Biotechnology, confusion, fear and protest

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On the 26th of June 2000 researchers announced that they had finally created a rough map of the human genome — almost 3 billion DNA letters. In December 2000 British MPs voted to allow scientists to collect cells from human embryos and to substitute a nuclei from an adult cell into embryo cells for research purposes. These sorts of developments leave many people confused and frightened.

The BSE, and Foot and Mouth, crises have left people wondering are scientists and governments to be trusted in these areas. There has been a consumer revolt against Genetically Altered foods and activists have rushed to pull up genetically altered crops. So what's all this about? Is it any use to anyone or just another example of big science and big business going mad at our expense?

What is Genetic Engineering?

Genetic Engineering (GE) refers to a set of technologies that make it possible to transfer genes between organisms. Genes are chemical sequences found in the nucleus of every living cell, which work as plans or blueprints to manufacture proteins. Thus genes working in conjunction with environment and upbringing are crucial in determining the makeup of any living entity. For example I could have inherited a gene which makes me big and fat but clearly if I can't get food or don't eat then I will remain skinny. My genes give me a certain potentiality but the influences around me decide to what extent the potential comes through.

GE, by enabling genes to be transferred and then switched on in totally new organisms, makes possible traits, which could never have arisen through conventional breeding. Previously a breeder who wanted a purple variety of cow would have to find a purple cow or a purple animal close to a cow and set-up a programme to breed this trait into conventional cows. A genetic engineer simply extracts a gene, which codes for a protein that creates a purple pigment from any organism and transfers it into an unfertilised egg. When the egg is fertilised and the new cow grows up, and if the scientist has found a way to make sure the gene is switched on in the cow's coat — she will be purple.[1] So far almost all success in this area has been with plants rather than animals where it is easy to generate a new plant from a single cell.

GE has existed more or less since the 1970s but it is only in the last 10–15 years that it has become a potential money-maker especially in the area of crop plants.

The American biotechnology giant Monsanto has over the course of the last 15 years, modified several popular crop plants to make them resistant to it's herbicide Roundup. This has obviously meant a huge increase in markets and sales. Other crops which have been modified include tomatoes where the ripening process is lengthened so that they can be transported longer distances. In Ireland Guinness have spent years (seemingly unknown to environmental activists, many of whom have been known to consume large quantities!) transferring genes into different strains of yeast to improve their brewing process.

However, since the introduction into the European market of foodstuffs derived from genetically engineered plants (Note: they've been selling in the US market for several years already!),

[1] This is not nearly as far fetched as it sounds. The first issue of the British magazine New Scientist (Jan 6th 2001) carried an interview with a Chicago artist Eduardo Kac. He paid a French laboratory to create a Genetically Modified Rabbit that glows green in blue light. Kac claims that he wishes to use the rabbit to open the process of genetic modification to a more public discourse!

massive consumer concern has emerged. So-called GM (Genetically Modified) food has become a big issue. That said, it is worth noting that GM food is only one of a number of food technologies that come under the under the general heading of biotechnology. One is the identification and possible treatment of so-called simple Genetic Disorders where a problem can be traced to one or two defective genes — Cystic Fibrosis being just one such where progress has been made.

Cloning is another. The cloning of Dolly the sheep caused massive media interest. More recently the same team of scientists have cloned a monkey — several countries including Japan and Britain now have legal bans on human cloning, which is probably already scientifically quite feasible.

The Good

Before looking at GE in the context of the economics of capitalism I will try to look at the technology per se. An important question needs to be asked: is GE in itself safe and potentially of benefit? In answering this it needs to be borne in mind that those who advocate GE claim a wide number of benefits on its behalf. Though some of these claims are wild and off the mark, there are undoubtedly some real benefits to be achieved through this new technology.

One in particular is the area of inheritable disease. Already some progress has been made identifying diseases that are caused be deficiencies in our human genes, in particular deficiencies present in new-born babies. Although pharmaceutical companies (concerned primarily with making profits) finance much of this research, it is obvious that there is real value to it. However charitable foundations, which don't have a direct profit motive, finance some research in this area; the benefits of research from these bodies could be made much more widely available.

Another area with obvious potential benefits is that of reproductive technology. Many childless couples have benefited from various techniques, for example increasing the production of eggs in a woman and then harvesting them and combining sperm and eggs artificially. Although this research has often been controversial in nature (for example see the recent debates here and in England on the use of stored, frozen embryos), anarchists have been at the forefront in defending this type of research against attack from the pro-life movement and other moralists of the Right.

Obviously there are sensitive issues in this area but we would argue that on balance this sort of research could lead to real and tangible benefits. In fact, if any questions are to be raised about this technology surely the question of access to health improvements has to be top of the list. It remains true that, while huge improvements have been the order of the day in the medical establishment over the last few decades, the problem remains that only the really wealthy can access these services on any ongoing basis — precisely because such services are so expensive!

Feed the world?

One of most prominent excuses put forward by many of the multinational food corporation to justify the introduction of GE foods 'is to solve the problem of world food shortage!' As Monsanto put it "As a life sciences company Monsanto is committed to finding solutions to the growing global needs for food and health"[2]. Although this sounds nice, it is nonsense!

