accepted without a compelling materialistic mechanism. Charles Darwin provided this mechanism in 1859.

Edward Larson does a superb of job of summarizing the immediate antecedents to *On the Origin of Species,* the emergence of evolutionary theory, and its consequences for science and society. He begins with 18th-century developments in France and England. Next, he describes the maturation of Darwin's thinking and the reaction of his allies and adversaries to *On the Origin of Species.* Natural selection faced many challenges as the 19th century ended, but none surpassed the rediscovery of genetics. Combined with the well-known lack of gradual transitions but presence of long-term trends in the fossil record, claims that mutations could produce new species in a single evolutionary leap led most biologists to reject natural selection or concede only a minor role for it in evolution. Larson interrupts his account of the theory here to take up eugenics, social Darwinism, and creationism. The history of the theory resumes with the early 20th-century synthesis of natural selection and genetics, and the emergence of population genetics and neo-Darwinian theory. The narrative ends with the recent resurgence of creationism, postneo-Darwinian refinements of selection theory, and debates related to punctuated equilibrium. The book concludes with an excellent guide to further reading.

This book is a lucid and entertaining review of the history of evolutionary thought, but I noted some omissions. The Hardy-Weinberg equilibrium and intense debate over the importance of neutral alleles in evolution are not even mentioned. Nor is the relation of punctuated equilibrium to the traditional distrust of natural selection by paleontologists explored. The synthesis of development and evolution that emerged 30 years ago is omitted. Despite these quibbles, this book is a must for evolutionary biologists. It can be used as a review for senior workers, an introduction for graduate students, and a comprehensive overview for undergraduates. I recommend it highly.

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THE EVOLUTION OF MORALITY AND RELIGION.

By Donald M Broom. Cambridge and New York: Cambridge University Press. $75.00 (hardcover); $28.00 (paper). xii + 259 p; species, author, and subject indexes. ISBN: 0-521-82192-4 (hc); 0-521-52924-7 (pb). 2003.

Francis Bacon famously remarked that "some books are to be tasted, others to be swallowed, and some few to be chewed on and digested." He did not add that some books might give you terminal dyspepsia, but then he may not have had occasion to read anything comparable to the current book under review. Donald Broom, a professor of veterinary medicine at Cambridge, has undertaken to write on a subject—the evolution of morality and religion—of considerable scientific, philosophic, and theological complexity and intellectual importance. He has produced a book that homogenizes that complexity and trivializes its subjects. This in itself might not be reason to reach for a bicarbonate of soda, but the grammatical solecisms squirming on virtually every page will induce in sensitive readers a quite uncomfortable feeling. Numerous run-on sentences slither through every chapter, and syntax is often so knotted as to strangle any coherent meaning. Perhaps the individual afflicted with multiple personalities will not flinch at the lack of agreement of nouns and their pronouns (e.g., "How can anyone believe that they," p ix), but I think only readers hardened by exposure to great quantities of freshman prose might be able to stay with the book long enough to extract any arguments or coherent theses. Arguments, such as they are, have a pudding-like ambiguity, into which are tossed large quantities of uncritically culled quotations from authors who might have said something associated with the topics at issue.

The central thesis is that morality has evolved. Exactly what is meant by morality is never made clear. This is as close as the author comes to an unambiguous assertion: "moral acts are those which confer a benefit on other individuals . . . [and] acts which are immoral are those which cause harm to other individuals" (p 140). There is no consideration of the intention of the individual conferring benefit or causing harm. So if someone intends to push you into the path of a careening truck but shoves too hard and actually saves you—should you deem him yet a good fellow? Should the Hippocratic physicians who risked their lives to bleed victims of the Athenian plague, thinking this would aid in the cure, be regarded as immoral? Nothing like these typical problems of moral philosophy trouble the conscience of the author. Is there any opposition between moral concepts of freedom and genetic notions of determined behavior? Not so as you would know from reading this book. Perhaps the philosophically acute will worry about the naturalistic fallacy of claiming that the behaviors or dispositions that in fact have evolved are the ones we ought to endorse? Broom mentions this problem in one sentence (p 195) and then deals with it by simply forgetting it. Darwin thought that we had to include notions of intention, intelligence, and reflection in constructing a theory of the evolution of morality. He recognized

that if we neglected these features of our ordinary conception of ethical behavior, we would have to regard the lower animals, which at times do act to benefit others, as moral creatures. Unabashed, Broom explicitly draws the conclusion Darwin wanted to avoid: "harming other individuals is a widespread behaviour, especially in social animals, and since refraining has some cost in most cases and there is an undoubted benefit to others, it is moral behaviour" (p 108). One wonders whether this applies to all creatures great and small.

