

When it comes to cloning, social science has to catch up with genetic science.

By ALAN B. KRUEGER

Published: March 1, 2001

THE field of genetics is moving at mach speed. In January, an international team of doctors announced plans to clone a human within 18 months. In February, two teams of researchers published a map of the human genome. While Wall Street frets over whether the discovery that the genome consists of "only around 30,000 genes" will limit the market value of genomics companies, the potential impact of genomics on the economy and society runs much deeper. Most fundamentally, cloning and genetic engineering could change the distribution of characteristics in the population.

By most accounts, the remaining technical hurdles are about to be cleared to make human cloning feasible. Cloning is a prerequisite for genetic engineering, the process of altering or adding genes to an embryo. If the experience of earlier reproductive technologies like in vitro fertilization is a guide, the marketplace -- not government regulation or prevailing ethical norms -- will determine who avails themselves of cloning services. At an estimated cost of about \$250,000 a clone, market forces loom large.

Although it ventures into the wilder realms of science fiction to ponder the effect all this will have on the population, some biologists and economists have begun to do just that.

The Princeton molecular biologist Lee M. Silver weaves a scenario in his book "Remaking Eden" (Hearst Books, 1997) that makes Malthus look like an optimist. If left to the marketplace, he argues, there is a real possibility that genetic engineering will lead to a two-class society, populated by well-off, genetically engineered "GenRich" individuals whose parents could afford genetic engineering, and impoverished "Naturals," conceived the old-fashioned way. He also foresees overpopulation, and the two classes splintering into distinct species, with the GenRich viewing Naturals much the way humans now view chimpanzees.

To many economists, Professor Silver's dismal forecast is, well, too dismal. Gilles Saint-Paul of Toulouse University has written a provocative paper, "The Economics of Human Cloning," that explores the impact of cloning if people seek it for a purely selfish reason: to capture part of the income earned by their clone. People also derive pleasure from having biological children in his model. He predicts that the most talented people will be cloned and the least talented women will be hired as surrogate mothers. After several generations, the distribution of income would become more nearly equal because fewer women would be willing to be surrogates at the market price.

Eventually, cloning produces a classless society in which demand for cloning disappears because everyone has high-ability genes.

The reason for this optimistic forecast is that economists tend to think prices eventually adjust in response to changes in supply or demand.

Suppose the work force consists of low-ability individuals (burger flippers) and high-ability individuals (entrepreneurs), who perform complementary tasks. If someone like Ray Kroc, McDonald's founder, is cloned dozens of times, increasing the supply of entrepreneurs, there would be a flood of fast-food restaurants, depressing the profit of entrepreneurs and increasing the demand for and pay of burger flippers. Market forces would place a check on the

exploding income gap.

Whatever the impact of cloning, it appears researchers are on the verge of learning much more about the genetic determinants of health and other life outcomes than their social and environmental determinants. This imbalance is unfortunate -- even dangerous -- because, as Professor Silver observes: "Environment and genes stand side by side. Both contribute to a child's chances for achievement and success in life, although neither guarantees it." Moreover, even with the mapping of the genome, the molecular biologist Shirley Tilghman of Princeton says we are still in the Dark Ages when it comes to understanding the combinations of genes that contribute to intelligence and personality.

Environmental factors may be overlooked in a rush to develop drugs that are aimed at particular genes -- even though environmental changes like preschool attendance or pollution abatement may be more cost-effective, more ethically acceptable and sometimes a prerequisite for genetic-based cures to work.

That environmental factors like education matter for economic outcomes is clear. For example, among identical twins -- who are more alike genetically than clones would be because they receive the same mitochondrial DNA from their mother's egg -- the twin with more education tends to earn a higher salary.

True, incomes are more highly correlated between identical twins than fraternal twins, suggesting that genes affect income. But the correlation is far from perfect and not all that much greater than for fraternal twins, which suggests that environmental factors are important.

Similarly, a study of 45,000 pairs of Scandinavian twins published in *The New England Journal of Medicine* last year found that among pairs of male twins, if one identical twin was diagnosed with cancer, there was a 29 percent chance that the other was, too, while if a fraternal twin was diagnosed with cancer, his twin had a 22 percent chance.

Although such contrasts are fraught with problems -- including the possibility of more similar environments for identical twins, a limited range of environmental differences, and interactions between genes and the environment -- findings like these do suggest that environmental factors and luck are the main determinants of one's economic fortunes and health.

Apart from education, however, there is little concrete evidence on the environmental factors that contribute to economic success. And most research on which education approaches work best for different types of students, and why, remains in the Dark Ages.

Researchers are also in the dark as to why health outcomes are so much better for those with higher-status jobs, as was found in the White Hall studies of British civil servants.

To address the imbalance between the state of knowledge in genetics and the behavioral sciences, Dr. Jack Stenner, chief executive of MetaMetrics Inc. in Durham, N.C., proposes a Human Phenome Project -- a concerted national effort to map the ways in which genetic and environmental factors interact to produce life's outcomes. After having financed much of the research that enabled scientists to map the human genome, maybe the National Institutes of Health could use some of its proposed \$2.8 billion budget increase to begin this effort.