[2] quoted in "Weird Science" Ainé De Paor, Magill Magazine, July 1999)

Firstly there is more than enough food to feed the world several times over already. There are huge food mountains and these could easily provide the 4.3 pounds (in weight) of food that the average person needs to live and prosper on per day. This would include two and a half pounds of grain, beans and nuts, about half a pound of meat, milk and eggs, and another of fruit and vegetables![3]

The problem, in other words, is not food but the distribution of what is already being produced. Hunger and poverty are a man-made problem — more specifically a problem caused and maintained by the manner in which the world economy is organised: to produce profits first and to meet needs second — capitalism. It is also worth bearing in mind that to date no GE food research has been devoted to increasing yield per se. Rather current GE food research supports and promotes intensive agriculture methods, which may eventually cut into both the quality and even the quantity of food we eat.

The Bad

When it comes to examining the bad side of biotechnology industry, it is once again difficult to separate out this feature from the reality that food production today is organised primarily to meet the profit needs of giant corporations.

It is accepted by many scientists that humans or animals who consume GM food will be exposed to "remote but real risks"[4] For example, if a new protein is introduced from a non-food organism into a food it may cause allergic reactions. Only very careful long-term monitoring of a large group of consumers could determine whether there were such problems. Similarly for long-term gastrointestinal problems or cancers. At present only single genes with well understood effects are being transferred. But the next generation of GM foods may involve several genes- how will these interact? The truth is no one knows!

And a further complication is lies with a seemingly minor aspect in the current technology — this is the common use of antibiotic resistance genes that are attached to the transferred genes to monitor their progress. This resistance may be transferred to bacteria in the body and later to infecting bacteria. Resistance to major antibiotics is a growing problem in hospitals. Finally there maybe other subtle effects, for example genes may insert randomly into DNA switching other genes on and off with potentially bad effects. Although millions worldwide do consume genetically altered food daily, for example yeast and soya, we still cannot be sure of the potential long term effects and very little study has been done.

...And the downright Ugly

So much for the technology itself — in so far as it can be judged. However, in a capitalist world no technology is implemented for the benefit of the many. The use of biotechnology has been a perfect example of how retaining market share and instant profits have predominated over all other considerations.

[3] "Why genetically altered food won't conquer hunger" Peter Rosset, New York Times, September 1st 1999)

[4] "Long-term effects of GM food serves up food for thought," Declan Butler and Tony Reichhardt, Nature 398:651, April 22 1999.)

For example, farmers who buy seeds from chemical giant Monsanto cannot save seeds. Monsanto have taken hundreds of seed piracy cases (see De Paor, ibid.). Besides sending Pinkerton detectives into the farmers' fields the company sponsors a free line so their neighbours can blow the whistle and they place ads on the radio naming and shaming those who have "stolen the company's genes". Such lengths may no longer be necessary, as Monsanto has now patented a terminator gene that ensures that the plants cannot produce new seed. This has no useful property other then forcing farmers to buy patented Monsanto seed every year!

GE is being used to grab a few specific traits — transfer them and patent the resulting organisms. GE has been intimately tied in with intensive agriculture, with massive inputs of chemical weed killers and fertilisers. The 27 corporations who have herbicide-resistant plant programmes include the 8 largest pesticide companies in the world namely; Bayer, Ciba Geigy, 1C1, Rhone-Poulenc, Dow/ Elanco, Monsanto, Hoescht and Du Pont as well as almost all the seed companies most of which have been bought by the chemical companies.[5]

GM plants, as presently being developed, pose several environmental risks including:

1. A loss of genetic diversity. Between 1845 and 1847 almost 1 million people were wiped out by famine and disease and another 1 million emigrated. There were economic and political reasons for this but the direct cause of the famine was a dependence on one variety of one plant; the potato. The potato remains a staple in the Irish diet only because researchers were able to go to the Andes and Mexico and find new strains resistant to blight. These were then crossed with the original potato to introduce the new trait. The lesson is that a loss of genetic variety is disastrous.

The worldwide trend with intensive agriculture is to concentrate on a small number of varieties. The GM industry is at the heart of this process. The corporations are gene thieves, extracting individual genes from particular plants. They depend on a rich variety from which to "mine" the genes. But they then patent the altered plant and encourage mass mono-culturing, where a huge number of farmers grow them and abandon the old varieties. Ultimately this narrows the gene pool, as other varieties of the crop are no longer grown or even wiped out as weeds.

The evidence is there. Both conventional breeding and GE are leading to mass erosion of genetic variation. In the last 80 years 97% of vegetable varieties in the USA have become extinct. In India there were 30,000 varieties of rice 50 years ago now 75% of the total crop is accounted for by just 10 varieties. This loss is permanent. Genetic engineering can only shuffle existing variety, it cannot really create anything new.

