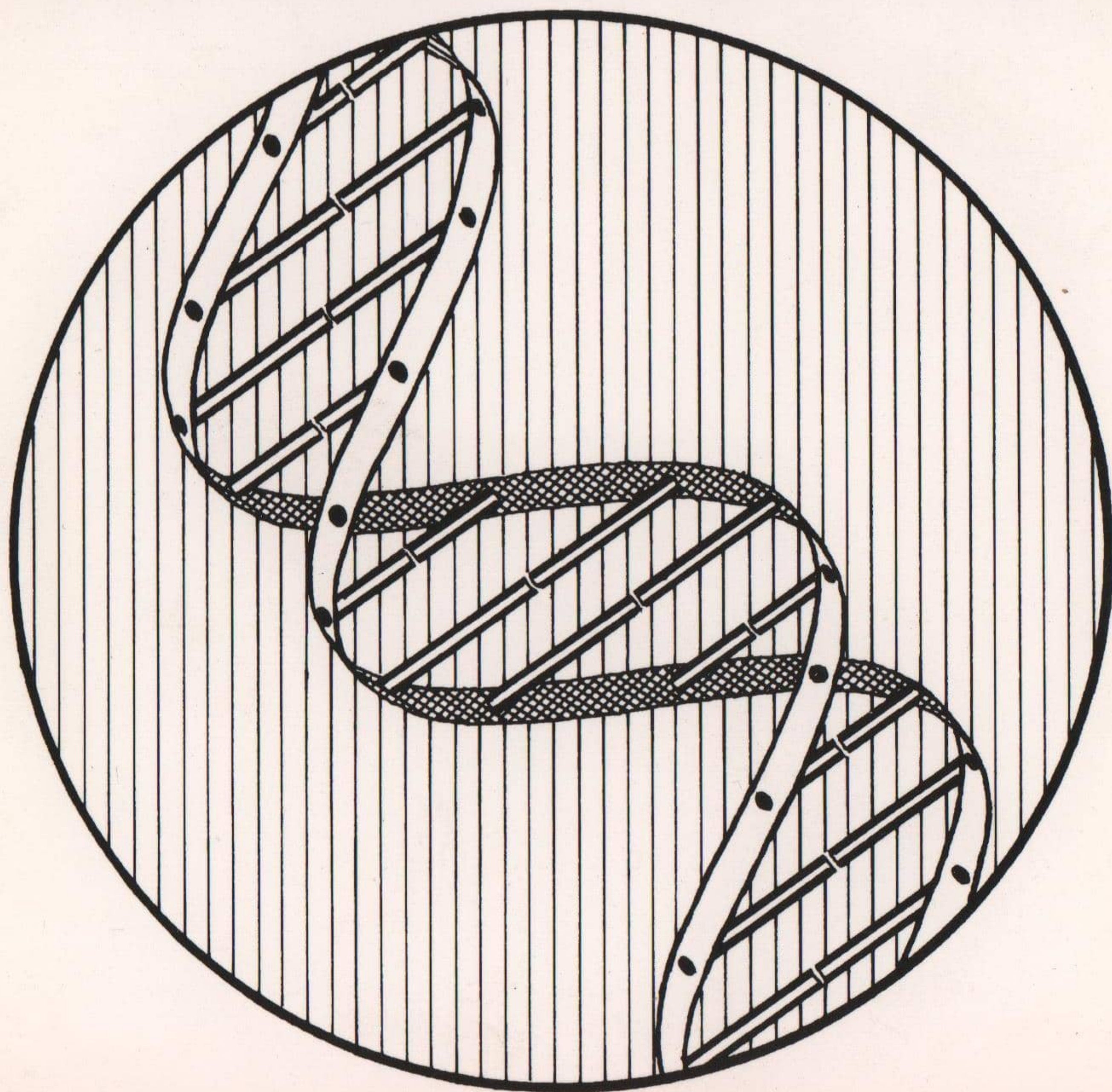


ANARCHISTS ON THE ETHICS OF

Genetic Modification



THE RAVEN

**ANARCHIST
QUARTERLY**

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This issue of the Raven was edited by Donald Rooum

Editorial

Genetic modification (GM) means producing new varieties, of organisms, not by traditional breeding methods, but by direct interference with DNA, the chemical which carries genes.

Anarchists are people who oppose coercive relationships, or domination of people by means of threats.

Anarchists here and now (i.e. in Britain at the turn of the millennium) do not agree about the ethics of GM. Some think that anarchism implies opposition to GM, as obviously as it implies opposition to torture camps and nuclear weapons. Others think that GM should be cautiously welcomed, as it has the potential to release people from coercion, in particular by freeing the poor from debt. Still others are not against GM, but do not see it as having much to do with anarchism.

A number of anarchists express their views in this number of *The Raven*. **Dave Robinson** contributes a cartoon to be taken as either against GM, or a satirical comment on anti-GM hysteria. **Helen Beynon, Mick Cropper, Richard Griffin** and **Jonn Roe** are all unequivocally against GM, using different arguments. **Donald Rooum** is concerned that anarchists should be reasonably well informed about GM, and avoid being misled by scare stories and superstitions.

From beyond the anarchist movement, we reprint the texts of two lectures on the ethics of GM, given to South Place Ethical Society in London, by biologists with experience in the relevant fields. Both are independent scientists, in the sense that neither is employed or remunerated by any organisation which either profits from GM, or campaigns against GM.

The lectures were not arranged as a debate, but, as it happened, Dr **Terry Mabbett** spoke largely about the dangers of GM, while Professor **Alan Malcolm** concentrated on the potential benefits. We are grateful to both the authors and the SPES for permission to reproduce these texts.

During 1998, the Nuffield Council on Bioethics circulated a consultation paper in preparation for its 1999 report on the ethics of GM (see book list). The **Institute of Biology** published its response to the consultation paper separately. Some of the points it makes, such as the recommendation of increased funding for biological research, may be taken as special pleading. But for the most part it seems impartial and thorough. We have obtained permission to

reproduce this document in full, so that readers may judge it for themselves.

We also publish an extract from a 1996 Institute of Biology paper on sustainable development, providing data for the debate about whether increased food production is really necessary to feed the world.

All science is tentative, all scientific hypotheses liable to be overthrown by observations which do not fit. Nevertheless there are some hypotheses, those dignified by the name of theories, which in practice are taken as true. They will have to be abandoned or modified if contradictory evidence turns up, but nobody expects contradictory evidence to turn up.

The theory of genetic chemistry is an example. Like the theory of gravity, its discovery was a stupendous intellectual achievement, but once it is formulated, it is easy to follow. The technologies based on it require specialist knowledge to implement, but are easy to understand in principle. Nobody who is interested in GM should have difficulty learning how it is done. *The Raven* is not the place for basic explanations, but we provide a list of useful books.

Dave Robinson

THE TRUTH ABOUT GM FOOD

GENETIC FUTURES THINK THERE'S A LOT OF UNINFORMED PREJUDICE VOICED AGAINST OUR FINE PRODUCTS. SO WE THINK IT'S TIME CONSUMERS GOT TO KNOW THE REAL FACTS

HI THERE. IT'S BRAD PALMER OF GENETIC FUTURES HERE.



Y' KNOW, SOME PEOPLE THINK THAT GENETICALLY MODIFIED INSTANT MEALS LIKE THIS ARE NO GOOD FOR YOU. WELL I'M EATING ONE RIGHT HERE AND I CAN TELL YOU IT TASTES VERY FINE INDEED, YES SIR!



ALL THESE PRODUCTS ARE THOROUGHLY TESTED IN OUR LABORATORIES ON RODENT VOLUNTEERS!



SO I JUST GET SICK AND TIRED OF ALL THESE GREEN ANARCHISTS PROTESTING ABOUT OUR FINE AND DECENT PRODUCTS THAT WILL MAKE LIFE BETTER FOR ALL OF US!



JUST TAKE A LOOK AT THIS NEW GF MAIZE CROP



BY INSERTING SOME DNA FROM THE ANACONDA SNAKE INTO THE PLANT, GF HAS PRODUCED A NEW AND EXCITINGLY VIGOROUS ARABLE FOOD PRODUCT



AND AS YOU CAN SEE, IT IS PERFECTLY SAFE

What they say about GM

“While I have every sympathy with the position you have decided to take, i.e. avoiding any genetically modified foods, I regret to say that in the near future you will starve.”

Stephen Ridge, an executive of the Somerfield supermarket chain, in a letter to customers, quoted in *The Skeptic* 12:2

“I happen to believe that this kind of genetic modification takes mankind into realms that belong to God, and to God alone. Apart from certain highly beneficial and specific medical applications, do we have the right to experiment with, and commercialise, the building blocks of life? We live in an age of rights - it seems to me that it is time our Creator had some rights, too.”

HRH the Prince of Wales, ‘Seeds of Disaster’, *Daily Telegraph*, 8th June 1998, reprinted in *The Ecologist*, Sept/Oct 1998, page 252

“Although full of unexplored possibilities, which will certainly surface in the years ahead, genetic engineers can only supplement the standard methods of improving plants: we cannot create genes, and so still need to use existing plants to derive new strains.”

Anthony Huxley, *Green Inheritance* (Collins, 1984) page 163

“English Nature will ... Continue to recommend a moratorium on commercial releases of genetically modified herbicide tolerant and insect resistant crops until current research has been completed and evaluated.”

English Nature, *Position statement on Genetically Modified Organisms*, July 1998

“English Nature is right – it is time for a moratorium, but not just until scientific research is complete ... A moratorium must allow for a full public debate on the justification for genetically modified crops, including whether they are needed and what the alternatives are. The debate should also cover the dangers of allowing science and food production to be dominated by commercial interests. Unless we pause now, the experiment will have begun and its effects could prove catastrophic.”

Dr Sue Mayer of Genewatch in *Biologist*, April 1998

“Conventional breeders generally combine entire genomes ... But lengthy programmes are then required to eliminate the unwanted genes that come with the few desirable ones. Genetic engineers can transfer the gene they require, and no other.”

Colin Tudge, *The Engineer in the Garden* (Cape, 1993), page 206

“Most of the scientists seemed to want the Government to treat applications of genetic engineering in food and in medicine in the same way. The public see them quite differently.”

Lord Melchett, executive director Greenpeace UK, in *The Guardian*, 17th December 1998

“Few, if any, of these [traditional] crops would survive the stringent tests recommended for GM crops.”

John Beringer ‘Keeping watch over genetically modified foods and crops’ in *The Lancet*, 20th February 1999

“Thus we see the power of genetic engineering in agriculture - its theoretical ability to seize upon virtually any gene, from any source - but also perceive that it absolutely does not supersede conventional breeding. The true role of the genetic engineers is to provide the breeders with genetic raw material.”

Colin Tudge, *The Engineer in the Garden* (Cape, 1993), page 235

Helen Beynon

On Taking Action

The application of biotechnology in agriculture has aroused a storm of protests across the globe in the past two years, making it one of the most talked about issues of the day. Opposition ranges from direct action to consumer action and lobbying. In this article I attempt to frame these protests in the context of the current environmental activist movement in Britain, explaining, why it has attracted attention from direct activists and how this fits in with the recent history of radical environmentalism. It is also important to understand the relationship of this movement to more established anarchist thinking.

Six years in brief

Since 1991, the fledgling Earth First!, hatched from an American egg, has grown into a movement most people in Britain cannot have failed to notice. Most environmental protesters are environmentalists first – the depletion of the Earth's scarce resources and biodiversity (literally, diversity of life) is what primarily drives their political action. At the end of the day, most of us would still oppose a workers collective carrying out an activity, such as large scale quarrying, that threatens the environment. I just hope that the fundamental tenets of anarchism would ever prevent this situation from arising.

Many older anarchists may feel that the confusion of tactics (lobbying and public enquiries as well as direct action) used in, say road protests, demonstrate the youth, naivete and lack of focus in the radical environmental movement. To some extent, this may well be true and most people have become involved in road protest from an emotional response, rather than a specifically political one. For myself, it was the experience of living near a beautiful nature reserve and ancient place called Twyford Down and witnessing a motorway driven through it. Consequently, most environmentalists are anarchists primarily by intuition and by practice, rather than by conscious decision or education: for example, most of our meetings operate by consensus, even though many of the people involved have never read anarchist theory or heard the word. Those activists that have come to anarchist ways of thinking, as well as working, have done so through a dwindling personal faith in the current status of

environmental protection, the toothlessness of the mainstream reformist agencies and an awareness of the problem being greater than any one of these or of one road destroying one hill or one woodland. We are fully aware that environmental destruction, alongside the exploitation of people and animals environment, is a cardinal feature of what was capitalism, but that has, in late twentieth century, become corporatism.

Those of us who are more articulate and prepared to speak out our activism in more overtly political terms see anarchism as an alternative to global corporatism and as offering practical ways of working. Sit in on any social gathering or activist meeting and you will hear familiar discussions on the Society of the Spectacle, on links with workers issues and alternatives to the standard choice of living off the state or falling into a career-guided professional employment. Whilst our anarchism may not be constantly voiced in the most academic of terms, it is a powerful demonstration of anarchy in action.

I apologise if much of the above is blatantly obvious to readers with experience of the environmental movement, but I felt that it is essential to explain the framework with which actions against genetic engineering (GE) have been taken.

A GE focus for direct action?

In writing this article, I have not attempted a balanced argument, but an exploration of my political reasons for opposing genetic engineering of food and why I believe this reflects the concern of many others within the radical environmental movement. In order to this I want to look in greater depth at some of the issues driving those actions, but I will start with the assumption that readers will already be familiar with the process of genetic engineering and the arguments made in its favour.

To date, the actions that have taken place have included crop damage, office occupations, a crop squat, blockades and protests in supermarkets and consumer awareness raising. What is notable in the reasoning for them is that the direct activists' concerns are not just environmental, but linked to wider aims of seeking more environmentally friendly ways of living – at the Norfolk Crop Squat in May 1998, a genetic crop release site was replaced with demonstration organic gardens. These are similar tactics to those used against timber imports, roads, quarries, strip mining, housing development, chemical works and so many other manifestations of environmental destruction. In looking at why GE has drawn such actions have taken place, it is almost impossible to be a reductionist

as the arguments are so interlinked, however, I have tried to break them down as much as possible.

Ecology, first

I have started with this issue not just because of its pertinence to the environmental movement, but for personal reasons: I trained as a ecologist, primarily as botanist and the bulk of my work in last ten years has been dealing with the creation, restoration, maintenance and potential threats to fragile habitats. I will also point out at this juncture that when I first encountered GE, I decided to spend a few months looking at both sides of the arguments before I made my own mind up; the assertion that all activists are mere sheep following the lead of their hysterical fellows is, frankly, an insult to our intelligence.

GE crops are, it is claimed, more environmentally friendly as they are engineered to be resistant to chemicals that, it is claimed, are less persistent once they enter an environment and so do less lasting damage to local wildlife. As an ecologist with a sound knowledge of the interface between farming and the environment, this raises several concerns: firstly, it is simple untrue that these chemicals, primarily glyphosate and glufosinate, have an only minimal impact on the local environment: increasingly, the evidence is that they can damage soil micro fauna or microflora and can, like any chemical, drift into other local habitats. Round-Up, a glyphosate based herbicide, is toxic to earthworms, soil bacteria and beneficial fungi, it may cause defoliation in trees and is known to be harmful to fish. ('Roundup: the world's biggest-selling herbicide' by J. Mendelson in *The Ecologist*, vol. 28). The potential of drift for an all embracing herbicide, even if its persistence is short lived, makes Rachel Carson's *Silent Spring*, seem all the nearer.

The potential for developing so called 'superweeds' by either the cross-pollination of crop with wild plant of a similar type, or by gradual resistance to change has attracted the accusation of hysteria by the supporters of GE. Yet, such resistances have already occurred with conventional crops; as I write, the National Institute for Agricultural Botany (NIAB) in Cambridge have admitted that in recent trials, GE oil seed rape cross bred with Wild Turnip, the resulting hybrid being herbicide resistant. Discussing this point with a GE supporter recently, I was told that if weeds resistant to a brand name chemical developed, they could be quickly zapped by another chemical to prevent the problem of them dominating a local habitat and out-competing more fragile species (a common problem already

with introduced species and crop escapes). This argument seems to complete defeat the original point of developing GE crops so that less chemicals can be used.

As biodiversity is important in habitats and ultimately to the maintenance of life on Earth, so a diversity of crops has been a feature of sustainable farming since time immemorial. For a small, peasant or subsistence farmer, planting the widest range of crops possible allows for survival whatever the vagaries of climate or pest; in India, rural women use up to 150 different crops or varieties. ('Roundup: the world's biggest-selling herbicide' by J. Mendelson in *The Ecologist*, vol. 28). Creating and planting crops that are genetically very similar has, even in conventional agro-botany, created significant problems: the Irish Potato blight in last century being a case in point. Many people in the world rely not just on crop diversity, but on wild plants; in West Bengal 124 'weed' species collected from rice fields help provide an income for farmers.

I have to admit to being an extremist in my views on agriculture: the means of producing food has to be wrested from the hands of giant corporations and wealthy property owners, so that we can develop new, organic ways of producing local food for local needs, taking as a prime concern the impact that the growing has on the environment. GE is only the thin end of the wedge of industrialised agriculture, which, although it does provide 'cheap' food in large quantities cannot be justified in the light of its effects on people, the environment, health and animals. To put it another way, a holistic, sustainable, collective approach to agriculture is needed globally. GE will not deliver it.

GE feeding the world?

"If you don't have land on which to grow food or the money to buy it, you go hungry no matter how dramatically technology pushes up food production." Food First report

The above quote, from an organisation well versed in global in the hunger issue, is in direct contradiction with the second of the major arguments used by the defenders of GE – that novel crops will allow farmers all over the world to get higher, more certain yields and so hunger will disappear. When I first heard these words in the promotions of a transnational company, old memories stirred; these were words I had heard before, long ago, when studying the development of agricultural societies in the south, words I had encountered in my own travels in India, words connected to the euphemistic 'Green Revolution'.

Before I look at the lessons taught by the Green Revolution and seemingly about to be repeated in the name of GE, I thought it would be worthwhile to have a cursory glance at the statistics of world hunger: the question on how to feed the world and why more than 786 million people (and rising) go hungry everyday is an issue of *The Raven* all of its own. In this article I can only attempt a cursory glance at the causes of world hunger and address why GE, as part of a corporate stock of technofixes, is not the solution to feeding the world, which, as every good anarchist knows is not the result of poor global food crop yields – both food production and hunger are rising – nor, according to research, is population increase the primary cause of starvation ('Why biotechnology and high-tech agriculture cannot feed the world' by A. Kimbrell in *The Ecologist*, vol. 28).

Most development experts now agree that the reason people go hungry is a process known as 'food dependence'. Over the past century, more and more countries have moved towards producing food for profit, rather than for local consumption. This is a global trend, deemed by many economists and politicians to be essential for raising the money necessary for the dream of industrialisation. As people become less self-sufficient, losing their food independence, they become dependent on commercially grown food and on becoming waged labour to obtain the money to buy these foods: more dependent, therefore, on the state and national (ultimately global) economy. As agriculture becomes more and more industrialised and small farmers find they cannot compete, the rural poor leave the land and quickly become the urban poor. Those remaining on the land become waged labour for larger farmers and do not have the time or land or access to resources to produce for their own needs.

No longer able to produce for their own needs, these people, often poorly paid to start with, become the victims of global economic trends: so it happens that in so many cases of famine, from the North American Dust Bowl to Ethiopia, that the country is full of food, ships of it are vanishing overseas, but the people are not able to eat it. Nor is this scenario so distant from our own shores. My neighbours are small farmers who, several years ago, put all their business eggs in the single basket of pig farming. All of their 100 acres are dedicated to growing wheat to feed their pigs, with not a single square foot available for growing potatoes, cabbages or other crops for their own consumption. Now the bottom has dropped out of the pig market, they are considering getting jobs in the city and renting their land to people with horses.

So, what has the lecture of food dependence to do with GE crops? Firstly, these are crops that will be grown specifically for profit, not for local need, so they will be absorbed into the process of creating food dependence. Secondly, they seem to be an extension of the process of enclosure, whereby wealthy farmers enclose common lands to grow crops for profit and employ former peasant farmers as waged labour – in this case the patents on plants and animals (preventing people from saving seed to plant next year's crop), the restriction of access to only those farmers who can afford the novel seeds and the development of the Terminator Gene (so farmers are physically as well as legally disabled from saving seed) will all reduce food independence.

It is at this point that the alarm bells of the Green Revolution start to ring. The Green Revolution was, in the briefest terms, the development of primarily wheat and rice strains by conventional plant breeding techniques that were highly responsive to chemical fertilisers. The varieties were developed in conjunction with global chemical companies and actively promoted throughout the South. As now, the claim was that these crops would produce higher yields and solve world hunger. In fact, although the Green Revolution of the 1970s did increase yields in some areas, it has clearly not prevented famine, not has it not reversed the trend of food dependence. Instead, many farmers became beholden to chemical companies to buy all their inputs, were unable to save seeds as they required special handling, discovered that wild plants or animals, which are often part of the staple diet disappeared under the application of chemical, that growing acre upon acre of the same variety increased susceptibility to disease and that many small farmers were forced off the land.

