

GENETICS AND HUMAN DESTINY

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'Man is gifted with pity and other kindly feelings; he has also the power of preventing many kinds of suffering. I conceive it to fall well within his province to replace Natural Selection by other processes that are more merciful and not less effective. This is precisely the aim of eugenics.' (Galton, 1908)

Man's centuries of search into the nature of himself and the world around him have culminated in the realization that it is within mankind's power to dominate the earth, and with time, some of the space around it, with a completeness and a mastery that had not hitherto been dreamed possible. The practical application of new scientific theories, knowledge and modern technological advances, provided man with this unique potential of control of the earth's destiny. In the last decade genetics has come to assume the status and dimensions of a new basic science in medicine. This discipline now spans the whole field of human biology, helping to intensify our understanding of the molecular basis of life processes, and so giving us the means with which to regulate life's machinery.

Julian Huxley¹ states that, 'Science has two functions: control and comprehension'. These should surely be sought in reverse order—firstly comprehension, then

*Daar is 'n woordelys van genetiese terme op bladsy 354.

control. Mankind has shown remarkable reluctance, however, to carry its understanding of certain problems to the natural sequence of control.

Two problems of paramount importance that face us today are the numbers and the quality of human beings in the world. As of yet, little is being done to guarantee prolonged survival on this planet or to ascertain whether evolution of the species (which in the previous millenium depended on natural selection and mutation) will continue.

The human population of the world is about 3,000 million at present and it is estimated that this will have doubled by the end of the present century.² This increase will place severe strains on food sources, raw materials and living space. New industrial and agricultural methods have eased the situation, but even now 'a lifetime of malnutrition and actual hunger is the lot of at least two-thirds of mankind'.³ Recent improvements have further tended to affect differentially the well-developed nations, increasing their surpluses, while the more poorly developed nations remain in a parlous state. Limiting the size of the population on any large scale is mainly a political prerogative. But the medical man must recognize that it is medical progress that has contributed substantially to the population explosion. His is thus equally the responsibility

in this pressing problem.

Birth control is widely accepted today, but a universal and easily applicable method remains to be found. Family planning and population control are being officially organized by some nations. Less than 50 years ago Margaret Sanger was jailed for publicly discussing birth control and Marie Stopes started an Institute of Family Planning in London, which was considered a public scandal. So it is that man has rapidly adapted his ideas to accept this controversial principle. The principle having been accepted, its practical application remains to be fully implemented. The cycle of population increase, poverty, consequent high birth rate and then further poverty may be interrupted by this method.

What of the composition of this burgeoning population? Preventive and therapeutic medicine have led to a vast change in the composition of the population. Many more people nowadays fall into the older age groups and constitute a formidable social, psychological and medical problem. This 'shift to the right' is being widely studied and has resulted in a whole new field of endeavour—gerontology.⁴

Old age however is essentially immediate and self-limiting. It contrasts vividly with something more subtle but yet more pernicious, where people who may have died young because of genotypic inferiority, are enabled by medicine to reach reproductive years and to disseminate and perpetuate their heritable disorder. With medicine advancing progressively against the factors of natural selection, Man will eventually be carrying a greater number of bad genes. Diabetes mellitus, congenital heart disease, mucoviscidosis and haemophilia are a few such examples. This dysgenesis of the human stock is further aggravated by rising mutation rates owing to ionizing radiation. Up to the present time attempts to manage this situation have fallen within the province of genetic counselling. The counsellor has changed from an inactive adviser to an active moderator. The role and scope of the counsellor in this country have been elaborated elsewhere.⁵ On the other hand, certain unexpected benefits may accrue from the presence of 'bad' genes in the population. The heterozygotic advantage of the sickle-cell trait and the possible advantage of the diabetic 'thrifty genotype' are two such examples.⁶ Such balanced polymorphisms are relatively uncommon, however.

Coincident with this change in the age/disease spectrum there is a possible change in man's intelligence spectrum. Evidence is available to show that there is a negative correlation between family size and the average intelligence of its members.^{7,8} Intelligence depends upon a polygenic hereditary mechanism. By contrast the mono-hybrid genetic disabilities in man, such as mongolism, Huntington's chorea and colour blindness, to mention but a few, while severe, are relatively uncommon.

Moreover, the mechanized automation of our modern world has increasingly displaced the demand for unskilled (low-IQ) labour and has created a vacuum at the upper end of the scale for those better endowed. As with birth control (of numbers) that went before, quality control will doubtless meet with fevered denunciations and much prejudice.

