by honeybees
66	pounds of pollen accumulated per hive per year
25-40	percentage rise in crop productivity resulting from bee pollination
12	bee colonies needed to pollinate one acre of cotton
1	the size in mm^3 of a worker honeybee's brain

Truly sustainable development..

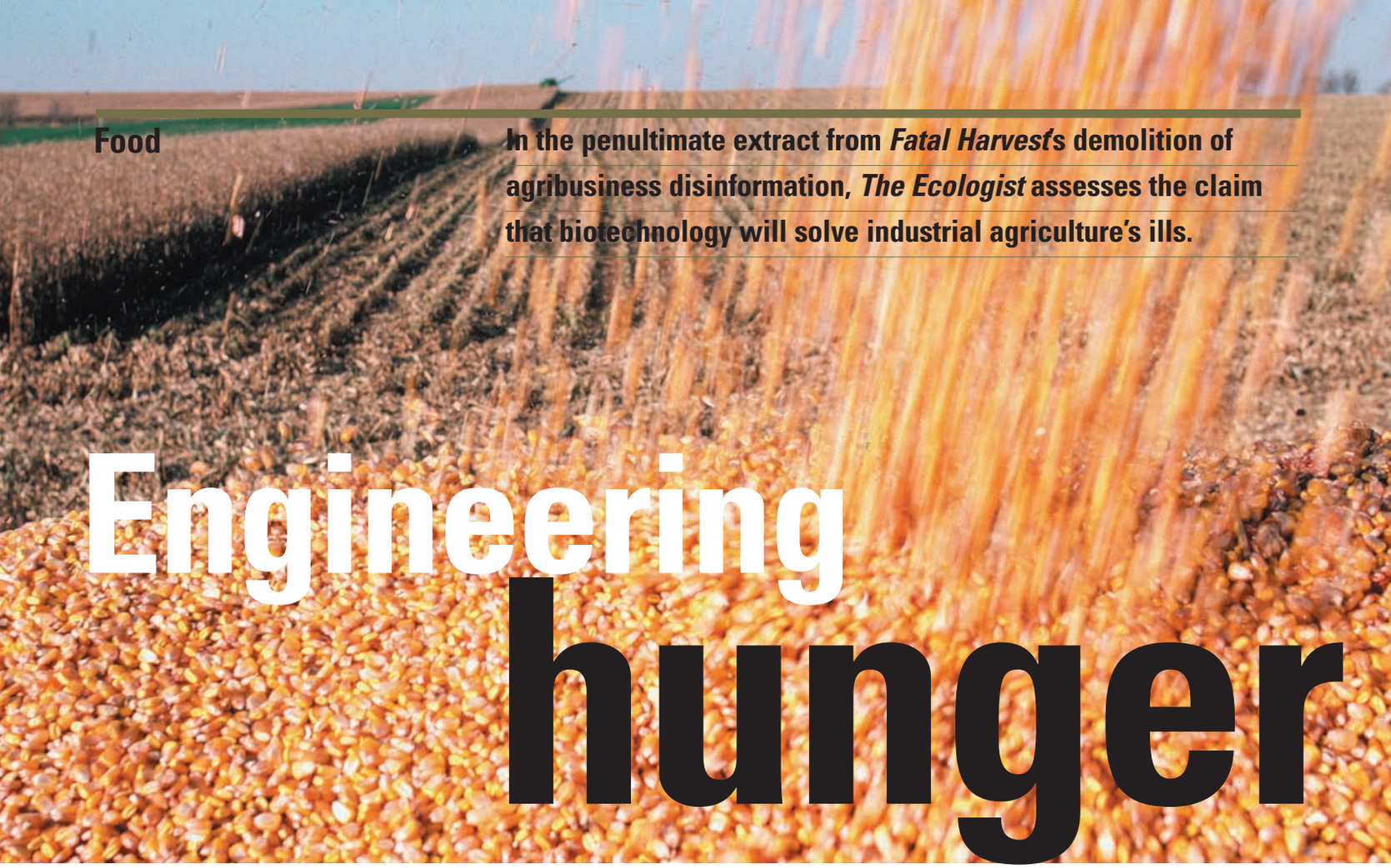
Working for beekeeping development world-wide, helping people to the use the craft of beekeeping to improve their standards of living, in ways that are sustainable and environmentally beneficial. A tiny, non for profit organisation that is making a real difference to hundreds of small communities. For more information contact Bees for Development, Troy, Monmouth, NP5 4AB, UK. Telephone: 01600 713648 or visit the website www.planbee.org.uk

- Bees produce the only food that will never spoil. Honey found in Egyptian tombs is still edible.
- Honeybees fly backwards out of their homes so they can see how they look from a distance.
- Honey has been used to embalm bodies (Alexander the Great being a notable example) as decay-promoting microbes cannot live in it.
- The hexagonal compartments that make up the structure of honeycombs are mathematically proven to be the most efficient means of storage possible. An absolute minimum of material is used to create hives.
- Honeybees have a dance 'language' that alerts other bees where nectar and pollen are located. The circle and waggling dance explains direction and distance. Bees also communicate with pheromones.
- Once the male drones have fulfilled their summertime role of mating with the queen, they are expelled from the hive because they are of no further use.
- Bees use the sun as a compass. Even when it is obscured by clouds, bees can detect its position from the light in brighter patches of the sky.
- Both the Egyptians and the Welsh have at some time used honey to pay taxes.
- The giant Indian bee (*Apis dorsata*) builds a single comb as much as five feet by three feet big, and which is attached to rocks, trees or buildings.
- In Ghana a good honey harvest is said to be related to beekeepers' relationships with invisible hairy dwarves. In Sweden failure in apiaries is blamed on the influence of trolls.

