

The Ultimate Arrogance: genetic engineering and the human future

Keith Buchanan

*Our time is cursed with the necessity
for feeble men, masquerading as experts,
to make enormously far-reaching decisions.
Is there anything more far-reaching than the creation
of new forms of life?*

Erwin Chargaff

The work of scientists has in the last half-century brought humanity face to face with two major menaces to its survival and created a situation without precedent in human history. This twofold threat has been posed by the development of nuclear fission for civilian or military purposes and the more recent development of biotechnology or genetic engineering. We live, all of us, all of Creation, in the ominous shadow of nuclear technology. We live also in what is potentially a no less chilling shadow—the darkening shadow of biotechnology, an industry which, according to the *Times of India*, is ‘the fastest growing industry in the world today’.¹

‘A Barrier that Should have Remained Inviolable’

It is more than a decade since the distinguished Austro-American biochemist Erwin Chargaff commented that these two immense and fateful scientific discoveries, ‘the splitting of the atom (and) the recognition of the chemistry of heredity and its subsequent manipulation’,² both involved the mistreatment of a nucleus—that of the atom and that of the cell. He added—and it was a comment whose prophetic vision was largely ignored at the time—‘In both cases do I have the feeling that science has transgressed a barrier that should have remained inviolate.’³ And in a letter to the editor of *Science* he stressed ‘the awesome irreversibility’ of the genetic engineering experiments being contemplated: ‘You can stop splitting the atom; you can stop visiting the moon; you can stop using aerosols; you may even decide not to kill entire populations by the use of a few bombs. But you cannot recall a new form

of life ... it will survive you and your children and your children's children ... An irreversible attack on the biosphere is something so unheard of, so unthinkable to previous generations, that I could only wish that mine had not been guilty of it.'⁴

This article attempts to draw attention to some of the implications of these developments—potentially the most momentous since the discovery of fire. They are, moreover, developments whose social and economic impacts are likely to be immense, not only on the peoples of the developed societies but even more on the highly vulnerable societies of the third world. They are developments which demand that we should take a new and more critical look at the direction in which modern science and technology seem headed, at the relationship of mankind to the rest of Creation—and, ultimately, they pose questions of ethics and responsibility which have been ignored in the scramble for profits and power....

The Rise of Genetic Engineering

The genetic engineering industry (or biotechnology) is based ultimately on the discovery that the inheritable properties of the cell are 'encoded in its DNA'⁵ and the realisation that DNA fragments comprising only one gene could be isolated and that such fragments could be spliced into a living cell which would then 'go on multiplying these newly added pieces of DNA as well as the products for which the intruders carried the information'.⁶ These discoveries laid the scientific basis for what promises—or should we perhaps say threatens?—to become one of the most powerful and profitable industries of our time.

Today, in Praful Bidwai's words: '“Biotechnology” describes a number of powerful techniques ... by means of which life forms can be manipulated and altered at the most basic level so that they develop some specific properties.'⁷ He continues 'Today, you can take genes, split and splice them, graft them on to another organism and “manufacture” a new life form, say, virus.' And, as a result of hotly contested US court decisions, it is now possible for a giant transnational company—or, indeed, a private individual—to take out a patent on such a product, whether it be a hybrid plant or any animal 'altered or mutated by genetic engineering or other biotechnology techniques'. Implicit in the thinking behind the new technology is the arrogant assumption that any scientist has the right to make good in his laboratory what are perceived as 'defects' or 'omissions' in the created world. And no less arrogant is the reduction of all life to something that exists merely for the profit of the powerful; as Jeremy Rifkin commented, 'Everything's up for grabs—plants and animals are purely there for our use, to be commercially exploited.'⁸

At a recent seminar on the socio-economic impact of new

biotechnologies on basic health and agriculture in the third world, sponsored by the Dag Hammarskjöld Foundation, it was estimated that the total global investment in biotechnology research was of the order of four billion dollars. 'About 60% is focussed on recombinant DNA or genetic engineering, about 30% in cellular biology and creating monoclonal antibodies or cloning single cells, and 8% in fermentation technologies. About ten organisations now account for 63% of the investments—a very high degree of concentration.'

New Blueprints for Living Things

One of the disturbing features about this research is that much is being done in secrecy: 'the actual work and the people who do this work are hardly ever seen ... there has to be greater public knowledge, discussion and awareness.'¹⁰ And for the biological Dr Strangeloves who are busy away from the public eye and from public accountability, the species is no longer something to be respected; rather is their attention focussed on 'the thousands of strands of genetic information that establish the blueprints for living things'.

