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reports

World Scientists scored again

Biosafety Protocol Won in Montreal

Industry reacts swiftly with counter-offensive

But civil society triumphed in Codex meeting in Chiba

It was a hard-won victory in Montreal this January, especially for the Like-minded Group - consisting of the African nations plus most of the developing countries and China - who were responsible for all the major initiatives. From the beginning, they insisted that,

1. the Biosafety Protocol applies to all genetic engineered material, regardless of whether they are commodities or not, for environmental release or contained use, in agriculture or in medicine;
2. each country has the right to refuse import on grounds of threat to human health and biodiversity;
3. the Biosafety Protocol is not to be subordinated to rulings of the World Trade Organization;
4. risk assessment is to be firmly based on the precautionary principle;
5. socioeconomic impacts are to be taken into account in risk assessment; and
6. exporters are to be held liable for any damages caused.

These elements were all included in the Protocol eventually agreed, at least in principle. The Miami Group – USA, Canada, Australia, Argentina, Uruguay and Chili – held out until the eleventh hour, when the mood of the conference suddenly shifted. The key factor, not mentioned in any report in the mainstream media, may have been the radical proposal from Portugal that the Protocol could be agreed *without* the Miami Group. This opened up a new possibility that was previously unthinkable. It was as if a ray of light had broken through layers of impenetrable darkness, revealing how isolated the Miami Group had become. There were other contributions to the success in Montreal, of course.

Not the least of which was our World Scientists' Open Letter, signed by more than 240 scientists from 33 countries when it was delivered to all Government delegates, again, thanks to the Third World Network. At least seven scientists were active at and around the Montreal conference, in teach-ins, street demonstrations at sub-zero temperatures, press-conferences, interviews to the press and in the popular media, and most of all, in providing support for the official government delegations in formal reports, briefing papers, and informal discussions. They were Dr. Phil Bereano, Dr. Mae-Wan Ho, Ms. Angela Ryan, Dr. Doreen Stabinsky, Dr. Beatrix Tappeser, Dr. Terje Traavik and Dr. Christine von Weisacker. ISIS produced a comprehensive Report for the Third World Network, *Unregulated Hazards: 'Naked' and 'Free' Nucleic Acids* (available on ISIS website), plus a number of other briefing notes on the scope of the Biosafety Protocol and on the precautionary principle, which were all circulated at the Conference.

The extent to which the biotech lobby was rattled by our Open Letter was already evident in Seattle, when some 300 scientists signed a letter to US Senator Kit Bond stating their support for agricultural biotechnology in food production and "strongly advocate the use of sound science as the basis for regulatory and political decisions pertaining to biotechnology".

Kit Bond is Senator for Missouri, home of Monsanto. One third of the scientists signing the letter were from Monsanto, Novartis or other biotech companies; and most of the rest are from universities and research institutions receiving substantial industrial support. By now, this same letter has received over 1000 signatures (see Report on Berkeley Professors Dare to Dissent, this issue). It contains nothing of substance, and is not supported by a single reference to publications in peer-reviewed journals; so much for 'sound science'.

Meanwhile, the mainstream media have been full of uncontested, unsubstantiated claims of world need for GM crops and the enormous benefits they will bring.

To top it all, the US, as chair to the Codex Alimentarius Commission of the WHO, produced a summary of the Biosafety Protocol that bears little resemblance to what had been agreed. This document was circulated in advance of the first meeting of the Ad Hoc Intergovernmental Task Force on Foods Derived from Biotechnology on the "Review of the Work By International Organizations on the Evaluation of the Safety and Nutrition Aspects of Foods Derived from Biotechnology", held in Chiba in Japan. Reaction from the global civil society came swiftly. A letter addressed to the US Chairman calling for the immediate withdrawal of the document has been signed by more than two hundred ngos and individuals from 31 countries (see http://www.iatp.org). Thanks to vigorous opposition from the ngos present in the Codex meeting in Chiba, Japan, the US did not have its way, another victory for civil society!

Surprisingly, the US delegation was less bullish than usual and actually went along with the flow of the meeting. According to senior FDA officials, within a few months the agency will announce new requirements for approval of all GM foods including a pre-market evaluation system. The FDA has come under immense public pressure back home which resulted in a seachange to their domestic regulatory policy. This development tied the hands of the US delegation at the Codex task force meeting - and may continue to do so in other international forums. The Codex task force is now preparing various procedures and requirements for the approval of GM foods that are on par with those used to regulate prescription drugs. They include long-term monitoring for adverse health effects and tests for genetic stability, toxins, allergens and other unexpected effects. Traceability is also on board: Technical labelling and record keeping mechanisms will keep track of all GM foods from field to plate, so that any GM product can be readily removed from the market if problems arise. The meeting ensured that Biotechnology companies are now accountable for any adverse effects to health that may come about from GM products in the global market place. Henry Miller, a well-known pro-biotech spokesperson, reported all this with dismay! (See Financial Times, Viewpoint by Henry Miller - ex FDA official, March 22 2000.)

ISIS will be delivering an updated version of the Open Letter from World Scientists to the UN Commission on Sustainable Development (April 24 to 5 May) which will be posted on our website. Please help us get as many signatures as possible. We realize it is not the numbers that count but the quality. There are very eminent scientists on our list that everyone has heard of and respect. Among the latest signatories are:

Dr. David Bellamy, Biologist and Broadcaster, London, UK
Prof. Liebe Cavalieri, Mathematical Ecologist, Univ. Minnesota, USA
Dr. Thomas S. Cox, Geneticist, US Depart. Agriculture (retires), India
Dr. David Ehrenfeld, Biologist/Ecologist, Rutgers University, USA
Dr. Samuel Epstein, School of Public Health, Univ. Illinois, USA
Dr. Brian Hursey, ex FAO Senior Officer for Vector Borne Diseases, UK
Prof. Jonathan King, Molecular Biologist, MIT, Cambridge, USA
Prof. Gille-Eric Seralini, Laboratoire de Biochimie & Moleculaire, Univ. Caen. France
Dr. George Woodwell, Director, Woods Hole Research Center, USA.

MWH & AR

ISIS Condemns Naked Corporate Propaganda

"The Rise and Fall of GM Food" Channel 4 TV Equinox, March 20, 2000

As part of the pro-GM offensive, TV Channel 4 Equinox, a science series commissioned a programme and tricked me into taking part in it. Their researcher told me it was going to air the scientific debate properly. Instead, it turned out to be a calculated attack on me and the anti-GM movement, and a naked propaganda for the biotech industry. It contains all the misinformation and disinformation that proponents have been perpetrating for years, plus a manipulative juxtaposition of images and narratives to create, at best, 'modified truth', which is appropriately the original title for the programme.

What I did not know, was that the producer is Martin Durkin, who was responsible, last May, for an Equinox programme which claimed breast silicone implants reduced the incidence of breast cancer, dismissing women who complained of serious health problems as cranks, malingerers and compensation-chasers.

In 1997, Martin Durkin made a series, Against Nature, for Channel 4, which compared environmentalists like George Monbiot to Nazis, accusing them of conspiring against the world's poor (see Monbiot's article, "Getting your science from charlatans", The Guardian, Thursday, March 16, 2000). The Independent Television Commission's verdict on the series was that the programme makers "distorted by selective editing" the views of the interviewees and "misled" them about the "content and purpose of the programmes when they agreed to take part." That was exactly what happened to me.

The main message the present programme conveys is that GM food is perfectly safe and beneficial and badly needed to feed the hungry in the Third World. But hysterical environmentalists and the privileged, chattering middle-classes (mainly women) have been responsible for bringing down the industry.

What offended me most was not the attacks on my position, but the programme's exploitation of the poor and starving in the Third World. Scenes of sick, starving children and subsistence farmers in Africa alternated with women from the Women against GMO Campaign lunching around a table or shopping for organic food. Dr. Tewolde Egziabher, spokesperson on biotechnology for the whole of the African Region, has already roundly condemned the use of images of starving African children to promote the technology which is of no benefit to the poor in African countries, nor is it safe nor environmentally sound.

The programme was also intent on attacking organic farming. It opened with the scene of a scientist in Cuba being honored as the father of biotechnology, but failed to mention that the recent major success in Cuban agriculture is the pioneering of integrated organic farming. This has managed to increase food production and to wean the country largely from agrochemicals (see Cultivating Havana: Urban Agriculture and Food Security in the Years of Crisis by Catherine Murphy, Food First Development Report no. 12, May 1999). Helen Browning of the Soil Association, one of the women of the Women against GMO filmed feasting around a table, is actually a successful organic farmer in the UK with 3000 acres. No, she was not interviewed on organic farming either.

I took part in a followup debate broadcast at ten past midnight, 22 March, where I began by dissociating myself from the Equinox programme. Gratifyingly, there was a flood of letters of complaint both to Channel 4 and to the Independent Broadcasting Commission. We shall be compiling the

excellent comments to post on our website. MWH

"Trust me, I'm an expert"

The Royal Society's "Guidance for editors"

The Royal Society, more or less by definition the scientific establishment in the UK, has recently issued a set of recommendations entitled, "Guidance for editors", which is reproduced with strong approval in the House of Lords Select Committee on Science and Technology Report on Science and Society (see How to Engineer Society to Accept Science as Usual, below). They obviously intend the document to be taken very seriously, because they begin by quoting the Press Complaints Commission Code that, "newspapers and periodicals must take care not to publish inaccurate, misleading or distorted material", and warns that "Editors must be able to demonstrate that the necessary steps have been taken". This is clearly meant as more than merely some helpful suggestions.

Everyone is in favour of accurate, genuine science reporting. We would not like to see so-called creation science treated seriously in the press, for example. There are, however, some very worrying aspects about this document. It ignores some of the basic principles of scientific enquiry and practice, not to mention the freedom of the press.

"Journalists", we are told, "must make every effort to establish the credibility of scientists and their work". Yes, but how is this to be done? The Royal Society will publish a directory that provides a list of scientists for the purpose. Before interviewing a scientist, the journalist will be expected to have consulted the officially nominated expert in the field, who will be able to say whether the scientist in question holds correct views.

Balance can be a problem for journalists: in politics it may be proper to give equal time to Government and Opposition, but things aren't so simple in science. Someone making a programme on smoking is not obliged to devote half the time to those few scientists who still insist that it is not harmful. The Royal Society, however, goes much further. "Newspapers may suppose that they have produced 'balanced' reports by quoting opposing views.." Not so, if "the opposing view is held by only a quixotic minority." Journalists are told to identify, wherever possible, a majority view, and that is the one they should present. The majority view may turn out to be wrong, but such instances, we are told, are the exceptions rather than the rule. Perhaps they are, but the BSE crisis shows what can happen when those in authority are able to prevent a minority view being heard.