CORBIS

A group of Kung women eat honey taken from a wild bees' nest, North West Kalahari, southern Africa

In the penultimate extract from *Fatal Harvest*'s demolition of agribusiness disinformation, *The Ecologist* assesses the claim that biotechnology will solve industrial agriculture's ills.



Engineering hunger

Myth number 6

The truth: New biotech crops will not solve industrial agriculture's problems, but will compound them and consolidate control of the world's food supply in the hands of a few large corporations. Biotechnology will destroy biodiversity and food security, and drive self-sufficient farmers off their land.

The myths of industrial agriculture share one underlying and interwoven concept. They demand that we accept that technology always equals progress. This belief has often blinded us to the consequences of many farming technologies. Now, however, many people are asking some very logical questions. A given technology may be progress, but progress toward what? What future will that technology bring us?

We see that pesticide technology is bringing us a future of cancer epidemics, toxic water and air, and the widespread destruction of biodiversity. We see that nuclear technology – used in our food in irradiation – is bringing us a future of undisposable nuclear waste, massive clean-up expenses and multiple threats to human and environmental health.

As a growing portion of society realises that pesticides, fertilisers, monoculturing and factory farming are little more than a fatal harvest, even the major agribusiness corporations are starting to admit that some problems exist. Their solution to the damage caused by the previous generation of agricultural technologies is – you guessed it – more technology. 'Better' technology, biotechnology, a technology that will fix the problems caused by chemically intensive agriculture.

In short, the myth makers are back at work. But looking past the rhetoric, a careful examination of the new claims about genetic engineering reveals that instead of solving the problems of modern agriculture, biotechnology only makes them worse.

WILL BIOTECHNOLOGY FEED THE WORLD?

In an attempt to convince consumers to accept food biotechnology, the biotech industry has relentlessly pushed the myth that it will conquer world hunger. This claim rests on two fallacies: that people are hungry because there is not enough food produced in the world; and that genetic engineering increases food productivity.

In reality, the world produces more than enough to feed its current population. The hunger problem lies not with the amount of food being produced, but with how it is distributed. Too many people are simply too poor to buy the food that is available, and too few people have the land or the financial capability to grow food for themselves. The result is starvation. If biotech corporations really wanted to feed the hungry they would encourage land

reform, which could put farmers back on the land, and they would push for wealth redistribution, which could allow the poor to buy food.

The claim that genetic engineering boosts food production is arguably even more mendacious. Currently, there are two principal types of biotechnology seeds in production: herbicide-resistant and 'pest'-resistant seeds. Monsanto makes Roundup Ready seeds, which are engineered to withstand the firm's Roundup herbicide. The seeds – usually for soya beans, cotton or canola – allow farmers to apply the herbicide in ever greater amounts without killing the crops. Monsanto and other companies also produce Bt seeds – usually for corn, potatoes and cotton – that are engineered so that each plant produces its own insecticide.

Independent research shows that these genetically engineered types of seed do not actually increase overall crop yields. A two-year study by University of Nebraska researchers showed that growing herbicide-resistant soya beans actually resulted in lower productivity than that achieved with conventional soya beans. These results confirmed the findings of Dr Charles Benbrook, the former director of the Board on Agriculture at the US's National Academy of Sciences. His work looked at more than 8,200 field trials and showed that Roundup Ready seed produced fewer bushels of soya beans than natural varieties.

Far from being an answer to world hunger, genetic engineering could be a major contributor to starvation. There are currently more than a dozen patents on genetically engineered 'terminator' technology. These seeds are engineered by biotech companies to produce a sterile seed after a single growing season. This ensures that farmers cannot save their seed and that they will have to buy from corporations every season instead. Does anyone believe that the solution to world hunger is to make the crops of the world sterile? With more than half of the world's farmers relying on saved seeds for their harvest, imagine the mass starvation that would result should the sterility genes escape from the engineered crops and contaminate non–genetically engineered local crops, unintentionally sterilising them. According to a study by Martha Crouch of Indiana University, such a chilling scenario is a very real possibility.

WILL BIOTECHNOLOGY PROTECT THE EARTH?

The idea that biotechnology is beneficial to the environment centres on the myth that it will reduce pesticide use by creating plants resistant to insects and other pests. Research by the US government has already disproved this claim. A study by the US Department of Agriculture in 2000 revealed that there is no overall reduction in pesticide use with genetically engineered crops.

And even as it does nothing to alleviate the chemical pollution crisis, biotech food brings its own very different pollution hazard: biological and genetic pollution. In 2000, researchers at Purdue University in Indiana found that the release of only a few genetically engineered fish into a large native fish population could make the original species extinct in only a few generations. While scientists at Cornell University discovered that the pollen from Bt corn could be fatal to the monarch butterfly and other beneficial insects. Furthermore, the US's Union of Concerned Scientists has shown that genetically engineered Bt crops could lead to pests becoming resistant to Bt. This non-chemical pesticide is essential to organic and conventional farmers throughout the country. If plant pests developed a resistance to it, it could fatally undermine organic farming in the US.