Misusing this new-found knowledge, an American veterinary scientist has 'created' a strain of 'supermice' by inserting a human growth hormone into a mouse embryo; these mice grew twice as large and twice as fast as normal mice and the human growth gene is now incorporated into their genetic make-up. Subsequent US Department of Agriculture experiments on the cloning of human growth hormones into domestic animals aim at similarly doubling the size and growth rates of these to produce, as an example, 'a cow the size of a small elephant, producing over 45,000 lbs of milk per year'.¹¹ Maybe we become desensitized to the horrors of the world being shaped for us or our children by receiving each new horror in small homeopathic doses—yet few of us can be so desensitized as not to be disturbed by the quality of the official thinking on these fundamental issues. This is illustrated by a spokesman for the US Patent Office who, in response to questions raised by Rifkin, commented 'A horse is just a temporary situation—it only represents a certain amount of (genetic) information and that now can be changed.'¹²

From the genetic manipulation of animals to the genetic manipulation of human beings is but a small step—and it was a step being contemplated by scientists as far back as 1963, when the genetic engineering of 'custom-built' human beings was being seriously discussed. A contributor to a symposium entitled *Man and His Future*, sponsored by the giant pharmaceutical firm Ciba, made the following observation: 'Clearly a gibbon is better preadapted than a man for life in a low gravitational field, such as that of a space ship ... A platyrrhine with a prehensile tail is even more so. Gene grafting may make it possible

to incorporate such features into the human stocks. The human legs and much of the pelvis are not wanted.... A regressive mutation to the condition of our ancestors in the mid-pliocene ... would be still better.'¹³ In such thinking we confront the shadows of the 'barbarian night' into which we are moving. It is against this sort of utterance that we must balance the proliferating claims by biotechnologists about the elimination of genetically-based diseases or bodily defects and the possibilities of a vast new range of pharmaceuticals to promote human and animal well-being. Balance too, the talk about 'creating life in the test tube' with the reality of an epoch when wars, preparation for wars and mass starvation are destroying yearly millions of lives 'created by the antiquated process'.

Manipulation and Political Power

As Rifkin has noted, the potential of these latest aberrations of a science which has cast itself free from its old ethical moorings has not been lost of those who would shape for us new and more subtle forms of political control. Among these are the sociobiologists who, updating the theories of Hitler, 'speak eloquently to the vision of a new order, one in which humanity takes on the task of redesigning itself in order that it might, in turn, redesign the world in which it lives.'¹⁴ He emphasises the menacing political implications of this thinking: 'Segregating individuals by their genetic make-up represents a fundamental leap in the exercise of political power. In a society where the individual can be manipulated and constrained at conception by direct design of the blueprints of life, political power becomes more absolute and human freedom more elusive.' And who will arrogate to themselves the awesome decision as to which genetic qualities are to be cultivated and which are to be 'engineered' out of existence?¹⁵ Who indeed has the right to reduce the whole of Creation to no more than one vast laboratory in which some geneticist or microbiologist may demonstrate at will his profit-spinning and power-addicted sophistication?

But we will later comment on the basic issue here involved—that of the whole direction of modern science and of the extent to which everything that can be done should be done.

Nowhere is the invasion and perversion of science (and of many of its practitioners) by powerful interests better illustrated than in the military field. The military leaders of the superpowers swiftly realised the potential of what could become a tool of mass destruction rivalling nuclear weaponry, and one that could be developed at a fraction of the cost. In 1984 the *Wall Street Journal* ran a series of articles on the Soviet programme of biological weaponry; meanwhile, expenditures by the US Defense Department on biological research increased by 59% between 1980 and the end of 1983.¹⁶ However, a report in the *Guardian* indicates

that US interest in this form of warfare dates back to the late 1960s. This report, by the Medical Correspondent, cites the testimony of the Defense Department to a Washington Appropriations Committee in 1969 that 'within the next five or ten years, it would probably be possible to make a new infective micro-organism which could differ in certain important respects from any known disease-causing organisms. Most important of these is that it might be *refractory to the immunological and therapeutic qualities upon which we depend to maintain our relative freedom from infectious disease*'¹⁷ (emphasis added).

A science which fashions this new and deadly arms race with genetic engineering technology is severing its lask links with that nobler and traditional vision of science as an exploration of *gesta Dei per naturam*....