The Royal Society acknowledges that it is important for scientists to communicate via the media, but is concerned that some scientists may be seeking publicity to further their careers or to make exaggerated claims. To counter this, the media should contact "scientific advisers" (again, presumably supplied by the Royal Society) who could establish the authenticity of any story.

On the matter of "uncertainty", "journalists should be wary of regarding uncertainty about a scientific issue as an indication that all views, no matter how unorthodox, have the same legitimacy." The Royal Society insists that it is peer review that confers legitimacy on scientific claims. Up to a point, we agree, though even they admit that the process is not infallible. Hans Krebs' paper on the cycle that bears his name is not the only important one to have failed peer review.

There are other important caveats. First, many new scientific results are presented at conferences before they have been subjected to peer review. No one expects scientific journalists to wait until they are accepted for publication, which may be months later. Peer review is not and never has been a precondition for being brought to the attention of the public.

Second, where there is the possibility of danger to health or to the environment, it can be totally counter to the public interest to wait for peer review. If Dr Arpad Pusztai's work did not have possible implications for health, he would not have spoken of it before peer-review and publication, for which he was condemned by the Royal Society. Holding back on a scientific claim until everything is settled is one thing; not alerting the public soon enough to a possible danger is another. Of course, if Pusztai's data had not had potentially serious implications, it is doubtful whether the Royal Society or anyone else would have reacted as they did, which is in itself a point that should worry us.

Finally, it is not only via the press that scientific claims can directly affect the public. The scientific data submitted by commercial companies to gain regulatory approval for their products are seldom properly peer-reviewed or published, either in scientific journals or in the press. The secret memoranda of the US Food and Drug Administration which came to light as the result of the Biointegrity civil lawsuit against the agency are a case in point (<www.biointegrity.org>). The first transgenic tomato to be commercialized actually did not pass the scientific peer-review, but these papers were concealed from the public by the FDA administration. The Royal Society, so quick to act in the case of Dr Pusztai, has said nothing aboutthis side of the issue.

Surely, journalists as well as the public can be credited with critical judgement when the science is clearly explained. Part of our social responsibility, as scientists, is to promote genuine, critical public understanding of science and to encourage open debate in terms that the public can understand. It is the role of journalists to help scientists communicate real science to the public, not merely the views of one body of scientists. MWH

How to Engineer Society to Accept Science as Usual

House of Lords Report on Science and Society

Some years ago, I listened to three popular science lectures at a seminar organized by Copus, the Committee on the Public Understanding of Science, formed in 1986 in the UK by the Royal Society, the Royal Institution and the British Association for the Advancement of Science. At the end, the lectures were judged. The one that was most praised was on a familiar topic, and while it did convey some real information, it was clear that the chief criterion was that it was the most entertaining. A second, well presented and providing an accessible introduction to an important topic, was much less highly rated. The public understanding of science had clearly come second to science as entertainment.

That incident symbolises for me the problems with the relationship between science and society, which a House of Lords Select Committee addresses in a new Report (Science and Society, Select Committee on Science and Technology 3rd Report, Session 1999-2000, House of Lords, The Stationery Office, London). This is the result of an extensive consultation exercise. Many non-government organizations including ISIS made submissions; and ISIS was cited explicitly twice.

The Report begins, appropriately enough, by noticing that there is a crisis of public confidence in science, brought on by what it referred to as the "BSE fiasco". In poll after poll, scientists, especially those working for the government and industry are among the least trusted. It also notices that instruments like Copus need more

dialogue with the public, rather than just a one-way information to the public. In fact, the Report recommends extensive dialogues with the public, not just for the Government's own Office of Science and Technology (OST) and Copus, but as part of the brief of every research organization and learned institution. However, it gives no indication as to how public aspirations are to feed into science or policy decisions, or have any influence on them. On the contrary, it explicitly states, "To prohibit science from progressing without express public support in advance would be retrograde and repressive, and would stifle creative scientific research or drive it overseas." No, that is not what the Select Committee is recommending. Instead, dialogues with the public are "intended to secure science's 'licence to practice", not to restrict it". Translated into ordinary language, "dialogue" is really a public-relations exercise, in order to allow scientists to do whatever they want to do in the first place. So, astonishing as it may seem, there is no mention of science and social responsibility, nor ethics or the public good, as one would expect in a report on science and society.

In the Chapter on communicating uncertainty and risk, it commends the guidelines for scientific advice issued by the Office of Science and Technology (OST), the main theme of which is "openness". So, where scientific advice is uncertain, this should be admitted from the start. But does uncertainty have any real impact on policies? No. The precautionary principle is not mentioned even once.

Strangely enough, in the same chapter on communicating uncertainty and risk, they admit that while scientific input to policy traditionally relies on "independent experts", "the concept of independence has become problematic, particularly because of the increasing commercialisation of research". So, what is the solution for the lack of independence in science? Scientists, they say, "must robustly protect and vindicate their independence", which is more easily said than done. "Sponsorships and affiliations must be openly declared, and must not be assumed to colour the quality or outcome of the science provided that the research output is submitted to peer review and published in the academic literature".

Again, that is more pious hope than a real solution. Declaring interests does not automatically guarantee lack of conflict of interests when scientific advice is given, and scientific data submitted by commercial companies for product approval are almost never published in the academic literature. The Report has to admit the difficulties, and calls for a "radically different approach to the process of policy-making in areas involving science". What exactly does that amount to? That the Government should press for something like the OST guidelines to be adopted at EU Commission level, and that the Interdepartmental Liaison Group on Risk Assessment should look into current research on how risk information is received by the public. In other words, yet another exercise on how best to window-dress for the public.

That is not all. There is another more worrying agenda. The chapter on Science and the Media urges the Press Complaints Commission (PCC), in bold print and in the strongest terms, to adopt the Royal Society Guidelines: "We recommend these guidelines, and we urge the PCC to adopt and promulgate them. In doing so, the PCC should make it clear that they are aimed not just at specialist science correspondents, but at all journalists who find themselves dealing with science, including those on the news desk."

The Royal Society Guidelines effectively stifle dissent within the scientific community and promulgate the views of the establishment (see "Trust me, I'm an expert", above). For good measure, the House of Lords Select Committee adds several comments, the first aimed at discouraging sensational headlines such as those that might damage the image of GM crops; the second, incredible as it may seem, attempts to purge the word, "safe" from the vocabulary of the media. "The very question "Is it safe?" is itself irresponsible, since it conveys the misleading impression that absolute safety is achievable." This frontal attack on the English language is actually a veiled attempt to undermine the precautionary principle in its most important form, which can truly safeguard human health and the environment. It entails a reversal of the present onus of proof. In other words, instead of requiring civil society to prove something harmful before it can be withdrawn or banned, perpetrators have to prove something is safe before it can be approved, especially where the product is of no proven benefit to society.

The admission of uncertainty in science is an important step. The role of science is to set precaution based on uncertain evidence: the precautionary principle is part and parcel of sound science. It is time the scientific establishment put an end to the abuse and misuse of scientific evidence that has allowed corporations to endanger human health and the environment with impunity for the past fifty years.MWH

Berkeley Professors Dare to Dissent

First critical forum on genetic engineering in any university on both sides of the Atlantic

Prof. Miguel A. Altieri of Berkeley and Dr. Peter Rosset of the non-Government organization, Food First Institute, both well-known proponents of sustainable agriculture, organized an International Workshop (March 2-4) on Ecological Impacts of Transgenic Crops in the University of California, Berkeley. Many of the participants also spoke to packed audiences in a campus-wide seminar and an open forum for the public. These events were the first ever on both sides of the Atlantic to have been organized by faculty members. All the more significant as the entire Bioscience Department of UC Berkeley has effectively been sold off to Novartis two years ago for US$50 million, amidst strong protest from some of the academic staff and students.

The participants included scientists whose work has cast doubt on the safety of transgenic crops. The organizers are producing a report and have promised to make available the detailed proceedings and papers circulated.

Miguel Altieri emphasized the many forms of sustainable agricultural practices which have already led to 100 to 200% increases in yield in developing countries. David Andow questioned the efficacy of Bt-resistance management. Ann Clark urged the need for a process-based regulation rather than a product-based regulation on grounds that the hazards are inherent to the technology. Katherine Donegan spoke on the substantial impacts of transgenic crops and crop-remains on soil ecosystem which may drastically decrease soil fertility. Michael Hansen exposed the inadequacy of regulation and risk assessment in the US. David Hathaway spoke on the ecological implications for developing countries. Angelika Hilbeck summarized the research of her group on the effects of bt-transgenic corn and bt-toxins on natural enemies of target and non-target pests. Mae-Wan Ho and Allison Powell spoke on the ecological impacts of viral resistant transgenic crops, highlighting recombination between viral transgenes and other viral genomes to generate new viruses. Jane Rissler and Allison Snow updated the spread of herbicide tolerance traits from transgenic crops to wild relatives.

There was a large measure of agreement among the participants that the risks are real, but opinions differed as to the appropriate course of action, which varied from calling for a total ban to a demand for labelling.

Speakers repeated their messages at the public meetings. Some students were giving out Novartis propaganda and a letter supporting agricultural biotechnology signed by 1000 scientists. Apart from that, the critics of agbiotech were not challenged by the practitioners, many of whom were in the audience. These were milestone events, and congratulations to UC Berkeley for hosting them. MWH

Warnings that GM Crops are Unsafe

ISIS Arrange Special House of Commons Briefings Feb. 10-11, 2000

By special arrangement with Alan Simpson MP, ISIS brought two expert witnesses before the UK Government, to warn of the hazards of GM food and crops, and of the bureaucratic cover up that occurred in the early 1990s when GM foods were first approved by the US Food and Drug Administration (FDA). Professor Terje Traavik, virologist and senior scientific advisor to the Norwegian Government, and Steven Druker. lawyer spearheading the civil lawsuit against the US FDA, gave a private briefing to UK Environment Minister Michael Meacher and his scientific staff in the Department of the Environment, Transport and Regions (DETR). This was followed, on the next day, by a public briefing for politicians and the press in the House of Commons.

During the private meeting with Meacher, Prof. Traavik did not mince his words. He warned that the first generation of GM crops are dangerous for human health and the environment, and should be banned. The second generation of GM crops will avoid some of the hazards, and may offer the way forward. Adequate risk assessment was impossible because so little research had been done to even characterize the potential risks involved. He emphasized that the preautionary principle must be used to deal with the terrible mess that biotech companies had made by forcing such a potentially hazardous new food science onto the world.