To counter the effect of the Green Revolution, many schemes have now been put in place to encourage small scale growing, gardening by women, crop diversity and the rediscovery or re-application of traditional methods in a more modern context. Although we in Britain were not subjected to the Green Revolution as an explicitly choreographed programme, we have undergone, over a longer time scale, a similar process in the industrialisation of agriculture and to counter this, money from Europe is now being diverted towards organic growing and better farmer-consumer links to benefit small scale producers. All this evidence seems to point in one direction – that the easing of food dependence and ultimately of hunger lies not in greater technological fixes, but at small scale approach, allowing, at the very least, some independence from global and national

economics. It is this vision of agriculture, however idealistic, that is supported by environmentally minded anarchists.

Many may counter with the often voiced argument that low-tech agriculture cannot feed the world. Studies ('Why biotechnology and high-tech agriculture cannot feed the world' by A. Kimbrell in *The Ecologist*, vol. 28) show that organic production is not far behind inorganic and doesn't have the hidden costs of damage to marginal habitats, health and wildlife, which has already been discussed as important food sources in their own right.

As a science

As a trained botanist, I have some knowledge of plant science, evolution and genetics. It is from this perspective that I raise questions about the actual science of GE crops, which I am sure is very exciting for those sitting in laboratories, experimenting with the mechanics of plants and animals. Firstly, comes the attestation that GE is just an extension of conventional plant breeding; clearly plants could never, conventionally, be impregnated by specific genes from a fish (as in the case of GE tomatoes) or scorpions (as in the case of GE cabbages). GE is clearly different from conventional hybridisation and this is not just an ethical dilemma, I have already discussed the fact that the application of conventional plant breeding is not without its problems.

Secondly, the claim that GE is a precise science is simply untrue: the effects of implanted genes and their reaction with existing genetic material is still largely unknown. The further consequences of these experiments once the plants are released for consumption and into our environment are, therefore, unlikely to be predictable. In the USA, material moved from Brazil Nuts to Soya Beans was not thought to not contain the specific material that triggers allergies to Brazil Nuts, yet the resulting spate of allergic reactions proved, tragically, otherwise.

Personally, I consider GE something of an old science, resting on the old world view of reductionism, of looking at things in parts that can be broken up and moved around. It is not an attempt to be holistic (a word tarnished by its appropriation by lazy self-obsessed hippies, but still relevant) which is only truly responsible way of looking at the world for an environmentalist and I believe for an anarchist. GE crops, even by their most ardent advocates, are promoted as little more than a sticking plaster over the gaping wound of the world's problems. As a scientific argument for solving problems GE fails in its application, ranking with the petrol free car

(still needs roads, causes congestion and requiring precious minerals to build) or selling organic food in supermarkets – a useful stop-gap for consumers but not an answer the problems of shipping food around the globe and the lack of effective links between local small scale producers and local consumers.

Further to this, GE is a bad science, in that it is led by profit more than the motivation to do good, however hard the advocates argue otherwise (*Genetic Engineering Dreams or Nightmares?*, Ho, 1997). The only reason a corporation like Monsanto invests in a risk like GE crops is in the belief that it will bring them a financial return. This is not cynicism, it is economic reality and as most scientists working in the field GE are, ultimately, paid by one of the world's large corporations, then it clearly fails the scientific tenet of objectivity. In 1994 shareholders report for Monsanto mentions that GE will offer "significant opportunities for sales growth" to herbicide manufacturers. It is the issue of profit-led science, as well as the consequences of application, that has cause such dissent amongst genetic scientists. ('Why biotechnology and high-tech agriculture cannot feed the world' by A. Kimbrell in *The Ecologist*, vol. 28).

World corporate power

Increasingly, over the past few years, world corporations and trade agreements have become the focus for environmental protests, as activists recognise the destructive nature of their pursuit of profit and the key role that global corporatism plays in the exploitation of people and planet. Many of us believe that the hierarchical control of corporations is even worse than that of the state as it is less visible and more global in its influence: corporations have control of supply and demand and in the case of those involved in GE, such as Cargill and Monsanto, have ownership of almost every link in the food processing chain. At the time of writing 70% of the 300-plus UK GE test sites were controlled by four companies: Monsanto, AgRevo, Nickerson/Hilleshog and Sharpes ('Hiding Damaging Information from the Public' by S. Gorelick in *The Ecologist*, vol. 28).

The opposition of corporate power in relation to GE crops has also raised questions around the control of information: Monsanto, the developer of Round-Up Ready Soya, has issued threats of suing for libel to magazines and organisations publishing information on their activities, has threatened to sue companies in the USA for labelling milk treated with their growth hormone BST and in the UK issued crippling legal threats to individuals involved in legitimate protests

against them. ('Hiding Damaging Information from the Public' by S. Gorelick in *The Ecologist*, vol. 28). All this is, of course, a painful echo of the McLibel case, in which another giant corporation sought to silence two penniless activists leafleting information about their industry. In an act of strange marketing hyperbole, Monsanto says, in glossy adverts, that it wants people to be "fully aware of the facts before making a purchase": this rhetoric is clearly not borne out by their resistance to labelling and reaction to their opposition.

Consumer distrust

The current wave of environmental protest is the antithesis of, if not a reaction to, the green consumerist wave of the 1980s. Most radical environmentalists are opposed to consumerism as incompatible with the protection of the environment and workers rights. However, we do take some satisfaction in the extensive consumer distrust displayed for GE foods: 77% of consumers appear to be against the foods (MORI poll of British people questioned), whilst 82% showed support for labelling. Similar studies throughout the developed world show that people's distrust increases as they know more about the issue – countering claims of many corporations that people only have distrust as a consequence of not knowing enough about the issue.

As well as demonstrating their distrust for GE crops, consumers are also demonstrating their increasing demand for organic foods, out of concern for their own health if not for the environment and workers.

Continuing Action

I firmly believe that GE is part of the corporate terrorism exercised on our bodies, our environment and on the poor people of the world. All over the globe and for many centuries, poor rural people have demonstrated against the stealthy industrialisation of agriculture: from the Swing Riots in East Anglia' where crops and farms were torched by enraged and displaced workers of the 1800s to the burning of fields of GE crops in Karnataka, India. In the UK. The planting of GE crops has gone ahead without adequate consultation, so sabotage has become an obvious response for those frustrated with reformist methods, those committed to economic sabotage as a valuable tool in opposing corporate power and to remove the crops from the environments they threaten. In this, the sabotage of GE crops is the same tactic as used at Twyford Down, Whatley Quarry and many, many other sites of ecological destruction.

It must be said that direct activists do not view direct action as a last resort: it is part of their philosophy of personal responsibility, and of the rationale that it is essential for someone to take revolutionary steps, if only in the hope that the odds for reformist change will be increased as a consequence of shifting the middle ground. Yet, as I said at the beginning, the global opposition to GE foods has been demonstrated not just through direct action, but throughout the setting in place of radical alternatives, all essential to the opposition of global corporate power – it is not enough merely to object and demonstrate, but also to learn to live without them and as far outside their laws and power as is possible. It is sad that, in Britain, the ‘lifestyle’ approaches of vegetable box schemes and organic gardening are belittled as hippie activities, when they are radical departures from the corporate ruled consumerist world, and that we so idealise similar actions taken in other nations, such as the cooperatives established by Movimento Sem Terra in Brazil. Growing your own food is an act of revolution, so too is buying from workers co-ops, farmers markets or box schemes, so too are the community seed banks established by small scale growers in Brazil and the return to traditional varieties and methods of growing in India, Latin America and Cuba (‘Return of the Seed Savers’ by M-W. Ho in *The Ecologist*, vol. 28).

All these actions, from sabotage to consumer power, demonstrate not just opposition to GE crops, but a willingness to provide viable alternatives to industrialised agriculture, alternatives that put people and the environment higher on the agenda of concerns. These actions are, in short, a revolution in the making, a revolution in practice.

Mick Cropper

Halt! Who Goes There, Friend or Foe!

At the time of writing the shit has really hit the fan. 'Genetical Engineering' is very much in the news. Spin doctors have moved into a sphere of action circling aimlessly, panic stricken. The shadow cabinet desperate to be noticed yet not too much. After all, people might recall past events when they were in power.

Sensationalism is the very life-blood of the media. It is scarcely credible that the tabloids will rationally debate the enormously complex subject of GM. The cartoonists are in their element. A cursory glance through the papers will give illustration to my meaning. Suggesting that mad scientists are creating bugs as big as buses, vegetables that walk and talk, rabbits that roar and, according to Dr Simon Lyster, we might have giant triffid-like lettuces. I mean, what can one do? How do I stop em! If they can be killed what wonderful compost material they would make. Come on, Dr Lyster, we want answers now.

Well, I guess that the silly season has to start somewhere, even if it is a little early. The present government could very well have to leave the 'House of Fun' if they botch this one. As the song says, 'Summer dreams ripped at the seams'. We live in hope.

Yet again it is the alternative press that will debate this controversial issue of genetical engineering. I would like to add my pennyworth.

As usual, where huge profits are at stake the already-rich are first at the trough. One little piggy that we are all familiar with is Lord Sainsbury, close friend of Tony Blair. Other major players in this cosy little sty are:

- David Hill, veteran Labour spin doctor (still in orbit?) who now advises Monsanto, gets £100,000 with PR firm Bell Pottinger Good Relations and is still on good terms with Labour MP Jack Cunningham, Cabinet enforcer who chairs the biotechnology sub-committee which is the key Whitehall battleground. A chemist by profession, he cancelled a meeting scheduled on 11th February 1999.
- Stan Greenberg, Labour election adviser paid huge fees to help Monsanto with its propaganda. A US strategist who shuttles between London and Washington, he is a business partner of Tony Blair's advertising guru Philip Gould.

- Geoffrey Norris, a key link between Downing Street and big business, the Number 10 policy adviser is described as a bio-enthusiast by friends. He sits on Dr Cunningham's biotechnology body and acts as Tony Blair's eyes and ears.
- Nick Palmer MP, Labour, paid up to £5,000 a year to advise life sciences giant Novartis. He used to be a computer scientist with the leading GM company. Source of information from *The Mirror*, 17th February 1999.

No doubt there will be more porkers in the farmyard not come to light yet. Only time will tell.

The informed already know the role of the transnationals and how they tell governments what to do. *The Guardian* of Thursday 18th February 1999 confirms this by its exposé of Monsanto's influence in Clinton's 'welfare to work' programme. A Monsanto board member chaired Clinton's presidential campaign. The company also donates heavily to both main political parties. The GM revolution has been accepted completely by the American people, we are told. Oh yeah! Tell that one to the Marines. In fact a later edition of *The Guardian* (20th February) points out that US activists against GM have been protesting since 1994 when Bovine Growth Hormone was brought out. We can expect more protest from farmers worldwide when they realise how they have been conned. The self-destruct seed called 'The Terminator' will work minds wondrously when the farmers realise they will have to rely on Monsanto and Zeneca for fresh supplies of seed. It is a daunting thought that allotment holders like myself won't be able to save our seed from the previous year's crop as we do now. As it is, already my fellow allotmenters cannot save seeds like they could if they grow F1 hybrids. These would just not grow true to form. Taste has been sacrificed for conformity of shape, so beloved by supermarkets for the cosmetic effect. Happy shoppers are gullible customers. Vegetables ain't what they used to be.

Monsanto and its apologists tell us that their product will be so benign. Less pesticides and weedkillers will be needed. Really! Then what will they do with the millions of gallons of 'Roundup' that is stockpiled throughout the world? It is my contention that the manufacture of this weedkiller will triple. Other sources have suggested that genes will be introduced to crops to withstand any amount of this chemical. Another nice little earner for our corporate friends. No mention of the effect on our wildlife, let alone us. In a certain hedgerow not far from where I live, as a child in the 1940s I counted 85 chaffinch nests in one afternoon. In the spring of 1975

five nests were found: two linnets and three chaffinches. We now know that the dieldrins* and intensive farming have been the cause of such low numbers. I merely point this out to try and show what is here and now. According to the government's own report, GM technology could accelerate the decline in bird populations, and presumably organisms that live within the top four inches of the soil. These microscopic creatures all have a role to play in soil fertility. Under a microscope in an inch of soil lives a remarkable world occupied by rather bizarre looking inhabitants of which I know so little. In my order of priorities I have alas to turn my quest for knowledge on to more humdrum things and away from the magic world of the microbiologist.

Back to basics then. Rather, I will continue to offer my support to the groups that oppose GM whether they be under the Rainbow Alliance or whatever. No fascists thank you. Whether your god be in the trees or on cloud nine, beltane, pagan, christian, muslim, buddhist, this atheist will tolerate your beliefs. Look forward to seeing you. Oh, the greatest untruth of all would be 'market forces' with the worship of mammon.

Recently I came across this piece of wisdom by William Jones in the 1890s lifted from the economic historian George Unwin as quoted in Joan Thirsk's book *Alternative Agriculture: a History from the Black Death to the Present Day* (Oxford Press, 1997, £25) which is surely very relevant to this essay:

"As for me, my bed is made; I am against bigness and greatness in all their forms, and with the invisible, molecular, moral forces that work from individual to individual, stealing in through rootlets or like the capillary oozing of water, and yet rending the hardest monuments of man's pride if you give them time. The bigger the unit you deal with, the hollower, the more brutal, the more mendacious is the life displayed. So I am against all big organisations as such, national ones first and foremost, against all big successes and big results; and in favour of the eternal forces of truth which always work in the individual and immediately unsuccessful way, underdogs always, till history comes, after they are long dead, and puts them on the top."

* Dieldrin, an insecticide used in the 1960s, caused birds to lay eggs with brittle shells – Editor.

Richard Griffin

Genetic Engineering, Anarchism and the Pursuit of Science

Introduction

Anarchism has always had a paradoxical relationship with science and technological progress, something the present debate about genetic engineering (GE) draws out in sharp focus. The purpose of this article is not to debate the merits or otherwise of GE food, but rather to consider anarchists' reaction to perceived scientific progress in light of the debate on GE within the anarchist milieu. I should, however, make my own position on GE clear from the start which is that I strongly oppose and attempt to avoid genetically engineered food where ever possible (not an easy task with as much as 60% of processed food contains GE food and with very little labelling).

Anyone reading the exchange of correspondence in the letters page of *Freedom* towards the end of 1998 and the start of this year on GE, would have detected a common theme within those writing in favour of the technology. To simplify the argument somewhat, it is said that humans have long improved on nature, the result of which has been to provide tangible benefits for human kind, (medicine is a prime example). GE food is the latest in a long line of scientific 'break through'. Friends of the Earth, in a pamphlet arguing against GE, set out the benefits claimed for it by its proponents. GE foods "are claimed to be safe and environmentally friendly, reducing the need for chemicals, whilst still helping to feed the world 's poor". Some anarchists accept such claims at face value. The problem for them is not the technique itself but the fact that it is controlled by a handful of global capitalist companies who exploit it for profit rather than social good. Science itself is neutral and can be trusted, the problem lies with capitalism.

Scientific Progress

This positivist attitude towards science lies at the heart of modernism and is something that anarchism (in common with other modern ideologies, perhaps most notably Marxism), has carried with it since the eighteenth century. Modernism has been defined as "the social order that emerged following the Enlightenment ... the

modern world is marked by its unprecedented dynamism. Modernity's forward-looking thrust relates strongly to belief in progress and the power of human reason to produce freedom" (Lyon, 1994, page 18).

Anarchists from Godwin onwards have believed in the benefits of technological progress, but, crucially, anarchists (in contrast to Marxists) have argued that alongside the harnessing of science and technology for the benefit of society as a whole (rather than just the capitalist class), the very landscape of society itself must be radically altered. The huge, sprawling, smoke belching steel or iron plants that so dominated our perceptions of communist countries (and which so mirrored capitalist industry) have had no place within anarchist visions of the future.¹

This tension between embracing scientific progress and optimism, but not the forms of industrial and social organisation science helps to create, can be seen clearly in Kropotkin's work. In *The Conquest of Bread* Kropotkin firmly places his faith in technological progress. In the coal mines of the future, he believed that "ventilators will always be working and there will never be explosions". He went on to say that "it is evident that a factory can be made as healthy and as pleasant as a scientific laboratory". Rapid technological change, as evident at the turn of the century when Kropotkin was writing as it is now, would not be restricted to the work place. In the home "machinery will undertake three quarters of domestic tasks", Kropotkin wrote. Kropotkin did not wish, however, to see the working classes just gain control of commanding heights of the economy. He also wanted to dismantle industrial society and replace it with decentralised small scale craft and commodity production.

Many anarchists have, then, on one hand seen human control (domination) of nature and scientific and technological progress as beneficial but on the other hand have opposed the way technology has been deployed and controlled as well as the sort of society it has, in the hands of capitalists, created.²

This is the paradox I have referred to in anarchism's relationship with science. It should also be noted, as green anarchists (influenced by deep ecology thinking) point out, that such a view is anthropocentric. Humanity is central, separate and superior to nature with a right to dominate and control it. Man is both the object and subject (Lyon, 1994, page 15). Nature is just a tool for man (and occasionally women) to use for their benefit. The most extreme version of this can be seen in Descartes' vivisection experiments in which he believed that the howls of pain from the

animals that he was dissecting were just the noises of machines he was dismantling.

This modernist notion of science – linear, neutral, human centred and representing progress – is what many anarchists seem to accept. It is, though, under attack from a number of directions including, most fundamentally, from within the scientific community itself. It is not an understatement to claim that a new scientific paradigm is evolving.

Cultural Relativism

The world view of science since Newton published his *Principia* in 1687 has been that the natural world can, like a machine, be broken down and analysed rationally and that laws can be discovered that predict behaviour such as the motion of the planets or flow of liquids. Marx claimed that historical materialism meant that the very course of human history could be predicted with accuracy. The medieval world of magic was replaced by the world of reason. Proudhon alludes in a letter to Marx to anarchism being a “religion of logic and reason”. Reason and logic can be trusted in a way that intuition and beliefs cannot. I would argue that those supporting GE technology accept this science modernist world view. With GE, it is claimed, humans have discovered the means by which they can improve on nature (food crops in this case). Scientists have carried out tests and can reassure us that this technology is safe. We can trust scientists because they are objective and driven by the pursuit of knowledge. The only issue is who benefits from and controls the technology.

This is, though, a very poor reason to accept GE (or any other scientific claim). The history of science is littered with a plethora of truth-claims that have subsequently been abandoned. Quine and Feyerabend have gone as far as to argue that: “truth is just a product of localised beliefs whose origin should be sought in the cultural context or in the socio biographical history (the professional interests, careerist moves, childhood experiences, religious convictions and so on) of the scientists who hold them”.

Ulrick Beck in his book *Risk Society* claims that science’s monopoly on truth and rationality has, in the face of growing risks from (amongst other things) pesticides, acid rain, nuclear reactors, chemicals and fertiliser-intensive mega agriculture, been broken. He goes on to point out that: “many scientists do go to work with the entire impetus and pathos of their objective rationality, and their effort to be objective grows in proportion to the political content of

their definitions. But at the centre of their work they continue to be reliant on social and thus prescribed expectations and values" (1992, page 29).

A good example of this cultural relativism can be found in Stephen Jay Gould's 1989 popular science book *Wonderful Life* in which he describes the original attempt to classify the fossil fauna found in the Burgess Shale in Canada at the start of the century by Charles Walcott. At the time because scientists believed that the classification of species already developed was correct the newly found fossils of the Burgess Shale were forced into these existing classifications even though in reality represented amongst them were a number of completely new species (including the distant ancestor of humans). The possibility of new distinct species could not, a hundred years ago, be accepted, however, because they did not fit in with science's then world view. Other examples abound. The claims made for the benefits and safety of nuclear energy is another good example. Science only decided asbestos was unsafe when enough workers had died through exposure to it. Think also of DDT, or more recently BSE, or further back in time Galileo's conceding to the view of the church.

This is not to say as some do that there is no such thing as scientific truth, but as Rose *et al* point out just because science has "so often said true things about the world, we are in danger of forgetting that sometimes the claims of those who speak in the name of science are rubbish" (1984, page 31). The fact that I am writing this article using software on a PC is one example of the fact that science can and does produce scientific truth claims that are right. The point is, however, that we should be sceptical about truth claims particularly when there are vested interests involved and where the technology interacts with complex systems. Both of these occur with GE. Billions of dollars have been invested in the technology and GE crops are interacting with local environments, extremely complex ecosystems.

Complexity and Chaos

The watch words of the old scientific world were 'rational', 'progress' and 'reductionism'. Nature was imagined as a machine – predicable, understandable, able to be reduced to its basic components. Man was placed at the centre of the universe where once God (another masculine figure) sat. This, of course, reflected the new industrial society that was being created.

“It is the ... machine image that has come to dominate science and to act as the fundamental metaphor legitimating the bourgeois world view ... The machine is as much the characteristic symbol of bourgeois productive relations as the ‘body social’ was of feudal society” (Rose *et al*, 1984, page 45).

This machine image of science and society is now in retreat.