Biotechnology and Society

One of the basic conclusions reached by the seminar on biotechnology sponsored by the Dag Hammarskjöld Foundation was that biotechnology, like any other technology, 'is inextricably linked to the society in which it was created and will be as socially just as its milieu. Therefore we conclude that in the current world this most powerful new technology could serve the interests of the rich and powerful rather than the needs of the poor and powerless.'¹⁸ This danger is illustrated by two recent developments—those of the genetically engineered growth hormone bovine somatotropin and of the engineering of new plants or natural product substitutes. The first of these is likely to be of major importance in the developed societies of the North, the second will have its major initial impact on the peasant societies of the third world. Because of this geographical contrast, as well as because of the differences in technology, it is useful to consider these two developments separately.

Engineered Hormones and Farming in the North

The use of the newly engineered hormone bovine somatotropin will, it is claimed, increase milk yield in the North by 20 to 40% and increase feed efficiency by 10%. The hormone, sometimes called bovine growth hormone or BGH, is produced naturally in minuscule quantities in the cow and is one of the factors regulating milk production. The gene for this has been isolated and transferred to ordinary bacteria cells. Using bioengineering techniques 'the altered bacteria can be mass produced and the growth hormone (produced by the bacteria) can then be isolated and purified for large-scale commercial use.'¹⁹ Like the new seeds on which the Green Revolution was based, however, it is 'only one part of a sophisticated capital-intensive package, which will require substantial long term investment.'²⁰ This investment will include facilities for

computerized monitoring to optimize feed nutrient levels and controlled environments which will reduce the impact on already stressed animals of abnormal weather conditions.

In the USA the 'need' for this increased investment may, it is estimated, force some 25 to 30% of the smaller dairymen off the land as increased production of milk forces prices down. Moreover, the number of dairy cows in the USA will drop 30 to 40% with the wide adoption of the hormone, so what we are likely to see is an increasing concentration of production on the larger enterprises which have greater access to capital. Most of the work on the hormone has been carried out on Holstein dairy cows and its future use will almost certainly lead to an accentuation of emphasis on this breed; this will lead to a dangerous narrowing of the genetic base of the industry and the loss of minor breeds possessing qualities such as hardiness or better roughage conversion which may be important in future breeding programmes (we may see here another parallel to the Green Revolution in which the 'pushing' of a limited range of carefully selected crops had led to genetic erosion—the loss of potentially valuable species on an alarming scale.)

All these developments promise increasing profits and power to the handful of giant pharmaceutical firms which are developing the hormone and to the large and more highly capitalised farming enterprises, at the cost of the small farmer. They are developments which pose also wider non-commercial issues. There is the underlying ethical problem posed by the increasing reduction of the dairy cow to little more than a milk-producing machine. There is the uncertainty as to the impact on human health (the Scottish Milk Marketing Board has come out against BGH milk). Above all, there is the problem of the morality of investing so much capital and effort in attempting to increase production in an industry which, throughout the West, is already staggering under its burden of surpluses rather than in attempting to devise some means of making existing surplus production²¹ available to the hundreds of millions who are undernourished or starving.

Other growth hormones are being developed by the biotechnological industry for beef cattle, pigs and poultry; these will pose the same problems as BGH.

Green Revolution to Gene Revolution in the Third World

At a time when many of the peasant societies of the South are still reeling from the unforeseen consequences of the Green Revolution they are being confronted by a new crisis posed by the impact of a biotechnology which aims to redesign the plant world. In Pat Roy Mooney's phrase, they are moving from the Green Revolution to the Gene Revolution.²²

We have been told much in recent years of the success of the North in expanding cereal production (even though much of the expansion has

been at the cost of small producers and we seem unable to devise mechanisms which would make it possible for the world's hungry to benefit from this expansion). We have been told less of the contribution of the South in providing the new plant strains (e.g. of maize) which were important in the expansion of production. With the advent of biotechnology the trend is away from the transfer of plants for hybridizing towards 'the transfer and safe storage (in gene banks) of germplasm essential to the new agricultural revolution offered by genetic engineering.'²³ For, if the North is 'grain-rich', the third world is 'gene-rich', as most of the world's Vavilov Centres—the areas of great plant diversity where most of our basic food plants originated—lie in the tropical and subtropical lands of the globe. The contribution of these germplasm resources to the development of agriculture in the North is illustrated by the conservative estimate that the United States alone has benefited to the extent of several billion dollars from such transfers. Once acquired, these genetic resources may be 'engineered' into new varieties of plants, both food crops and industrial crops. They may then be patented and this life form becomes the property of the transnational company that 'developed' it.