Steven Druker told of how the US FDA had misrepresented and concealed the scientific advice it received from its own scientists. Internal documents, obtained as the result of the civil lawsuit, show how the FDA had ignored repeated warnings that GM foods are not substantially equivalent to conventional foods and involve new risks. He explained that the first GM food approved in the US, the Flavr Savr tomato, actually failed to pass the FDA's required toxicological feeding trials, and this matter was never resolved by the agency. Instead, FDA eliminated the requirement for feeding trials, and proceeded to approve GM foods on grounds that they were GRAS, generally recognized as safe. FDA scientists were also vigorously opposed to the use of antibiotic resistance marker genes in GM foods and animal feed, on grounds of risks to human and animal health. FDA ignored this advice as well.

Michael Meacher and his staff were reported to be very interested in the presentations and 'alarmed' by the legal challenge now under way in the US. The meeting ran over time by half an hour as the speakers were questioned in more detail. The Minister spoke extensively with Prof. Traavik and requested copies of all his reports to the Norwegian Government.

At the public briefing in the House of Commons the next day, Steven Druker repeated his message. He made clear that the FDA are in direct violation of US law, which clearly adopts the precautionary principle and mandates it in the Food, Drug and Cosmetic Act. The Act requires new food additives to be demonstrated safe before they are approved for market.

He quoted several FDA scientists, who strongly protested against the approach taken by the agency. "The agency is trying to fit a square peg into a round hole by trying to force an ultimate conclusion that there is no difference between foods modified by genetic engineering and foods modified by traditional breeding practices." wrote Dr. Linda Kahl, an FDA compliance officer. In summarizing the input from the FDA's scientists, she stated,"The processses of genetic engineering and traiditonal breeding are different, and according to the technical experts in the agency, they lead to different risks." Dr. James Maryanski, the FDA' biotechnology co-ordinator wrote in a letter to a Canadian official, "There is no consensus about the safety of GM foods in the scientific community at large, and FDA scientists advised they should undergo special testing, including toxicological tests."

Steven Druker said, "The FDA have totally misrepresented the scientific facts in order to promote the US biotech industry. The claim that is policy is science-based is completely contradicted by its own scientific experts and is therefore false and amounts to a major deception."

Prof. Traavik began by saying he is a professional genetic engineer and has been for the past 20 years. At first, he was a total 'believer' in thinking that there were only benefits. But he changed his mind as the result of discoveries made in his own laboratory. "We have no gene technology!" he said categorically, basically because the so-called technology is uncontrollable and unpredictable, so much so that there is no basis at all for risk assessment. Perhaps the next generation of technology may deserve the label. He emphasized that the gene constructs are the same, and involve the same risks, whether they are used in agriculture or in medicine, such as gene therapy vectors and vaccines. Nature has never seen those sorts of genetic constructs before. They pose huge risks as they can become mixed up with normal viruses and other invasive elements and transfer their traits elsewhere. The potential hazards of artificial constructs are much greater than chemicals. Because, instead of breaking down or diluting out, they are taken up by cells to multiply mutate and recombine indefinitely. It may be "BSE [mad cow disease] in technicolor".

The foreign genes and constructs cannot be targeted and are inserted at random, causing all sorts of genetic disruptions. These can result in the production of new toxins and allergens. All plants contain toxins and allergens but the toxins are produced at very low levels. GM can result in over-production of these toxins and allergens. He repeated his call for banning the first generation of GMOs.

Prof. Traavik also stressed the desperate need for public funding of risk associated research based on the holistic, ecological paradigm rather than the reductionist paradigm now ruling.

During the discussion, Prof. Arpad Pusztai, formerly from Rowett Institute, added that in his experiments (published in The Lancet last year), position effects due to random gene insertion were clearly observed. He worked on two lines of transgenic potato that were deemed to be substantially equivalent. However, after stringent analysis, they were shown to contain very different levels of protein and were certainly not substantially equivalent. The two lines came from one transformation experiment, but had very different compositional profiles.

One journalist questioned, "Surely not all scientists who support GM have got it so badly wrong?" Dr. Mae-Wan Ho replied from the floor that science was in crisis and funding in science is such that scientists are consciously or unconsiously adopting

the corporate agenda, which is not the same as the public good.

Dr. Ian Gibson, Chair of the UK Government's Science and Technology Committee, added that in his view, the whole process of safety assessment for all foods needed to be reviewed and updated.

The meeting was alive with questions from the floor and also ran over time. Reports have appeared in The Express and the Daily Mail, and Steven Druker gave at least two radio interviews to the BBC on the following day.

There was also a report that Steven Druker's testimony had a major effect on UK prime minister Tony Blair, who was moved to a dramatic U-turn with regard to GM crops in admitting that they may damage both human health and biodiversity.

Steven Druker stayed on to attend the OECD's intergovernmental meeting on safety in biotechnology in Edinburgh (reported by Dr. Pusztai, this issue). AR

OECD Agenda: "There is no evidence that GM-food is harmful"

Pusztai on OECD Meeting on GMOs Feb. 29 – March 2, 2000

Dr. Arpad Pusztai was the only scientist sceptical of GM food safety to be invited to the much publicized OECD's intergovernmental Conference on GMOs. Here is his personal account, slightly edited.

After the meeting was opened by a number of politicians, Prof. Charles Arntzen from the Boyce Institute, USA, kicked off with the virtues of edible vaccines in potatoes. He made no comment on whether they would be tested rigorously; nor on the fact that they have to be eaten raw as heating would destroy the vaccine. Next, Dr Suman Sahai from Gene Campaign, India, argued convincingly that GMOs offer no benefit for developing countries. Instead, it was a means of exploitation, of robbing the poor to enrich the rich in the First World. Then came the darling of the Conference, Professor Zhangliang Chen (Vice President of Beijing University, China) who said China is slowly replacing everything with GM-counterparts and they have also tested their health effects on rats. However, no details on design or methodology or publications in peer-reviewed journals were given. This did not stop him from giving a glowing certificate of health and worth to all the GM-crops he tested. I was attacked for publishing our results in worthless rags such as *The Lancet* and *The Journal of Nutrition* when we should have done like Professor Chen and not published anything at all. I have a feeling that I was expected to ask for the forgiveness of the new God of GM-biotechnology.

After coffee came Professor Gordon Conway (President of Rockefeller Foundation) who gave his totally 'unbiased' views on the benefits, risks and ownership of GM-crop biotechnology. The 'balance' was redressed by the panellist who had 5 min each: both Benedikt Haerlin (Greenpiece International) and Mrs Marilena Lazzarini from the Institute for Consumer Defence, Brazil spoke well but made no great stir in the GM-biotechnology-dominated audience. In contrast a Novartis employee, Dr Andreas Seiter, did go through the biotech industry routine and was acclaimed by the audience.

The afternoon session on GM Food and Human Health should have been very short, as we have no data on this topic at all but that did not deter the Organisers. The first speaker, Prof. Ambroise Martin (University Lyon) had 20 min but did not say much. The next speaker was in Geriatric Medicine at Cornell University. He talked a lot about medical aspects of the old and at the end he waxed eloquently about the work of Arntzen who is a genius and is going to solve all the problems of the old by making them eat potatoes, bananas, etc with edible vaccines in them. The last speaker of the session before coffee was Prof. Hans Gunter (Darmstadt Technical University) who gave all the possible health risks of GM-food. There is obviously a subtle change in the air on GM-food in Germany – he sounded a warning note of caution. He advocated post-market monitoring of the effects of GM-food although he did not specify how to do this.

After coffee there was a presentation on Food Allergy and GMOs by Prof. Carsten Bindslev-Jensen (Denmark) who said that they tested all GM-food they could lay their hands on for allergy (skin-prick test with human subjects) and found that none of them was any worse than the non-GM counterparts. My problem with this is that I do not believe in these tests for a start so I am not so sure whether his message was a good one or not or just simply means that he used a technique, which is severely limited and found no problem.

Then came the panel discussion. As a special favour granted by Sir John Krebs, I was given 10 min to give my slides on my protocol (now on my homepage) which was cut to 8 min by the Chairman. It would not have made much difference if I had been given 1 h, the effect would have been the same. Nobody made the slightest reference to it then or later. As Prof. Chen from China had such a "poor" opportunity previously to give his views he was allowed another bite of the same cherry. The message was still the same and the audience loved it. Prof. Alan McHughen (University of Saskatchewan), another GM enthusiast, said that we must introduce all his GM-crops but must also be vigilant. He could not say how, in 5 mins. Finally, Dr James Maryanski of FDA told us of all the great safety tests the FDA had done and also how generously they were with public hearings, and made 44,000 pages of their files available to the public. If course, this is not really needed because GM-food is the best and most rigorously tested food in the history of mankind.

He was refuted by US Lawyer Steven Druker from the Alliance of Biointegrity. The FDA had not revealed those 44,000 pages out of the goodness of their hearts -they were made to do so by a Court Action. The files revealed how the FDA had completely ignored the advise of their own scientists about safety, especially, that there was no substantial equivalence between GM and nonGM crops. You can find Steven's contribution on the biointegrity website <www.biointegrity.org>.

I would like to say something about the personal attacks on me from the floor. I had some exchanges with Phil Dale from the John Innes Centre in Norwich. He said (remember that we ought to have discussed my slides!) that I am a particularly unfair person because I never discussed the results of our nutritional work with the SCRI and Durham scientists, although they were involved in the research. Actually, as I have coordinated the whole programme, I made sure that we had 3-6 monthly workshops with written minutes of the events. The next bits of exchange was with Monsanto and other biotech people who got upset about my remark that when we started in 1995 there was not a single paper published in peer-reviewed journals on the nutritional/physiological testing of any GM-food. They kept jumping up, one after another. to say that there were lots of papers; the Monsanto guy, Fox, said that he himself must have produced them by the dozen. I kept challenging them as to where these were published but they were not forthcoming in their replies. Eventually a number of people like Joan Ruddock tried to defend me from the floor. In fact, she later confronted the Monsanto guy in private when, as always, he admits that they must have misunderstood me. The truth is that

they count anything, even their memos, as publications. It is no wonder that the Chinese scientists' talk went down so well with them.

On Tuesday the GM-propaganda machine got into a higher gear. Kuiper chaired the sessions throughout the whole day. Needless to say, he never allowed me to take part in the discussions. The first speaker was Prof. Bernard Chevassu-au-Louis (President of the French Health and Food safety Agency). He gave his lecture in French which even with the translation was a little difficult to follow. Generally, he did seem to be good. His most memorable contribution was that, on the basis of substantial equivalence one could not differentiate a mad cow with BSE from a healthy one, that has put the substantial equivalence principle in the proper context, no matter how much Dr Peter Kearns (OECD) tried to salvage it. He said we must use it as our guiding principle. This just showed up that these people do not understand (or do not want to) that science is quantitative. It is not much use to say that you are a little mad; one needs to know how little?