Dobzhansky outlines the issue, the 'to be or not to be': 'The vital issue is whether mankind can rely on "normal" biological forces for maintenance and improvement of its genetic patrimony or whether man will have to take it upon himself to control and direct his own evolution as he will see fit in the light of his knowledge, wisdom and ethics.'⁹

How can we direct and control our own evolution? How can we improve the 'genetic patrimony'? Eugenics, which Huxley defines as 'the progressive genetic improvement of the human species',¹⁰ does this in two ways which have been termed negative and positive. Negative eugenics concerns itself with the application of genetic counselling, marriage guidance and voluntary sterilization with the limitation of dysgenesis. As a philosophy, negative eugenics has made some impact by weight of advice alone. There is, of course, no legal machinery whereby either marriage or the procreation of children can be restricted for eugenic reasons. At the individual level, the counsellor merely states the chances of manifestation of a particular dysgenic trait and it is left to the couple involved to decide whether to marry and to have children. The last decade has been coloured by significant advances in biochemical genetics and cytopathogenetics. Following on this, the very concept of eugenics as such almost fades in the bright light of molecular therapy. Far from being an inactive adviser, the counsellor in many instances, therefore, converts to the status of active moderator.⁵ Positive eugenics is concerned with the encouragement of the development of such traits as higher intelligence, which are considered desirable. Again, the weight of advice of the counsellor would be in favour of those who are in some way gifted or exceptional having large families. The creation of a socio-economic milieu conducive to such a policy, would equally be a part of positive eugenics.

Artificial insemination by donor (AID) has proved both practical and acceptable to humans, though much social and religious suspicion and resistance remain to be overcome. Today it is not only possible to employ artificial insemination using male sperm, but also female ova. Thus it was that fertilized ova from English sheep were implanted in the uteri of rabbits and flown to South Africa, where the ova were transferred to the uteri of South African sheep, which in due course bore English lambs. This experiment cogently testifies to the practicability of Huxley's prediction in his 1962 Galton lecture,¹¹ that married couples will indeed be able to select the genetic heritage of their children by using donor sperm and ova from banks. It is possible to visualize that the fertilized ovum could then be foster-mothered. In this way there is envisaged a diversity of excellence in the population.

Many will argue that such a method would be unacceptable to human couples. Much the same was said before about birth control, which has rocketed to world-wide use in so short a time. As Huxley points out,¹¹ 'truth, in fact, prevails though its prevailing demands time, public opprobrium of the self-sacrificing pioneers at the outset, and public discussion backed by massive dissemination of facts and of ideas to follow'. Such a system voluntarily practised would ensure that the directive of these eugenic trends lay in the hands of enlightened individual couples rather than in those of a central controlling body. While

thus attempting to unravel the tangled skeins of tomorrow, it seems likely that our deepening understanding of the genetic code and of gene action will become precise enough for the genetic destiny of the fertilized ovum to be favourably influenced by scientific means. It will therefore not be all-important what sperm blends with what ovum.⁵

Sir Julian Huxley divides evolution into three phases: *cosmic* (inorganic evolution of the planet from its formation), *biologic*, and finally *psychosocial*.¹² In this final phase, 'the struggle for existence has been replaced by what might be termed the striving for fulfilment'. Here, experience, knowledge and culture are transmitted from one generation to the next. Thus it is that we inherit not only a genetic constitution, but also the accumulated experiences of the past, which we carry into the present and future, so modifying these. Even the most circumscribed study of human activity in this century will convince us that man's relationship with man is urgently in need of repair. The trailing social sciences need to stride out to catch up with the rapid advance of the physico-biological sciences. Psychosocial evolution must be fully understood and then, in sequence again, more fully controlled.

One might conclude that man's continued advances will occur at the intersection of the following disciplines: contributions coming from positive eugenics in terms of selective reproduction in the widest sense, from manipula-

tion of molecules and genetic surgery, and from the elaboration and implementation of the psychosocial concept.

Indeed, as J. R. Oppenheimer states, 'we live in an unusual world, marked by very great and irreversible changes that occur within a span of a man's possessive life. We live in a time where our knowledge and understanding of the world of nature grows wider and deeper at an unparalleled rate, and where the problems of applying this knowledge to man's needs and hopes are new, and only a little illuminated by our past history'. We, as humans, must take the challenge: and we, as medical men, who have created many of the problems of today, must be in the forefront, risking the darkness of tomorrow rather than basking in the light of yesterday.

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