

Molded by our genes

The Impact of the Gene: From Mendel's Peas to Designer Babies

By Colin Tudge

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In *The Impact of the Gene*, Colin Tudge guides the reader through the most significant breakthroughs in genetics to persuade us that by understanding how genes influence our behavior, we can design better strategies for the survival of our own (and other) species. The reader is first presented with a cogent description of the foundations of modern biology: the discovery that characteristics of an organism can be passed on to its progeny (courtesy of Gregor Mendel). This is followed by a relatively simplistic overview of the nature of the gene and Darwin's brilliant contributions to evolutionary theory; subsequently, Tudge provides an introspective discussion of genetic determinism and the ethical considerations of molecular cloning. He presents a narrative that should convince any critical reader that genes influence behavior, that natural selection probably operates at the level of the gene pool rather than the individual (the 'selfish gene') and that the behaviors observed in a species reflect past adaptive mechanisms. Although in this case, Tudge is preaching to the converted, I found his arguments extremely compelling.

Although he claims that the book has focused on Gregor Mendel, this is neither the strongest nor the most riveting aspect of his work. In fact, my interest grew at the rate at which the science of genetics unfolded: slowly at first, with starts and stops, and gaining momentum when Tudge finally began to ask how we should proceed with the newly emerging genetic engineering technology. The first one hundred-odd pages detail contributions up to and including Mendel's. Tudge seems overly sensitive to others' criticisms of Mendel (specifically that the data were manipulated to achieve clear-cut 3:1 ratios for autosomally inherited genes). He goes to great lengths to convince the reader that Mendel had ample background information from previous

contributions by earlier scientists, as well as from animal and plant breeders, to know exactly how to design the experiments that yielded such elegant and pivotal information. He presents both Mendel's inauspicious academic career and the rarified atmosphere at the monastery in Brno as arguments that all the important factors were fortuitously aligned so as to promote Mendel's contributions. But, as Tudge himself admits, Mendel's contributions languished for decades; the depth of these contributions was never acknowledged during his lifetime.

Although Tudge protests too much about Mendel, his later discussions on neo-Darwinism and evolutionary psychology are intriguing. Here, he certainly has far less quantitative data to persuade the reader, but his philosophical arguments are both compelling and thought provoking. Chapter eight ('Genes Rearranged and Genes Conserved') contains a captivating discourse on the necessarily different requirements for breeding (or 'gene manipulation') for wildlife conservation compared with approaches used for improving crops and livestock. The final chapters are a coherent and extremely persuasive plea for the reader to accept that the way we have shaped our societies has been a largely unsuccessful attempt at behavioral adaptation. If we are to be morally accountable for our actions, he argues, we need to separate what we believe is the human nature that we have currently evolved (and which can only be understood in the larger context of genetics and evolution) from our instinctive morality. The latter, he wisely cautions, can be quite distinct from that espoused by traditional organized religions.

The science in this book aims to educate the middle ground: although the necessary aspects of genetics and molecular biology

are presented in a coherent and reasonable fashion, a scientist working in these research areas will be tempted to gloss over some of his narrative. Those completely unfamiliar with these topics may find his descriptions difficult to comprehend. Everyone, however, should be able to enjoy the often fascinating historical accounts of how we have come to be technically capable of and morally culpable for producing 'designer babies'. This aspect is facilitated by Tudge's dry sense of humor and his insight into the effects of cultural, religious and political environments on the approach to, as well as the interpretation of, these critical scientific questions.

Throughout the text, there is a beautiful interplay of practicalities versus ethics when considering gene manipulation. In discussing eugenics (whether to build better basketball players or a meatier pig), he succinctly points out that we must ethically address what is theoretically possible, even if it is not realistically plausible. The reader gains a true appreciation for the necessity of maintaining a diverse gene pool (with the exception of plants specifically adapted to inbreeding). Tudge also convincingly reasons that although certain genes may predispose us to specific diseases, the fact that so many genes are pleiotropic in nature suggests that these same genes might prove to be otherwise beneficial; sickle-cell hemoglobin, for instance, provides resistance to malarial infection. He implores us to accept that, because we can never completely understand the workings of all biological systems, it behooves us not to manipulate what we may not be able to control. As humans, we must make a conscious decision to take what we believe is the right and ethical path. And as Tudge has commented several times within the text, cultural mores and religious dogma can derail science and lead us to deny inarguable scientific truths.

Scientific discoveries often yield information that is horribly misused by scientists, politicians and religious leaders alike. With this book, Colin Tudge accomplishes something fairly rare: he has not only introduced us to the ethical questions thrown into prominence by the emerging technologies of molecular cloning and genomics, but has given us the tools to understand why these questions are so crucial to address. If politicians and theological leaders could be forced to read and comprehend this book, we might very well find ourselves in societies far better suited to the human species. □