Another significant environmental issue with genetically engineered foods is that the crops are notoriously difficult to control. They can migrate, mutate and cross-pollinate with other plants. If a pest- or herbicide-resistant strain were to spread from crops to weeds a 'super-weed' could result. Overall, the environmental threat of biotechnology caused 100 top scientists to warn that its careless use could lead to irreversible, devastating damage to the environment.

WILL BIOTECHNOLOGY PRODUCE SAFE FOOD?

The biotech industry claims that it is bringing a whole new generation of healthier and safer foods to the market. Yet US government scientists say the genetic engineering of foods could make safe foods toxic. Genetically engineered foods may contain both old and new allergens that could create serious reactions in millions of consumers. Biotech foods can also have lower nutritional values. In 1999 the British Medical Association recommended banning importing unlabelled genetically modified organisms because of the potential health risks. What makes these risks all the more alarming is that the US government requires no mandatory safety testing or labelling of any genetically engineered foods. As a result we have no assurance on the safety of these foods and no way to trace adverse reactions. Far from improving the safety of our food supply, biotechnology is creating new, unique health risks.

IS BIOTECHNOLOGY CHEAP AND EFFICIENT?

Biotech companies have spent billions of dollars researching the effects of inserting fish genes into tomatoes, firefly genes into tobacco plants, human genes into farm animals, and creating thousands of other transgenic organisms. It has taken thousands of trials just to come up with herbicide-resistant crops that lead to lower yields and greater chemical use. Biotechnology has yet to bring to market a single product that actually benefits consumers. As companies pass on the enormous costs of their research, why should the public pay more for biotech foods that offer no advantages and only risks?

The biotechnology industry continues to promote itself as the ultimate panacea for all the problems of industrial agriculture. A review of its real impacts reveals that it is not an antidote to modern agriculture but rather simply a continuation and exacerbation of today's food production crisis. Biotechnology increases environmental degradation, causes new food safety risks and threatens to increase world hunger. It is not the solution, but a major part of the problem ■

Reprinted with permission from *Fatal Harvest: the tragedy of industrial agriculture*, edited by Andrew Kimbrell, distributed by Island Press, www.islandpress.org.

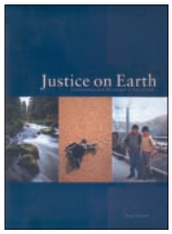
Justice on Earth: Earthjustice and the People it has served

Tom Turner

Chelsea Green Publishing Company 2003

£24.99, ISBN 1931498318

Reviewed by Matilda Lee



Tom Turner's new book is an encouragement not to give credence to the oft repeated saying that 'corporations rule the world'. *Justice on Earth* tracks cases of environmentally damaging projects across the US and the grassroots action groups that coalesce to block them. The book details the surprising power that these groups – teamed with public interest legal experts from Earthjustice – wield when faced with threats to their local environments. The beauty of this book, aside from its illustrations, is its message that if environmental protection is not the business of corporations or governments, then communities can and must make it theirs.

Straw Dogs

John Gray

Granta Books 2002

£12.99, ISBN 1862075123

Reviewed by Jeremy Smith

Gray argues that there's nothing special about our species. In fact: 'humanity' does not exist. There are only humans, driven by conflicting needs and illusions, and subject to every kind of infirmity of will and judgement.' Railing against humanism as 'a secular religion thrown together from decaying scraps of Christian myth', his book challenges our most basic of assumptions – the idea that we are somehow different from all other beings on this Earth.

Wanderlust: A History of Walking

Rebecca Solnit

Verso 2003

£10, ISBN 1859843816

Reviewed by Jeremy Smith

Drawing together many histories – of anatomical evolution and city design; of treadmills and labyrinths, of walking clubs and car dependence – *Wanderlust* explores the range of possibilities for this most basic act. Solnit zooms in on the walkers whose everyday and extreme acts have shaped our culture, from the peripatetic philosophers of ancient Greece to the mountaineers of today. Finding a profound relationship between walking and thinking, Solnit argues for the necessity of preserving the time and space in which to walk in an accelerating and vehicle-bound world.

Guide to a Green Planet

Edited by Jules Pretty

University of Essex 2002

£5.99, ISBN 1904059147

Reviewed by Tom Stafford

Bringing together the perspectives of 48 authors from the University of Essex, this guide focuses on the many issues facing the planet today. Contributions range from coral bleaching in the natural world to the environmental and health risks of GM crops, with Pretty et al pushing the case for re-evaluating the way in which we live our lives. Whether it's the decline of global fishing stocks, or the food we eat that is making us ill, this guide compels us to see that talking is not enough and only immediate action will stop this planet from entering into a state of terminal decline.

Enough – Genetic Engineering and the End of Human nature

Bill McKibben

Bloomsbury 2003

£16.99, ISBN 0747565368

Reviewed by Jeremy Smith

Genetic engineering is not just about the manipulation of plants. Already developers forsee and are working towards a future where we can manipulate our own genes in order to 'improve' human beings. They say this will make us happier, more intelligent, and more able to adapt to life on the planet. McKibben's dazzling new book challenges these assumptions, asking whether or not this is a technological advance too far. He argues that meaning will only ever be found by remaining truly human.

