BOOK REVIEWS

Owen as Strategist

Richard Owen. Victorian Naturalist. NICOLAAS A. RUPKE. Yale University Press, New Haven, CT, 1994. xviii, 462 pp., illus. $45 or £35.

Richard Owen (1804–1892), the "English Cuvier," may have been the greatest comparative anatomist of his time and, by the mid-1850s, "the most visible scientist of the British empire." His glory proved ephemeral. If not written out of history, Owen's name is barely known today beyond circles of historians of biology, by whom moreover he has traditionally been cast in the role of the reactionary arch-villain opposing Darwinian evolution theory and deservedly defeated by truth's valiant knight, Thomas Huxley.

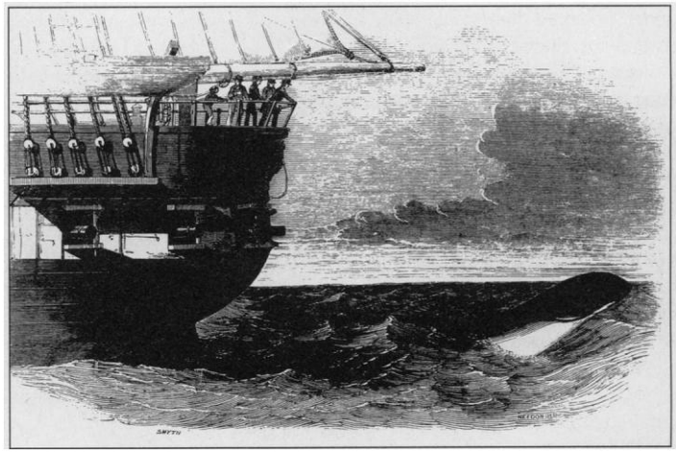
For some years now some historians have attempted to break the grip of the mythic past of Victorian science as reconstructed by the victors and to cease to act as executors of the Darwinian will. One of the results of these attempts, best exemplified in Adrian Desmond's works (*Archetype and Ancestors*, 1982, and *The Politics of Evolution*, 1989), has been the reemergence of Owen as a pivotal figure in the unfolding of evolutionary theorizing.

In this first and very substantial book-length biography Nicolaas Rupke's contention is that too exclusive attention is still being paid to the history of evolutionary thinking in the assessment of Owen. Owen's agenda as Rupke sees it was preeminently, and almost from the start of his career, institutional, aimed at anchoring English professionalized science in a museum that would establish national hegemony and imperial grandeur. Owen tried first, unsuccessfully, to lead the Hunterian Museum—where he had been appointed in 1827—away from the narrow purpose of surgical training. Finally, after decades of debates, in the course of which, in 1856, he was appointed first superintendent of the natural history collections at the British Museum, he succeeded in securing the creation of the new British Museum (Natural History) in South Kensington, finally inaugurated in 1881, the crowning achievement of his career.

Owen's conflict with the Darwinians is generally seen as a "cognitive clash" over evolution; for Rupke, the confrontations had at least as much to do with the distribution of institutional authority. Whereas Adam Sedgwick had hailed the appointment of Owen as "*Imperator*" of the natural history department of the British Museum, Darwin, Huxley, and others, first in 1858 and again in 1866, memorialized the government to oppose aspects of Owen's plans for the new museum. In fact, in the mid-1850s, even before becoming himself an evolutionist, Huxley had launched repeated public attacks on Owen's scientific achievements. Owen's famous anonymous and very critical review of the *Origin of Species* in the *Edinburgh Review* for April 1860 appears, in that perspective, as only one episode in a series of skirmishes.

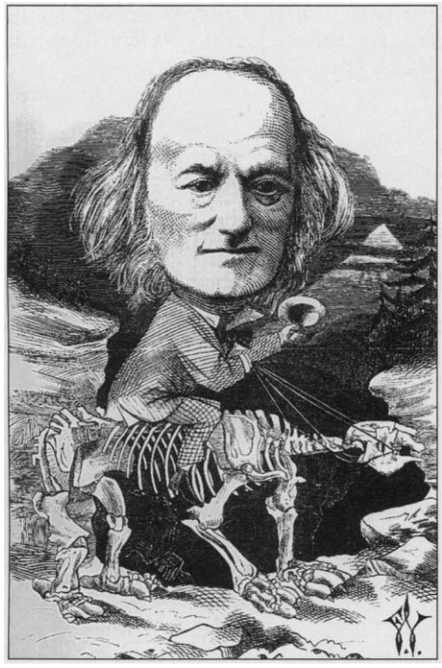
Though he differed from Darwin as to the mode of evolution, Owen was, Rupke strongly argues, a convinced evolutionist. Already in 1849 he had declared himself "in favour of the view of the origin of species by a continuously operative creational law" and had advanced what he termed the "axiom of the continuous operation of the ordained becoming of living things." However, Rupke seems to go too far in asserting that such statements proclaim Owen's "belief in the natural origin of species." Though Owen, who emphasized that "change must be sudden and considerable," hinted at alternation of generations as the model mechanism for the origination of new species, what he had in mind when he spoke of an "operative creational law" remained through and through a teleological process—so much so in fact that he did not shy at writing that the appearance of the horse had been "predestined and prepared for Man." For Owen evolutionary change, though embodied in natural beings, far from being naturalistic, remained guided by divine volition.