The third world is in danger of losing in several ways. First, while some 92% of the world's germplasm is estimated to be held by gene banks in the North, 'enormous losses' of irreplaceable germplasm have been occurring in such banks.²⁴ Secondly, the 'pushing' of new hybrids leads inevitably to genetic erosion i.e. the loss of many old and potentially valuable seed strains which pass out of cultivation. Thirdly, since the hybrids do not breed true, the peasant cannot save seeds but must buy fresh hybridized seed each year—to the obvious profit of the firm producing the hybrid. A fourth danger which has emerged in recent years with the increasing takeover of the seed industry by chemical and pharmaceutical firms is the dovetailing of pesticide and seed research programmes and the breeding of plants less for nutritional value than for herbicide or pesticide resistance. And the third world is endangered not simply because an increasing proportion of its food resources is controlled by the North, but because this control is exercised by a small handful of giant firms whose sole criterion is profitability and which are accountable only to their shareholders. The third world's growing awareness of this potential vulnerability of their agricultural systems is illustrated by Pat Mooney's comment that 'their diplomats in Geneva and Rome have been saying "Give us this Day our Daily Bread" must not become a prayer to Shell Oil.'²⁵

The development of bioengineering substances threatens a far more massive devastation of third world peasant societies than did the development of chemical substances. These new substances include thaumatin, which is 100,000 times sweeter than sugar and which has been

developed by bioengineering from a West African plant; such a substance obviously threatens the livelihood of tens of millions of cane-producing peasants. Tissue culture of oil palm can increase yields by 500%, leading to 'a glut on the vegetable oils market and reduced prices for the producers of all oils'.²⁶ And, given the costs and management skills involved, these new palms are likely to be estate grown, thus displacing millions of peasants in West Africa and Southeast Asia. A third range of crops includes bioengineered flavours, fragrances or medicinal plants for which the total market is estimated at twelve billion dollars yearly; today 'major companies are currently exploring the possibility for factory production of cinchona (Boehringer Mannheim for malaria drugs), vanilla (the entire industry is involved and commercial production is expected by 1989) and cocoa (Nestlé, for cocoa butter)'.²⁷

An even greater threat is posed by the work on genetically altered viruses. It has been difficult for scientists to test these in the countries of the North. Under these circumstances 'venture capitalists ... frustrated with the delay in windfall profits predicted at the turn of the decade' have turned to the countries of the third world to test their products. The testing of a genetically-altered rabies virus in the Argentine by an American group illustrates this danger; it was possible because US regulations permit testing in other countries—and it came to light only after the tests were complete. Clearly 'there is an urgent need for an international agreement on bioscience testing and for advice on national laws in order that the third world not become the North's guinea pig for genetically-altered organisms.'²⁸

Beyond the Search for Profit and Power

Against the background of the developments described here and the threat they pose not only to humanity but to all those living things with which we share the earth, the prophetic observations of Lewis Mumford, made almost two decades ago, acquire an immediate relevance. He was one of the few who recognised the potential distress and derangement which might be caused by a 'surfeit of inventions', and that the inordinate growth of science and technology could 'become increasingly irrelevant to any human intent whatever, except that of the technologist or the corporate enterprise: that, indeed, as in the form of nuclear or bacterial weapons, or space exploration, it may be not merely coldly indifferent but actively hostile to human welfare.' A sound and viable technology and one related to human needs must, he saw, involve 'deliberate regulation and direction, in order to ensure continued growth and creativity of the human personalities and groups concerned'. Such regulation and direction, based on human values, 'must govern our plans in the future, as indefinite expansion and multiplication have done

during the last few centuries.’²⁹

The motivation of this ‘indefinite expansion’ has been—and continues to be in today’s biotechnology revolution—the quest for profit and power. Until this is recognised and ethical values put in their place the whole of humanity will remain under menace.