Broom provides religion with a comparable deft analysis. He regards the concept of a deity as a way of simply encapsulating moral principles. Presumably this substitution has been produced by the silent hand of evolution: "All human societies have a propensity for religion because religion provides a valuable structure for the moral code which is valuable in all of those societies" (p 176). The Greeks of Homer's *The Iliad* had gods a plenty, whose moral behavior—abounding in duplicity, fornication, and treachery—might not be regarded as part of the "common moral code" that Broom believes characterizes all religions (p 164). But, then again, one cannot be certain from the account provided in this book.

Cambridge University Press has priced the book beyond the means of most students. A judicious decision on its part.

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Stem Cell Research: New Frontiers in Science and Ethics.

Edited by Nancy E Snow. Notre Dame (Indiana): University of Notre Dame Press. $25.00 (paper). vii + 219 p; index. ISBN: 0-268-01778-6. 2003.

Developmental biologists have long studied the first stages of life. Now medical scientists are focusing on the earliest postfertilization stages as a potentially new and far-reaching paradigm for treating many diseases. The embryonic stem cells found in the inner cell mass after the trophectoderm has formed, but before implantation has occurred, are precursors of all cells in the body. With the ability to culture human embryonic stem cells (hESCs) in the laboratory firmly established, the door is now open to direct those cells to differentiate into tissue useful for cell replacement therapy for a wide range of diseases, including diabetes, Parkinson's disease, and spinal code injuries, among others.

Many scientific hurdles stand in the way of achieving that promise. The growth factors that determine tissue lineages are still unknown, and much research into stem cell niches and the genes that control differentiation will be needed. Once hESCs can be directed to form the desired tissue, clinical trials with humans can begin to determine safety and efficacy as well as the quantity of tissue cells needed for clinical effect.

Complicating the scientific tasks are the ethical and legal controversies that swirl around the use of hESCs in research. Because those cells are obtained from the inner cell mass of blastocysts, deriving them also destroys the embryo. The main current source of hESCs are embryos donated by infertile couples who no longer need them for treating their infertility. If not used in hESC research, those embryos would be discarded. Yet persons who view fertilized eggs and embryos as persons or moral subjects with inherent rights oppose all hESC research on the ground that no innocent life can be sacrificed to better the interest of others. On the other hand, persons who view early embryos as too rudimentary in development, have no moral objection against destroying embryos, destined for discard, to be used for research or even created for that purpose; they also support efforts to expand research and realize the promise that hESCs hold for countless patients.

In the future, some embryos might be created solely to obtain hESCs for research or therapy. Indeed, creating embryos by nuclear transfer may be the most effective way to obtain histocompatible tissue for cell replacement. But doing so for the thousands or millions of persons who might benefit from such therapies will require the creation and destruction of many embryos, and will be dependent on easy access to the oocytes needed to create such embryos. Successful large-scale use of ESCs for therapy could also lengthen the average life span sufficiently to raise intergenerational resource allocation problems and questions about the desirability of extending life even further than is now possible.

Embryo research is legal in almost all states, but need not be funded or promoted by public authorities. Indeed, there is a federal law against any funding of research with embryos or their destruction. Because hESCs are not themselves embryos, the federal government may still fund research with hESCs derived with nonfederal funds. President Bush, however, has refused to fund research with hESC lines derived before August 9, 2001—the date on which he announced this policy. Only 20 cell lines now appear qualified for federal support, and none of them are suitable for clinical research because they were cultured using mouse feeder cells and thus pose a risk of viral transmission. In addition, a wide variety of hESC lines are needed to study the development of disease and uncover the events that lead from ESC to functioning organism.