“Instead of being a machine nature at large turns out to be more like human nature: unpredictable, sensitive to the surrounding world, influenced by small fluctuations” (Capra, 1996, page 187).

Where once there was certainty, understanding and control there is now complexity, chaos and co-operation. It is surprising that these new scientific ideas have not been embraced more readily by anarchists, particularly as they provide some basis in nature for concepts such as non hierarchical organisation and decentralisation. “In nature there is no above or below and there are no hierarchies. There are only networks nestling within networks” (Capra, 1996, page 35).

There is not sufficient space to discuss at length all the new scientific paradigm. Capra’s *Web of Life* is a good summary. To take just one issue that is relevant to the debate on GE – it is now recognised that systems, whether subatomic particles, the biosphere or economies are extremely complex making it impossible to predict accurately the outcome of any change in that system (the so-called ‘Butterfly Effect’). Once it was believed that the economy could be managed through changes in government investment and interest rates for instance. The Philips curve even predicted levels of unemployment for any given level of inflation. It is now recognised that attempting to predict the behaviour and reaction of millions of consumers and producers to, say, a reduction in interest rates, is impossible with the sort of accuracy that was once claimed. The more complex a system the harder to predict outcomes.

Even if current tangible benefits can be found for GE food, this is not enough to declare them safe. We cannot be sure that within GE technology lies no future risk. Of course some will argue that if hazards do materialise in the future science will find a solution to them. Those who argue about future risks are dismissed as irrational and alarmist (no doubt in the same way those who claimed the world was round were once treated). “Critiques of science and anxieties about the future are stigmatised as irrationalism” (Beck, 1992, page 45).

GE crops are interacting with local eco systems – other plants, trees, soil, water, air, animals and insects. It is impossible, as some scientists have claimed, to predict that there will be no negative effects from this. The processes are too complex to accurately predict. Side effects may take a considerable amount of time to materialise. Those still influenced by the old scientific paradigm will, though, readily accept that such accurate predictions can, in fact, be made. This appears to be the position of at least some anarchists who support GE.

Anarchism and Science

The French anarchist Emile Henry just before he went to the guillotine wrote “beware of believing anarchism to be a dogma, a doctrine above question or debate, to be venerated by its adepts as is the Koran by devote Moslems, No ! the absolute freedom which we demand constantly develops our thinking, raises it towards new horizons ... takes it out of the narrow framework of regulation and codification”. It seems, though, that for many anarchists their attitude to science and progress, illustrated by the current GE debate, is constrained by a ‘narrow framework’ derived from the old scientific paradigm.

In assessing whether or not GE technology is a good or bad thing, anarchists need to consider its effect in terms not just of its impact on humans alone, but to take a more holistic approach. It is also essential to be sceptical about science truth claims, particularly when vested interests are involved. Research on the effects of GE potatoes on rats was claimed, initially, to be inaccurate. The scientist responsible resigned. Later twenty international scientists called for Dr Pusztai to be reinstated, arguing that he had been ‘shafted’, although they were not arguing that his research was either correct or incorrect, just that he should have been allowed to continue his experiments.

Anarchism has always adapted. It needs to do so now. Crucially I believe this means shedding its modernist past, including out dated notions of scientific progress. Noam Chomsky has described anarchists as people who question authority. Unfortunately it seems that some anarchists are unwilling to question the authority of science. In addition to reflecting anarchism’s adherence to modernism this also, I think, shows a reluctance to accept green thinking. Green philosophy has certainly shorn itself of modernism. At its most extreme it has completely rejected technology, progress and civilisation. However it is not necessary to accept the position

that, for example, *Green Anarchist* takes to recognise the value of seeing the world through non modernist spectacles.

Notes

1. The fact that anarchism has represented the negation of much of capitalism's structures as well as its values may be a major reason why anarchism has survived the collapse of the Berlin Wall not only intact but strengthened. Most communist states rather than negating capitalist structures appropriated them instead. If you mimic something you are bound to be compared to it and certainly since 1945 there is little doubt that capitalist countries out performed communist ones economically, as well as creating freer social systems. Why sign up to an inefficient copy when you can have the real thing?

2. Science in modern society underpins its ideological foundations as much as Christian religion underpinned feudal society. Darwin's evolution theory which seemed to emphasise the 'survival of the fittest' was used, in the nineteenth century to justify not only capitalist exploitation but also Western imperialism. Richard Dawkin's modern reading of Darwin and his concept of the selfish gene has been used by some to justify greed and individualism, particularly in the 1980s. Greed is good because it is in our genes. Anyone who has actually read Dawkin's books will know that his arguments are not as extreme as this. In fact in *The Selfish Gene* he provides, using game theory, a scientific grounding for co-operation (1976).

References

Ulrich Beck, *Risk Society* (1992).

F. Capra, *The Web of Life* (1996)

Richard Dawkins, *The Selfish Gene* (1976).

David Lyon, *Postmodernity* (1994).

S. Rose, R. Lewontin and L. Kamin, *Not In Our Genes* (1984).

"Many nightmares predicted for genetically engineered crops have already happened... not many people noticed or cared because they were the fruits of conventional breeding, not genetic modification."

Tony Conner, New Zealand Institute for Crop and Food Research, quoted by Phil Cohen in *New Scientist*, 31st

October 1998

*Jonn Roe***Genetic Manipulation:
who benefits, who suffers?**

There is an undeclared war going on at the moment: it is between a handful of huge multinational companies, which aim to maximise their profits at whatever cost, and the consuming public. In this war not only national governments (the US in particular) are on the side of the multies, and not of their voters/citizens, but sad to say, scientists in general are, too. This *trahison des clerics* has two basic reasons. One is the need of all scientists for finance, nowadays less and less to be expected from the state, and therefore more urgently needed from capitalism. The other is the false ethos of science's supposed 'search for truth', which, when it has carried out its own 'tests', recognises no morality above that of itself.

The hidden ethical (or non-ethical) assumption behind science is Jewish-Christian, deriving from the Old Testament. Here it is stated that God gave the Earth to men to do what they like with. Man has the 'dominion' over not only plants and minerals but animals, birds and all living things. Spiritually supported by this blanket permission, Western science has refused to recognise any bounds to its interference with the way the world – indeed, the Universe – works. No other religion gives this *carte blanche* to man's predatoriness. What Christians are pleased to call Native or Primitive religions revere the earth, and preserve what lives by it: they worship idealised forms of animals, or the sun (the fount of all energy – a 'discovery' scientists delightedly used this century to massacre, and pollute the atmosphere with radiation). A religion such as Buddhism would not dream of attacking the biosphere, whose delicate equilibrium permits man to live within it. But the Western scientific attitude has already blasted holes in the ozone layer, has developed methods of hunting and killing animals and fish – and breeds of animal, made extinct – and other humans – far 'in advance of' anything the primitives had or wanted; and has delightedly bred creatures with two hands or six legs, fowls which consist almost entirely of chest (good to sell and eat) and animals which have no parents.

The 'superiority' of Western science lies in its superior destructiveness: no advance in moral stature can be observed in man

since Renaissance experimentation took over. It is thus not surprising that scientists once again line up on the side of arrogance and the 'improvement' of nature; nor is it amazing that their allies are the totally immoral and unscrupulous neo-liberal, globalised, capitalist mega-companies whose aim is to supersede nations and control the activities of the world, without even the figleaf of democratic control.

In love, war and the application of scientific discovery, all's fair. Indian farmers have been duped into planting GM crops without knowing; Monsanto in Britain has planted areas not even observing the lax and favourable 'rules' laid down – for example, leaving insufficient no-man's-land between the experimental crops and others. I have not seen any studies at all on the effect on base water of the region where this kind of plantation takes place – though much of it is to permit virulent pesticides to be used in vast quantities.

Do you imagine that government scientific committees will protect you: will filter the 'scientific discoveries' to make sure that no future harm can occur? On the Advisory Committee on Releases into the Environment, eight of the thirteen members have direct links with the biotechnology industry, and six are paid by organisations allowed by the committee to grow genetically manipulated crops. Nigel Poole, who works for Zeneca, has had six applications to the committee approved – but he 'left the room' when his company's application came up. So that's alright, then. As a matter of fact, not one application to release genetically modified organisms has been refused by the committee since it was set up in 1992. The head of the British Environment Agency, Lord de Ramsey, is one of a number of landowners being paid by Monsanto to have crops tested on his land. Lord Sainsbury, the Science Minister, owns the patent of a gene used in GM.

Dr Vyvyan Howard of the University of Liverpool commented on the audit report into Dr Puzstai's research (see later), which cleared him of alleged fraud but considered that his findings were not supported by the data: "A major problem with the audit report is that the authors have been selective with the data they have included, which makes an objective appraisal of their conclusions impossible from solely reading the report. I have the impression it was hastily compiled and systematically biased toward brushing aside your experimental finding".

In the US, the FDA's biotechnology coordinator has said that the FDA "would not require things to be on the label just because a consumer might want to know them". The FDA rules on GM mean

that even risk-assessment data can be withheld as 'confidential business information'; in some states food companies can sue competitors under 'veggie libel' laws, if they label their products as having no genetically-engineered ingredients, on the basis that this might imply superiority to GM products. (*Guardian*, 26th February 1999).

Is the use of GM merely another development in crop 'improvement' such as has been going on for centuries (hybrids, etc.)?

Michael Pollan, growing Monsanto potatoes, writes in the *New York Times*: "All domesticated plants are in some sense artificial – living archives of both cultural and natural information that we in some sense 'design'. A given type of potato reflects the values we've bred into it – one that has been selected to yield long, handsome chips or unblemished round crisps ... Some of the more delicate European fingerlings I'm growing alongside my New Leafs imply an economy of small market growers and a taste for eating potatoes fresh. Yet all these qualities already existed in the potato, somewhere within the range of genetic possibilities presented by 'solanum tuberosum'. Since distant species in nature cannot be crossed, the breeder's art has always run up against a natural limit of what a potato is willing, or able, to do. Nature, in effect, has exercised a kind of veto on what culture can do with a potato.

My New Leafs are different. Although Monsanto likes to depict biotechnology as one more in an ancient line of human modifications of nature going back to fermentation, in fact genetic engineering overthrows the old rules governing the relationship of nature and culture in a plant. For the first time, breeders can bring qualities from anywhere in nature into the genome of a plant – from flounders (frost tolerance), from viruses (disease resistance) and, in the case of my potatoes, from 'bacillus thuringiensis', the soil bacterium that produces the organic insecticide known as Bt. The introduction into a plant of genes transported not only across species but whole phyla, means that the wall of the plant's essential identity – its irreducible wildness, you might say – has been breached."

"The regulation of food is nothing like as strict as the regulation for drugs. And when you start tinkering around with the genetic structure of food you have to move towards thinking of them as pharmaceuticals." – Professor Jonathan Rhodes, University of Liverpool

Does 'scientific procedure' protect us?

A typical instance comes from the University of Vermont, where Monsanto was spending nearly half a million dollars to fund test trials of rBGH, and the researcher leaked information about severe health problems affecting treated cows, including mastitis and deformed births. The 'scientist' heading the research had already made numerous public statements to state lawmakers and the press indicating that treated cows suffered no abnormal rates of health problems. (The rogue researcher was subsequently found to be correct in all details). In fact, three independent British scientists analysed the same data as Monsanto's team published and found the hormone was linked to increased pus and bacteria counts in milk – something Monsanto's scientists hadn't noticed. More, Monsanto tried to block publication of these new facts. Monsanto, by the way, are the people who brought you Agent Orange, widely used in Vietnam, and PCBs, which are now banned after having caused untold damage through being released as soon as developed, for profit reasons.

On the basis that what doesn't look odd or taste odd and doesn't cause a stomach upset immediately after eating, must be OK, fans of Flavr-Savr tomatoes boast "I have eaten a genetically manipulated tomato, and nothing has happened to me." You remember those T-shirts that came out after the 3-Mile Island disaster with, on the front, "I survived 3-Mile Island" and on the back, "... I think". I don't know if BSE meat *tasted* different from any other.

Some nations are trying to be cautious. Austria, Luxembourg and Greece have temporary bans on specific GMO releases, and Austria and Luxembourg have banned the use or sale of Novartis 'Bt' maize (which is engineered three ways to make it herbicide – and antibiotic – resistant as well as poisonous to insects). The European Parliament (largely powerless) is hostile to GM. In Blair's England, however, new regulations have halved the number of trials needed to test new plant and seed varieties; and Monsanto has been pleased to note that though 80% of the public hates it, MPs and Influential Persons are much more favourable (so much for democratic control).

What will be the effect of GM products on you and me?

1. We do not know whether they will trigger allergies, or affect the human immunological system. Remember that we shall be eating these products which have been spliced to resist high doses of poison and antibiotics.

2. The seeds may transmit their genetic material to other species and cause super-plagues. (This would be greatly to the advantage of Monsanto etc., for they could then sell new toxic sprays. Their GM seeds are already programmed to resist Monsanto's best-selling 'Roundup' agrotoxin, so that this can be sprayed ad lib on surrounding weeds and whatever, giving Monsanto double profit).
3. Insects and animals in the environment will be affected in unknown ways by their eating and living with these new strains, and also by the high levels of poisonous spraying thus permitted.
4. The research of Dr Pusztai's team at Rowett Research Inst., showed that rats fed on GM potatoes changed the size and weight of their bodily organs 'worryingly', the brain began diminishing, and the immune system was weakened. Attempts to throw doubt on the research – including the terminating of funding, and the sacking of Dr Pusztai – have failed. Dr Pusztai has said on television that he would not eat GM food. He is the leading authority – in the world – on lectin research and glyco-proteins in plants.

The British Royal Commission on this subject reported: "The full consequences of genetic engineering cannot be foreseen. It is possible now to do things that were inconceivable 20 years ago. Ingenious people in the future may be able to use the tools at their disposal, for example, to develop organisms whose impact may be quite unlike anything previously known."

Remember that these 'ingenious people' will be working for one of the huge transnational companies that recognises no law other than its own profit.

An even more alarming development, once again with Monsanto behind it, is the 'terminator' gene. This is spliced into crops grown from Monsanto seed so that future seed cannot be used again by the farmer – the seed commits suicide, or 'terminates'. Thus the farmer is compelled to keep buying the Monsanto product which, you will understand, does not come cheap. So much for the help to be given to farmers in the Third World and Monsanto's drive to diminish hunger.

In any case, Monsanto already forces farmers to sign contracts undertaking not to use seed from Monsanto-sold crops, and thus to buy again.

Our question 'Who benefits' thus has a reasonably clear answer.

Background on Monsanto, the most powerful GM company

Currently Monsanto and its subsidiaries hold the patents on half of the 36 genetically engineered whole foods being marketed in the US.

“Monsanto has built much of its corporate empire upon the back of one chemical: glyphosate. Marketed mainly as the herbicide Roundup, sales are worth \$1,200 million a year. In 1994 it was used on almost 800,000 acres in the UK. This Monsanto flagship product continues to generate a remarkable annual growth of about 20% year after year. There is, however a natural barrier to continued significant increases in the use of Roundup. Obviously the use of too much of the herbicide on any crop will not only destroy unwanted weeds but also the crop itself. Monsanto’s solution to this dilemma has been to create crops resistant to the herbicide. It’s a double financial win for Monsanto in that they can now sell the herbicide-resistant plants and ever more amounts of Roundup, (but) despite advertising claims that Roundup is safe for humans, pets and wildlife, and is benign to the environment ... symptoms of acute poisoning in humans following ingestion of Roundup include gastrointestinal pain, vomiting, swelling of the lungs, pneumonia, clouding of consciousness, and destruction of red blood cells. A series of suicides and attempted suicides in Japan during the 1980s using Roundup herbicide allowed scientists to calculate a lethal dose of six ounces. The herbicide is 100 times more toxic to fish than people, toxic to earthworms, soil bacteria and beneficial fungi.

While it is claimed that glyphosate is inactivated in soil rapidly, it is more accurate to say it is usually absorbed into soil components. Thus glyphosate *remains* active in soils, and residues have been found in lettuce, carrots and barley planted one year after glyphosate treatment. Roundup-Ready crops will allow farmers to use Roundup on a much wider and less discriminatory manner. Whereas fields were once sprayed with Roundup in pre-plant weed emergence situations, crop producers will now be able to apply Roundup to the genetically engineered crops throughout the contamination season. Not only does this create obvious water, air and food contamination problems, it also threatens herbicide-resistance.” – Joseph Mendelson, in *The Ecologist* special on Monsanto

“Conventional maize-breeding programmes will always outperform hybrids given the same research investment. The only advantage to hybrids lies in their profitability for companies.” – Jean-Pierre Berlan (French INRA), Richard Lewontin (Harvard) and Jack R. Kloppenburg Jr. (Wisconsin University)

“By April 1998 there were 332 test sites in the UK, 70% of which are controlled by just four companies: Monsanto, Agrevo/BGS, Novatis/Hilleshog and Sharps Seeds Ltd.” – *The Ecologist*

“Once a particular course of technological development is set in motion, it can have much wider consequences than its creators could have predicted: the more powerful the technology, the more profound the consequences. For example, the so-called Green Revolution in agriculture in the 1960s and '70s temporarily increased crop yields, and also made farmers throughout the world increasingly dependent on costly chemical inputs. This spurred widespread displacements of people from the land, and in many countries has undermined the soil, groundwater and social land base that sustained people for millennia. These large-scale dislocations have fuelled population growth, urbanisation and social disempowerment, which have in turn led to another cycle of impoverishment and hunger.” – Brian Tokar

Further dangers

“French researchers have discovered that some varieties of transgenic canola can harm bees, a farm's most effective pollinator, by destroying their natural ability to recognise flower smells.” – Joseph Mendelson, legal director for International Centre for Technology Assessment, Washington

“The genes you put in may actually leak out and get to places where we can't control them ... Genes can leap in the most extraordinary and alarming way. There's no reason to say the same thing cannot happen in genetically modified plants. It only has to happen once: the dangers are quite real.” – Professor Steve Jones, Professor of Genetics, University College

The US *Science* magazine published this April research by the Dept. of Entomology at Kansas showing that Darwinist Natural Selection works with the insects attacked by the pesticide Bt, which has been spliced with corn to kill them when they eat it. Some of the insects developed immunity to Bt; they reckon in ten years these insects would have proliferated and become 'invulnerable'.

This, as readers will have noticed, is a process parallel to what happens with the infectious organisms which medical science 'defeats' and which then develop resistant strains which are far more difficult to 'attack' (and make you much iller).

"Seeds genetically manipulated to resist herbicides can transfer their genetic material to bacteria in the human gut, according to the study realised by the Dutch Institute for the Control of Quality in Farm Products." – News item, 28th January 1999

"There have already been a number of potential disasters with accidentally released GMOs. In Mid-April 98 Monsanto announced that it was recalling small quantities of GM canola seed which contained "an unapproved gene that has found its way into the product by mistake." – Zac Goldsmith, *The Ecologist*

Reaction

The BMA has demanded a moratorium on crops and GM foods. It also demands a revision of the WTO rules to guarantee that governments, and not commercial companies, be responsible for the importing of GM products. It further criticises the use of 'marker genes' in GM crops since these may create bacteria resistant to antibiotics. "Once the genie of the lamp has got out of the bottle, the impact on the environment is irreversible" the President warned.

By order of the Technical Commission on Biosecurity, officials of IRGA destroyed 300 GM rice plants at the experimental station in Cochoeirinha (south of Brazil). The destruction took place because of a series of irregularities such as there being little distance between the planting and the neighbouring green areas, and risks to the environment, according to a news report on 23rd April 1999.

The Agriculture Secretary of the state of Rio Grande do Sul stated "There will be no more planting of transgenics in public areas in this state". A British biscuit-making company is having talks with Rio Grande do Sul growers about importing pure (non-GM) soya in large quantities into Great Britain.

“In June 1998 an inspector at Joseph Nickerson Farm, Lincolnshire, showed that control measures to prevent the pollen from GE oil seed rape reaching neighbouring normal crops were inadequate. The Health & Safety Executive is prosecuting Monsanto. We may ask: when/if GE planting becomes more generalised, how will *all* the neighbouring crops/weeds be able to be protected?

Monsanto is facing an increasing number of lawsuits as its GE plants are not behaving as intended or promised. Many of the farmers who grew Monsanto's herbicide-tolerant cotton in 1997 were horrified as the cotton balls fell off their crops, which could be a sign of high stress or gene instability. In 1996 Monsanto's pest-resistant cotton couldn't take the heatwave of the southern US and found itself eaten alive by bollworms and their friends. About 50% of the fields needed emergency spraying with insecticides to salvage the crop.” – Dr Ricarda Steinbrecher (genetic scientist)

- All over India angry farmers and activists have been burning GM crop fields in outbursts of direct action anarchism.
- In August 1998 activists destroyed a trial corn crop in fields close to Britain's largest organic vegetable farm, on the basis that the farm was being made unviable by the impossibility of certifying that its products were not contaminated.
- The Landless Movement in Brazil has offered to destroy any GM fields that are pointed out to it.
- All African delegates to the FAO conference on Plant Genetic Resources (minus the South Africans) signed a document entitled “NO – Let Nature's harvest continue.” (see *The Ecologist*, September 1998).
- The Greenpeace X (for ‘stop’) campaign began in September 1996 when it sprayed a large red X over a whole crop of Monsanto soya in Mid America. The HQs of Nestle, Danone and Unilever were then X-ed, and X stickers were applied to margarines and soya products in hundreds of supermarkets. Seed ships containing contaminated grain were X-sprayed in Liverpool; GM soya mixed with cement sealed Monsanto into their Brussels HQ. Cricket has been played with GM potatoes. After a field in Carlow had been dug up, Ireland became totally GM-free. Even in France farmers invaded a Novartis conditioning and storage plant and destroyed five tons of transgenic maize.