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- 1 Praful Bidwai: ‘Biotechnology: The Second Colonisation of the Third World’, in *The Times of India Sunday Review*, April 19, 1987.
- 2 Erwin Chargaff: *Heracleitean Fire: Sketches from a Life before Nature*, New York, 1978, p. 183.
- 3 *ibid.*
- 4 *ibid.* p. 189.
- 5 For the curious story of just how Crick and Watson went about the discovery of the role of DNA (deoxyribonucleic acid) see ‘A Quick Climb up Mount Olympus’ in *Voices in a Labyrinth* by Erwin Chargaff, New York, 1977, pp. 9–14.
- 6 *Heracleitean fire* p. 186.
- 7 Bidwai *loc. cit.*
- 8 Jeremy Rifkin: ‘The horse is just a temporary situation’; interview by Julie Sheppard in *London Food News*, No. 6, Summer 1987, p. 7.
- 9 Chakravarthi Raghavan: ‘Towards a People-oriented Biotechnology’, in *International Foundation for Development Alternatives Dossier 60*, Nyon, July–August 1987.
- 10 *ibid.* The comment was made by a Tanzanian diplomat and member of the board of the Dag Hammarskjöld Foundation.
- 11 Jeremy Rifkin: *Declaration of a Heretic*, London 1985, p. 52. The ethical aspects of such work are explored by Michael W. Fox in ‘Genetic Engineering’, in *The Animals’ Agenda* March 1987, pp. 9–15.
- 12 *London Food News*, *loc cit.*
- 13 From G. Wolstenholme, ed.: *Man and His Future*, 1963, cited by Chargaff in *Voices...*, pp. 48–9.
- 14 Rifkin: *Declaration ...* p. 72.
- 15 For the small beginnings see the report on Prof. Robert Winston’s work entitled ‘Genie in the bottle’ in the *Guardian* 13 June, 1987. As the American poet said: ‘The fog comes on little cat feet.’
- 16 Rifkin: *Declaration...* p. 57.
- 17 ‘“Aids created” claim renewed’, *Guardian* 27 Oct. 1986, commenting on the claim by a Harley Street consultant that ‘the Aids virus is a germ warfare agent created in an experiment which went disastrously wrong.’
- 18 *SUNS* (special united nations service, published by IFDA, Nyon) No. 1674, 17 March, 1987, p.3.
- 19 Rural Advancement Fund International, Brandon, Manitoba and Pittsboro, N.C., *RAFI Bio-Communiqué*, Oct–Nov 1986, ‘Bovine Growth Hormone’. 5 giant transnational companies are involved.
- 20 *ibid.*
- 21 The US Government’s stockpile is more than 3 billion pounds of dried milk and cheese, while in 1986 the government launched a \$1.8 billion programme which paid dairy farmers to slaughter their cows for export. *RAFI Bio-Communiqué*, Oct–Nov 1986.

- 22 Pat Roy Mooney: 'The Law of the Seed' *Development Dialogue*, 1983: 1—2 Dag Hammarskjöld Foundation, Uppsala.
- 23 *ibid.* p. 88.
- 24 Mooney quotes losses of 'half to two-thirds' in the gene-banks in Australia and the USA. *ibid.* p. 76.
- 25 *ibid.* p. 132.
- 26 Dag Hammarskjöld Foundation *Introductory Notes for Symposium Participants* 1987 p. 4.
- 27 *ibid.* p. 8. For the tissue culture production of vanilla and its implications for the economies of several African countries see *RAFI Bio-communiqué*, January 1987.
- 28 *Introductory Notes for Symposium Participants*, p. 12.
- 29 Lewis Mumford: *The Pentagon of Power*, London 1971, p. 128. The late Sir Martin Ryle, Astronomer Royal, was deeply concerned with the many misuses of science and technology. See his letter to the President of the Pontifical Academy of Science and the background to it: *Martin Ryle's Letter*, Menard Press, London, 1985, pp. 16—20. Particularly striking is his question: 'Should fundamental Science (in some areas now, others will emerge later) be stopped?'

Reviews

FAITH AND ETHICS: RECENT ROMAN CATHOLICISM by Vincent McNamara. *Gill and Macmillan, Dublin; Georgetown University Press, Washington, D.C. 1985.*
Pp. 225. £9.96

This is the most interesting book I have read about fundamental moral theology for quite some time. It is about a controversy which for the last few years has engaged some of the most prominent Catholic moral theologians. The controversy concerns the specificity of Christian Ethics. Stated simply, the question at issue is whether Christian ethics has any specifically Christian content. Does the Christian revelation add anything to the moral obligations which people of good will can discover for themselves without the aid of revelation? Everyone involved in the controversy agrees that Christian revelation adds specifically Christian motives to human acts, and that it gives Christian morality a specific form and context, but does it add anything to the content of a good humanistic ethic?

Though, of course, antecedents can be discovered in theological tradition, the controversy is of recent origin. For some time before the Second Vatican Council there had been calls for the renewal of moral theology. They were accepted and endorsed by the Council. The neo-Scholastic version of moral theology was found wanting in many respects, not least being that it seemed to be a purely secular morality with a mere surface dressing of Christianity; one which used the Bible, not as a genuine theological source, but as a source of proof texts. There was a call for a morality of genuinely Christian inspiration, rooted in the Bible. At first it looked as if it would be relatively easy to renew moral theology, but soon difficulties began to surface. There were problems about how the Bible could be used as a source of moral teaching, and it appeared to some scholars that, if we based our morality on the Bible, we would be unable to dialogue about moral issues of