2. Further ecological problems are emerging. One is the transference of herbicide resistance into weeds. Cereal crops often grow side by side with weedy grasses very similar to themselves. It is quite easy for a resistant gene to be transferred in the pollen of an engineered species. Even if this doesn't happen- increasing use of herbicides on the fields of resistant crops will increase selection pressure on the weeds. This will make the emergence of "super weeds" a possibility. Gene flow has been demonstrated between maize and it's weedy plant relative teosinte. (Altieri, ibid.)

The same applies to plants engineered to produce their own insecticides. Several commercial crop plants have been engineered with a naturally occurring ant- insecticide produced by bacteria known as Bacillus Thuringienis. Insects are now being exposed to massive doses of this toxin

[5] "The Environmental Risks of Transgenic Crops: An agro-ecological Assessment" Miguel Alteieri, Department of Environmental Science — University of California)

concentrated in engineered plants. The end result can only be that resistance will develop quite fast among survivors. Furthermore it now appears that BT also kills natural pollinators of some plants in the pollen of the engineered plants.

Massive increase in the use of herbicides like Monsanto's Roundup means that beneficial animals like spiders and worms are also wiped out- the herbicides are concentrated in the food chain raising the question of human safety when massive doses are involved.

Privatisation

Put simply, the application of Biotechnology and GE to maintain profits and market positions raises real ecological problems and may carry risks for human health. One final effect, which is often passed over, is the privatisation of science itself. Science relies for progress on the free exchange of new ideas and experimental information through journals like Science and Nature. Increasingly, research is being kept secret and the results patented by business. Just as the engineers steal the accumulated knowledge and breeding of the last few centuries, they are also privatising scientific knowledge. 46% of biotechnology firms support research at universities in the USA and 33 out of 50 states have university-industry centres for "biotechnology transfer." To quote Altieri, the challenge for universities and state funded research will be:

> "to carefully monitor and control the provision of applied non-proprietary knowledge to the private sector so as to protect that such knowledge will continue in the public domain for the benefit of all society."

In summary, taking biotechnology and GE in isolation there may be some benefits e.g. in the treatment of hereditary diseases and fertility treatment.[6]

As GE has been applied through capitalism it has proved disastrous. The environment, and possibly human health, has been sacrificed for profit and monopoly. We should oppose current trials in Ireland. When activists attacked a Monsanto sugar beet trial in Shanagary Cork they were accused of being luddites. However it is clear that the trials are rubbish. If they are carefully regulated to prevent the accidental release of pollen then they are bogus trials. But if they are carefully regulated then they don't reflect the real dangers. As they are being conducted by the companies themselves they are not subject to neutral scientific evaluation. Anyhow there isn't much money in pointing out the dangers. As Butler and Reichhadrdt put it (Nature, ibid.)

> "such research is unattractive to researchers as it tends to yield negative results that are difficult to publish and account for to funding agencies."

Anarchists are not anti-technology. On the contrary we advocate the optimum use of science and technology for the benefit of common good. For example if it were possible to build robots to sweep streets, such an invention would certainly be welcome in an anarchist society. Isn't it in all our interests to reduce the time spent on boring and repetitive tasks?

[6] There are also some theoretical ideas for engineering plants that could fix their own Nitrogen from the soil or have high tolerance to salty conditions. These things might be of REAL benefit to poor countries. Needless to say barely a penny has gone into this research.

Up to a point capitalism accelerates the introduction of new technology and the development of new technologies (a real benefit, it should be said, to the capitalist form of economic organisation), but capitalism often places the brakes on new technology too. Capitalists will only invest in technology that can cut costs, especially labour costs, and thereby improve their competitive position. For years the large oil companies have bought out patents for alternative energy sources and buried them. Anyone who uses a computer has probably had ample time to regret the dominance of two companies; Intel and Microsoft which have slowed rather then improved the rate of evolution of computer technology in order to preserve their monopolies.

Capitalists only invest in technology when it suits them. In this context GE as it stands, is simply theft. Theft of the property of the many (breeders and farmers) for the profit of a few. The question of whether it could be of any benefit is a moot one until the many have power over the decisions of what they produce and consume.

Glossary

In order to make this article easier to understand we have included a short glossary of technical words, which are explained here in a bit more detail

DNA: The chemical substance DioxyriboNucleicAcid that makes up genes. DNA is made up of 4 different chemical bases or letters.

Chromosomes: Chromosomes are tightly wound strands of DNA bundled together in an area in the centre of very cell known as the nucleus. Chromosomes contain all the genes for an animal or plant and a lot of extra DNA whose function is still unsure (bacteria and other simple organisms don't have their DNA coiled into chromosomes but they do have genes)

Genes: Genes are sections of DNA that act as blueprints or plans for the creation of proteins. Proteins decide how the body is made up and develops. Human hair is made up of protein, as is haemoglobin on your blood and your fingernails. Other proteins control chemical reactions in the body. Proteins play a crucial role in making us what we are and so genes which act as blueprints for proteins have a major part to play in our make up.

Genome: The Genome is basically all the DNA on all the Chromosomes in a cell, including all the genes.

Clone: A clone is an exact genetic replica of an individual with exactly the same genes as the original — anyone who has ever succeeded in rooting a cutting from a plant has, in fact, created a clone.

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