Dreaming War – Blood for Oil and the Cheney-Bush Junta

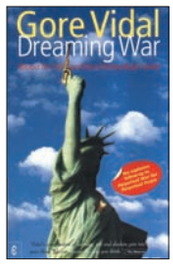
Gore Vidal

Clairview 2003

£9.95, ISBN 1902636414

Reviewed by Robert Gould

With essays on topics from US oil interests in Eurasia to the motivation behind the War on Terror, Vidal casts a scathing eye across his country's current foreign policy. Arguing that Bush is more interested in empire building than peace keeping, and using historical insights to support his claim – *Dreaming War* challenges the established viewpoint time and time again. His dry, dark humour make it a joy to read, too.



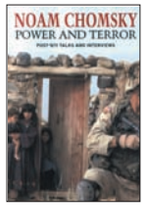
Power and Terror

Noam Chomsky

Seven Stories Press 2003,

£7.99, ISBN 1583225900

Reviewed by Jon Napier



In this collection of interviews and talks, Chomsky challenges the notion that one can solve the terrorism of the weak against the powerful without confronting the more extreme, systemic terrorism of the powerful against the weak. 'A report on our use of chemical weapons, which may have killed hundreds of thousands of people: not a mention.' Despite the cynicism inherent in his views of the western media and the way we 'see' the world, there is a sense of optimism that answers can be found so long as people believe that true freedom comes through knowledge.

Obedience to Authority

Stanley Milgram, Pinter & Martin (1974)

£12.99, ISBN 0-953-096416

Can normal people be induced to torture and kill? Using a fake 'memory experiment' scenario, Milgram set up a situation where participants were asked to administer shocks of (they believed) lethal voltage to other members of the public. The majority complied with the experimenter's orders, demolishing the myth that only evil people do evil. This book demonstrates that it is normal human psychology to let authority override our ethical principles. The series of experiments presented show that we, ordinary people, can be manipulated to participate in horrendous crimes by little more than the order of an authority figure in a white coat. Milgram's work was inspired by an effort to understand the Nazi holocaust, but it is as vital as ever for understanding our complacence when faced with the injustices of the global economy.

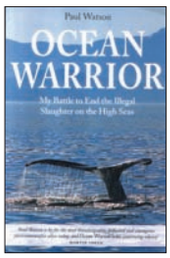
Ocean Warrior

Paul Watson

Vision Paperbacks 2003,

£11.99, ISBN 1904132251

Reviewed by Jeremy Smith



Watson – a founding member of Greenpeace – became tired of inaction and bureaucracy and decided that, in order to protect the whales, dolphins and other sea life, he would have to take matters into his own hands. *Ocean Warrior* is the story of how he did exactly that. Watson's mission is to draw attention to the atrocities commited against the creatures of the world's oceans in the name of profit. From the ramming of the Sierra, a whaling vessel used to illegally slaughter an estimated 25,000 whales, confronting the Norwegian Navy, Watson's autobiography shows that if you want the world to change, hoping someone else will do it all for you is not enough.

Bagdad Diaries

Nuha al-Radi

Saqi Books 2003

£9.99, ISBN 0 86356 336 X

Reviewed by Jon Napier

Written by an Iraqi artist living in Baghdad from the first Gulf War to her exile in 2002, *Baghdad Diaries* presents snapshots of daily life throughout the terror of the first war and the sanctions. From the first barrage of bombs exploding over the city in 1991, al-Radi records the story of a country where before the war the biggest problem facing Iraqi children was obesity, through to the humanitarian catastrophe of sanctions in its aftermath, in which by some estimates, 30 per cent of children suffered from cancer. A warm and human close up of a civilised, but brutally treated people, eloquently well written and bleeding with humanity. Those who refer to brutal murder as 'collateral damage' should read this book.

The Murdering of My Years: Artists and Activists Making Ends Meet

Mickey Z.

Soft Skull Press, $US15,

ISBN 1887128786

Reviewed by Annie Stewart

The Murdering of My Years is an innovative compendium of stories from artists, cabbies, waitresses, clerks, telemarketers et al that tells how they balance activism and art with the daily struggle to make ends meet. Stories range from the heartbreaking to the absurd, from the strange and captivating to the depressingly banal. This is the book's strength – the variety of voices challenging the myth of the American work ethic and calling for readers to extricate themselves from the ennui and disillusion that afflicts our society.

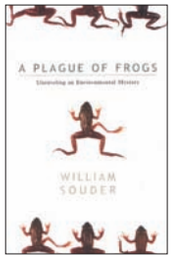
A Plague of Frogs

William Sounder

Univ. Minnesota Press 2003

£10.99, ISBN 0816641781

Reviewed by Annie Stewart



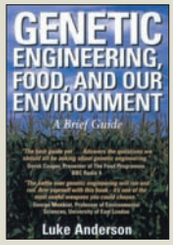
Frogs have been around 80 times longer than humans. They have survived mass extinctions, ice ages, the shifting of the continents: everything that has been thrown at them. However, in 1995, a group of school children discovered an excessive number of deformed frogs in a pond on a southern Minnesota farm. Frogs are permeable, their skin is less a barrier to the open world than an open portal. Whatever is in the surroundings can thus be in the frog, and many scientists regard frogs as an early warning system for the environment. So begins an ecological detective story that, while it starts in such local surroundings, resounds with the wider implications of humanity's devastating effects on the nature of which we are part. Souder manages to make frogs as fascinating to the casual reader as they are to the scientists who study them.