Organisations: Besides Greenpeace, join ‘No Patents on Life’

campaign; ASKED (Action on Solidarity, Equality, Environment & Development) Amsterdam; People for Global Action; Genetic Engineering Network; SHAG (Super Heroes Against Genetic) to practise cricket, or Earth First!

The Mythology of Science

In the fields of applied biology, health and medicine, we are trying to get rid of the great scourges of cancer, obesity, alcoholism, etc. But so far, successful treatments for these diseases remain beyond our grasp. The genetic-industrial complex – obsessed with profit – puts itself forward as the solution. Confusing the agent with the cause, it drums into us that these social ills are genetic and therefore individual. The effect is to transform every healthy individual into a potential patient, expanding the market to the limit – as it previously did for seed with hybrids, and as it will do with Terminator. By cutting themselves off from society in the name of objectivity and technology, biologists are falling victim to their own narrow concept of causality and their ‘a-historicity’ easy prey for investors. But the way for researchers to work for the better world that the vast majority of us want is for them to open themselves up to the scrutiny of their fellow citizens. That means scientific democracy.

“The genetic-industrial complex is trying to transform political questions into technical and scientific ones so that responsibility for them can be shifted on to bodies it can control. Its experts, dressed in the candid probity and the white coat of impartiality and objectivity, use the camera to distract people’s attention. Then they put on their three-piece suits to negotiate behind the scenes the patent they have just applied for, or sit on the committees that will inform public opinion and regulate their own activities. It is a serious thing when democracy no longer has any independent experts and has to depend on the courage and honesty of a few scientists and researchers, as it must, for example, in the nuclear industry.”

– Jean-Pierre Berlan and Richard C. Lewontin (Director of Research, Agassiz chair and professor of population genetics at Harvard respectively)

It has to be said that science in the twentieth century has a depressing history of subservience to military and capitalist masters. The splitting of the atom and the release of nuclear power (later, fans of Orwell, please note, modified to nuclear ‘energy’ – just as the

accidents at the British nuclear plant were re-named 'incidents') was hailed as scientific progress and a 'watershed discovery', and 'our' scientists duly lauded. The discovery was developed and used, however, for military purposes – a far cry from the Crusade For Pure Truth which scientists protest is their brief. When 'Peaceful Uses' later arrived on the scene, these were eventually found to be almost as noxious as the military ones, and to this day no scientist has the slightest idea what to do with the radioactive detritus created – which includes substances created by scientific ingenuity and previously unknown to nature, such is their extreme toxicity.

Medical research, guided and funded by huge transnational companies, offers a stream of (patented) blockbuster drugs, with infamous 'side effects' (another Orwellian term) sometimes listed in small print, to the horror of the reader, under the dosage chart; and sometimes neither anticipated nor promulgated by scientific heroes pushing back the frontiers of knowledge. They were far more interested in their papers published in *Nature* (another ironic name), their fame among their fellows, and their continued subventions from their paymasters.

I see a parallel with GM. The same scientists, working, not this time for the military (as far as we know), but for those huge profit-making multinational drugs firms ('Dolly') or for globally monopolistic pesticides manufacturers (Monsanto; ICI/Zeneca), carry out their excited experiments in secrecy from the general public (for whom, such is the pace of scientific 'advance', the penny of the payer doesn't drop until it is too late) and arrive at results which confirm what companies wanted to hear. Protests are drowned out as 'Luddite', and before an anarchist can say Jack Robinson the whole game – what Steve Jones in the *New York Review of Books* called the Genetic Toyshop – is set up and selling.

As Marcel Berlin's article in *The Guardian* pointed out, any damage done to eaters by GM productions is 'lawyer-proof' – how could anyone prove that it was by eating a certain artificial food that a certain health problem / allergy / disease was caused? The forty-year struggle of miners to prove, to the satisfaction of a government not anxious to pay anything out, that their fatal disease was caused in the mines, would be child's play.

Bernard Shaw said that doctors are lucky in that they bury their mistakes. Scientists not only bury their mistakes, they indulge in professional amnesia about them. X-rays were hailed as a revolution (scientists are always hailing revolutions) in diagnosis and treatment. After tens of thousands of people contracted cancer from X-rays,

and only after, it was 'discovered' that the dose they had had was 'excessive', and new swifter X-ray techniques were developed which are now (of course) sworn to be harmless. One is reminded of the 'safe dosage' promulgated for radiation, which has been revised downwards from time to time till it is over 100% less than initially asserted. Some poor wretched Fijians are still trying to get compensation from the British government for having been detailed to pick up debris immediately after a nuclear test explosion many years ago.

Yet scientists regard their findings – 'checked and double-checked' – as sacred and their opinions as uncontestable. Not so long ago acupuncture was derided in medical / scientific circles. After tens of thousands of people had had problems such as back pain and headaches alleviated by this treatment – used by the Chinese for centuries – scientists have begun grudgingly to accept that there may be something in acupuncture. But of course they cannot accept the theory behind acupuncture – the lines of force, the *yan* and *ying* – because this does not fit in with Western scientific dogma.

In fact scientists believe that there is only one answer to every question; whereas anyone who has experienced life for some time knows that there are always two – or more – answers, depending on the point of view. The 'Scientific' or 'logical' truth that scientists worship is merely one arbitrary construct out of many in the infinite universe. The world web of relationships miraculously combines generalised truths with particular truths: any 'explanation' that does not recognise both these aspects simultaneously is partial – and dangerous. It is simply not true that $2 + 2 = 4$ in any sense except the meaningless general. Two apples plus two rocks or two dogs do not 'equal' four anything. But the manipulation of generalisations gives human beings tremendous power: power that they/we are totally unfitted to deal with. Statistics the reduction of the infinity of particularities to arbitrary generalisation – enable economists (who like to think of themselves as scientists, and not as cousins to fortune-tellers) to make forecasts; these are invariably wrong, wholly or partly, but the belief in them is enough to give them great fame in a culture that worships 'scientific thought'. Mathematics – a set of disciplines based entirely on theoretical considerations – by unlocking certain generalisation in the functioning of the universe, has enabled men to harness (as the expression is) the energy of the sun. This is considered to be 'progress': a word that surreptitiously introduces an ethical dimension where none is defensible. In fact it is not part of science to evaluate the moral implications of its

'discoveries'. Nor of the commercial possibilities handed on a plate to the highest bidder. Military uses are assessed as if by the Roman Catholic church: whether use is to be in a 'just war'.

There is a quotation that says that power corrupts, and absolute power corrupts absolutely. I would imagine that it is the whole basis of anarchism. The power which scientists achieve, by ignoring particularity and morality, is compounded by their hubris, for they really believe in the rightness of their science, as much as or more than any religious fanatic. If one cannot 'prove' something by their methods, it is not 'true'. Part of particularity is the entire subjective world; of love, of joy, of pain, of the irreconcilable difference of individuals. Scientists cannot isolate love in their laboratory, so they simply ignore it. It is not important. Not important, at any rate for the purpose of gaining power over reality. They could not isolate, or 'prove', telepathy or telekinesis, so these do not exist either. It is remarkable how many things that we take for granted in our ordinary lives do to exist, for the scientific mind. And yet, because scientific method gives power, human beings admire and even follow it.

This is in spite of the fact that scientists change their minds about what is true once every twenty years or so. This they do not call being 'wrong': no scientist (except for those completely out of the scientific consensus, like Lysenko) is ever 'wrong'. What has happened is 'progress'. It is progress, for example, that more people die of cancer and heart disease than ever before. The explanation? In former times, explain scientists, they would have died earlier, of something else. So there has been progress! This is what scientists call logic – when they themselves are using it. There are writers who maintain that any improvement in public health this century has been due to clean drinking water, generalised sewage provision, and the use of aspirin. Other medical benefits have been marginal.

We have a progress from syphilis to Aids, from deaths from dysentery in England to deaths from dysentery in Africa, from one type of flu to another. From bicycles to cars, from planes that pollute the lower atmosphere to ones that pollute the upper, from strawberry to chemically produced strawberry flavour. Progress is a fiction; as any historian knows: as Nicolas Walter pointed out in his excellent booklet on Anarchy, we gain something, we lose something: history is not going anywhere.

Thomas Kuhn has pointed out in his book *The Structure of Scientific Revolution* that science is not progressive. He says that in scientific revolutions it is not only our scientific theories that change but the very standards by which scientific theories are judged, so that the

paradigms that govern successive periods of normal science are *incommensurable* (his italics). Since a paradigm shift means complete abandonment of an earlier paradigm, and there is no common standard to judge scientific theories developed under different paradigms, there can be no sense in which theories developed after a scientific revolution can be said to add cumulatively to what was known before the revolution. Only within the context of a paradigm can we speak of one theory being true or false. "We may, to be more precise, have to relinquish the notion explicit or implicit that changes of paradigm carry scientists and those who learn from them closer and closer to the truth." According to Steven Weinberg, "Kuhn made the shift from one paradigm to another seem more like a religious conversion than an exercise of reason" (Weinberg also says that 'Structure' has had a wider influence than any other book on the history of science).

Scientists are very afraid of – and contemptuous of – what they call 'the irrational'. But the 'irrational' merely means what we cannot explain. 'Explanations', only too often, are in fact merely rationalisations (as psycho-analysts know). And, as I have pointed out, there are always several explanations for the same phenomenon: we simply pick the one that suits us.

As far as Genetic Manipulation is concerned, we see science all geared up to make the same fatal mistakes yet again. It hands its newly-minted capacity (power) to huge immoral monopolistic companies to do as they wish. It even attacks laymen who protest at this. It refuses to accept common sense (common sense is irrational – but it was common sense that said that feeding sheep's brains to herbivorous animals was bound to bring harm). I have read a scientist saying that there is 'no difference' between GE soya and ordinary soya: can you imagine any less 'scientific' statement than that? As usual, it pooh-poohs opposition ('fundamentalist' is the fashionable put-down). It ignores public opinion (science is always 'ahead of' public opinion). According to Professor Lewis Wolpert (ex-chair of the Royal Society's Committee on the Public Understanding of Science) science is "value free". This lets out Hitler's scientists, doesn't it. George Monbiot has pointed out; "our laboratories are crammed with idiot savants, people with a profound understanding of their own subject, but who know nothing whatever about the political and economic realities which govern its deployment". Worst of all, these people are arrogant: as arrogant as politicians and economists.

Donald Rooum

Genetic modification: dangers and scare stories

Three facts about genetic modification (GM) are widely known in this country today. One: GM is associated with the name of Monsanto, an avaricious transnational agribusiness. Two: GM soya products were sold in Britain without the knowledge or consent of consumers. Three: government spokespersons tell us that GM products are safe, and they said the same thing about BSE beef. Little wonder, then, that the British public is suspicious of GM.

Since 1997, suspicion has turned to fearful hostility. Supermarket grocers and local authorities have removed GM products from their shelves and kitchens, not because such products are harmful, but in response to customer worries.

Before genetic chemistry was understood, people for thousands of years altered the genotypes of plants and animals by breeding from individuals with desired characteristics. Now, they know how to change DNA, the chemical which carries genes, more directly. The current favourite name for this is genetic modification.

Some other names are genetic manipulation, genetic engineering, and transgene technology. 'Genetic manipulation' is commonly used to include selective breeding and hybridisation, so using it to mean GM only is confusing. 'Genetic engineering' suggests precision, but the effect of combining a new gene with old genes is unpredictable, so GM can only supply raw material for selective breeding. 'Transgene' suggests that genes are clipped out of one organism and transferred into another, which is not what happens. 'Genetic modification' is not a very satisfactory name, but appears to be the least unsatisfactory of those available.

GM foods on sale in Britain

GM human insulin, from the bacterium *Escherichia coli*, has replaced pig insulin in the treatment of diabetes since 1981. But the first GM food product to appear in this country, in 1994, was cheese curdled with rennin (also known as chymotrypsin) from a GM fungus, *Kluyveromyces lactis*. Rennin is not present in the finished cheese, so it escapes the law requiring GM food to be labelled as such. The Co-op supermarket labels it 'Produced using gene technology, and so

free from animal rennet'. Other supermarkets label some of it 'suitable for vegetarians', but more than 70% of cheese is now made with GM rennin, and most of it is not labelled. Cheese made the old way, with rennet (impure rennin) from calves' stomachs, may be labelled 'organic'.

In 1996, the Sainsbury's and Safeways supermarkets introduced GM tomato paste, labelled as such, and cheaper than the non-GM tomato paste next to it on the shelf. The origin of these GM tomatoes was that scientists at Nottingham University thought they might have found the gene for the enzyme which makes ripe tomatoes go soft. To test this, they manufactured a gene with exactly the opposite sequence of nucleotides, and added it to tomato DNA. If the hypothesis was correct, the artificial gene would inhibit the softening gene and the tomatoes would ripen hard; which is what happened. Then it was realised that hard-ripening tomatoes, though useless for salads, could make tomato paste less costly. The cheaper tomato paste has now been withdrawn from sale in response to customer fears.

Later in 1996, it was learned that soya products were made from a mixture of GM and non-GM soya, without British food processors, retailers or consumers knowing about the GM element. People were justly furious. A scare-story spread that the GM soya had not been pre-tested, and an American producer was using British consumers as 'human guinea-pigs'.

The truth, however, is rather cock-up than conspiracy. There are more than six hundred agricultural varieties of soya, from which farmers choose those which they think will give them the highest yield. Millers do not care about varieties, but process all the soya together. A trade association discussed the possibility of segregating soya flour and oil, according to whether it came from GM varieties or other varieties of soya, and decided against on grounds of cost. This could be the worst commercial decision of the twentieth century.

Danger to wildlife from herbicide-tolerant crops

The danger of GM to wildlife on farms is not a scare story. Agriculture consists of replacing wild plants with crop plants. The more intense the cultivation, the more inimical it is to wildlife, and some GM products make it possible to eliminate wildlife from farms entirely.

In the USA, where three quarters of the land is wilderness, wildlife on farms is not of great public interest. But in the UK we do not

have wilderness. We only have the countryside. All the cultivable land has been farmed for centuries, and our surviving wildlife is farm wildlife. Some farmers in America kill all the weeds on their land with herbicide, and sow GM herbicide tolerant seeds in the cleared ground. If many farmers in Britain did that, there would be an environmental disaster.

Herbicide tolerant crops in current use are tolerant of one particular herbicide, glyphosate, patented by Monsanto under the trade name Roundup. The gene for glyphosate tolerance was copied from a strain of the bacterium *Escherichia coli*. When 'Roundup Ready' crops were planted in Australia, it was discovered that a variety of rye grass was glyphosate tolerant. In laboratory experiments, glyphosate tolerance was transferred from GM crop plants to soil fungi, and a hybrid of glyphosate-tolerant oilseed rape and wild turnip was glyphosate tolerant.

Other glyphosate tolerant weeds will appear, perhaps quite soon, and the Roundup Ready system will become useless. Contrary to the scare stories, however, this will not cause uncontrollable 'super-plagues'. Other herbicides will not be affected. GM crop plants tolerant of another herbicide, glufosinate, are on trial. If they reach the market, the effect will be similar to glyphosate-tolerance.

Danger to wildlife from pesticidal crops

Another scheme for protecting crops is to make them poisonous to the wildlife which eats them, by inserting genes from selectively poisonous organisms. One such is the bacterium *Bacillus thuringiensis* (Bt), which is lethal to caterpillars and fly maggots, but harmless to bees and ladybirds. 'Organic' farmers may spray their crops with Bt without losing the 'organic' licence, because spraying with live bacteria counts as biological control. But if crops are GM, to produce the Bt toxin themselves, they may not be labelled 'organic'.

This is not as paradoxical as it seems. Spraying is inefficient. Insecticidal spray always misses bits of the field, allowing a few individual insects to escape. A field of pesticidal plants would eliminate all the pests, except for the few individuals which happen to be immune, and a pesticide-immune population would develop.

However, there is an easy solution. The Nuffield Council on Bioethics recommends that growers of pest-resistant crops should also plant small areas of a non-resistant variety, as a refuge for the pests. The obvious place for such refuges is along roadsides, where yields are lower anyway because of traffic. Fields of pesticidal crops will be recognised by their neglected appearance, as seen from the road.

In May 1998, researchers from Cornell University covered a patch of milkweed in pollen from Bt maize, and so killed half the monarch butterfly caterpillars feeding on the milkweed. Handfuls of maize pollen are unlikely to land on milkweed by accident, but odd grains of pollen may land there (as of course may droplets of sprayed Bt or other insecticide). Fortunately, Bt genes can be inserted into the DNA of chloroplasts, which do not occur in pollen.

Danger of cross-pollination

Cross-pollination between different species is rare, but it does occur. Between varieties of a single species, cross-pollination is to be expected, especially if the varieties are planted close together. The way to avoid accidental GM crosses is to insert the new genes into chloroplast DNA, as pollen does not carry chloroplasts. This may become standard practice.

With some plants there are other ways to prevent cross-pollination. Plants which have separate sexes may be restricted to females, and slow-maturing plants may be harvested before reaching reproductive age. These methods were used both together in an experimental plantation of GM poplars, with reduced lignin to reduce the use of chemicals in paper-making. The plantation, at Bracknall in Berkshire, was destroyed on 12th July 1999 by anti-GM activists, who issued a statement about GM trees being a threat to forests. Evidently, they did not know that the trees they destroyed were incapable of affecting other trees, or that the experiment, if successful, would have been environmentally beneficial (or perhaps they did not care).

Danger to human health

In 1989, a batch of tryptophan food supplement capsules caused 5,000 people in the USA to fall ill, and 37 to die. The manufacturer pleaded guilty to skimping on purification procedures. By this time the bacteria from which the tryptophan had been extracted were destroyed, so nobody knows whether the toxin came from the bacteria or somewhere else.

Some time later it was learned that the bacteria were a GM variety, with double tryptophan-producing genes. Supposing for the sake of argument that the toxin came from the bacteria, nobody knows whether or not the GM had something to do with it. This doubly doubtful case is the only known case in which GM food might possibly have poisoned somebody.

Of course there are loads of rumoured cases. And many of the scare

stories incorporate the figures of 5,000 ill and 37 deaths from the doubtful tryptophan case. Joan Walley MP told the House of Commons that 5,000 had fallen ill and 37 died from a riboflavin (vitamin B2) food supplement (*Hansard*, 3rd February 1999). A comrade, whom I greatly admire, assures me that 5,000 persons allergic to brazil nuts fell ill, and 37 died, after eating soya into which a brazil nut gene had been inserted.

The truth about the soya with a brazil nut gene is as follows. The gene for producing methionine in brazil nuts was inserted into soya, to produce a soya variety with a high methionine content. Samples of this brazil nut soya were mixed with blood serum from someone allergic to brazil nuts, and produced allergic reactions. Brazil nut soya was never offered for sale, nobody ever ate any of it, nobody was made ill by it, and stories of a tragic spate of allergic reactions are fictitious.

The true story demonstrates (a) that gene combinations do not always behave as expected, and (b) that developers of GM varieties are aware of the uncertainty, and test products before offering them for sale.

In the 1960s, before GM existed, poisonous new varieties of potato and celery were sold in the United States and Canada, and since then, breeders have been very cautious.

A splendid example of a GM food scare is the Pusztai scandal. The Rowett Institute in Aberdeen introduced an insecticidal snowdrop gene into potato plants, protecting them from colorado beetles. These GM potatoes were tested for harmful effects by one of the Institute scientists, Dr Arpad Pusztai, who fed the tubers to rats. In August 1998, he went on the television show *World in Action*, and stated that the GM potatoes had damaged the rats' immune systems. The Institute stood by him for three days, but sacked him after they read his data.

In February 1999, twenty-one international scientists signed a memorandum calling for Dr Pusztai's reinstatement. The signatories did not say they agreed with Dr Pusztai's conclusions – his paper had not been published – but the news stories implied that they did. Eighteen anti-GM organisations formed a consortium to mount a press campaign, and denunciations of 'Frankenstein food' appeared in the national press for eleven days in succession. Six scientists were appointed by the Royal Society to 'peer review' Dr Pusztai's paper, and in May 1999 their report was published. They found "no evidence of adverse effects from GM potatoes". The GM potatoes had less protein than the potatoes fed to the control rats, and the observed immune deficiency was consistent with shortage of protein.

Danger of multinational domination

Seventy-five per cent of the world vegetable seed market is controlled by five multinational corporations. When Calgene (now a subsidiary of Monsanto) announced that it had made it possible for a 'tropical' cash crop to be grown in temperate countries and was accused of damaging the economies of poor countries, their spokesman replied: "It is our hope, all of us in the industry, to bring products that will better people's lives. But at the end of the day, we are answerable to ... our shareholders" (*Biologist* 46/3, June 1999).

