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## Fruit from the Tree of Knowledge

Twenty years ago today, a group of scientists watched a mushroom cloud ascend. They had discovered knowledge from which had come a power that would shape much of man's destiny. As the significance of the release of nuclear energy became understood, qualms arose in the minds of those who had participated in making the device possible. For the briefest of moments atomic scientists might have had some influence in decisions with respect to the use of their creation, but soon control resided elsewhere.

Now science is producing the basis for other great developments, the consequences of which are likely to overshadow those of atomic energy. The new potentialities were phophesied by Aldous Huxley shortly after the first nuclear explosions. He said, "The release of atomic energy marks a great revolution in human history, but not . . . the final and most searching revolution. The really revolutionary revolution is to be achieved, not in the external world but in the souls and flesh of human beings."

We have been provided with a glimpse of the progress of that revolution in a recent book edited by Tracy Sonneborn, *The Control of Human Heredity and Evolution* (*Science*, 18 June). The volume is a lucid record of a symposium attended by outstanding geneticists who reviewed advances in their subject and discussed possible applications.

Knowledge of genetics is evolving rapidly. The basis of inheritance and the mechanisms by which the genetic code is transcribed are fairly well understood. Progress in studies of microorganisms has been especially fast. It is possible to alter the genetic makeup of bacteria in an increasing number of precise ways. Eventually many applications of biological engineering to microorganisms will be made. Controlled laboratory change of human genetic DNA seems at the moment some distance off. However, the quality of the research talent available makes further dramatic advances inevitable. Two applications have been described as being almost feasible. One is control of the sex ratio in humans. A second is the production of parthenogenetic offspring.

At present the most practical means of controlling human heredity and evolution is that advocated with evangelical zeal by H. J. Muller. He proposes the establishment of sperm banks of germ cells derived from outstanding persons. Professor Muller is optimistic about the likelihood of general acceptance of his scheme. He says, "With the coming of a better understanding of genetics and evolution the individual's fixation on the attempted perpetuation of just his particular genes will be bound to fade. . . . [He] will condemn as a childish conceit the notion that there is any reason for his unessential peculiarities, idiosyncrasies, and foibles to be expressed generation after generation."

Not all the participants at the symposium were so optimistic that the new knowledge of genetics would be applied in an idealistic manner. R. D. Hotchkiss, commenting on recent developments in changing DNA constitution, said, "Many of us feel instinctive revulsion at the hazards of meddling with the finely balanced and far-reaching systems that make an individual what he is. Yet I believe it will surely be done or attempted. The pathway will . . . be built from a combination of altruism, private profit and ignorance."

I agree. Geneticists will create new knowledge and will have high ideals for its proper application. In practice, power to apply that knowledge, as was the case in atomic energy, will come to rest in other hands.

—PHILIP H. ABELSON