'If anyone tells you that GM is going to feed the world, tell them that it is not'

Steve Smith, head of Syngenta UK (formerly Novartis Seeds)

Genetic Engineering, Food and the Environment

Luke Anderson, Green Books 1999, £3.99, ISBN 1870098781



Highlights the many issues related to the human, political, and environmental implications of genetic engineering. Contains a directory of campaigning organisations.

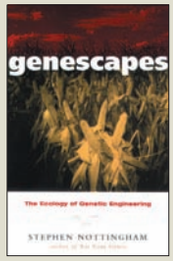
Genetic Engineering - Dream or Nightmare?

Mae-Wan Ho, Continuum 2000, £14.99, ISBN 0826412572

Widely acknowledged to be the most sustained and reasoned challenge to many of the scientific assumptions underpinning genetic modification.

Genescapes

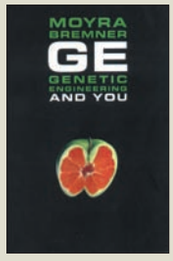
Stephen Nottingham, Zed Books 2002, £12.95, ISBN 1842770373



Explains the principles of ecology that provide a framework for assessing the environmental impacts of GMPs and describes the ecological risks associated with a wide variety of transgenic organisms. Concise and well structured.

Genetic Engineering and You

Moyra Bremner, Harper Collins 1999, ISBN 0 00 6531903, £6.99



Bremner's well-researched and exhaustive analysis of the perils of genetic engineering is backed up by an extensive resource for further reading.

Seeds of Distrust: The Story of a GM Cover-Up

Nicky Hager, Craig Potton 2001, ISBN 090880292, £5.99

An intriguing case-study expose of the lies, media manipulation and spin surrounging GM crops. This book almost brought down the government of New Zealand when first published in early 2001.

Trust Us We're Experts

Sheldon Rampton & John Stauger, Penguin Putnam, £19.99, ISBN 158542059X

Explores the widespread, devious, and underhanded ways in which industry manipulates science and decieves the public through the use of bogus experts, manufactured facts and twisted date.

Norfolk Genetic Engineering Network • http://ngin.tripod.com/gmintro.htm
The place to go for regular GM news. The above link leads to an excellent introduction to the science, written by geneticist Dr Michael Antoniou, among others.

Gene Watch UK • www.genewatch.org
A group aiming to ensure that genetic technologies are developed and used in the public interest, in a way which protects the environment and human health.

neRAge • www.nerage.org
Aims to centralise the tremendous volume of news and information on biotechnology. Users can submit items in a very similar way to indymedia sites.

Genetics Action • www.geneticsaction.org.uk
Provides 'information for action'. Specialises in putting individuals in touch with different national and international campaigns. Offers practical support, eg how to set up a campaign in your area, ideas for protests and things you can do if you don't have much time to spare.

The GM Public Debate• www.gmpublicdebate.org
The home of the UK debate's steering board. Aims to create a dialogue between all strands of opinion before legislative decisions on GM crops are taken.

"WE KNOCKED THE B*ST*RD OFF!!!"....NO, NOT GEORGE W...(SHAME ON YOU FOR THINKING IT A GOOD IDEA!).....BUT..... SAID BY SIR EDMUND HILLARY AFTER THE 1ST ASCENT OF MT EVEREST IN MAY 1953.

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ACT NOW

Join the virtual sit-in. When survivors of the Bhopal disaster took their protests to parent company, Dow, they got slapped with a lawsuit claiming US $10,000 in damages. Take your protests online by occupying Dow's website.
visit: **www.dowethics.com/bhopal.com/go/visit**

Volunteers needed to **take part in a national survey** to assess the health of Britain's urban mammal population. Mammal Trust UK will provide everything you require. The survey ends in the last week of June 2003.
tel: 020 7498 5262.
visit: **www.mtuk.org**

Boycott Brand America. Join Adbusters' co-ordinated campaign of culture-jamming to protest against American foreign policy. Take the campaign into your home, your school, your streets, your life.
visit: **www.adbusters.org**

Lobby the Icelandic government. Plans to build a dam and aluminium smelting station will have massive impacts on Iceland's Eastern Highlands, The area is Europe's second-largest wilderness.
visit: **www.foei.org/cyberaction/iceland**

Join the public consultation over airport building. Government proposals opened the door to development at Cliffe in South East England. The area affected is protected under national and international wildlife law. The closing date for submissions is June 30.
Write to: Future Development of Air Transport, South East and East of England, Department for Transport, Room 1/28c, FREEPOST, London, SW1P 4YS
email: *air.consult@dft.gsi.gov.uk*

Adopt an Otter. Support the work of the International Otter Survival Fund. Money raised will support work in research, rehabilitation and protection of this threatened species across Europe.
visit: **www.otter.org**