It is implied in some anti-GM publications that GM is somehow responsible for capitalist domination. But GM has been around for only twenty years, while the world seed trade has been run by a few multinationals for fifty years at least.

The world's biggest seed merchant, Pioneer Hi-bred, relies on its established lines, such as maize 3780, the world's highest yielding and best selling maize variety since 1970. It invests in GM research, but is cautious about entering the market.

GM seeds are supplied by the lesser four of the big five, plus the Chinese government.

Monsanto, the firm which gives GM a bad name, has bought up at least three GM companies, with their patents.

Aventis and Astra-Zeneca, European companies formed by mergers at the end of 1998, both have seed divisions which own GM patents bought from universities.

Novartis, based in Switzerland, does its own research, and in 1998 took out more than four hundred patents for GM products, in the USA.

Danger from the novelty of lateral gene transfer

Bacteria are known to acquire genes in all sorts of ways.

"There is very strong evidence that [*E. coli* O157] is standard *E. coli* with additional virulence genes [acquired] by horizontal gene exchange from distantly related species." – Hugh Pennington in *Biologist*, June 1998.

In eukaryotes, genes are transferred 'vertically' from parent to offspring, and some people are disturbed that the 'lateral' transfers permitted by GM seem unnatural. But there are informed conjectures that lateral gene transfers occur without human intervention.

“Nodules within the roots of leguminous plants such as clover ... produce haemoglobin, the blood pigment that carries oxygen within the blood of vertebrates. Did legumes (or their ancestors) acquire the necessary genes directly from animals? Nothing should be written off a priori.” – Colin Tudge in *The Engineer in the Garden*, page 73.

“Gary Stroebel, of Montana State University, and his team have recently discovered a fungus that grows on the Pacific yew tree and can produce the cancer drug taxol ... Stroebel suggests that it could have picked up the genes for ... taxol from the yew tree”. – Susan Aldridge in *The Thread of Life*, page 74.

“A recent study (*Proceedings of the National Academy of Science, USA*) found that a certain gene was shared by hundreds of plants as distinct as banana, coffee, cucumber and the Brazilian rubber tree. They decided that the presence of this gene could only be explained by lateral transference.” – Jonn Roe in *Freedom*, 23rd January 1999.

Danger to animal welfare

Animal suffering can be the result of selective breeding. Such genetic abuse is usually thought of in connection with food animals, but the archetype is the British bulldog, deliberately bred to have a body shape which makes breathing difficult, and facial skin folds which harbour painful infestations. GM is not yet involved in such cruelties, but it could be.

Giant tilapia have been produced by inserting the promoters of growth hormone genes into liver cells as well as pituitary gland cells. The same technique has also produced giant salmon. I am told the giant fish seem happy as well as tasty (Norman Maclean, University of Southampton), but a similar technique could cause great suffering in animals with legs.

The cattle growth hormone, BST, is produced by GM *E. coli* and injected into dairy cows in America, to lengthen the period of lactation. This increases the incidence of mastitis relative to the number of animals, but not relative to the amount of milk produced, so farmers find it acceptable. After animal safety reviews, an ice-cream company labelled its product as containing no BST milk, and Monsanto filed a lawsuit against the labelling on the ground that the milk itself is indistinguishable.

Danger of terminator genes

Delta and Pine Land Company (now owned by Monsanto) holds the patent for a 'terminator gene', but Monsanto now denies its existence. It seems the firm managed to get a pre-emptive patent for the idea. Even though it does not exist, however, the Consultative Group on Agricultural Research, meeting in Washington in November 1998, agreed to ban it.

The terminator gene, if it happens, will cause seeds to die as they ripen, remaining edible but not viable. A second gene will allow the seed merchant, but not the farmer, to switch the terminator gene off.

The objective is to make growers buy new seed every year (as they must with F1 hybrid seeds), so that the breeder can recover the investment. At present, growers sign a contract agreeing not to breed the seeds themselves, but it is easy for them to cheat.

The scare story is that terminator genes will prevent subsistence farmers and allotment holders from planting seed which they have bred themselves. This is obviously daft, but some quite intelligent people believe it.

Danger to seed merchants' profits of apomixis genes

Apomixis is the equivalent in plants of parthogenesis in animals. The plant eggs turn into seeds without being pollinated.

Genes for apomixis are likely to be used in GM experiments earlier than terminator genes because they already occur in nature, for instance in garlic and dandelions. With them, even F1 hybrid plants can be induced to breed true. Their effect will be the exact opposite of terminator genes.

The danger is to seed merchants, who depend for their profits on repeated sales. We must expect the giant seed corporations to do all they can to stop it. They may try, for instance, to buy up the patents for apomixis and suppress them.

To counter this we need a vigorous campaign to make apomictic GM crops available, especially to the poor. But this seems unlikely to happen in this country, where the campaigning classes are caught up in an anti-GM campaign which is quite indiscriminating.

Danger of fuelling population growth

World food stocks are decreasing as the human population expands. If mass starvation is to be prevented, food supply needs to increase. The report of the Nuffield Council on Bioethics (July 1999) recommends funding research "into higher, more stable and sustainable production of tropical and sub-tropical food staples ...

seeking gains for poor farmworkers and smallholders”.

This assumes that famine is disaster, and not everyone shares that assumption. It is actually used as an argument against the green revolution of the 1970s that it “fuelled population growth” (i.e. that it lowered the infant mortality rate). There are those who see mass starvation as a lesser evil than the environmental danger caused by over-population. This counter-intuitive ethical position is arrived at after careful, perhaps anxious thought, and is not to be lightly dismissed. It requires a thoughtful response.

Undeniably, human population growth is harming the natural environment in all sorts of ways, and the harm would stop if billions of people were to disappear. But starvation is not disappearance. Starving people have time to strip the bark from trees, kill the animals in reserves, damage the environment in all sorts of ways in the final scramble for food. As a strategy for saving the planet, mass starvation would be counter-productive.

The birthrate goes down as people become prosperous enough, and confident enough of infant survival, to practise birth control. This has already happened in European countries. The way to stabilise world population is to arrange for people everywhere to be well fed.

Danger from scare-stories and superstitions

Many anti-GM beliefs, for instance the belief that GM food in the shops is poisonous, are ill-informed. But the campaigns which encourage ill-informed beliefs are often run by people who are well-informed. The best produced anti-GM leaflets and press releases are put out by organisations like Greenpeace, Friends of the Earth, the Soil Association, and *The Ecologist* magazine.

These organisations employ well-informed, full-time experts who could, if they chose, explain the benefits of GM as well as the risks. They choose instead to form a ‘Rainbow Alliance’ with ignoramuses and deluded nuts, and encourage the spread of scare stories about ‘Frankenstein foods’.

My guess is that they are interested in protecting wildlife, and suspect the food-buying public will be more interested in the price of food. They calculate that if people can be persuaded that GM food is poisonous, they will refuse to buy it even though it is cheaper, and wildlife will be protected by market forces. But using falsehood in support of truth is a questionable tactic. We have the example of government assurances about BSE, to show that when people learn that they have been lied to, they distrust everything the liar says.

In any case, ethics is more important than tactics. Anarchists ought not to get involved in a dishonest campaign, even though we join other campaigns run by the same organisations.

Caution is appropriate with GM, but caution means assessment of risk, not indiscriminating hostility. Applications of GM should be assessed case by case, to avoid the risk of throwing the baby out with the bathwater. If we care for human welfare, we should be campaigning for the benefits of GM to be available to the poor of the third world.

“It may soon be possible to develop plant varieties that can produce seeds without sexual fertilisation, by apomixis, resulting in offspring that are genetically identical to the mother plant. This would revolutionise plant breeding by allowing any desired variety, including hybrids, to breed true. ... Resource poor farmers would be able to replant the seed every year. However, the current trend towards the consolidation of plant GM technology ownership into a relatively small number of companies may severely restrict access to affordable apomixis technology (at least for the duration of the patent rights).”

Nuffield Council on Bioethics, *Genetically modified crops: the ethical and social issues* (1999) page 77

Terry Mabbett

The genetic modification of crops: a cause for concern?

[Lecture to South Place Ethical Society, London, reproduced by permission of both the author and SPES]

Genetic change in living organisms is desirable and without it evolution would not exist. Until the end of The Second World War virtually all genetic change could be accounted for by naturally occurring mutations (changes) in genes and the exchange of genetic material during natural sexual reproduction and conventional plant breeding. With first atomic explosion over Japan in 1945, followed by a whole succession of nuclear tests from then until now, radiation released into the environment has undoubtedly increased the rate of mutation in plants, although it has not been quantified. Indeed scientists have, over the last fifty years, used radiation as a mutagenic agent in an effort to secure mutations in crop plants that could be usefully used in conventional plant breeding programmes.

Twenty years ago genetic change entered a new era with the advent of a new technology called gene transfer, by which genes were transferred from one living organism to an often totally unrelated living organism. The very first experiments were conducted with micro-organisms and then scientists moved on to crop plants. These were initially called 'transgenic' crops but more recently and probably because it doesn't sound quite as threatening to the general public, they have been labelled 'genetically modified' crops.

Work began in the early 1980s and produced strains of bacteria that were able to 'seed' ice crystals on the surfaces of leaves – the usefulness being to stop internal freezing damage in frost susceptible fruit trees like peaches, apricots and citrus. This particular example sticks in my mind because I attended a conference at one of the Cambridge Colleges where this and a whole host of other projects, then loosely called biotechnology, were presented. The only press representatives were myself and several specialists from research based publications in biochemistry and related fields. I distinctly remember saying to myself, as the true extent of what was happening became evident, 'I hope the relevant authorities are going to keep the public informed for they will die of fright if presented later with a *fait accompli*'.

Now some fifteen years later the true extent is being unveiled. Genetically modified maize, soyabean, oilseed rape, potato and tomato to name just a few and the general public are frightened.

Potato and tomato

Potato and tomato, both members of the plant family Solanaceae, were two of the first crops to be 'played with'. Potato has been genetically modified for the farmer to resist specific insect pests by transferring a gene from the 'snowdrop'. This produces an 'insecticidal protein' called lectin which occurs naturally in snowdrop bulbs. This is the GM crop which is at the centre of controversial research at The Rowett Research Institute in Scotland involving effects on the immune systems of rats.

Genetically modified tomato was developed with the processing industry's requirements in focus. You will notice from supermarket shelves that genetically modified tomatoes are not sold as fresh fruit but as ingredients in processed products such as paste and puree. This is because the genetically modified tomato has its 'softening gene' blocked by treatment with a so-called 'anti-sense RNA' mechanism which is common in bacteria. This blocks the gene which controls a specific enzyme responsible for dissolving a sticky chemical called pectin. Pectin holds the tomato cells together and keeps the fruit firm. These gene blocking mechanisms could be inserted into any existing well known varieties (including the garden favourites 'Moneymaker' and 'Alicante') which in all other respects will be identical to the original variety.

With this enzyme blocked GM tomato ripens on the vine full of flavour, while staying firm, thus providing the processor with tasty, firm fruit still full of pectin. Advantages for the processor are that 'he' does not have to add pectin and there is less water in the fruit to boil off. Advantages for the consumer are identified as 'fullness of flavour' but since many processed tomato products are adulterated with all sorts of spices including garlic this tomato as a 'saver of flavour' could turn out to be a 'red herring'.

Soyabean, maize and oilseed rape

The main beneficiaries of GM soyabean, GM maize and GM oilseed rape, very much in the news over the last twelve months, are the pesticide manufacturing companies. The clue to this association has been evident over the last fifteen years as the big players in pesticide chemistry bought up dozens of plant breeding and seed producing companies.

Not the household names of the UK garden market, which are essentially 'small fry', but the huge North American seed companies developing and selling seed to Mid West and prairie farmers growing soyabean, wheat, and maize. In Europe substantial seed companies in France, Germany and the UK offering oilseed rape, sunflower, sugar beet and cereals have been snapped up. You may still be asking what is the connection. The connection is that the pesticide companies want to sell more of their agrochemicals and especially herbicides.

Herbicides are chemicals designed to kill weeds. A weed is simply a green plant growing in the wrong place at the wrong time. For example Sorghum, a cereal and member of the grass family (Graminae), is classed as a weed in many parts of North America while in the drier parts of Africa it is the main staple food crop. Because herbicides kill living green plant tissue they must be used very selectively and carefully in the crop situation. There are some which only kill certain species, e.g. the hormonal weedkillers (MCPA and 2,4 D commonly used in lawn herbicides) kill broad leaved weeds like daisy and dandelion but leave members of the grass family unharmed. For this reason they can be used in cereal crops to kill broad-leaf weeds without harming the wheat or barley.

But most others are not selective and therefore must be carefully timed to hit the weeds before the crop seeds germinate in the soil. This obviously restricts their use. GM soya, GM maize and GM oilseed rape have been produced by inserting genes which make them specifically tolerant to particular herbicides. Thus Monsanto's GM soyabean is tolerant to glyphosate, one of Monsanto's leading herbicides. This means that farmers growing GM Soyabean ('Roundup Ready Soyabeans' - 'Roundup' is Monsanto's trade name for glyphosate) can use glyphosate to kill weeds growing in their crop at any time without fear of damaging the crop.

Cotton

Cotton presents a particularly interesting example because scientists have taken a gene from a naturally occurring bacterium, which infects and kills the bollworm (a caterpillar of a moth and the world's worst insect pest of this fibre crop) to produce GM cotton.

In fact commercial formulations of this bacterium called *Bacillus thuringiensis* (Bt) have been available for more than ten years for spraying on to the cotton crop. The bacterium infects the bollworm and makes a toxin (poison) which kills it. The gene responsible for making this toxin has now been put into cotton plants (Bt cotton)

which can produce this bacterial toxin. When the bollworm hatches from the egg and starts to feed on the leaves and cotton bolls it is poisoned and dies.

Simple and effective enough and, you may say, nothing to do with the human food chain. But in addition to being grown for its fibre (lint cotton) the crop also produces a huge tonnage of seeds rich in oil which is used to make margarine and other edible fats, the residue after crushing called cotton seed cake being widely used in animal feed. Furthermore cotton in full flower is one of the most attractive crops to bees.

Winners and losers

Whether you are a winner or a loser depends very much on who you are and your viewpoint.

Here there is no straight answer. On the surface and in the short term the large scale arable farmer in North America and Europe may stand to gain but if things go wrong he could find himself in a nightmare situation. For instance if whole swathes of farmers start to grow GM crops, say soyabean, tolerant of a particular herbicide, they will only be using that particular herbicide, with its own chemistry, to control weeds.

This will place incredible and intolerable selection pressure on weed populations. In turn it will speed up the evolution of herbicide-resistant weeds (already a huge problem even before the advent of GM crops) rendering useless not only that herbicide but all others with a similar chemistry. If farmers have become locked into the GM crop phenomenon they may well find that there are no alternatives if things go wrong. Farmers can grow what they want but will only secure a profit beyond the farm gate. If the public does not want to buy there is little they can do – the BSE crisis in the beef industry has shown that.

The situation for farmers in the developing world is even more threatening because lacking their own strong representation and through the economic weakness of their country's finances they are likely to be railroaded into growing GM crops. These farmers traditionally save their own seed because many do not have the financial security to buy new seed each year. The owners of GM Crops will want to make sure that farmers are growing 'pure' GM crops each year. This can only be achieved by introducing a so-called 'terminator gene' which stops the GM crop producing viable seed thus forcing the farmer to buy new stocks of seed each year. Clear enough but what happens if the gene escapes into neighbouring non

GM crops being legitimately grown for seed?

The situation for the organic farmer is dire. Pollen can travel thousands of miles in air currents in the upper atmosphere, let alone to the neighbouring farm. Indeed pollen, whether carried by wind or insects is adapted for efficient movement and dispersal to other plants of the same species. For a few crops like potato which are sown, harvested and consumed in the vegetative state – i.e. the potato tuber with no sexual reproduction and genetic exchange involved – there should be no problem. However, for the majority like wheat, barley, maize, soyabean, sunflower etc., where the harvested part is a seed or fruit then if an organically grown crop has been pollinated and fertilised by GM pollen it is no longer an organic crop. The futility of trying to stop the escape of pollen from one field into another, even by the use of barrier crops, is clear and is at the root of the problem suffered by Monsanto in a recent court case in Lincolnshire.

Well publicised instances of GM food contaminating non GM food products such as GM corn in 'organic' tortilla chips from the USA, which had to be destroyed, could well be due to contamination of the growing crop. Beekeepers are in a similar position because they have no control over which flowers their bees visit while livestock farmers, especially those catering for the organic market, will have to be very sure from where their feed – rich in maize, soya, sunflower, cotton seed, wheat and barley – is sourced.

Consumers

Consumers in the developed world are raising objections but the whole business of GM crops and GM manufactured foods is so all-pervading that it is probably already too late to avoid GM food particularly if your diet is mainstream – supermarket shopping with a large proportion of processed and fast foods.

The ingredients of soya and maize in particular are widely used in processed foods. Soya protein, soya oil, soya flour, corn flour, corn oil and maize protein are all used in processed food of which some 60% contains soya. Soon to be released is a GM wheat to make springy dough which is designed for bread making, although the gene for this at least has been sourced from a variety of wheat itself. Furthermore the big exporters of soya and maize such as the United States are the very places where GM crops are well established commercially and growing fast.

Millions of hectares of GM crops are being produced in the USA and there are already over 300 test sites in the United Kingdom. At

this rate of acceleration if hundreds of millions of consumers suddenly refused to purchase GM foods there would probably be insufficient 'natural' food to satisfy the demand. On top of this it is virtually impossible to separate GM and 'natural' crops by looking at them. CWS (The Cooperative Society) has recently said that it will label all processed foods with soya as containing GM soya because it is impossible to say with certainty that they do not.

The only way of ensuring that certain foods do not contain GM soya is to separate GM soya from non GM soya at the farm gate and maintain this by strict inspection, enforcement and legislation through the whole marketing chain, the processor and right up to the supermarket shelf - a nightmare of administration and red tape which will cost a small fortune. It is a cruel irony that soya should be one of the first crops to go 'GM' in a big way when an increasing proportion of the population are moving towards soya milk at the expense of cows milk.

Consumers in the developing world, and especially those countries where there are regular shortages of staple foods, may be thought to have a different viewpoint and priority especially following recent propaganda to persuade the population that GM crops and GM food is the only way to 'feed the world'. In fact this subtle piece of 'blackmail' was really aimed at the 'consciences' of the developed world, the reasoning being that if consumers in London accept GM foods those in Lusaka will have to fall into line. However, GM cropping should not be compared with 'The Green Revolution' of the 1960s which was founded on a lot more than new, higher yielding varieties - fertilisers, irrigation and mechanisation. Anyway these crops have not been genetically modified for higher potential yield and famine has more to do with climate, weather patterns, poverty, war and corruption rather than deficiencies in existing agricultural technology.

The environment

Potential threats to the environment are many. There are hundreds of crop plant species and thousands of weed species but less than a hundred plant families. The big fear is that the 'alien' genes introduced into specific GM crops will escape and find their way into wild plants - there are already claims from France that a gene introduced into oilseed rape has been identified in wild radish - oilseed rape, cabbage, cauliflower, kale, sugar beet, swede, mangold, turnip, radish and many others are all members of a huge plant family called the Cruciferae. The *Collins Guide to British Wild Flowers*

lists some 75 wild Cruciferae including some very close relatives of oilseed rape. Oilseed rape itself is thought to have originated from a cross between cabbage and mustard.

And this problem is likely to get worse as GM cropping moves out of its North American base because the 'Centres of Origin' for most of the world's staple crops are elsewhere – wheat in Western and Central Asia, maize in Central America and soya bean in Asia, South Pacific and Australia. It is in the centres of origin where all the wild types and closely related 'weeds' will be found. Once these 'alien' genes get into wild types and weeds nobody knows how they will react. If they become dominant we could end up with whole races of 'super weeds' resistant to commonly used herbicides or containing other genetic traits that enable them to colonise whole areas and in doing so reduce biodiversity.

GM crops like Bt cotton which produce toxins to kill insect pests may not be able to differentiate between insects pests and beneficial insects and, therefore, kill anything that alights on them. In addition to bees this may include ladybird beetles and other useful insects which actually control insect pests naturally by feeding on them. There is already evidence that the growing of Bt cotton is accelerating the occurrence of bollworm populations which are resistant to the Bt toxin. In addition to sidelining Bt cotton this would remove the sprayable formulations of Bt as a useful and harmless biological control of dozens of caterpillar pests which damage all sorts of crops. The Bt gene has additionally been put into potato and maize to control the very same caterpillars – corn earworm and potato/tomato leafworm which attack the cotton bolls.

The use of GM crops tolerant to particular herbicides is likely to increase rather than decrease the use of herbicides. The big fear is of miles and miles of 'green concrete' – crop monocultures all sprayed with the same herbicide and not a weed in sight. Being completely weed free is in nobody's interest because all sorts of animals including insects and birds rely on weeds for their existence. Indeed the removal of seed-bearing weeds from modern agriculture has been a major factor in the rapid decline of many erstwhile common seed-eating birds such as the linnet, goldfinch and yellowhammer.