Dr Calestous Juma (Director, Science Technology, Development Programme, Harvard University) could not come, so we had a real treat, a Professor of Microbiology, who doubles up as the S. African regulatory authority stepped into his shoes. She was enthusing all the time and according to her, the greatest triumph of the GM technology is that one S. African woman farmer, by planting GM-cotton took 30,000 rands (£3,000) to the bank at the end of the season. We were all duly impressed and many biotechnologists during the rest of the meeting referred to her example. Unfortunately, even this was not documented but the believer of the new faith swallowed it nevertheless. Next was Dr Alan Randell (Codex Alimentarius, FAO) who gave a very good factual account of the work of the Codex people. Obviously, he was in favour of GM but he also recognised that we need to do our homework and carry out proper testing according to strictly agreed protocols. We shall see!

After coffee unquestionably the best talk of the session was given by Prof. John Durant (Head of Science Communication, Science Museum UK). He explained to all the blockheads of the GM-biotech industry representatives that it was no use to blame the GM fiasco on the press, on maverick scientists (I expect the likes of me), the gullibility of consumers, sinister green pressure groups, etc. The fault lies with the proponents. So from there on, the motto of the Conference was borrowed from him: "openness, transparency and inclusiveness". In the best example of hypocrisy, the Conference went on and referred constantly back to him The Consumer Perspective was then given very lucidly and forcibly by Mr Julian Edwards, which was good and to be expected.

The following panel and plenary discussion was quite something. I have never heard such extreme and sometimes disgraceful views expounded in public as was done by Dr Val Giddings (Vice-President for Food, Agriculture, Biotechnology Industry Organisation (BIO) US). To give you some of the flavour of what he said - the only way to solve allergenicity, once for all, was via GM-technology. It was pointed out that we only escaped by the skin of our teeth the brazil nut allergen transfer into soya. But he then used this as an example of how well the regulation worked. He went on - when he was in Brazil he was told by some of the politicians there that even if there were some deaths due to anaphylaxis it is a price well worth paying if they could at the same time feed the population with this GM-soya. To show up how impartial the Chair was, nobody had a chance to reply to this once the people regained their breath after Dr Giddings great intervention. Mr Martin van Zwannenberg (ex-Divisional Director of Food Technology, Marks & Spencer, UK) had the distinction to almost physically attack me for my views, which disgraced science, etc...

Just imagine what sort of crowd they assembled here in Edinburgh? Clearly the creme of the society and 'science'.. Dr Michael Hansen (Consumers Union, USA) pointed out that (what I said above) science is quantitative and the present woolly definition of substantial equivalence is only a cop-out for the biotech regulators because how small is small. In fact the best would be to totally abandon this stupid thing. Needless to say, 90% of the people at the Conference would not agree with him. There was one very gung-ho GM person, who was absolutely impervious to any argument that was to her dislike. She was flatly opposed even to the idea of labelling. So much so that her views got into the final draft rapporteurs' report as something we "all agreed about". In fact, she was probably the only one who totally opposed the idea of labelling and nobody else made a great deal of it, even those from the GM-biotech industry kept reasonably quiet.

Sir John Krebs chaired the Wednesday session and this was somewhat of an eye-opener for me. The only speaker of the morning was Dr Ismail Serageldin (Vice-President, World Bank). He referred a lot to the South African farmer woman with her GM-cotton. Professor Chen from Zimbabve also extolled the virtues of GM for the developing world and so on. Unfortunately, the Organisers forgot to invite people such as Tewolde Egziabher and others to counterbalance this open enthusing on the great value of the GM-technology. Obviously, the World Bank will be giving big loans to the poor Third World Countries to buy the technology or even more the seeds in order to increase their dependency on the First World multinational companies and increase their financial debt. After this Dr Peter Tindemans (The Netherlands) and Dr Ian Gillespie (UK) - the rapporteurs, introduced their draft report which was then discussed by the participants under the Chairmanship of Sir John Krebs. Half of this was taken up by personal attacks on myself and other sceptics. I must say that this was too much even for people like Kuiper, Tom Sanders and some other scientists and the remainder of the Consumer, green groups (most of them left by this time). Needless to say, I was not given any chance to defend myself. But this is in the great British tradition. After all, I was gagged for seven months before so what's the difference now? I am not going to say anything about the draft report because it is supposed to be confidential. However, I have already made my protest about some of the points in the report. The most blatant of which stated that there was general agreement on the point that there is no evidence at all to show that GM-food has a harmful effect on health. I believe this was the main purpose of the Conference: to state this clearly so that the Government's hands will be untied, and they can go ahead to legalise the whole GM-business. I gave them a very strongly worded protest on this point because even if they disregard all of my work, how can they make such a sweeping statement when there has never been any experiments with humans to show whether GM-food is good, bad or indifferent. When the final report of Sir John is published, it will give me the opportunity to put my comments on my homepage. I know that it is regularly visited by people from all over the world and if there are many like me, then they will not be able to get away with this.

The CaMV Promoter Saga Continues..

Nature Biotechnology makes a habit of losing e-mails and submissions

To recapitulate on the story so far, a scientific paper, "Cauliflower mosaic viral promoter – A recipe for disaster?", co-authored by Mae-Wan Ho, Angela Ryan and Joe Cummins was submitted to the Journal, *Microbial Ecology in Health and Disease* last October (now published: vol.11, 194-197, 1999). The Journal's Editor, promptly posted it on the Journal's website before publication and put out a press release. Within two days, someone managed to solicit at least nine critiques, including one from Monsanto, which were posted on a website funded by the biotech industry and widely circulated on the internet. The critiques varied in tone from moderately polite to outright rude. We wrote a detailed rebuttal, which was likewise circulated and posted to the same website, and have not received any replies from our critics since. In January, *Nature Biotechnology* published a distorted, one-sided and offensive account of our paper, concentrating on the criticisms and ignoring our rebuttal completely.

Our paper reviews and synthesizes existing scientific findings on the cauliflower mosaic viral (CaMV) promoter that is in practically all GM crops already commercialized or undergoing field trials. The findings suggest to us that artificial gene-constructs containing the CaMV promoter may be especially prone to breaking and joining up with other genetic material, thereby increasing the chance that it can be transferred horizontally to unrelated species. The potential hazards are harmful mutations, cancers, reactivation of dormant viruses and generation of new viruses. These considerations are especially relevant in the light of recent findings by Arpad Pusztai and his collaborator Stanley Ewen (*The Lancet* 354, p.1353, 1999), that transgenic potatoes - containing the CaMV 35S promoter - may be unsafe for young rats, part of the effects being attributed to the construct or the genetic engineering process, and hence common to all GM crops.

Secret documents belonging to the US Food and Drug Administration, which came to light as the result of a civil lawsuit against the agency (see Special House of Commons Briefings, this issue, and www.biointegrity.org) reveal that the first GM crop to be commercialized, the Flavr Savr tomato – which also had the CaMV promoter - actually failed to pass the standard safety tests. Since then, no comprehensive safety testing has been done on any GM foods. In line with the precautionary principle, we recommend the immediate withdrawal of all GM crops and products containing the CaMV promoter, until and unless they can be proven safe.

Nature Biotechnology had agreed in principle to our right to reply. But their editorial office has somehow managed to lose our e-mails and submission more than once over the past three months, and each time after a long delay. We have finally got an acknowledgement from them that they have received our corrected galleys. It is now posted on our website.

Meanwhile, we have written a more detailed reply for *Microbial Ecology in Health and Disease*, Hazards of Transgenic Plants with Cauliflower Mosaic Viral Promoter, with new references and arguments. This shall be posted on our website when it is accepted for publication.

MWH

Lead Article

Can such rampant unregulated gene shuffling be safe?

New artificial genetic constructs pose even greater threats health and biodiversity

It has long been our contention that genetic engineering is inherently hazardous, if only because of the rampant, arbitrary combinations of genetic material it creates. The most dangerous category of recombinant genetic material are perhaps the artificial vectors for carrying and transferring genes, which are generally made of viruses that cause diseases and other genetic parasites that spread virulence and drug and antibiotic resistance. Unlike natural viruses and genetic parasites, which respect species barriers, artificial vectors are designed to be promiscuous, and to be able to jump ultimately across all species barriers. These are also designed for invasiveness, to overcome mechanisms that guard against their integration and expression in foreign genomes.

In a recent ISIS report (1) produced for circulation at the Biosafety Protocol Meeting in Montreal (Jan. 2000), we pointed out that an increasing variety of naked/free nucleic acids are now being made for use in research, industrial productions and medical applications, *all of which are being released unregulated into the environment*. They range from oligonucleotides to artificial constructs thousands and millions of basepairs in length, often containing heterogeneous arrays of genes from pathogenic bacteria, viruses and other genetic parasites belonging to every kingdom of living organisms. As most of them have never existed, or if they have, not in such large amounts, they are, by definition, xenobiotics – substances foreign to nature - with the potential to cause harm. Some gene therapy vectors and vaccines have already been found to elicit toxic and other harmful reactions.

Nucleic acids are now known to persist in all environments, including the digestive tract. Transformation by the uptake of DNA is a significant route of horizontal gene transfer, and there is overwhelming evidence that horizontal gene transfer and recombination have been responsible for the recent resurgence of drug and antibiotic resistant infectious diseases.

Recent research in gene therapy and in vaccine development leaves little doubt that naked/free nucleic acids are readily taken up by the cells of all species of mammals including human beings, and may become integrated into the cell's genome. Integration can result in harmful biological effects, including cancers. There is also the potential for generating new viruses by horizontal gene transfer and recombination. In short, the need to establish regulatory oversight of such artificial constructs at both national and international levels is long overdue.

We report on several new categories of constructs below: powerful synthetic promoters, hybrid gene-therapy vectors that combine high infectivity with the ability to integrate into genomes, a vector made from an insect virus with mammalian viral promoters that can infect practically all mammalian cells at high frequency, and synthetic jumping genes that can infect bacteria as well as all higher organisms.

Promoters are gene switches for turning genes on, and every functioning gene has to have one. Promoters typically have a modular construction, consisting of parts that respond to different signals from a battery of other genes, which determine where and when they are turned on, by how much and for how long. Thus, promoters allow genes to talk to one another. These gene-conversations form complex intercommunication networks that enable the tens of thousands of genes in an organism to function as a coherent whole, and to respond appropriately to the environment.

Researchers in Texas are developing synthetic superpromoters

that surpass the capacity of natural promoters to boost gene expression (2). The scientists took four different regulatory elements from muscle-specific promoters and reassembled them at random to make new synthetic promoters. Some of the resulting synthetic promoters give gene-expression levels greatly in excess of those of normal muscle promoters or viral promoters. The promoter elements used were:

- Serum response element (SRE) found in the promoters of several muscle proteins: alpha-actin, myosin light chain, and dystrophin
- MEF-2 sites found in the promoter/enhancer regions of the myosin light chain 2A gene
- MEF-1 sites or E-boxes, found in regulatory regions of most, if not all, muscle specific genes
- The highly conserved muscle CAT motif, or TEF-1 binding site, which has been shown to mediate both muscle specific and non-muscle specific transcription – it is also active in SV40 virus.