The Pacific leatherback population fell from 91,000 in 1980 to just 5,000 in 2002. The main culprit is longline fishing – a destructive, non-selective fishing technology that also threatens the survival of 23 species of sea birds. **Write to Kofi Annan** and urge the United Nations to put a moratorium on longline fishing in the Pacific.
visit: **www.globalresponse.org**

Join a vigil for the bushmen in Botswana. Evicted by the government from their ancestral home, Survival believes this is because of diamond deposits under their land. Vigils are held every Wednesday outside the Botswana High Commission and De Beers diamond shop in London. For information on protests in other cities, visit: **www.survival-international.org**

CAREER

Graduate internships with People & Planet, a student organisation campaigning on poverty, human rights and the environment. Role requires someone motivated by social justice and environmental issues. 12 month contract, starting in July. £8,408 per year. Deadline for applications May 9.
tel: 01865 245 678
visit: **www.peopleandplanet.org**

Growing Careers. A searchable website featuring a wide range of careers in agriculture, nurseries and garden centres, landscaping and conservation as well as horticultural and land-based engineering.
visit: **www.growing-careers.com**

ENDS environmental job search. New appointments and training opportunities in various fields, including contaminated land consultancy, project development and air-quality consultancy. Updated weekly.
visit: **www.ends.co.uk/jobs**

Searchable database of thousands of jobs, internships and volunteer opportunities with non-governmental organisations. Search by country, language or field of interest.
visit: **www.idealist.org**

COURSES

Challenging Globalisation: Alternative Models with Vandana Shiva, Juliet Schor & Prasannan Parthasarathi. Residential course at Schumacher College, England, July 6-25, 2003.
Join activists from around the world to explore debates about the globalisation of economy and culture, as well as practical, humane alternatives to the current system of control and domination. Scholarships available.
tel: 01803 865 934
email: *admin@schumachercollege.org.uk*
visit: **www.schumachercollege.org.uk**

Short courses in training to become a volunteer. The Volunteer Service Programme of the Institute of Cultural Affairs offers a participatory programme for those interested in volunteering overseas. It has trained and placed over 300 UK volunteers with development projects worldwide.
Write to VSP Co-ordinator, PO Box 171, Manchester M15 5BE
tel: 0845 450 0305
email: *vsp@ica-uk.org.uk*
visit: **www.ica-uk.org.uk**

Whale and dolphin conservation courses in Greece and Italy organised by Tethys research Institute, a non-profit organisation engaged in the protection of cetaceans and their environment. 6-9 day courses from June to October.
tel: +39 0272001947
visit: **www.tethys.org**

HOLIDAYS

The Eco-lodge
A simpler way to relax!
tel: 01205 870 062/871 396
email: gclarke@internationalbusinessschool.net
www.internationalbusinessschool.net/ecolodge

Myconos. Charming maisonette. Garden resort, private beach, pool, tennis. Available July.
tel: 01482 491 785
email: *h.p.livas@eidosnet*.co.uk

The St Ives Bay SK2
Beautifully converted railway carriage offering s/c holiday accommodation at the Cornish coastal station of Hayle. Available as two lets, or one sleeping up to 14. Excellent base for public transport. Bike hire available nearby. Green Electron and recycling facilities. Day trips by train available. As featured on Discovery Channel's Amazing Conversions. For more information,
tel: 01503 230783
visit **www.railholiday.co.uk**

Near ULLAPOOL, Scotland. Self catering cottages on the Leckmelm Estate, member of green tourism business scheme. Prices from £160 - £420/unit/week. Short breaks available.
tel: 01854 612471 for a brochure.
visit: **www.leckmelmholidays.co.uk**

RESOURCES

Graphic design and production with minimum ecological impact. Through detailed research into materials and new technology, we specialise in meeting the design needs of environmentally concerned organisations.
Visual communication says everything.
email: ecodesign@f2s.com
visit: **www.claremansfield.com**

VOLUNTEER

Work on an organic farm. WWOOF compiles an international list of farms that welcome volunteers.
Write to PO Box 2675, Lewes BN7 1RB U.K
visit: **www.wwoof.org**

Aidcamps International offers **short-term volunteer work overseas on Third World development aid projects** in Kenya, India etc.
visit: **www.AidCamps.org**

Work in Iceland. The British Trust for Conservation Volunteers runs two-week projects during amongst the island's stunning national parks. Prices from £650 - £750. A good level of physical fitness required.
email: *Information@*btcv.org.*uk*
visit: **www.btcv.org/international/iceland**

WANTED

Cottage on its own, to buy (or rent?). Mod cons and road not needed. Not in frozen north but with woods and water.
Please contact David, on 01533 773 257

Disabled woman requires female personal assistant to help with all aspects of daily living. London and surrounding areas. full driver's license required. Non-smoker, environmental awareness preferred. Daily travel allowance available. £6 per hour for up to 6 hours a day (flexible).
tel: 0208 5952 965

Downham Cycle Taxis. People-powered rickshaws serving the community of Lewisham and Bromley whilst protecting the environment. Charity 1090053. Donations/funding urgently needed.
Write to: Downham Cycle Taxis. Goldsmiths Centre, London, SE6 1QD.
tel: 0208 461 3876

Homeopath, campaigner, writer with M.E. seeks **assistant** to facilitate a fuller life.
If interested, write to 28 Merryhill Crescent, Hereford HR2 7AH.