GM cropping could well decrease biodiversity at the very time when governments around the world are calling for conservation.

In this and other respects GM crops and GM food could make the world a more 'ordered' and more controlled place with everyone from the producer to the consumer locked into a 'scientifically-correct' but 'politically unpopular' system of food production and

consumption – some awful hybrid between Huxley's *Brave New World* and Orwell's *1984*. At the end of the day you must ask yourself not 'do we want it' but 'do we really need it' and the answer to the latter, irrespective your view on the former, must be no.

“One oft-expressed concern is that inserted genes might escape from transgenic crops into their wild relatives. Terminator technology seems to have solved this by introducing the self-destruct mechanism which ensures that ‘escaped’ genes are extinguished.

Perhaps in this respect the technology is to be welcomed. On the other hand, one possible problem is that pollen bearing the killer gene might carry it to non-transgenic crop species in a neighbouring field, causing some seed death. Though pollen drift is likely to be negligible, this should be monitored.”

Professor Mike Black in *Biologist* 45:3, June 1998

Alan Malcolm

GM cars then GMTV, now GM food: whatever next?

*[Based on a lecture to South Place Ethical Society, London, reproduced
by permission of both the author and SPES]*

In this essay I wish to address seven questions which I think are uppermost in many people's minds in order to reach conclusions about the introduction of gene technology into the food chain.

These are:

- 1) What is it?
- 2) Is it ethical to interfere with our genetic material?
- 3) Do we need it?
- 4) Do we want it?
- 5) Can we reject it?
- 6) Who is in charge?
- 7) Where will it end?

Although scientists love to describe the fact that we have been interfering with the genes of plants and animals in the food chain ever since man became agrarian, and that therefore this new technology is little more than a logical extension, many would believe that this is being economical with the truth. The type of genetic improvements which have been made over the millennia have taken place extremely slowly and have given generations opportunities to pause and take stock of each advance and also to reject such mistakes as occurred. The new technology has within two decades totally revolutionised the way that we approach the introduction of new varieties of food-crops. The fact that it is a much more specific technology and is, if anything, less likely to result in undesirable products is clearly not widely accepted. The idea that genes can be taken from one organism and put into an alternative organism which would never normally have been able to cross-breed within nature seems to many people, at the very least, bizarre. It is perhaps important to emphasise that we are really considering two different applications of the technology. At the present time none of the food in British supermarkets is itself modified or altered in any

way as a result of this technology. It is the production of enzymes in the factory or the production of the food crop in the field which is changed but the product on the shelf or in the tin has not altered. However in the very near future we will indeed be eating fruits and vegetables where the concentration of nutrients such as vitamins or antioxidants has indeed been altered.

Everybody will, of course, have their own definition as to the extent to which we should 'interfere with nature'. For most, that little problem of selecting wheat varieties for shortness of stalk in order to increase yield. Very few people have had problems with the introduction of human genes into bacteria in order to produce pharmaceutically useful products such as insulin, blood-clotting factors and growth hormone. Very clearly, people's acceptance of the latter relates to the clear demonstration of a case of need for those suffering from illnesses which might otherwise prove fatal. The Polkinghorne Committee, set up by the Government seven years ago, considered the problems of inserting animal genes into plants (could vegetarians eat them?) and of putting pig genes into any other species (could Jews and Moslems eat them?). They also discussed whether putting human genes into food crops might be perceived by some as equivalent to cannibalism. On the basis of their discussions they came to the conclusion that there was no major ethical problem for most of society in altering the gene of a tomato to change its ripening characteristics, that Jews would not have a problem with putting pig genes into non-porcine species but that Moslems would. They felt that on the whole it would not be a good idea to put human genes into food crops. Interestingly enough, there is in fact no commercial drive to perform this operation either.

Cheese produced using chymosin, produced in the laboratory by gene technology, provides an advantage to vegetarians who would previously have objected to the use of animal-based rennet to clot the milk proteins. The tomato, with modified ripening characteristics, enables the farmer to produce the ripe tomato with less input of water. It enables the processor to use less electricity to drive off this water in order to produce tomato paste and the net effect for the consumer is that the tomato paste is that little bit cheaper. In the case of herbicide-resistant crops such as soya, it enables the farmer to produce the harvest with less input of herbicide and with less labour. In the case of insect-resistant crops such as cotton and maize, it enables the yield to increase very dramatically with much reduced application of chemical insecticides. It does however remain the case that in northern and in North America we are not, on the

whole, short of food. Indeed, if anything, we suffer from a surfeit of food such that the fastest growing health problems are based round obesity. The situation, however, does not yet obtain in less well-developed countries such as South America, many parts of Africa, China and India where, for many reasons, there is a genuine shortage of protein and carbohydrate. It is, therefore, essential that crops capable of growing in arid conditions or high salt environments or resistant to locusts, are developed and used in order to cope with a world population which, while growing less rapidly than twenty years ago, is nonetheless still expanding. An increased food production on a global scale is clearly necessary and this needs to be achieved without increasing the land area available for agriculture and without an increase in chemical fertilisers, herbicides or insecticides.

In spite of the clear benefits to different people on different occasions, there is obviously considerable unease in the public at large, although the extent to which this is aggravated by sensational media coverage is a matter for debate. Although many opinion polls ask leading questions resulting in the impression that the public in northern Europe would prefer to do without it, the behaviour of people when faced with choices in the supermarket clearly is inconsistent with this. The cheese mentioned above clearly labelled and with suitable information leaflets available, has clearly been successful in commercial terms. The GM tomato paste outsells its non-GM rival quite comfortably since the customers care more about the reduced price than about their awareness of the technology behind its production. It remains a fact that although people are aware that electricity is produced in a variety of different ways, some of which have environmental or potential ecological consequences which they would not endorse, no serious attempt is made by the public at large to reject electricity coming from sources such as nuclear power stations. They are, on the whole, concerned with the safety and the usefulness of the product itself, trusting to other regulatory processes to ensure overall global security. It is clearly only possible to exercise freedom of choice and to reject it if desired, if the product is clearly labelled and if sources of primary production are clearly segregated. While this may sound a trivial undertaking, it is not in fact a simple operation. The cheese mentioned above is, in fact, identical as cheese to that produced using animal rennet. There is no scientific basis on which to conduct an authenticity test nor is there a nutritional consequence to the consumer of eating GM cheese instead of classically produced

cheese. There is no chemical difference between Lecithin produced from herbicide-resistant soya compared with Lecithin produced from traditional soya. It would, therefore, be impossible for any legislation to monitor the validity of any claim either way. Even where claims of segregation have been made, it is very debatable as to how long a free market will sustain such behaviour. The price of soya from southern American producers which are claimed to be GM-free is already running at approximately double that of United States soya, partly driven by market forces and partly driven by the cheaper cost of producing the soya using gene technology. In view of the consumer's preference for low prices where given a choice, it seems highly improbable that such segregation has a genuine commercial future. There is clearly great concern that an increased power and influence over the food supply chain is shifting away from governments who used to regulate, either by rationing during World War Two and its aftermath or by the use of The Common Agricultural Policy, the range of foods available to us as well as the prices at which these are offered to multinational companies whose only responsibility is to their shareholders.

Institute of Biology

Genetically Modified Crops: the social and ethical issues

*A response the Nuffield Council on Bioethics Consultation
[published by IoB 3rd August 1998, reproduced by permission, and also
available on the IoB website www.primex.co.uk/iob]*

The Institute of Biology, as the independent charitable body charged by Royal Charter to represent UK biologists and biology, is pleased to respond together with its following specialist affiliated societies: the Association of Applied Biology, the British Crop Protection Council, the British Ecological Society, the British Electrophoresis Society, the British Grassland Society and the Institute of Horticulture. The Institute of Biology with its 16,500 members and 75 Affiliated Societies is well placed to consider life science consultations. In this instance, in addition to the afore specialist societies, representatives from a number of the other Affiliates have provided comment on an informal (unattributable) basis.

Summary

2. This response does not represent official policy. It has been compiled to inform discussion and debate. Principally we note and consider:
 - that Genetically Modified (GM) crops can greatly contribute to human well-being;
 - that there are human health, environmental safety and propriety concerns;
 - that, with the proper regulatory regimen enforced, benefits are likely to greatly outstrip concerns so that ethically there should be effort to realise benefits;
 - that there should be complete transparency as to the presence of GM foods in the human food chain;
 - that it is not unethical to favour some crop genes per se compared to others, but there are, for some, ethical concerns as to the size of the species gap across which genes are transferred;
 - continued GM research is required to maximise benefit and minimise risk.

Status of this response

Is that of an informed discussion document rather than an affirmed policy statement.

3. We recognise that: a) ethical criteria are derived culturally and not empirically; b) consequently ethical criteria are apt to change with time and circumstance; and c) controversial issues themselves engender a spectrum of views, even within a comparatively informed and homogeneous sub-section of the population such as the UK life science community. Nonetheless, despite the amorphous nature of many GMO ethical issues, the existence of controversy raising many social questions makes it important that the biological community (independent of the bio-industries, pressure groups, and government) makes a contribution, albeit short of a formal policy statement. This response should therefore be seen as an informed contribution to current discussion.

Consideration of 'ethics'

We consider the human well-being, and the integrity of the natural environment ethical dimensions, not religion.

4. This response's consideration of the term 'ethics' is in the main (but not exclusively) made with regard to safety – human well-being and the integrity of the natural environment – and propriety matters. We note that the human well-being is also related to environmental integrity via the now commonly accepted definition of environmental sustainability – that of the ability of the environment and its resources to sustain subsequent generations. However, unlike the dictionary definition of 'ethics', we make no reference any religious dimension.

General points

GM Crops can greatly contribute to human well-being (which it would be unethical to ignore), and while there are risks we are confident that these can be minimised.

5. We are certain that the potential for Genetically Modified Crops to contribute to the World's food supply is considerable; indeed, such added contributions are already being made. While much of the current food shortages are due to distribution and other social phenomena, it has become recognised that the global population will face (given current circumstances and existing trends) food shortages arising out of demographics (principally a nine to eleven billion population in the mid-21st century a few decades away).^{1, 2, 3} Consequently, in terms of human well-being, it would be *unethical*

not to explore the possibility of realising such contributions. However, it is equally realised that there is the potential for Genetically Modified Crops to undermine human well-being both ecologically (through gene transference to other species and subsequent ecological degradation) and bio-medically (principally toxicologically and through immunoreaction). Nonetheless, we are confident that it is possible to considerably reduce risks to a point where there is probably less environmental risk than already exists associated with a number of current human activities (including certain agricultural practices). We consider that the current ethical debate (of which the Nuffield Council's current consultation is a part) is integral to the overall process by which GMO crop risks are lowered and their benefits maximised.

There have been no GMO disasters to date.

6. While not a cause for complacency (especially considering the embryonic nature of GM science), it is encouraging that there have been no GMO disasters to date. Given this, together with the potential for GM crops to greatly contribute to human food supply, it underlines the ethical dimension of actively exploring this potential contribution to alleviate (future) hunger; especially since food shortages are anticipated in the next century. If there had been GMO disasters then this ethical argument would be, at least partially, undermined

Specific points

[(Qn.) Questions in bold relate to those posed by the Nuffield Council]

Q1. Do GM crops and food pose ethical questions about what is acceptable with regard to the manipulation of nature? If so what are the key ethical questions from your perspective?

Yes, but opinion is divided as to the nature and extent of these ethical questions.

7. From a biological perspective there are two broad categories of ethical issues (see paragraph 4 above). First, safety. In terms of risk there are health and safety concerns associated with the use of GMOs and there are also environmental concerns. Both these have clear links to human well-being. Secondly there are propriety concerns. These too are related to human well-being (albeit primarily through the economic, and secondly, and indirectly, through the ecological, system). The question here is who owns, and

hence has a right to the profits arising from, GMOs and/or their modified genes? There are, as yet, unresolved tensions here and opinion is divided. On the one hand companies developing GMOs need to have their research costs recouped. On the other less-developed nations, whose species' genes may be used, require value to be realised on their native genetic biodiversity if the said biodiversity is to be conserved for the global good even if the cost has to be met globally rather than locally.

Human health and safety concerns are primarily immunological and toxicological.

8. The health and safety issues are largely immunological and toxicological in nature. Immunological because individuals sensitive to a protein eating a crop not normally associated with the said protein but modified to manufacture it, would have an adverse immunological reaction. Peanut protein is the oft quoted example.

Bridging evolution-determined genetic gaps.

9. Environmental integrity concerns will result if GMOs bridge evolution-determined genetic gaps. These have the potential for disrupting complex long-established, evolution and ethnobiologically-determined interactions (for example, local land-management systems). It is not known how well ecosystems are buffered against the effects of gap-bridging phenomena, so the risks associated with GMOs are difficult to assess. Indeed, given the complexity of ecological processes, the GMO-mediated bridges may well be chaotic and so for all practical purposes (given that it is unlikely that all attractors will be properly identified) will be unpredictable. Given that this is an unknown, we can come to no firm conclusions regarding risks at this stage.

Genetic manipulation of crops per se is no more or less ethical than breeding.

10. Aside from the safety and economic issues discussed above, it should be noted that genetic manipulation of crops per se is no more or less ethical than conventional breeding programmes. At the heart of genetically modifying organisms is the concept of manipulating genes. Notwithstanding the result (whether or not it bridges genetic gaps, or its ecological and economic consequences), the idea of favouring some genes at the possible expense of others is no more or less ethical than a programme of breeding: for that is exactly what breeding programmes do. If one were to argue that the manipulation

of genes by itself was unethical then the domestication of dogs from wolves, or high yield wheat strains from wild-type grasses, etc., would be equally unethical. This would ethically undermine the applied biological foundations on which our global society depends, and on which humanity has relied for thousands of years.

There are non-science based, public concerns relating to ethics of the degree of genetic manipulation (as opposed to manipulation itself).

11. We note here that genetic gap-bridging manipulation does have a non-biological and non-safety ethical concern for some of the public, i.e. there are, we believe, common public concerns not so much with the genetic manipulation itself (even if that is how the concern is erroneously expressed) but the 'degree' of manipulation. Transferring genes from animals to plants is viewed by some as less ethical than, say, transferring genes between plant species. The closer related the species between which genes are transferred, the closer GM techniques come to those of 'normal' (non-GM) breeding, and the less ethically controversial they become. Where an individual draws the line (or society collectively) between what is ethical and what is not, is made on a variety of criteria that are in the main unrelated to science. Furthermore, the decision arrived at is variable, both between individuals and collectively with time. There is no single 'right' answer. This does not make such line-drawing any more or less valid on a social basis, but it is not an exercise scientists can undertake on behalf of society (other than for themselves as individual members of the public in their own right). However what the scientific community can do is to inform society of the scientific dimensions. Equipped with current scientific knowledge, individuals and society can make their decisions on an informed basis including (importantly) that of current scientific uncertainties.

Q2. What are the principles by which we should control the development and application of GM crops? Do present regulatory systems reflect these principles.

European development controls are largely based on the precautionary principle and are theoretically satisfactory. Controls on applications have theoretical flaws only (these have not yet been manifested to our knowledge).

12. Given the above (paragraphs 7-11) the question that arises is whether our current practice of manipulating genes in the laboratory does undermine the safety derived from existing genetic gaps, and whether 'present regulatory systems' adequately control biomedical

risk when GM crops are consumed'? Taking as read that all human activity has risk associated with it and that we all live with risk all the time⁴ do the present regulatory, systems 'safely' control a) the development, and b) the application of GM crops via well-regulated testing, licensing, and approval protocols'? Here the present UK and EU 'development' controls, which are largely founded on the precautionary principle, are in theory pragmatically sound. Indeed, to date as we understand that there have been some 10,000 trials of GM plants (some 2,300 in OECD nations) with no GM-related ecological impact of consequence, it is therefore difficult to ascertain grounds for meaningful concern. However, this history is short and GM releases few compared with the number to be expected should the technology become widely used. Nonetheless, with regards to the 'application' of GM crops (i.e. their consumption) current UK and EU controls do not fully employ the precautionary principle in that not all GMO containing foods have to be labelled. It is possible to envisage some (as-yet-undeveloped) GM crop causing illness for susceptible individuals when consumed despite current EU controls. This is a theoretical flaw and not one that has yet caused harm. Any such harm would not be in the food industry's medium-term interest and may not be deliberate. [Interestingly, there are signs in the UK of increased voluntary labelling beyond that required by EU regulations. In May 1998 the Consumer Association⁵ welcomed major UK supermarket chains labelling all GM foods including those where (due to mixing with non-GM stock early in the processing and supply chain) there was doubt as to the presence of GM material or not (see paragraph 13) – for instance, soya.]

An example of a theoretical risk despite current EU controls.

13. For illustrative purposes we present a purely theoretical example of harm that could arise despite current controls. A small proportion of the population is allergic to a particular peanut protein (and so cannot eat peanuts without having a severe allergic reaction which in some cases, if untreated, can be life-threatening). These people know who they are. They avoid peanuts and, as far as possible, avoid foods that may contain peanuts. On a pragmatic day-to-day basis they know that they are at risk, and while it may be that they accidentally eat a (normal) dish containing the protein unbeknownst to them, for them to ingest the protein unknowingly means that it is in all likelihood a trace ingredient and the reaction would be probably (though not necessarily always) noticed in time for medication to be

taken. However if a crop was genetically modified to express this gene then the 'loopholes' in current EU legislation mean that the foodstuff sold need not be labelled, hence consumers at risk not alerted. The loopholes in question exist in the EU Novel Foods Regulation (of May, 1997). The regulation recognises that in some instances it is not possible to segregate (hence label) some GM and non-GM foods. Here the oft quoted example is imported US soya, where GM and non-GM soya is mixed so early in the refining-cum-distribution chain that it is not possible to distinguish between the two at the point of entry to the EU (let alone at the point of sale to the consumer). However, importantly such types of risk are known to the European food industry and it is most unlikely that they would knowingly expose their consumers to such a risk. as it would not be in their interest. (See also paragraph 12.)

We support current EU proposals for all GM (and GM-nonGM mix) foods to have distinct labelling.

14. Current EU proposals are for *all* GM foods to have distinctive labelling even if there is uncertainty. and that this is based on the precautionary principle. We are most supportive of this proposal which is championed by the Consumers Association. This support is not borne out of any meaningful biological risk (as in the main we believe that the current GM regulations together with current EU practice provide ample consumer safety). It is due to the need to reduce possible public fears through ensuring that there is transparency and consumer choice. We are firmly of the view that the consumer must be fully informed as to what it is s/he is buying. Ensuring that there is public confidence in the food supply system is vital. (It is relevant to note that food scares (as exemplified by the BSE crisis) can result in food wastage which is unethical in a world with hunger.)

Though regulatory systems reflect principle, lack of adherence needs to be monitored and penalties given.

15. While the EU regulatory systems do reflect the precautionary principle and so far growing GM crops has not resulted in any ecological disaster, any system's merits are only valid if the system is adhered to. It is with regret that we note that in April 1998 some companies breached the terms of their consent to release, resulting in the Advisory Committee on Releases to the Environment (ACRE) deeming it necessary to 'name and shame' companies that have breached the terms of consent to carry out field experiments. If we

consider it important that we do not turn our back on the opportunities GM crops can bring, it is equally important that the public has confidence in GM crops and research and that good companies are not penalised because of a few incidents resulting in poor PR. While we regret that 'naming and shaming' had to take place, we recognise the need for ACRE's action. The regulatory systems must be transparent and be seen to work through effective penalties.

Imports currently can circumvent the regulations which themselves provide no guarantees.

16. There is currently a lacuna in regard to tracking GM versus non-GM agricultural products traded on the World market (cf. paragraph 12, soya). Furthermore, GM-plants may be imported accidentally. For instance, GM-tomato seeds may be imported in the guts of air travellers. They will survive passage through a human and may subsequently germinate. It is therefore difficult to conceive of regulations, no matter how tight, providing complete guarantees of eliminating unknown GM imports.

There is an urgent need for a holistic strategy to combat the growth in antibiotic, insecticide, fungicide and herbicide resistance.

17. Antibiotic, insecticide, fungicide and herbicide resistance are increasing problems. For instance whereas in 1950 there were less than 20 species of arthropod (mainly insects) resistant to one or more chemical pesticides, by the late 1980s this number had increased by over 21-fold to more than 420. Over the same time the number of resistant strains of plant pathogen had increased from under 10 to over 50, and weeds from none to about 50.² The use of 'resistance' genes in GMOs is therefore of legitimate concern. The Institute of Biology has in the past called for there to be a holistic strategy to address the question of resistance in its various forms across both the agricultural and biomedical sectors.⁶ (These different forms of resistance have at their base a similar Darwinian mechanism.) This concern has recently been noted by the House of Lords⁷ despite their original consultation document stipulating that, since the Nuffield Council would be undertaking this consultation on GM crops, their Lordships' enquiry would have a narrower focus.

Q3. Is there an ethical obligation to ensure that non-GM foods continue to be available and distinguishable from GM foods?

Depending on the modifications, not necessarily. But overall, on humanistic ethical grounds, there must be choice and labelling.