What will these synthetic promoters do to gene-regulation in the organism as a whole? This question is almost never asked by genetic engineers whose focus is entirely on the function of the one or two transgenes controlled by the promoters. As every regulatory element of a promoter is embedded in an intricate web of highly specific modulations of gene functions, simply recombining the elements will have unintended global (pleiotropic) effects. When the resultant promoter makes genes over-express as well, there could be major disruptions to the genetic intercommunication networks.

What are the potential hazards? Again, this question is seldom considered. The recombination of synthetic superpromoters with cellular proto-oncogenes may give rise to cancer on account of over-expression of the proto-oncogenes. Similarly, recombination of the superpromoters with dormant viruses and other infectious genetic elements in the genome may create infectious viruses and other invasive elements. It is already known that the CAT motif is also active in SV40, a virus now found to be associated with many human cancers.

Gene therapy is fraught with difficulties and pitfalls (see ISIS Report, ref. 1) Gene therapy vectors (and naked DNA vaccines) have caused acute toxic shock reactions and severe immune reactions. Between 1998 and 1999, there were six deaths and more than 650 adverse events resulting from clinical trials of gene therapy, the causes of which are yet to be determined. Naked DNA can also trigger autoimmune reactions. Recent research indicates that any fragment of double-stranded DNA or RNA (down to 25 base-pairs) introduced into cells can induce autoimmune reactions, which are linked to rheumatoid arthritis, insulin-dependent diabetes and Graves disease of the thyroid (see ISIS News #2). Many 'spontaneous' mutations result from insertions of transposons and other invasive elements into genes. Insertion mutagenesis is associated with a range of cancers of the lung, breast, colon and liver.

Gene therapists are finding it almost impossible to get gene therapy vectors efficiently and safely delivered into target tissues *and* to produce therapeutic amounts of gene product for an appropriate time. Now, dangerous recombinant viral vectors are under development in a desperate attempt to overcome the problems. Researchers have created an adenovirus-retrovirus vector by combining the long terminal repeats (LTRs) of the Moloney murine leukemia retrovirus - which has the ability to integrate into genomic DNA, with adenoviral vectors - which have high infection efficiency (3). An integration frequency of 15% was observed and expression persisted for nine weeks (the last time point studied), being 15 fold greater in the hybrid vector than in the control.

This work demonstrates that adenoviral vectors containing retroviral LTR elements are able to integrate in the *absence* of the retroviral structural proteins, which were previously thought to be necessary. The scientists point out that a large variety of retroviral sequences exist within genomes and are known to be present in mammals including humans. These elements may have provided helper-functions to the hybrid vector. Random integration was observed and sequence analysis found no site-specific target sequence. Insertion occurred over different chromosomes, and multiple insertions were seen within individual cells. Many unproductive integrations were also found as the result of the vector breaking, a sign of structural instability.

In an attempt to achieve more efficient gene transfer and expression *in vivo* the researchers have, in effect, created the potential for a new supervirus that will have the infectivity of the adenovirus and the ability of the retrovirus to invade genomes.

Baculovirus, previously thought to be specific for insect cells and widely manipulated for controlling insect pests in agriculture, was recently found to infect mammalian cells. It is therefore being actively developed as a vector for gene therapy. We have pointed out the hazard, obvious to us, though not apparently to the genetic engineering community, that genetic engineered baculoviruses used in agriculture may infect agricultural workers, food processors as well as the public at large (4).

Researchers at the Glaxo Wellcome Research Institute have created a recombinant baculoviral vector intended for gene therapy containing two mammalian gene-expression cassettes with constitutive promoters. (A constitutive promoter is one that gives continuous gene expression.) The cytomegalovirus (CMV) immediate early promoter/enhancer is used with the green fluorescent protein gene, and the simian virus 40 (SV40) early promoter is used with the antibiotic resistance marker gene for neomycin phosphotransferase II (NPTII). The antibiotic Geneticin is used to select for cells that have taken up the recombinant baculoviral vector. High frequencies of uptake (72% to 94%) were found for a variety of mammalian cell lines: those originating from human hepatomas, from pig kidney and from a variety of other tumours of pig, rat and human. From these cells that have taken up the vector, further lines could be selected that express the genes stably, suggesting that the vector may have integrated into the cells' genome.

The vector is probably promiscuous for all mammalian cells as well as insect cells. It has the potential to generate new viruses that cross from insects to mammals and vice versa.

Investigative journalist Edward Hooper has written a book detailing the circumstantial evidence that the AIDS virus, HIV may have been created in the manufacture of polio vaccines in monkey cells (5). And researchers have pointed out that this should give grounds for caution in xenotransplantation (6). In our view, gene therapy vectors are even more likely to facilitate the evolution of cross-species viruses.

David Baltimore, Nobel laureate and president of Caltech who works in gene therapy is now coming out fervently against its practice. He said recently in an interview "I disagree we've had value from gene therapy trials so far. A number of us are asking, 'what the hell are we doing putting these things into people?' ". We strongly share his views.

Finally, scientists in Boston have developed a new breed of transposons or jumping genes as "a universal tool for genetic studies in bacteria" (7). The construct is derived from *mariner*, a superfamily of transposable elements found across genomes of diverse eukaryotic organisms. The *mariner*

family element - *Hirmar1* , isolated from the horn fly was used to make this new transposition system, named 'minitransposons'. It employs the short inverted repeats of *Hirmar1* flanking a kanamycin antibiotic resistance marker gene that is driven by a bacterial promoter. Transposition and random insertion in *E. coli* and in *Mycobacterium* was observed, with little site-specificity beyond the known requirement for the dinucleotide TA. Within the 500 base pairs analysed, insertion was shown in 21 of the 23 possible TA dinucleotide insertion sites.

Significantly, the scientists found one insertion that caused the activation and over expression of a host gene. The insertion site was 164 basepairs away from the gene; the bacterial promoter used to drive the expression of the antibiotic resistance gene had inserted in the same orientation and was therefore able to drive its over expression. The authors report the system as "universal", which means it can operate in any organism and they suggest it should be widely used to study many important pathogens.

Considering the difficulty in maintaining sterile conditions in laboratories, the widespread use of this system poses a serious health risks. It is designed specifically to overcome all species barriers and to insert into all genomes, where it can cause insertion mutagenesis.

There must be stringent measures to prevent these and other artificial constructs from being released into the environment in any form. Nor should they be used for gene therapy or to create transgenic organisms that are released into the environment. Civil society should be debating whether such hazardous research of no obvious benefit should be supported.

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MWH & AR

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_ Biopatents

EPO Gives Patents on Life the Go Ahead

At the end of last year, the European Patent Office (EPO) announced its lifting of the four-year moratorium on patents on life. The enlarged board of appeal overturned its earlier judgement and ruled that such patents are no longer excluded by the wording of the European Patent convention. Previously, the lower board of appeal has excluded patents on GM plants as they constitute new varieties of plants and are regulated by The International Union for the protection of New Varieties of plants.

The enlarged board ruled that the exclusion of plant varieties should be interpreted in a 'narrow sense' and not deny patents on plants produced by novel - and hence patentable, biotechnological processes - it now defines a plant variety, ridiculously, as being less than a single gene's separation between two plants.

The EPO is now processing some 1,200 applications for patents on GM animals and plants. Two European Union States have referred this matter to the European court, acknowledging ambiguity over the new ruling. An open consensus conference is now warranted and should be organised by the EPO via a public website. This would enable proper public debate throughout Europe on patents for life and help the EPO to settle any conflicts of interests that may arise during the application process. Source: Patent confusion in law on new plant varieties, letter to editor by John R Porter, *Nature* Vol 404, 2 March p 13 AR

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EPO Issued Patent by Mistake

Germany's federal minister of legal affairs, Herta Daubler-Gmelin has filed a formal objection against a patent issued by the European Patent Office (EPO) in Dec last year, which includes claims on technologies that could be used to alter the composition of the human germ line. The patent covers the "isolation, selection and propagation of animal transgenic stem cells", and was filed in 1994 by the Univ. of Edinburgh's Centre for Genome Research. The technique is now licensed exclusively to the Austrian company Stem Cell Sciences. It does not explicitly exclude the application of such techniques for human cells and states that the term 'animal cell' is intended to embrace all animal cells, including human cells. This patent violates the EPO's own rules as determined by the European Patent Convention, which stipulates that patents must not violate common standards of ethics and morality.

Patent officials have admitted "a very serious error" has been committed but point out that the EPO does not have the legal right to amend a granted patent containing an error "on it's own initiative". The European patent convention allows anyone to challenge a patent within nine months after it is granted.

Germany is particularly sensitive to the potential applications of genetic engineering, partly for historic reasons, and all the political parties in Germany have dissociated themselves from this patent, stating that strict bioethical standards have been undermined by commercial pressures. Germany's research minister, Edelgard Bulmahn, criticised the lack of transparency in the EPO's patenting procedures and calls on the convention's 18 signatory states to "fundamentally reconsider" the patents office's rules and its appeals system.

Further controversies are set to follow, including an application for the technology used to produce Dolly the sheep. Geron Corp. was granted two patents by the UK patent office covering the methodology of nuclear transfer using a quiescent donor and animal (human and non-human) cells, as well as the embryos, animals, and cell lines made using the technology.

This has sparked concern over the rights of ownership of human embryos. The US patent office has issued a Notice of Allowance for this patent but the US patent differs significantly from its UK counterpart, and covers only the cloning of non-human mammals. The UK patent supports the concept that the human embryo is an invention and therefore patentable.

Sources: Germany Challenges Human Stem cell patent awarded 'by mistake'. *Nature*, News, Vol 404, 2 March 2000 & Geron issued UK Dolly patent, Vicki

Glaser, *Nature Biotechnology*, Vol 18 March 200 p 256-7 AR

Stricter criteria for patents may lead to many rejections

On Dec 21 1999 the US Patent and Trademark Office (USPTO) issued two new directives under section 101 "utility", and section 112 "written description requirements". The new guidelines may see a significant increase in rejections on patents for life and lead to unforeseen complications for biotechnological applications. The Supreme Court rejected a Patent application to certain steroid compounds, which failed to disclose utility under the new directives. The applicant attempted to overrule the rejection by reference to an article that said the steroids belong to a class of compounds that are being screened for possible tumour-inhibiting activity. However the court upheld its position stating that the utility asserted were general "biological activities" and "biological properties" of the compound and that specific utility is required under section 101. Congress intends that no patent be granted on a chemical compound whose sole utility consists of its potential role as an object of use/testing. It stated at the hearing that "The patent system is not a hunting licence" and "must be related to the world of commerce rather than to the realm of philosophy".