Moroccan rural community seeks **help with education and sustainable development projects.** Please send suggestions, books etc to Mr El Hassan Errezzaki. Tizguine Association, Dour Tarna Aday, Anzi 85100, Tiznit, Morocco.

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ecologist diary

EARTH FROM THE AIR

Earth from the Air is a spectacular collection of large-scale photographs of astonishing natural landscapes. Created by world-famous photographer Yann Arthus-Bertrand, every stunning aerial photograph tells a story about our changing planet. A free open-air exhibition in the gardens of the National History Museum, Kensington, London, open from 10am–8pm daily.
For more information, visit:
www.earthfromtheair.com

MAY

1 MAY, LONDON, UK

Mayday 2003. A day of action against capitalism and war. Protest group Critical Mass is calling all bikes, skates, or anything without an engine to gather and demonstrate the alternatives to car culture. Meet 11am at the National Film Theatre, under Waterloo Bridge, South Bank.
email: *londonmayday@yahoo.co.uk*
visit: ***www.cmlondon.enrager.net***

1-2 MAY, ABERDEEN, UK

Disrupt Big Oil's recruitment drive. BP and Esso will be at the city's Robert Gordon University, as part of their £750,000 recruitment drive. The perfect chance to register any disapproval.
tel: 020 7802 2410
email: *jcostello@ukooa.co.uk*
visit: ***www.infor@risingtide.org.uk***

1-31 MAY, UK

The Big Swim. Raise money to support the WWF's work with endangered whales. Get sponsored and get down to your local swimming pool to raise money. You can swim anytime during May and at any pool.
tel: 0845 766 8860
visit: ***www.wwf.org.uk/bigswim***

3 MAY, LONDON, UK

Cannabis march and festival. Join Smokey Bear for his picnic as part of an international day of pot protest. Day begins with a procession from Kennington Park to Brockwell Park before free festival from 1pm. Includes Hemp Expo, medical cannabis marquee and more.
tel: 020 7274 3364
email: cannabisfestival@ccguide.org.uk
visit: ***www.ccguide.org.uk***

10 MAY, MANCHESTER, UK

2nd Sources of Radicalism Conference. Hosted by International Centre for Labour Studies, Red Pepper magazine and local trade unions. Topics include anti-militarism, Sylvia Pankhurst, the labour movement and music. Advance booking advised. £10.00/£5.00 concessions.
tel: 0161 275 4795
email: *anne.morrow@man.ac.uk*
visit: ***www.leftdirect.co.uk/sources***

11-17 MAY

Christian Aid Week. Join up to 300,000 volunteers across the UK raising funds to help some of the world's poorest communities. An education programme visiting schools across the country will also run throughout the week.
tel: 020 7620 4444
visit: ***www.christian–aid.org.uk***

12 MAY, LANCASHIRE, UK

Campaign Against the Arms Trade. BAE Systems is the UK's largest arms company, producing virtually every type of weapons system. Protest outside their base at Samlesbury Aerodrome, Balderstone, Blackburn.
tel: 020 72810297
email: *siteunseen@caat.demon.co.uk*

14-16 MAY, LIVERPOOL UK

Community Recycling Network Annual Conference. Three days of lectures and workshops will focus on municipal waste management. These will include examples of best practice from around the world.
tel: 0117 9420142
email: *events@crn.org.uk*
visit: ***crn.org.uk***

17 MAY, MANCHESTER, UK

Annual Schumacher Lecture. 'Visions of a New Renaissance'. Speakers include Satish Kumar and David Lorimer. Doors open 9.30am Tickets £18/£9 concessions.
tel: 01204 697 411
email: *chris.lyons@zen.co.uk*
visit: ***www.schumacher.org.uk***

ARKive

20 MAY, BRISTOL UK

ARKive launch. A new website which aims to record the world's endangered species in moving footage, photographs and sounds. Meet the team behind it at Wildwalk, Bristol Harbourside.
tel: 017 915 7102
email:*Hamish.maccall@wildscreen.org.uk*
visit: ***www.wildscreen.org.uk***

20-21 MAY, NORTHAMPTON, UK

Improving Urban Green Spaces. Two half-day seminars on the innovative Pocket Park scheme. Hosted by Northamptonshire County Council, these will cover all aspects of sourcing, funding and maintaining these urban parks.
tel: 01604 237223
email: *Sheaver@northamptonshire.gov.uk*

23 MAY, HADRIAN'S WALL, UK

National Trail Opening
For the first time, visitors can walk the entire 84 miles of Hadrian's Wall. A series of events to celebrate the opening is planned for the following weekend.
tel: 01434 602505
email: *info@hadrians-wall.org*
visit: ***www.hadrians-wall.org***

23-25 MAY, ABERYSTWYTH, UK

Introduction to Renewable Energy Weekend. Short course providing a comprehensive introduction to renewable energy electrical technology for business, non-profit, public and academic sectors. Centre of Continuing Education, University of Wales, Aberystwyth, Mid-Wales. £35/£25 concessions.
tel: 01970 622 677
email: *bff@aber.ac.uk*
visit: ***www.greendragonenergy.co.uk***