18. From a purely biological perspective it all depends on how the GM-foods were modified. Biomedically, if the foods were modified to express proteins likely to cause allergies then safety would be compromised and choice would need to be retained. Similarly, if the modification enabled crops to be sprayed with herbicides, then environmental integrity might be compromised, so again choice arguably should be available for the concerned consumer. On the other hand, if crops were modified so as to survive on marginal land, or were enhanced nutritionally without human risk, then there would be little 'biological' reason to object to a lack of choice. Similarly, if the modification enabled there to be out of season crops, it might not be practically possible to provide a non-modified option. Nonetheless, we are in favour of consumer choice being retained where possible on humanistic ethical grounds. Clear GM labelling should be mandatory. [However we note that less developed nations may not be able to afford the luxury of choice and that this raises social (non-biological) ethical questions.]

Q4. How can consumer choice be adequately protected?

Through regulation as required.

19. The consumer may be adequately protected through periodic review and the introduction of regulation as required. (Though, to be consistent, one can equally argue that the choice should also be preserved in favour of consumer access to GM-crops should GM-techniques lead to a lowering of price or confer other consumer benefits such as out-of-season crops.)

Q5. How should we handle uncertainty that exists in making predictions about the long-term environmental impact of [GM] crops?

Despite uncertainty, GM-risks need to be accepted and GM research continued. Avoiding risk through turning our back on the potential benefits to be realised from GM technology will lead to other (non-GM) environmental impacts.

20. Uncertainty is by its very nature unquantifiable, yet it is possible to ascertain the need to take risks by looking at the certainties. Given that we are confident that the human population will nearly double by the mid-21st century,³ it is extremely probable (i.e. almost certain) that agricultural systems will be stretched to the point of being incapable of meeting demands in the same way as demands

are met today. Furthermore, we consider that this situation is likely to be exacerbated due to land-use competition for biofuels. It is therefore imperative that we look for new ways of improving production (over all output) and productivity (efficiency per unit area). It is therefore important that we continue to research into GM crops and explore the ecological risks rather than do nothing. Even though doing nothing will incur no GM-ecological risk, it will incur the considerable environmental impact costs associated with hunger.

There are a number of potential ecological impacts to consider.

21. The ecological impacts that may arise through bridging genetic gaps (see paragraph 9) principally include those arising through the possible hybridisation with wild relatives of the GM crop. These can impact in a number of ways:
 - by the creation of 'super weeds', which can be further complicated through 'stacking' whereby a wild strain receives more than one transgenic gene from more than one GM-crop strain growing nearby;
 - by genetic erosion (particularly vulnerable are high genetic biodiversity regions, where there may co-exist many strains of the same species);
 - through 'genetic pollution' of the natural gene pool.

Use of the precautionary principle combined with incremental release.

22. We consider the preferred way to handle GM-ecological uncertainty is to adopt the precautionary principle engaging in indoor-laboratory trials first, and going through a number of tests, gradually moving toward unrestricted outdoor release only once the previous (more restricted and confined) trials have proven satisfactory.

Continued GM research is actively reducing risk (example given).

23. While engaging in research and developing GM crops does have associated, but uncertain risks, researchers are actively seeking ways of reducing this risk. This route is not fruitless. One recent (1998) development⁸ is that of inserting the modified gene into chloroplast and not the nuclear DNA. As pollen DNA only comes from the nucleus (pollen does not contain chloroplasts), it is possible to remove the risk of pollen transmitting GM-material. Maternal transmission of GM material would be more restricted (far more particles of pollen are produced compared to seeds, and pollen is also far more mobile).

Use of terminator technology (second example, but this has other (non-ecological) ethical drawbacks).

24. Risk can also be reduced through the use of 'terminator technology': genes that are expressed in embryos at a very late stage in development allowing crops to develop normally, but killing them at maturation so effectively making the harvested seed sterile. This modification helps ensure that there should be no offspring crops (in fact, though the risk is reduced, it is not eliminated). However, there are other (non-ecological) ethical difficulties with this. Such genetic manipulation effectively puts the company owning the GM crop in a very powerful position. This could potentially stifle competition and operate against the common good interests of crop producers and consumers.

Through independent (publicly funded) research – UK SET funding must be restored.

25. While all research is welcome, special regard should be given to independent (hence publicly funded) research, as this should be seen to be independent from commercial and political pressures. This is just one reason that it is important that real-term UK Science SET funding is restored.

Q6. Do people wish to be more involved in decision-making about the application of the technology? If so how can this be achieved?

Probably some do. The OST's instigation of a bioscience public debate is particularly welcome.

26. Opinion varies. Some probably do. Including lay members on safety boards is one way. The current OST proposals for a public consultation on developments in the biosciences is welcome.

Q7. What benefits do you think that this technology might have in developing countries? Under what conditions could these benefits be realised?

Benefits could be potentially very considerable.

27. We are confident that the potential benefits to developing countries could be considerable and possibly on the order of the first green revolution (which capitalised on the use of artificial fertilisers combined with the introduction of selected crop cultivars). Benefits from GM crops could include:

- reducing pressure on land due to agriculture becoming more concentrated so freeing land for non-agricultural use, or reducing the pressure to encroach on non-agricultural land;

- reducing the need for agrochemicals;
- manipulating crops so that they are better suited for their end-use;
- developing drought and salt-resistant crops;
- improving crops' nutritional values;
- developing pathogen-resistant crops (though this has some risk attached to it);
- creating less perishable crops.

But companies need to see a return on their GM R&D investment, while farmers in developing countries require financial protection.

28. Companies developing GM-crops will naturally want a return on their substantial R&D investment. This might effectively place GM crops out of financial reach of farmers in developing countries unless they receive loans from western institutions, or alternatively make GM crops available through multinationals. Mechanisms need to be devised whereby both farmers in developing countries have their livelihood protected, and companies developing GM crops receive a fair return on their up-front R&D investment.

Q8. What are the responsibilities of companies with regard to the development and commercialisation of GM crops?

GM crops should uniquely meet proven socio-economic needs safely.

29. Companies should ensure that GM crop species meet proven socio-economic needs that cannot be met by non-GM agriculture? and that this is done safely *and* with full adherence to international regulation.

In addition to earlier concerns, traditional productive sustainable farming practices may be threatened. A regulatory framework to which GM companies should adhere is required to take into account this bio-social dimension.

30. There is a danger that companies will displace traditional productive sustainable farming practices, and this may have a significant ethno-botanical and/or biodiversity cost. It is debatable whether companies should have immediate regard for such considerations, unlike the concerns for environmental and bio-medical safety cited above. However companies must operate within a regulatory framework and have due regard for any regulatory protocols established, and be responsible for adhering to them. Such regulation might have regard to these bio-social dimensions. Adherence, though, will need to be independently monitored. Transparency, to engender public confidence, is required while companies need a 'level playing field' on which to fairly compete.

Monopolistic and environmentally damaging practices need to be avoided.

31. There are concerns that companies might be tempted to market GM crops of little net agricultural benefit and/or GM crop packages (GM unique herbicide-resistant crops sold together with the relevant herbicide). Farmers might become attached to such marketing packages which are, in effect, monopolistic and possibly environmentally damaging depending on the quantity of herbicide required for the crop's management regimen, and the ecotoxicological nature of the herbicide itself. Cause for such concerns would be negated through adherence to sound regulatory protocols.

International funding of a base level scheme may protect developing nations.

32. The problem of developing nations not being able to afford to monitor satisfactory GM protocols needs to be addressed. It may be that a base level scheme (which would not prevent individual countries from having more stringent measures) would need to be established and run on internationally funded basis.

Q9. What is the ethical acceptability of patents associated with novel GM crops?

GM crops may be patented, not individual genes.

33. We strongly believe that firms that develop GM-crops have the right to recoup their development costs, and that patents and intellectual property rights are ways that could secure such returns. We are less certain as to the exact detail of how this might be done. We tend towards the view that while modified crops should be patentable that individual genes by themselves should not.

There may be possible merit in associating propriety genetic rights with principal natural plant communities.

34. While individual genes should not be patentable there is an argument that the inherent value of regional biodiversity is fundamentally genetic. Consequently genes from plants from an identifiable area lend value to the (strain of) local species as a whole. There is therefore a logical argument that propriety genetic rights are associated with a plant community (even if the genes themselves are not patentable by those merely transferring them between species). Such royalties could lend value to the preservation of local biodiversity.

Further information

The Institute and learned societies involved in this response are pleased to have contributed to this Nuffield Council on Bioethics consultation. We look forward to receiving any documentation arising out of this exercise. We are pleased for this response to be publicly available and will be placing it on the Worldwide Web. For further information regarding the Institute's consultations and its Affiliated Learned Societies. Individuals may refer to <http://www.iob.org> Learned institutions, governmental bodies and agencies who wish the Institute to engage in consultations should, in the first instance, contact Jonathan Cowie (Science Policy) or Anne Jordan (Education) at the Institute of Biology, 20-22 Queensberry Place, London, SW7 2DZ.

References and Notes

1. L. Brown and H. Kane (1995) *Full House: Re-assessing the Earth's population carrying capacity* (Earthscan: London).
2. G. Conway (1997) *The Doubly Green Revolution: Food for all in the 21st Century* (Penguin: London).
3. Parliamentary Office of Science & Technology (1994) World Population Growth – POST Note 52. *Science in Parliament* 51(6), pages 23-26.
4. British Medical Association Professional & Scientific Division (1987) *Living with Risk* (BMA-Penguin: London).
5. Anon (1998) 'Action on GM foods at last' in *Which?* (May, page 5).
6. Institute of Biology (1997) *Resistance to Antimicrobial Agents – Causes and Consequences of Emergence* (IoB: London).
7. House of Lords Select Committee on Science and Technology (1998) *Resistance to Antibiotics and Other Antimicrobial Agents* (The Stationery Office: London)
8. A.J. Gray & A.F. Raybould (1998) 'Reducing transgene escape routes' in *Nature* no. 392, pages 653-654. Reporting on H. Daniell et al, (1998) *Nature Biotechnol* no. 16, pages 345-348.

Institute of Biology

Indicators of the forthcoming shortfall in global food supply

[Amartya Sen was awarded the 1998 Nobel Prize for Economics, for demonstrating that famines are due, not to shortage of food, but to failure of distribution. Some contend that there is therefore no need to increase global food supply. But Professor Sen's calculations refer to the present, not the near future. Human population is increasing, and by the most optimistic calculations, will almost double by the year 2050. Increase in food supply is needed to prevent famine in the next two generations. This list of indicators is reproduced by permission from *Agriculture and Biodiversity*, a consultation paper prepared by the IoB in 1996. Full text on www.primex.co.uk]

- Globally some 40% of terrestrial primary productivity (the biomass produced through photosynthesis) is affected by systems managed by Man.*
- World food grain production has been very broadly stable since the late 1980s (1,600-1,780 million tonnes *per annum*). Against a backdrop of rising global population this means that since 1984 to 1995 *per capita* production has fallen from 346 kg to ~293 kg.
- World meat production has maintained a steady increase throughout the second half of this century from 44 million tonnes *per annum* in 1950 to 192 million tonnes in 1995, such an increase that *per capita* consumption has also grown over the same period from 17.2 kg to 33.4 kg *per annum*.
- Though the World fish harvest continues to rise, this is due to the rise in aquaculture (fish farming), the total fish catch from the sea has declined from its peak in 1990.
- The World's carry-over stocks of grain have declined: and in 1995, at 296 million tonnes, stocks were at their lowest since the early 1970s. In terms of days of grain, carry-over stock was the lowest level since the mid-1960s. The forecast level for 1996 is to be lower still at around fifty days worth of stock.

- The World grain harvested area has had a slightly declining trend since the late 1970s. Putting this in context with a growing World population then the World grain harvested area per person has markedly declined from ~0.225 hectares per person in the mid-1950s to under 0.13 hectares per person in 1994. Whilst some of this decline is due to set-aside policies, the majority of it is due to a combination of the industrialisation of land use (particularly in Pacific rim countries) and desertification. Set-aside land could be brought back into production but, for instance, the total area of corn set aside in the US (1995) is only two million hectares (less than 0.4% of the World total grain farmland). [In short, set-aside land provides a negligible cushion.]

* (This is not to say that 40% of terrestrial primary productivity is managed, directly or indirectly by human kind, but that this productivity takes place *within* systems managed by humankind. In other words, we are not just talking about the food eaten by humans, or even this together with the food produced as animal fodder which is in turn consumed by humankind, but all the biological productivity that exists in farms, parks, moorland, woodland, lakes and boreal forests that are managed by our species to some degree or other.)

Some books on genetic modification

Notes by Donald Rooum. The first six publications listed include useful summaries of genetic biochemistry and GM techniques.

Nuffield Council on Bioethics, *Genetically Modified Crops: the ethical and social issues* (Nuffield Council on Bioethics, 1999, £20.00). Exhaustive and informative. Detailed contents list and cross-references, but might be improved with an index.

Colin Tudge, *The Engineer in the Garden: genetics from the idea of heredity to to the creation of life* ([1993] Pimlico, 1995, £10.00). Popular science, ethics, and speculation about the future, by a lively, erudite author whose more usual subjects are ecology and biodiversity.

Susan Aldridge, *The Thread of Life: the story of genes and genetic engineering* ([1996] CUP Canto, 1998, £8.95). Popular science, with historical anecdotes and a recipe for extracting DNA using a kitchen blender. A good read.

Bernard R. Glick and Jack J. Pasternak, *Molecular Biotechnology: principles and applications of recombinant DNA* (2nd edition, American Society for Microbiology, 1998, £29.95). Textbook for serious students at university level.

Michael J. Reiss and Roger Straughan, *Improving Nature?: the science and ethics of genetic engineering* (CUP 1996, £9.95). A work of moral philosophy, which includes information for the benefit of philosophers without prior knowledge of GM.

Luke Anderson, *Genetic Engineering, Food and Our Environment* (Green Books, 1999, £3.50). Unreservedly hostile to GM, but careful to get the data right and give references, making it useful even to those who are not hostile. Lists other books.

Helen Kreuzer and Adrienne Massey, *Recombinant DNA and Biotechnology: a guide for teachers* and *Recombinant DNA and Biotechnology: a guide for students* (American Society for Microbiology, 1998, £29.95 and £27.95). Two books for schools and colleges, ridiculously overpriced.

Andrew Simms, *Selling Suicide: farming, false promises and genetic engineering in developing countries* (Christian Aid, 1999 £3.50). Data on the economics of world agriculture, would be more useful if it was less selective.

The Ecologist, 28:5, September/October 1998 'The Monsanto Files: can we survive genetic engineering?' (£4.00 post free from Ecologist back issues, Unit 18 Chelsea Wharf, London SW10 0QJ). Articles hostile either to Monsanto or to GM, varying from informative to potty.

New Scientist, 2158, 31st October 1998 'Gene Revolution 2' (for New Scientist back issues telephone 0181-503 0588). Informative articles including one by the American anti-GM writer Jeremy Rifkin.

“English Nature recognises that the use of genetically modified crops (such as those modified for herbicide and insect tolerance) may have potential benefits for farmland wildlife, particularly if their use results in better targeted or lower usage of agrochemicals. So far there is little evidence that such benefits are being realised and English Nature therefore advocates the precautionary principle where commercial releases are proposed.”

English Nature, *Position statement on Genetically Modified*

Organisms, July 1998

Pete Turner

Workers' Control: a timely reminder

The publication by Freedom Press of a number of articles from Freedom by the late Geoffrey Ostergaard entitled *The Tradition of Workers' Control* is timely. After eighteen years of Tory administrations Labour, or rather New Labour, is in power and working peoples hopes for a fairer and more caring society have risen. The hopes of trade unionists, especially activists, returned on 2nd May 1997 and they walked again with a spring in their step.

It is among these trade union activists that the anarchist movement in this country has failed to penetrate. For me reading the section 'British Syndicalism Through the Ages' was a reminder of the rich historical tradition which has been given to us. But it also reminded me just how little of this tradition of workers' control, and indeed labour history, is known by the average activist or shop steward.

Geoffrey Ostergaard writes that the "phrase 'Workers' Control of Industry', was first coined by the Guild Socialists in the years immediately prior to the First World War, but the idea behind it can be traced back to origins of the socialist movement in this country. The socialist movement itself was a reaction on the part of the sections of the working class to conditions created by the Industrial Revolution of the eighteenth century. One of the central features of this revolution was the transformation of the productive system : the 'domestic system' of industry was replaced by the 'factory system' and the independent craftsman, owning his own tools and living by the sale of the products of his work, increasingly gave way to the industrial proletariat, owning little or nothing but his labour power which in order to subsist, he was compelled to sell, on whatever terms he could get, to the capitalist owners of the new factories."

These changes were enormous and far exceeded in impact on peoples lives anything experienced in, say, France. From being independent craftsmen or peasants forming and having a place in the local community, workers became just a commodity, subject to the law of the capitalist market place. Those affected became totally

The Tradition of Workers' Control by Geoffrey Ostergaard, published by Freedom Press, £6.95.

alienated from the products they were making, but also from the new industrial communities they now occupied. To combat these harsh conditions of work and the appalling exploitation, workers combined to form trade unions. Trade unions as such seek improvements in the economic and social position of their members without challenging the system of basic exploitation for profit. Syndicalists, while recognising that improvements should be fought for within the present system, argue that only when workers are actually in control of what they produce and its distribution will exploitation, poverty and alienation come to an end.

Geoffrey Ostergaard traces the history of syndicalism and workers' control in this country. He points out the conflicts between those who view syndicalism as giving little recognition to the consumer. In the view of the Guild Socialists provision had to be made for the interests of the producer and the consumer. It would be the State that would have to look after the latter. The theory that the both the State and the Guilds were necessary to one another does not hold water. It was an attempt to "reconcile opposing claims of collectivism and syndicalism". It came from those like G.D.H. Cole and S.G. Hobson, who had a Fabian background. Syndicalists would argue that producers and consumers were one and the same persons. Or, as the Guild Socialists and certainly the Fabians would assert, there are conflicts of interests between consumers and producers. Anarchists would argue that the re-emergence of any form of state would mean a return to a class society. The Co-Sovereignty theory was one of a "division of powers".

Hobson went further, with what was called Guild-Sovereignty, where the state "represented the interests of citizens as distinct from either the producer or the consumer, and in such a capacity must always be allowed to have the final word in any dispute between the Guilds and the State".

Cole responded by putting forward a more decentralised form of organisation. This led to a rejection of the current theory of democratic representation and the political institutions based on it. "The present theory of political representation, it was argued, assumes that one man can represent a number of other men as men; but this assumption is unjustified. Each individual is a 'universal', with several interests, each of which is more or less limited and specific. Men unite in a number of associations, such as the Church, the trade unions, and co-operative societies, whose 'function' is to promote those interests. A general and inclusive association, such as the State claims to be, cannot possibly possess a function in this

sense since it is supposed to represent in an unlimited and unspecific way all men's interests however different or divergent they may be." It is therefore, not a 'true association'. Because no particular interest or set of interests exhausts the personality of man, "no man can represent another man and no man's will can be treated as a substitute for, or representative of, the wills of others".

Geoffrey Ostergaard traces the influences of workers control through to the nationalisation programme of the Labour Government of 1945. By this time there was nothing left of control by the workers, but the State was very much the owner. In the first two decades of this century workers' control had become popular. Syndicalist ideas and those of the Guild Socialists, had made workers' control a demand which was taken seriously. The ownership and control of industry was also evolving: ownership and control, as companies expanded and went public, gave rise to managers. Investors and shareholders were the owners, but the managers in control became the 'new ruling class'.

State ownership or nationalisation fitted very nicely in this pattern. At the same time it gave the impression that those who worked in the industry had some 'control', while the 'collective' through the state, had ownership. The future programme was sealed in 1935, with a joint deal between the TUC and the Labour Party whereby there would be statutory representation of workers on boards. However, these would not be appointed by workers, but by the Minister. They would no longer be members of a union, and would be responsible to the Government. Ten years later, even this representation was dropped when the Coal Industry Nationalisation Bill was drawn up. This was with the agreement of the leadership of the National Union of Mineworkers. So the miners' leaders abandoned the last vestige of the syndicalist dream of 'the mines for the miners'.

Back in 1912, *The Miners' Next Step* had forecast that the nationalisation of the mines is not a step towards industrial democracy; it "simply makes a National Trust, with all the force of Government behind it, whose one concern will be to see that industry is run in such a way as to pay the interest on the bonds, with which the Coal-owners are paid out, and to extract as much profit as possible, in order to relieve the taxation of other landlords and capitalists."

Brian Bamford, in his introduction rightly points out that: "radical large-scale trade union activity in Britain lacked any anarchist or anarcho-syndicalist influence. Malatesta, and later Ostergaard, may have been right to advise the anarchist movement to steer clear of

deep involvement in the unions, but the British Labour Movement has suffered from a lack of a libertarian input. It produced short-sighted trade unions, mindless militants and union bosses willing to collaborate with the state and employers, and when it did become radical, as in the miners' strikes of 1984-85, leaders like Arthur Scargill emerge, men without a serious strategy for changing society."