Under the new utility guidelines the USPTO is looking for "specific utility" and "substantial utility". In future, US patents on DNA fragments or express sequence tags (EST) will require a written description of their specific utility that exists in a real-world context.

It is not thought likely that the new utility guidelines will bring back in full force the "utility" problems that the biotechnology industry faced in the late 1980s and early 1990s. However, there is little doubt that the patent system in the US has been reshaped and issues of utility are firmly back on the agenda.

Source: Analysing the USPTO's revised utility guidelines, Thomas J Kowalski, *Nature Biotechnology*, VOL18 March 18 200 p 349. - AR

Monsanto in court over cotton patents

Aventis CropScience USA together with an independent researcher are suing Monsanto Company over patents that cover transgenic cotton and methods for genetically modifying cotton. It is alleged that Monsanto has exploited the patents to exclude competition in transgenic cotton, which now represents about 68% of the cottonseed sold in the US. The techniques for regenerating transgenic cotton were obtained from Dr Norma Trolinder during a period of collaboration with Monsanto. Monsanto then failed to include her as a co-inventor. Dr Trolinder has transferred the patent rights to Aventis and together they are suiting on the grounds that Monsanto has been able to monopolise the transgenic cotton industry.

Source: Aventis Cropscience US press release, March 13 2000 AR

Human Type 2 RNAse H now owned

Isis Pharmaceuticals Inc. (no connection whatsoever to ISIS Institute of Science in Society) watched as its shares jumped nearly 16 percent last week after announcing that it had been granted a US patent for a key enzyme related to antisense technology. The patent covers the DNA sequence for human Type 2 RNase H as well as vectors and cells containing this DNA sequence and probes to hybridise to the gene or mRNA. The patent includes claims covering methods of making any antisense drug or inhibitor using or relying on the human type 2 RNase H mechanism and specific chemical classes of antisense drugs that work by this mechanism. It was openly admitted by Isis pharm. that human type 2 RNAse and its mechanism is already known and that the patent covers the cDNA clone only, which now owned by the company. However, the patent effectively covers the use and development of any antisense compound, since human type 2 RNase H is central to all antisense technological development and is present in all human cells. This is likely to lead to an increase in legal challenges and counter-challenges.

Source: PATNEWS, USA, by Gregory Aharonian, March 3 2000 patent-news@europe.std.com AR

USDA Betrays Public Trust with Two New Terminator Patents

The US Department of Agriculture (USDA) holds two new patents on the controversial terminator technology, which render harvested seeds sterile. The new patents were issued in 1999 and are jointly owned by the USDA and Delta & Pine Land - the owners of the original 1998 patent. The USDA's new patents share the same titles, inventors and abstracts as the earlier patent, but they describe new innovations and demonstrate that USDA scientists are continuing to refine the technology and advance research.

Thanks to RAFI for this item .AR

Gene Stocks Undergo Sharp Sell Off

On 15 March, President Clinton and Prime Minister Tony Blair declared that the sequence of the human genome should be freely available. The statement led to a frantic selling of the stocks of biotechnology companies that hope to profit through drugs based on the genetic data - tens of billions of dollars in market value drained from the industry. However, despite falling almost 13 percent, the Nasdaq biotech index remains up almost 30 percent this year - investors believe that a new wave of drug and gene therapy products is imminent.

The two leaders' statement, which was eight months in the making, is an outgrowth of the longstanding rivalry between a public consortium of US and British academic centres (largely funded by the National Institutes of Health and the Wellcome Trust London) and the Celera Corporation of Rockville. Celera and its president, Dr J Craig Venter, have long been at odds with leading scientists of the public consortium, chiefly Dr John Sulston of the Sanger Centre in Britain and Dr Robert Waterston of Washington Univ. in St Louis. Merger talks broke off earlier this month when the Public consortium proposed that both sides abandon what it called "the current antagonism and excessive competition". Dr Michael Dexter, Wellcome's director, said the Trust's concern was over the general ownership of the genome, which in his view "is mankind's, and should not be owned by any one company, individual or country." Furthermore, he said the Trust would fight any patents based on sequence data if they obstruct academic work and progress. Dr William Haseltine, the Chief executive of Human Genome Sciences, said that raw data " has no practical use" and added that this was "the biggest untold secret of the human genome project."

According to US patent figures Incyte leads in the human gene patent race with 353 US patents issued, followed by Human Genome Sciences (114 patents), SmithKline Beecham (60), The US government (49), The Univ. of California (46) and Massachusetts General Hospital in Boston (45). Biotechnology companies have yet to prove their ability to translate their research into revenues but these figures helped drive the Nasdaq

composite to an 86 percent gain last year - the best performance by a major index ever in the US. Source: 'A call for sharing of research causes gene stocks to plunge', by Alex Berenson and Nickolas Wade, New York Times USA, March 15 2000 - AR

"Unfair Biopiracy" says Minister of Environment in Indonesia

In a workshop on biopiracy held in Jakarta, Indonesia, activists urged for a further delay of the enforcement of trade related aspects of intellectual property rights (TRIPS), which should have begun in January. The interests of local communities who own these resources needs to be protected by law. "People aren't ready to use patents and developed countries are abusing this for their own interests," said Tini Hadad, an executive board member of the Indoesian Consumers Foundation. The House of Representatives will hold a hearing this week with the government about a draft on patent regulation. The hearing is believed to be in anticipation of the review on TRIPS by WTO next June. State Minister of Environment Sonny Keraf told the workshop that biopiracy was a new form of imperialism, noting that developed states have taken advantage of developing country's slow anticipation of patents. He said "It's ridiculous that we should have to pay to use herbs that have been growing in our land, which we've used since ancient times." He added it was not fair to allow patents on biological diversity. A well-known Japanese cosmetics firm - Shideido, has quietly patented several local traditional formulas of herbs and spices including the anti-ageing agents made from Sambiloto (*Andrographis panicurata*) and Kenukus (*Piper cubeba*), and hair tonic from Javanese chili. Source: 'NGO seminar urges campaign against "Unfair" biopiracy', The Jakarta Post, Indonesia, sent by GRAIN, BIO_IPR docserver, March 20 2000. AR

Science Bytes

The Secret Language of Histones

Histones are proteins associated with DNA to make chromatin, a complex of protein and DNA which is organized into linear structures or chromosomes in higher organisms (eukaryotes). As histones and chromatin structure are specific to eukaryotic genomes, the question arises as to how the chromatin environment may affect gene function.

Histone proteins are one of the most highly conserved in nature.They form nucleosomes, bead-like structures which package DNA into repeating nucleosomal units that are in turn folded into higher order chromatin fibres. It is clear that histones are integral, components of the machinery responsible for regulating gene expression in eukaryotes. They may also be involved in many other processes such as DNA replication, repair, recombination and chromosome segregation. The 'tails' of histones protrude from the chromatin polymer, thus providing an exposed surface for potential interaction with other proteins. A diverse array of post-translational modification occurs in the tail domains of these proteins. The function of these modifications is now being revealed, by a combination of biochemical and genetic evidence. Strahl and Allis (2000) proposethat a 'histone language' is encoded on these tail domains and read by other proteins. Distinct modifications on one or more tails may act sequentially or in combination to form a 'histone code', which brings about distinct downstream events.

The histone code is by no means deciphered, although studies involving chemical modifications are now at an all time high. The authors present the staggering possibility that every amino acid in a histone tail has specific meaning and is part of the vocabulary of the overall code. They conclude that understanding the rules and consequences of the histone code will impact on many, if not all, DNA related processes with far reaching implications for human biology and disease.

Reference: Brian D Strahl, C.David Allis (2000) The language of covalent histone modifications. Nature, Vol 403,pp 41-45

Our Comment This paper describes a whole new level of gene regulation, of which we have a mere glimpse. The 'histone code' represents the ultimate in biochemical sensitivity and specificity of mechanisms which modulates gene function through chromatin structure in all eukaryotic genomes. The random insertion of transgenes into this incredibly subtle regulatory system can only be seen as a brutal assault on its integrity, especially when they contain strong promoters. The work described here is an example of fundamental biological research that should be done before the mad rush to genetic engineer organisms and human beings.

AR

Look! No Genetic Engineering

Growing Hydrogen from Green Algae and Sunlight

A research group headed by Anastasios Melis, a biochemist in the Department of Plant and Microbial Biology in University of California Berkeley, have made a sensational discovery. It has kept Melis' telephone buzzing ever since he gave a talk at the American Association for the Advancement of Science annual meeting earlier this year. They discover how to grow hydrogen gas from green algae and sunlight. Hydrogen is the cleanest renewable fuel around. The beauty of burning hydrogen is that you get pure water back, and already, motor-cars are under development that would burn hydrogen. (This may be a good way to purify water as a by-product!) The alga they are working with is the single-celled Chlamydomonas, which can be grown easily in the laboratory. Normally, it lives by photosynthsis, a process in which the energy of sunlight is absorbed by the green pigment chlorophyll to split water into its elements, hydrogen and oxygen. Actually, only oxygen is released, while hydrogen is separated into a positively charged proton and a negatively charged electron. The electron goes through the electron transport chain to reduce carbon dioxide to carbohydrates (CHO)n, while the proton goes through the ATP-synthase to make ATP, the universal energy intermediate in living organisms. Some of the carbohydrates are oxidized, or combined back with oxygen to give carbon dioxide and water in respiration, in a reversal of photosynthesis. The rest of the carbohydrates are converted into starch, proteins, nucleic acids and other constituents of the cell which are necessary for growth and repair. Proteins contain nitrogen and also sulphur. It so happens that when the alga is deprived of sulphur and sealed tight but still exposed to sunlight, it switches to another metabolic state after 24 to 30 h and begins to release hydrogen gas which is 87% pure. The rest is mostly nitrogen, with 1% carbon dioxide and traces of oxygen. And it can keep this up at least until 150 h. The precise source of the hydrogen is not yet known. It almost certainly involves a reversal of the charge separation process in photosynthesis, ie, electrons are recombined back with protons to give hydrogen. This reaction is catalyzed by an enzyme, hydrogenase. But simultaneously,

there is a breakdown of proteins. It appears that the alga is recycling its proteins to get sulphur, so that the building blocks necessary for survival can be made.

The beauty of it is that the alga has this ability all along, all that was needed was to alter its environment to activate the process. The rate of production is still modest, about 2 millilitres per hour per litre of culture, which the researchers are confident of increasing up to 10-fold.The process is also reversible, so that the alga can be alternated through phases of photosynthesis and hydrogen production several times. As of the beginning of March when I met him, Dr. Melis has had lots of interest from companies that grow algae, but not yet from the petrol companies. This is a prime example of the kind of science that can really provide safe, environmentally friendly and sustainable technologies. It also shows how rewarding it is to work with the organism naturally existing in the environment, whose physiological potential is far greater than can be imagined.