23-24 MAY, NEWCASTLE, UK

Global 'Boycott Proctor & Gamble' Day. Proctor & Gamble conduct animal tests of their products. On the eve of a global day of protest,join Uncaged as they deliver thousands of pledges to boycott the pharmaceutical giant. 10am-12.30pm. Saturday will see protests around the world.
tel: 0114 253 0020
email: *info@uncaged.co.uk*

23-25 MAY, ESSEX, UK

Permaculture Weekend for Beginners. Courses include sustainable design principles, permaculture ethics, organic gardening, community economics. Dial House Centre for Dynamic Culture Change, North Weald, Essex. £60 (flexibility/concessions available).
email: *landandliberty@ukonline.co.uk*
visit: ***www.gb00063551.pwp.blueyonder.co.uk***

23-25 MAY, SCOTLAND, UK

Ceilidh Gall Gallowa Mayfest. Set in the remote uplands near Castle Douglas, the Knockengorroch Celtic music festivals are non-profit making projects dedicated to cultural regeneration in Scotland's Southern Uplands. Tickets £31/28 concession.
tel: 01644 460 664
email: *info@knockengorroch.org.uk*
visit: ***www.knockengorroch.org.uk***

FROM 24 MAY, LONDON, UK

'Go Wild' at Kew Gardens. The Royal Botanical Gardens' summer festival highlights the splendour of Britain's varied native wildlife. As well as focussing on wild plants and animals, Go Wild also looks at sustainable practices in traditional agricultural and land management.
tel: 020 8332 5665
email: *info@rbgkew.org.uk*
visit: ***www.rbgkew.org.uk***

28 MAY, INTERNATIONAL

International Day of Action for Women's Health. Organised by the Women's Global Network for Reproductive Rights, events in different countries will aim to remind the UN of its Alma Ata declaration to deliver helath provision for all by 2000.
email: *office@wgnrr.nl*
visit: ***www.wgnrr.org***

31 MAY - JUNE 1, KENT, UK

Animal Rights Activist Gathering. Learn campaigning and activist techniques. Planned workshops include fundraising, media relations, law, first aid for animals and starting a sanctuary. Free basic camping.
tel: 0845 4560284
email: *info@farmedanimalaction.co.uk*
visit: ***www.farmedanimalaction.co.uk***

JUNE

1-3 JUNE, EVIAN, FRANCE

G8 meeting. Governments of the eight most powerful nations meet to discuss trade, security and development. For information on access, accommodation, towns, security measures, etc, visit:
www.evian-g8.org
www:nopasaran.samizdat.net
www.g8circus.org.uk
www.killbush.forplanetearth.com

4 JUNE, LONDON, UK

Sustainable Development 2003. This event will explore the role organisations in both commerce and public service can play in moving towards a sustainable economy.
tel: 0161 211 3038
email: *david.tiller@govnet.co.uk*
visit: ***www.skuk.org***

5 JUNE, INTERNATIONAL

UN World Environment Day. Annual celebration of the environment, aiming to enhance political attention and action. Celebrations include street rallies, bicycles parades, green concerts, tree planting, recycling efforts, clean-up campaigns and much more. This year's theme is 'Water: two billion people are dying for it'.

For further information visit: www.theecologist.org

Care for others as you care for yourself

Viridian is a new kind of vitamin company dedicated to ethical business practices including environmental awareness, pure ingredients and charity donation.

In fact, in 2001/2002, Viridian is donating £30,000 to a range of environmental, children's and other selected charities including *NSPCC, Friends of the Earth, Childline, Woodland Trust, Shelter, The Orangutan Foundation, Help the Aged, Amnesty International, Terrence Higgins Trust, Barnados, National Deaf Children's Society, RSPB, Trees For London, UNICEF, Hackney City Farm, Born Free Foundation and Maggie's Cancer Care.*

Viridian supplies specialist health food stores and each year the stores vote which charities will benefit the following year – as the company grows, so do the charity donations.

Viridian vitamins and herbs are excellent quality and cost no more than comparable, non-donating brands found in the mass market. So, by switching to Viridian, you not only get the best in nutrition, you also help generate thousands for charities. Everyone's taking vitamins these days and what better way to take them than with a large dose of Viridian's feel-good factor.

The Viridian range of vitamins, minerals, herbs, amino acids and nutritional oils is available from selected independent health food stores.

viridian
Care for others as you care for yourself

For your nearest stockist call 01327 878050.
www.viridian-nutrition.com

was she dead when they butchered her?

Many whales harpooned in commercial whaling operations die a slow and agonising death. We cannot even be sure that all whales are actually dead when the butchering process begins.

Why do we allow one of the most highly evolved and intelligent creatures on our planet to be treated so barbarically?

Will you give just £3 a month to help us to stop this horrendously cruel practice?

get angry - call 0870 870 5001 today

to join WDCS, the Whale and Dolphin Conservation Society and add your voice to our call to STOP commercial whaling.

As well as your membership pack, we'll send you a campaign pack full of ideas on how to help stop whaling and magazines and newsletters throughout the year.

WDCS
Whale and Dolphin Conservation Society

WDCS is the global voice for the protection of whales, dolphins and their environment

Company Registration No: 2737421 Reg Charity No: 1014705 Photos: © Mark Votier/WDCS