Although this is a little unfair to Arthur, who has never claimed to be a syndicalist, our movement's input has been very small. Those comrades who have been involved with the unions have been, in my experience, well aware of the pitfalls. 'Deep involvement', means being paid by the union. But anarchists should become involved with unions at a non-paid rank and file level. Malatesta wrote (see *Malatesta: Life and Ideas*, page 113): "Anarchists must recognise the usefulness and the importance of the workers' movement, must favour its development and make it one of the levers for their action, doing all they can so that it, in conjunction with all progressive forces, will culminate in a social revolution which leads to the suppression of classes and to complete freedom, equality, peace and solidarity among all human beings."

However, many in the movement stayed out of this aspect of struggle and some criticised those who joined the workers' struggles. Brian Bamford recalls the National Rank & File Movement. I remember its launch and the high hopes we had, but other comrades felt differently. They objected because others affiliated were not anarchists, they had been expelled from the Socialist Labour League or some other trotskyist organisation. The movement wasn't pure, and often got involved in ordinary trade union day to day issues. But it was an attempt to forge an organisation of solidarity, which could assist workers in struggle. It would go beyond the question of wages and conditions, and put the issues of the class struggle and capitalist exploitation before workers. It was opposed by both bosses and the trade union leaders; who threatened and even, if my memory serves me right, expelled an engineer.

Those anarchists who have been involved in the trade unions have seen that most disputes are not about more money, but about the conditions of work, whether it's speed-up; health and safety; not being consulted; victimisation; or a general attack on the unions. They all come under the general heading of control. Control over the work processes, encroaching control by the workforce, the undermining of the so-called management's 'right to manage'. These are the undercurrents which play such an important part in the day-

to-day scene in the organised workplace.

For those of us who have involved ourselves in the trade unions movement, we have often felt very isolated. Isolated in our ideology, both among our fellow trade unionists, and from anarchist comrades. But we were always heartened by our knowledge that the average rank and file member had a healthy scepticism towards trade union officials. That workers do see the value of direct action and can, and do organise themselves when the situation demands. Many of us have witnessed the transformation of fellow workers when involved, say in a strike. All sorts of hidden talents emerge or are learned quickly. Some address meetings; organise collections; organise pickets; feed strikers; write leaflets.

Those anarchists who have involved themselves, through having to earn a living, in the trade union movement have often been criticised for it or told we "shouldn't work with communists". But, as long as our principles were not compromised, with anarchists so thin on the ground, what else could we do? To carp from the sidelines was no help whatsoever. In fact this standing to one side approach, gave the impression that some section of the movement did not want a social revolution. That they had found a comfortable place within the present system and that perhaps the 'great unwashed' might upset their current status.

But for those who got their hands dirty the fact is that the strength of the workers lies at the point of production: "and that action is most effective which is direct and which keeps the initiative in their own hands. for them to look to political parties which take control away from them; to hope that State boards consisting of ex-employers and ex-trade union officials can have their interests at heart, is throwing away their important advantage – the fact that on the job they are indispensable and union officials. employers and political leaders are not."*

Recent Tory administration legislated restrictions on trade union activities. And although these have been called the 'anti-trade union laws', really they were a direct attack on workers attempts to defend and improve their wages and conditions, and to increase their degree of control at the workplace. For capitalism they have proved a success, but the accompanying high unemployment rates also helped in that it made workers think twice before taking any form of direct action. But the trade unions were left with a relatively industrially in-

* *Syndicalism: The Workers' Next Step* by Philip Sansom, published by Freedom Press, 1951.

active and declining membership. We now have a Labour government, with a massive parliamentary majority. Following their victory on 1st May, International Workers' Day 1997, people's expectations were high, there was a feeling around, one got stopped in the streets and strangers talked in cafes. But for how long will this honeymoon period last? If New Labour is unwilling to settle the Liverpool Dockers' dispute, or even to remove the resigning every three years for the deduction of trade union contributions at source, then we can only expect the same Tory medicine in a different bottle. The fight back, I believe, will come soon and we as anarcho-syndicalists have to play our part within the trade unions and at our workplaces.

However, in ending this review, I must make a mention of the importance of trades councils. Although trades councils are the local representatives of the Trades Union Congress, they not only carry out TUC policies locally, but act in the community at large; support disputes; support and organise campaigns on all issues affecting workers and their families. Geoffrey Ostergaard writes of Tom Mann and Guy Bowman's views that they were an essential element in syndicalist organisation: "their function being to ascertain the needs of people in their respective districts and to arrange distribution".

This did indeed happen during the 1926 General Strike and in some areas the distribution of essential goods was controlled by the local trades council. They were, in Bowman's view, an alternative to the municipal council and would have to stand against them to "destroy it and establish themselves in its place". While trades councils are made up of affiliated trade union branches who send elected delegates, they are directly linked to the community and as such from the link with the consumer, which was a concern of the Guild Socialists.

I recommend *The Tradition of Workers' Control* to readers and, as we pass into the second half of the first year of Blair's Labour administration, it is a timely reminder and an encouragement for present struggles and those to come.

Piotr Arshinov

The old and the new anarchism (reply to Comrade Malatesta)*

In the anarchist organ *Le Reveil* of Geneva, in the form of a leaflet, comrade Errico Malatesta has published a critical article on the project of the Organisational platform edited by the Group of Russian Anarchists Abroad.

This article has provoked perplexity and regret in us. We very much expected, and we still expect, that the idea of organised anarchism would meet an obstinate resistance among the partisans of chaos, so numerous in the anarchist milieu, because that idea obliges all anarchists who participate in the movement to be responsible and poses the notions of duty and constancy. For up to now the favourite principle in which most anarchists are educated can be explained by the following axiom: "I do what I want, I take account of nothing". It is very natural that anarchists of this species, impregnated by such principles, are violently hostile to all ideas of organised anarchism and of collective responsibility.

Comrade Malatesta is foreign to this principle, and it is for this

* Malatesta wrote a reply to the Organisational Platform of the Libertarian Communists whilst under house arrest in fascist Italy. It appeared in the Swiss anarchist paper *Le Reveil* and then as a pamphlet in Paris. A translation is published in Malatesta, *The Anarchist Revolution* (Freedom Press) under the title 'A Project of Anarchist Organisation'. One of the authors of the Platform, Piotr Arshinov, replied to Malatesta's criticisms in the paper set up by him and Nestor Makhno in Paris, *Dielo Trouda*. Equally, Makhno sent a long letter to Malatesta, stating that a misunderstanding of the text by Malatesta must have led to their disagreement. Malatesta did not get this letter for over a year, and replied as soon as he could. Makhno's letter and Malatesta's reply appear in *The Anarchist Revolution*. Malatesta still expressed disagreement with the Platform, opposing moral responsibility to collective responsibility, and criticising the Executive Committee mentioned in the Platform as "a government in good and due form". Makhno replied a second time (see my translation of excerpts of this letter in correspondence in *Freedom*, 18th November 1995). Malatesta appears to have conceded that it was a question of words because if collective responsibility meant "the accord and solidarity which must exist between the members of an association ... we will be close to understanding each other". Isolation due to house arrest and a problem of language may have contributed to these disagreements between Malatesta and the Platformists.

Arshinov's reply to Malatesta, which I have translated from the French, is its first appearance in the English language – Nick Heath

reason that his text provokes this reaction in us. Perplexity, because he is a veteran of international anarchism, and if he has not grasped the spirit of the Platform, its vital character and its topicality, which derives from the requirements of our revolutionary epoch. Regret, because, to be faithful to the dogma inherent in the cult of individuality, he has put himself against (let us hope this is only temporary) the work which appears as an indispensable stage in the extension and external development of the anarchist movement.

Right at the start of his article, Malatesta says that he shares a number of theses of the Platform or even backs them up by the ideas he expounds. He would agree in noting that the anarchists did not and do not have influence on social and political events, because of a lack of serious and active organisation.

The principles taken up by comrade Malatesta correspond to the principal positions of the Platform. One would have expected that he would have as equally examined, understood and accepted a number of other principles developed in our project, because there is a link of coherence and logic between all the theses of the Platform. He asks whether the General Union of Anarchists projected by the Platform can resolve the problem of the education of the working masses. He replies in the negative. He gives as reason the pretended authoritarian character of the Union, which according to him, would develop the idea of submission to directors and leaders.

On what basis can such a serious accusation repose? It is in the idea of collective responsibility, recommended by the Platform, that he sees the principal reason for formulating such an accusation. He cannot admit the principle that the entire Union would be responsible for every member, and that inversely each member would be responsible for the political line of all the Union. This signifies that Malatesta does not precisely accept the principle of organisation which appears to us to be the most essential, in order that the anarchist movement can continue to develop.

Nowhere up to here has the anarchist movement attained the stage of a popular organised movement as such. Not in the least does the cause of this reside in objective conditions, for example because the working masses do not understand anarchism or are not interested in it outside of revolutionary periods; no, the cause of the weakness of the anarchist movement resides essentially in the anarchists themselves. Not one time yet have they attempted to carry on in an organised manner either the propaganda of their ideas or their practical activity among the working masses.

If that appears strange to comrade Malatesta, we strongly affirm that the activity of the most active anarchists – which includes himself – assume, by necessity, an individualist character; even if this activity is distinguished by a high personal responsibility, it concerns only an individual and not an organisation. In the past, when our movement was just being born as a national or international movement, it could not be otherwise; the first stones of the mass anarchist movement had to be laid; an appeal had to be launched to the working masses to invite them to engage in the anarchist way of struggle. That was necessary, even if it was only the work of isolated individuals with limited means. These militants of anarchism fulfilled their mission; they attracted the most active workers towards anarchist ideas. However, that was only half of the job. At the moment where the number of anarchist elements coming from the working masses increased considerably, it became impossible to restrict oneself to carrying on an isolated propaganda and practice, individually or in scattered groups. To continue this would be like running on the spot. We have to go beyond so as not to be left behind. The general decadence of the anarchist movement is exactly explained thus: we have accomplished the first step without going further.

This second step consisted and still consists in the grouping of anarchist elements, coming from the working masses, in an active collective capable of leading the organised struggle of the workers with the aim of realising the anarchist ideas.

The question for anarchists of all countries is the following: can our movement content itself with subsisting on the base of old forms of organisation, of local groups having no organic link between them, and each acting on their side according to its particular ideology and particular practice? Or, just fancy, must our movement have recourse to new forms of organisation which will help it develop and root it amongst the broad masses of workers?

The experience of the last twenty years, and more particularly that of the two Russian revolutions – 1905 and 1917-19 – suggests to us the reply to this question better than all the ‘theoretical considerations’.

During the Russian Revolution, the working masses were won to anarchist ideas; nevertheless anarchism, as an organised movement suffered a complete setback, whilst from the beginning of the revolution we were at the most advanced positions of struggle, from the beginning of the constructive phase we found ourselves irremediably apart from the said constructive phase, and consequently

outside the masses. This was not pure chance: such an attitude inevitably flowed from our own impotence, as much from an organisational point of view as from our ideological confusion.

This setback was caused by the fact that, throughout the revolution, the anarchists did not know how to put over their social and political programme and only approached the masses with a fragmented and contradictory propaganda; we had no stable organisation. Our movement was represented by organisations of encounter, springing up here, springing up there, not seeking what they wanted in a firm fashion, and which most often vanished at the end of a little time without leaving a trace. It would be desperately naive and stupid to believe that workers could support and participate in such 'organisations', from the moment of the social struggle and communist construction.

We have taken the habit of attributing the defeat of the anarchist movement of 1917-19 in Russia to the statist repression of the Bolshevik Party; this is a big mistake. The Bolshevik repression impeded the extension of the anarchist movement during the revolution, but it wasn't the only obstacle. It's rather the internal impotence of the movement itself which was one of the principal causes of this defeat, an impotence proceeding from the vagueness and indecision which characterised different political affirmations concerning organisation and tactics.

Anarchism had no firm and concrete opinion on the essential problems of the social revolution; an opinion indispensable to satisfy the seeking after of the masses who created the revolution. The anarchists praised the communist principle of: "From each according to his abilities, to each according to his needs" but they never concerned themselves with applying this principle to reality, although they allowed certain suspect elements to transform this great principle into a caricature of anarchism – just remember how many con-men benefited by seizing for their personal profit the assets of the collectivity. The anarchists talked a lot about revolutionary activity of the workers, but they could not help them, even in indicating approximately the forms that this activity should take; they did not know how to sort out the reciprocal relations between the masses and their centre of ideological inspiration. They pushed the workers to shake off the yoke of authority, but they did not indicate the means of consolidating and defending the conquests of the revolution. They lacked clear and precise conceptions, of a programme of action on many other problems. It was this that distanced them from the activity of the masses and condemned them

to social and historical impotence. It is in this that we must seek the primordial cause of their defeat in the Russian revolution.

And we do not doubt that, if the revolution broke out in several European countries, anarchists would suffer the same defeat because they are no less – if not even more so – divided on the plan of ideas and organisation.

The present epoch, when, by millions, workers engaged on the battlefield of social struggle, demanded direct and precise responses from the anarchists concerning this struggle and the communist construction which must follow it; it demanded of the same, the collective responsibility of the anarchists regarding these responses and anarchist propaganda in general. If they did not assume this responsibility the anarchists like anyone else in this case, do not have the right to propagandise in an inconsequent manner among the working masses, who struggled in agreeing to heavy sacrifices and lost numberless victims.

At this level, it is not a question of a game or the object of an experiment. That is how, if we do not have a General Union of Anarchists, we cannot furnish common responses on all those vital questions.

At the start of his article, comrade Malatesta appears to salute the idea of the creation of a vast anarchist organisation, however, in categorically repudiating collective responsibility, he renders impossible the realisation of such an organisation. For that will not only not be possible if there exists no theoretical and organisational agreement, constituting a common platform where numerous militants can meet. In the measure to which they accept this platform, that must be obligatory for all. Those who do not recognise these basic principles, cannot become, and besides would themselves not want to become, a member of the organisation.

In this fashion, this organisation will be the union of those who will have a common conception of a theoretical, tactical and political line to be realised.

Consequently, the practical activity of a member of the organisation will be naturally in full harmony with the general activity, and inversely the activity of all the organisation will not know how to be in contradiction with the conscience and activity of each of its members, if they accept the programme on which the organisation is founded.

It is this that characterises collective responsibility: the entire Union is responsible for the activity of each member, knowing that they will accomplish their political and revolutionary work in the

political spirit of the Union. At the same time, each member is fully responsible for the entire Union, seeing that his activity will not be contrary to that elaborated by all its members. This does not signify in the least any authoritarianism, as comrade Malatesta wrongly affirms; it is the expression of a conscientious and responsible understanding of militant work.

It is obvious that in calling on anarchists to organise on the basis of a definite programme, we are not taking away as such the right of anarchists of other tendencies to organise as they think fit. However, we are persuaded that, from the moment that anarchists create an important organisation, the hollowness and vanity of the traditional organisations will be revealed.

The principle of responsibility is understood by comrade Malatesta in the sense of a moral responsibility of individuals and of groups. This is why he only grants to conferences and their resolutions the role of a sort of conversation between friends, which in sum pronounce only platonic wishes.

This traditional manner of representing the role of conferences does not stand up to the test of life. In effect, what would be the value of a conference if it only had 'opinions' and did not charge itself with realising them in life? None. In a vast movement, a uniquely moral and non-organisational responsibility loses all its value.

Let us come to the question concerning majority and minority. We think that all discussion on this subject is superfluous. In practice, it has been resolved a long time ago. Always and everywhere among us, practical problems have been resolved by a majority of votes. It is completely understandable, because there is no other way of resolving these problems inside an organisation that wants to act.

In all the objections raised against the Platform, there is lacking up to the moment the understanding of the most important thesis that it contains; the understanding of our approach to the organisational problem and to the method of its resolution. In effect, an understanding of these is extremely important and possesses a decisive significance with the idea of a precise appreciation of the Platform and all the organisational activity of the *Dielo Trouda* group.

The only way to move away from chaos and revive the anarchist movement is a theoretical and organisational clarification of our milieu, leading to a differentiation and to the selection of an active core of militants, on the basis of a homogeneous theoretical and practical programme. It is in this that resides one of the principle objectives of our text.

What does our clarification represent and what must it lead to? The absence of a homogeneous general programme has always been a very noticeable failing in the anarchist movement, and has contributed to making it very often very vulnerable, its propaganda not ever having been coherent and consistent in relation to the ideas professed and the practical principles defended. Very much to the contrary, it often happens that what is propagated by one group is elsewhere denigrated by another group. And that not solely in tactical applications, but also in fundamental theses.

Certain people defend such a state of play in saying that in such a way is explained the variety of anarchist ideas. Well, let us admit it, but what interest can this variety represent to the workers?

They struggle and suffer today and now and immediately need a precise conception of the revolution, which can lead them to their emancipation right away; they don't need an abstract conception, but a living conception, real, elaborated and responding to their demands. Whilst the anarchists often proposed, in practice, numerous contradictory ideas, systems and programmes, where the most important was neighbour to the insignificant, or just as much again, contradicted each other. In such conditions, it is easily understandable that anarchism cannot and will not ever in the future, impregnate the masses and be one with them, so as to inspire its emancipatory movement.

For the masses sense the futility of contradictory notions and avoid them instinctively; in spite of this, in a revolutionary period, they act and live in a libertarian fashion.

To conclude, comrade Malatesta thinks that the success of the Bolsheviks in their country stops Russian anarchists who have edited the Platform from getting a good night's sleep. The error of Malatesta is that he does not take account of the extremely important circumstances of which the Organisational Platform is the product, not solely of the Russian revolution but equally of the anarchist movement in this revolution. Now, it is impossible not to take account of this circumstance so that one can resolve the problem of anarchist organisation, of its form and its theoretical basis. It is indispensable to look at the place occupied by anarchism in the great social upheaval in 1917. What was the attitude of the insurgent masses with regard to anarchism and the anarchists? What did they appreciate in them? Why, despite this, did anarchism receive a setback in this revolution? What lessons are to be drawn? All these questions, and many others still, must inevitably put themselves to those who tackle the questions raised by the Platform. Comrade

Malatesta has not done this. He has taken up the current problem of organisation in dogmatic abstraction. It is pretty incomprehensible for us, who have got used to seeing in him, not an ideologue but a practitioner of real and active anarchism. He is content to examine in what measure this or that thesis of the Platform is or is not in agreement with traditional points of view of anarchism, then he refutes them, in finding them opposed to those old conceptions. He cannot bring himself to thinking that this might be the opposite, that it is precisely these that could be erroneous, and that this has necessitated the appearance of the Platform. It is thus that can be explained all the series of errors and contradictions raised above.

Let us note in him a grave neglect; he does not deal at all with the theoretical basis, nor with the constructive section of the Platform, but uniquely with the project of organisation. Our text has not solely refuted the idea of the Synthesis, as well as that of anarcho-syndicalism as inapplicable and bankrupt, it has also advanced the project of a grouping of active militants of anarchism on the basis of a more or less homogeneous programme. Comrade Malatesta should have dwelt with precision on this method; however, he has passed over it in silence, as well as the constructive section, although his conclusions apparently apply to the entirety of the Platform. This gives his article a contradictory and unstable character.

Libertarian communism cannot linger in the impasse of the past, it must go beyond it, in combating and surmounting its faults. The original aspect of the Platform and of the *Dielo Trouda* group consists precisely in that they are strangers to out of date dogmas, to ready made ideas, and that, quite the contrary, they endeavour to carry on their activity starting from real and present facts. This approach constitutes the first attempt to fuse anarchism with real life and to create an anarchist activity on this basis. It is only thus that libertarian communism can tear itself free of a superannuated dogma and boost the living movement of the masses.

Piotr Arshinov

Dielo Trouda, No. 30, May 1928, pages 4-11

• Comment on Raven 36

Dear Raven,

The article 'Runway Two' which appeared in *The Raven* number 36 (volume 9, page 381) under my Christian name 'Julian' did so because the person who submitted it was unaware of my surname. As somebody who always makes a point of giving my full name and never a false name when on the campaigns – because I saw no cause for shame or concealment in what we were doing – I would simply like to state that my name is Julian Fitzgerald.

Julian Fitzgerald

“[Labelling of genetically engineered foods] would be of value to several categories of consumer: Those who object to genetic engineering of any sort; Vegetarians who might not wish to eat plants containing animal genes; People with allergies to particular gene products; Those who prefer certain genetically engineered foods (e.g. those who prefer cheeses made with genetically engineered rather than animal rennet).”

M.J. Reiss and R. Straughan, *Improving Nature?*,

pages 185-186

“If we are to satisfy the environmental concerns associated with modern high-input agriculture and feed the increasing world population, it seems that gene technology has many advantages.”

Christopher Leaver FRS (professor of plant sciences Oxford University) ‘Novel ways to feed the world’ in *The Guardian*, 17th February 1999

“Christopher Leaver’s childish faith in technology’s ability to solve political and economic problems [is] shared by some of the best researchers in Britain. Unable to see beyond the sub-microscopic, they have unwittingly become mercenaries in the corporate war against the poor.”

George Monbiot, ‘Blinkered Science’ in *The Guardian*, 25th February 1999

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