Reference: Melis, A., Zhang, L., Forestier, M., Ghirardi, M.L. and Seibert, M. (2000). Sustained photobiological hydrogen gas production upon reversible inactivation of oxygen evolution in the green alga Chlamydomonas reinhardtii. Plant Physiology 122, 127-135. MWH

Book Briefs

Beginning Again, People & Nature in the New Millennium,

David Ehrenfeld, Oxford University Press, New York, 1993
(ISBN 0-190507812-8)

If I were to be stranded on a desert island, this is the book I would consider taking with me, which is why I want to say something about it even thought it was published some years ago. It is a unique collection of essays that would remind me, with wry amusement and relief, of the destructive, bureaucractic life that I have been liberated from, and at the same time, fill me with a delicious sense of beginning all over again, perhaps, in a never ending love-affair with everything. Now that we have left the old millennium behind, it is indeed the time to begin afresh.

Ehrenfeld is not just a nature writer or an ardent conservationist, he is an astute social and political commentator, he is poet and essayist, superb story-teller, biting satirist and humorist, but always with deep conviction and compassion. He ranges far and wide, weaving natural history with the history of practices, persons and places. Turtles, dandelions, mountain-goats, George Orwell, Dr. Seuss, Stanislaw Lem and more, much more, are all part of the rich tapestry. You are bewitched and at his mercy almost from page one. The turtle stories alone could fill a volume for a life-time's contemplation.

The giant turtle emerges from the dark sea to lay her eggs at Tortuguero on Costa Rica's Carribean coast,

"…I could watch the perfect white spheres falling and falling into the flask-shaped pit scooped into the soft sand.

"Falling as they have fallen for a hundred million years with the same slow cadence, always shielded from the rain or stars by the same massive bulk with the beaked head and the same large, myopic eyes rimmed with crusts of sand washed out by tears. Minutes and hours, days and months dissolve into eons. I am on an Oligocene beach, an Eocene beach, a Cretaceous beach – the scene is the same. It is night, the turtles are coming back, always back: I hear a deep hiss of breath and catch a glint of wet shell as the continents slide and crash, the oceans form and grow. The turtles were coming here before here was here.."

From this heart-rending beauty, he plunges me into a scene of unbearable violence from poachers who had removed the undershell of the turtle to sell to the European turtle soup manufacturer.

But, by far, my most frequent reaction was laughter. Ehrenfeld encountered the musk turtles who climbed up on trees to sun themselves - not "proper behavior for turtles, but they do it anyway" – and debated with himself whether to capture one for his young son Sam, who was especially enamored of turtles. Unfortunately, those particular turtles were ugly and stank horribly. Against his better judgement, perhaps, he caught one, much to the delight of Sam who insisted on naming her "Mack". Mack is the turtle at the bottom of the pile supporting Yertle, king of the turtles, in Dr. Seuss' fable *Yertle the Turtle* , who demanded to have more and more of his subjects to stand on, so that nothing should be higher than him. In the end, Mack the bottom turtle, oppressed by the impossible weight placed upon him, burped deliberately, and sent the whole pile tumbling down, dethroning the king.

There are many other gems in the volume. "The Overmanaged Society" is brilliant. It not only made me laugh, but *cheer* aloud, as anyone who has had to suffer the exponential growth of management in our universities would.

"Overmanagement is a by-product of an exploitative age in which the massive extraction and processing of natural resources have been accompanied by the release of huge amounts of surplus wealth. Managers feed on this wealth, dissipating it as management grows and rendering it unavailable for future use, … the growth of management is uncontrolled: eventually it consumes and extinguishes the power of the society that nurtured it, as resources dwindle and wealth, wasted, declines.

"..we stand at the beginning of a new societal conflict, the successor to the Marxist-capitalist debate: the struggle of the producers of goods and services against centralized management."

There are echoes of George Bernard Shaw's attack on the middle-men and brokers of our society.

The consequences of overmanagement are dire. Bad decisions are made through a selective information feedback, which reinforces decisions taken by the administration and suppresses information critical of it. The Challenger disaster which killed the young school teacher in her maiden-voyage to space was probably caused when 'unfavourable' information about the poor cold-tolerance of the space shuttle's O-ring seals failed to move upwards to the NASA command. The principle investigator of the disaster, Nobel laureate physicist Richard Feynman admitted as much. The same selective information flow might have contributed to the Three-Mile Island disaster, Chernobyl, Sellafield, and every major catastrophe in recent memory. Will the same mistake be made in genetic engineering?

Another consequence of overmanagement is the demoralization of the producers. It saps the creativity of workers in every field. Ehrenfeld warns of the decline of science as science becomes more a pursuit of power than of knowledge; worse yet, it has actually become a pursuit of wealth.

But why does management spread? "Management spreads because its methods and output automatically create an environment conducive to its own increase." In other words, managers beget more managers. One reason has to do with the increasing habit of documenting everything, the function of which, "is to provide a source of undemanding work for managers who might otherwise not be terribly busy". More important, compliance with adminstrative demands for ever more minute personal and other information reinforces the desired belief that the provider of the information is

subordinate to the recipient." The fact that there has been no mutiny of academics against the administration is a sure-sign that our academic institutions are moribund.

The other reason management expands is because they have taken control of the money supply and of hiring and firing. In the decades immediately following the Second World War, university administrations all over Europe and the United States discovered "a vast new source of unregulated cash" – the overheads on research grants. In the US, figures in excess of 50% are common. More overheads meant more administrators and more pressure on academics to get more grants. Ehrenfeld's solution is to limit the overheads to around 10% and to have academics making decisions on hiring and firing administrators.

"Since Challenger and Chernobyl it is no longer reasonable to doubt that we are entering a new phase of human civilization." Ehrenfeld proclaims in another key Chapter, "The Lesson of the Tower", "The brief but compelling period of overwhelming faith in the promise and power of technology is drawing to a close." Although his critique is mainly on NASA's space programme, it applies with equal force to all corporate technologies on which the powers that be are still pinning their hopes today. It is a fatalistic acceptance of "scientific progress" for better or for worse, which is allowing the corporate technologies to wreak havoc and destruction.

If you are tired of pundits pronouncing on the 'information revolution' and predicting a future ruled by an artificial cosmic super-brain, here's the perfect antidote. In Stanislaw Lem's *The Cyberiad*, the heroes are trapped in their spaceship, in a remote junkyard corner of space, by a pirate named Pugg, a hideous monster robot with a Ph. D. and an insatiable thirst for information. So they made a gadget that generates random facts about the universe at an incredible rate and then prints out those that are true.

"The tiny diamond-tipped pen shivered and twitched like one insane, and it seemed to Pugg that any minute now he would learn the most fabulous, unheard-of-things, thing that would open up to him the Ultimate Mystery of Being, so he greedily read everything that flew out from under the diamond nib…the sizes of bedroom slippers available on the continent of Cob, with pompons and without…And the average width of the fontanel in indigenous step infants… and the inaugural catcalls of the Duke of Zilch, and six ways to cook cream of wheat… and the names of all the citizens of Footaraw Junction beginning with the letter M, and the results of a poll of opinions on the taste of beer mixed with mushroom syrup…

"And it grew dark before his hundred eyes, and he cried out in a mighty voice that he'd had enough, but Information had so swathed and swaddled him in its three hundred thousand tangled paper miles that he couldn't move and had to read on about how Kipling would have written the beginning to his second Jungle Book if he had had indigestion just then, and what thoughts come to unmarried whales… and why we don't capitalize paris in the plaster of paris."

Enthusiasts and apologists of corporate technologies are forever telling us how the powerful technologies will change our conception of being human and even of God. But Ehrenfeld says, "Rather than rethink our ideas of God, we would do better to reconsider the nature and effects of our own creation. We need not follow the example of the citizens of Babel and bring our language, our "city", our technology, down in ruins upon our heads. There is time to choose to stop building ill-starred towers to challenge the heavens. There is time to pause, and time to find other edifices of less height and greater grandeur upon which to lavish our creative powers."

And what of life in the new millenium? "The future is shy. If you want to catch a glimpse of it, you have to sneak up from behind. So the place to start for a look into the future is the past." Here, Ehrenfeld reminds us of all the destructive human activities and of our futile attempts at management and conservation, ending perhaps with the most profound conclusion: *"[T]he ultimate success of all our efforts to stop ruining nature will depend on a revision of the way we use the world in our everyday living when we are not thinking about conservation*. If we have to conserve the earth in spite of ourselves, we will not be able to do it."

Above all, Ehrenfeld offers us wisdom, a wisdom that sparkles and refreshes like a sunny brook that takes you on its meanderings through the enchanted grove of potential futures. Ehrenfeld's business is prophecy, according to him, to describe the present with exceptional truthfulness and accuracy such that the future can become apparent. But he is more the sage we so sorely need, who can help us negotiate our way towards Heaven, if only to prevent an involuntary descent into Hell. MWH

Beyond Evolution

By Michael W. Fox, The Lyons Press, New York, 1999, ISBN 1-55821-901-3

Michael Fox, a veterinarian and a bioethicist, author of numerous books on animals and veteran campaigner for animal welfare, has joined the biotechnology debate. But this is no ordinary book about animal welfare. His major concern is the worldview behind the development of the new 'life' industry and "a world order based on genetic manipulation, control and monopoly." He questions the whole approach of genetic manipulation from food crops to biopharming of animals and other abuses in transgenic animal research.

Many extinctions – genocide and ecocide - are justified on grounds of 'progress' and profit. Crops are raised in ecologically unsound ways, using synthetic herbicides and chemical fertilizers that sterilize the living soil and make plants sick and more susceptible to blights and pests. For the same reasons, animals are incarcerated in factory farms and feedlots, under conditions that encourage disease epidemics which kill thousands, with tens to hundreds of thousands more having to be sacrificed. These diseases often cross to human beings, causing food poisoning, epidemics and deaths (recent examples include *Salmonella*, *E. coli 0157*, mad cow disease, and the Nipah virus in Malaysia).

Now, industrial science is using genetic engineering to increase crop and farm animal productivity, which will only exacerbate the problems of corporate agriculture.

"Will this new technology mean the end of the natural world as the human species creates a new world order beyond evolution?" He asks, "We have become blind to the perfection of larks." This book is a powerful critique of the mechanistic worldview of western science and a plea for "reason and compassion to improve the human condition and enhance the life and beauty of the natural world."

Western science began in sixteenth century Europe under the legacy of the Judaeo-Christian tradition. It inspired the search for eternal laws that could make the universe move in predictable, mechanical ways. Through Copernicus, Galileo and Descartes, this strand of thought eventually culminated in Isaac Newton's mathematical laws of mechanics. So successful was the mechanistic framework that every event in nature came to be seen in this perspective.

Another strand in the legacy of the Judaeo-Christian tradition, which Fox emphasizes, is that human beings are considered to be created in the image of God and to have immortal souls, while animals and the rest of nature are there to be used by human

beings. Descartes established the dualistic separation of human beings from nature, of mind from body and matter from spirit. He maintained that only human beings can reason, that animals are unfeeling machines; and condoned cruel experiments on dogs and cats. Francis Bacon, similarly, urged that we "vex Nature of her secrets" that it was our right to extend our power and dominion over the universe. In *The Island of Dr. Moreau*, he described animal parks used for public viewing and for "dissection and trials, that thereby we may take light what may be wrought upon the body of man…"

Fox and Jeremy Rifkin of the Foundation of Economic Trends challenged the National Institutes of Health (NIH) in 1985 to suspend government-funded transgenic animal research until the ethics and consequences had been fully explored and publicly aired. They met with united opposition from the scientific community. "I never felt more alienated from my own kind…" He writes. They sat in the NIH's Genetic Engineering Committee's large conference room, with scientists gathered around a thirty-foot long oval table with the press and observers. "I experienced a sense of vertigo and unreality as the chairman read statements from scientists supporting transgenic research." These statements came in rebuttal to the ethical question he and Rifkin raised about the right to interfere so profoundly with the *telos*, or inherent nature, of animals. One scientist said, "The idea that a species has a "telos" is contrary to any evidence provided by biology and belongs rather in the realm of mysticism." Another statement implied that genetic manipulation of other species was a perfectly natural development in human evolution, that what we do should not be curbed by regulation as we are "mere agents of nature." Dr. Maxine Singer, world-famous molecular biologist, declared, "Species can have, and many in the past have had a telos (an end), namely, extinction. That is the only telos known to exist." Dr. David Baltimore, nobel laureate molecular geneticist, stated that he opposed prohibitions and regulatory statements about "morally and ethically unacceptable" practices because "those are subjective and therefore provides no basis for discussion".

Many scientists can see no difference between conventional selective breeding and genetic engineering in any case. Of course, they ignore the obvious repost that conventional breeding takes place by crossing individuals within a species or between closely related species, whereas, in genetic engineering, there is no limit to the new combinations of genes created, and no limit to the transfer of genes between species that would never interbreed in nature or in captivity.

Fox caused a ruckus at the NIH and other animal laboratory facilities when he sent letters to several vets in charge of animals asking what analgesics they used. Many were using none to alleviate post-operative pain following various experimental procedures.

One animal scientist, when challenged as to whether pigs have feelings in a debate on factory farming, replied "We need to do more research before we can be really sure." On the issue of transporting calves in veal crates over long distances, the same scientist defended the practice on grounds that "There is no scientific evidence that veal calves need to turn around." In a recent survey of academics from various disciplines, 17 to 25% of those in animal science and zoology believed animals do not have minds.

Fox does not deal with human cloning because it has received much more publicity. But it is clear that mechanistic biology has reached its logical, nightmarish conclusion, when even human beings are to be genetically manipulated and cloned. The first 'human' clone has already been created, by injecting the genetic material of a human being into a cow's egg, all too reminiscent of Mary Shelley's prophetic parable of *Frankenstein*. Dr. Frankenstein is the scientist obsessed with mastery over nature; so much so that he attempts to create the perfect human being, only to realize too late that he has created a monster. Mary Shelley's classic is as much a parable of the mechanistic science that inspires the deed as it is of the scientist 'playing God'.

Millions of genetically engineered mice are created to serve as dubious models of human diseases, and an increasing number have to be sacrificed to make room for more. Livestock are humanized' to provide spare organs for transplanting into human beings, or engineered and cloned as 'bioreactors' to produce pharmaceuticals and industrial chemicals in their milk, blood, urine and the latest, semen, and with tens of thousands of failures and abnormalities.

Apart from the potential hazards of creating new viruses that cross species barriers, the excessive suffering inflicted on the animals violates the most basic moral code of our society. Fox' concept of *telos* is important. Indeed, each species has its own intrinsic value, its own purpose in the scheme of nature, which we violate at our own peril. This is also the most abiding ecological wisdom which western science has lost touch with, and is only now rediscovering (see Ho, M.W., 1993, 1998 (2nd ed.) *The Rainbow and the Worm, The Physics of Organisms*, World Scientific, Singapore). Fox's most important message is that,

"There are moral absolutes such as the reverence for life, compassion and ahimsa (nonharmfulness) that can provide both a goal and a common ground for a reasoned and scientific approach to resolving ethical issues. These absolutes are the cornerstones of a monistic hierarchy of human values that could effectively incorporate the plurality of interests of various segments of society and of different culture." MWH

From Naked Ape to Super Species

By David Suzuki and Holly Dressel, Stoddart Publishing Co.Ltd
Distributed in Canada:
customer.service@ccmailgw.genpub.com
Distributed in USA:
gdsinc@genpub.com

This book manages to compile a fully justified view of the stark reality of human existence and the global eco-crisis we now face. It places the onus on the reader as part of the whole problem, which is that the human race has become a parasitic 'superspecies' that has caused bio-devastation after bio-devastation to the earth. I felt the comfort zone of my denial system slip away with each turning page. The approach encourages and supports each and every one of us to take on the responsibility of reversing this treacherous trend and hence to escape from the role of passive impotent observer. It puts appropriate fire in one's belly.

It opens with the infamous Biosphere II story - a sealed scientific project in the Arizona desert that was meant to be a miniature version of the earth's natural systems. However, it eventually became over run with cockroaches and climbing weeds, proving just how little we understand the natural balances of 'biosphere I' – the earth.

Reductionism and the clockwork view of our earth is discredited from the outset and the alternative - a holistic understanding of the complex network of inter-relationships within every ecosystem, is presented with great care and sensitivity. And it is powerfully persuasive. The continual denial of our fundamental inter-relatedness with all other life forms is seen as the greatest contribution

toward the demise of our environmental health and well being. The soil is a living organism in its own right but in many parts of the world the land is now virtually bankrupt. The organic reserves, once held in the soil – built up over time, have been mined away via the 'chemical fix' approach to agriculture that has prevailed over the past 50 years. If we do not fully embrace sustainable development, our environmental health problems will continue to escalate and our farmlands may eventually become completely barren landscapes. This book marvels at the inherent regenerative capacity of our land, which could easily redeem this sorry state of affairs, if we would only give it a chance.

The extent of our idiocy towards environmental issues is made very clear: More than 100 nations signed the Rio declaration, yet we have proceeded to violate it every since, making a mockery out of these good intentions. We continue to chop down massive areas of forest and have more cars on the road now than ever before. The UN Intergovernmental Panel on Climate Change (IPCC) – a panel of 2000 scientists, reviewed 20,000 papers on climate change and concluded there is overwhelming evidence human activity is a major cause of global warming. This is no longer a science issue in dispute yet the media repeatedly dig up obscure scientists to say that it is – in a gross misrepresentation of science. Furthermore, following Rio, 1600 scientists released a 'warning to humanity' about global warming, including half of all living Nobel Prize winners, but all to no avail. Economic policy is correctly portrayed as a smoke screen for hard ball politics and this is where global capitalism takes centre stage - like a cancer at the heart of humankind that must keep growing (money) indefinitely. Corporate morality is dominated by exploitation and when money grows faster than trees and our governments have loss control, we are all sentenced to an unsustainable future locked into greed.

This book explores the reasons why we find ourselves in such a terrible mess. Ownership of print and electronic media is concentrated in the hands of a few tycoons who dictate the perspective and output.

'Greenwashing' is a deliberate effort to prey on public exhaustion and need for distraction away from the stresses and strains of contemporary life. The public relations industry has immense influence and churns out reams of empty promises on a 'propaganda for hire' conveyer belt. We are spoon-fed sound bites like "we've dealt with this now" whilst nothing is done. We're not in an 'information age' we're in an 'entertainment age' and our TV screens are consumed by 'happy talk', sport and news items, which rarely focus on serious environmental issues. The environmental movement has been thoroughly marginalised by the media despite the fact that it now represents the majority view. Environmentalists are thrown into a catch 22, resorting to stunts in order to attract attention. Movie stars have been enlisted in order to ensure the media will turn up! This book calls on us to be smart and learn the difference between 'information', which is data and 'knowledge', which is wisdom.

The relationship between 'bad science and big business' in the biotechnology industry is so atrocious that it has mobilised large sectors of civil society to bite back at the corporate machine. We find ourselves unwilling participants in a dangerous feeding experiment with no controls. Gene patenting provides strong incentives for biotech companies and 'your money or your life form' has become the new economic trend in agribusiness. Patents on life and the patenting of human genes amounts to the greatest insult to human dignity and biodiversity so far recorded in history. Moreover, it is a wholly corrupt business - most research is conducted in public laboratories and paid for out of the public purse. We're back to the old colonial days of making people pay for things that already belong to them.

There is a conscious effort to promote and maintain global capitalism and the free market economy for it is perceived as the backbone of global democracy - it came about after World War II to prevent world wars from happening again. So we are threatened - 'capitalism or else – the dreaded alternative!' Democracy and the 'public good', as originally written by the ancient Greeks, is a concept of responsibility, accountability and sharing. Our 'global village' does not represent proper democracy. Instead we are under the control of a feudalistic system, which is poised at all times to make matters worse. Each citizen requires clean air, pure water, nutritious food and a healthy balanced ecology but all these basic needs are denied to people the world over.

There are plenty of suggestions and guides for how we can reclaim our true nature as human beings and citizens. The path of true democracy and environmental health awaits us but we must all fight hard from our own little corners and remember that the battle has only just begun. This book must be read by everyone. AR

New Papers on ISIS website:

Unregulated Hazards: 'Naked' and 'Free' Nucleic Acids. Ho, M.W., Ryan, A. Cummins, J. and Traavik, T. (2000). ISIS Report, produced for Third World Network and circulated at the Biosafety Conference, Montreal, Jan. 24-28, 2000.

Towards a new ethic in science. Ho, M.W. for *Ethical Careers Guide for Young Scientists: Careers that Don't Cost the Earth*, Scientists for Global Responsibility, London.

Turning the tide on the brave new world, Ho, M.W. (An edited version translated into Dutch and published in NordZuid Cahier, Blauen bananen gemanipuleerd voedset, pp.45-62, Brussels, februari, 2000)

DNA in animal feed, ISIS Report November, 1999. Ryan, A. and Ho, M.W.

Biosafety Alert. Suggested modifications to Draft Annex 3 of Transatlantic Economic Partnership Biosafety Pilot Project, November 1999, M.W. Ho

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Risks of Viral Resistant Transgenic Crops. M.W. Ho, A. Ryan, J. Cummins. International Workshop on the Ecological Risks of Transgenic Crops, Berkeley, March 2-5, 2000.

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