Contrary to Darwin, Huxley, or Hooker, Owen never was a field naturalist. He was the epitome of the museum man, and foremost a comparative anatomist. Though he started his career as a follower of Cuvier and was supported by Oxbridge scientists and patrons such as William Buckland, who saw in functionalism the way to vindicate and perpetuate the natural theology of William Paley, Owen, contrary to his mentors, paid much attention to correlations but very little to adaptations. Moreover, in the late 1840s he had become, with his advocacy of the theory of the vertebrate archetype, one of the world leaders of transcendentalist biology, a romantic idealism more akin to the Londonian scientific institutions at the time than the older Oxbridgian philosophy of functional design. The archetype was for Owen a blueprint from which species departed and exhibited specialization; such views made Owen insensitive to the populational and ecological explanation of divergence through natural selection espoused by Darwin. However, Owen never abandoned Cuvierian functionalism, which he was still defending in the 1870s. Indeed, Rupke shows convincingly that the two epistemologies, the functionalist and the transcendental, continued to be cultivated in two rather segregated bodies of his work, form not function becoming however the primary context of explanation. This change of emphasis, according to Rupke, reflected not so much a theoretical conversion as a change in opportunities for broadening Owen's institutional power base.



"A sea serpent passing under the stern of the British frigate *Daedalus*, in 1848. The credibility of sightings of sea serpents was established by following legal procedures, such as giving sworn evidence. Owen's denial of the reality of sea serpents was in essence a refusal to acknowledge the authority of the judiciary in matters of natural history." [From *Richard Owen*]

Indeed, the author throughout the book stresses how much Owen's theorizing was guided by strategic thinking. This makes more understandable how Owen could con



Richard Owen "caricatured riding a megatherium skeleton. The megatherium was a popular museum icon which helped strengthen the drive for a separate natural history museum." [From *Richard Owen*; Wellcome Institute Library, London]

currently promote conceptualizations that other naturalists at the time saw as entailing contradictory consequences. It is also congruent with Rupke's overall assessment of Owen's career: "he was less a major innovator of biological theory than an executor of the work left incomplete by great predecessors."

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Parasites on the Move

Evolution of Infectious Diseases. PAUL W. EWALD. Oxford University Press, New York, 1994. x, 298 pp., illus. $35 or £80.

Evolutionary biology has long enjoyed the status of an academically profound but socially irrelevant discipline. A few years ago, George Williams and Randy Nesse proposed to change that perception. Their 1991 article "The dawn of Darwinian medicine" in the *Quarterly Review of Biology* proposed that modern medicine would benefit by accommodating evolutionary principles. Ewald's book adheres to the same philosophy, focusing on infectious diseases of humans—the viruses, bacteria, and other parasitic microbes that collectively cause a majority of human deaths. Ewald's main theme, based on over a decade of his writings, is that human social and medical practices influence whether human diseases evolve to be lethal or benign. The premise is that if society heeds this lesson we can ultimately reduce the morbidity and mortality caused by some of our old diseases and possibly prevent the emergence of new ones.

The book uses one basic model to explain the evolution of parasite virulence. The conventional view in parasitology has been that virulence represents a non-adaptive state, characteristic of parasites that have only recently invaded a new host species. The contemporary, "enlightened," model of most evolutionary biologists, including Ewald, is different. Put simply, this model is that natural selection acts on a parasite to maximize its fitness, measured by the number of hosts infected (or the rate of infection). Virulence, that is, the harming or killing of a host, is of little consequence to the parasite if the parasite can infect lots of additional hosts in the process. High virulence is thus expected to evolve whenever a parasite is faced with an abundance of opportunities to infect new hosts.

In its most general form, the model derives from various sources in population and evolutionary biology, most formally the mathematical approaches of Roy Anderson, Robert May, and several of their collaborators. However, some extensions of it are unique to Ewald, and his main contribution is to apply it to explain why some parasites are so virulent as to cause host death whereas others are relatively benign. Most of the book explains how the evolutionary framework can be used to answer this question, and observations and interpretations of the literature are compared with the evolutionary predictions. Ewald argues that the mode by which a parasite is transmitted to new hosts is all-important to its fitness and thus to the evolution of virulence. Parasites transmitted by biting insects (such as the plasmodium responsible for malaria) or by water (such as the bacteria responsible for cholera and dysentery) are predicted to be highly virulent, while those transmitted by person-person contact (as in the case of respiratory diseases) are predicted to be of low virulence. The reason for this prediction is that parasite fitness is less compromised by a dying, immobile host when the infection can be spread by means other than person-person contact—a sick host doesn't get up and around to transmit the parasite to lots of people. Most chapters of the book are devoted to the impact of different modes of transmission on the evolution of virulence. And most contain extensive citations of the epidemiological, clinical, and evolutionary literature. Ewald's use and command of the historical literature on infectious diseases is without parallel among evolutionary biologists.

One especially interesting chapter concerns hospital-acquired infections. Ewald suggests that certain hospital practices have led to the evolution of more virulent strains of bacteria, fungi, and viruses or to the replacement of more benign strains with more virulent ones. If the hospital environment has indeed created deadlier strains of infectious diseases, then it is certainly important for the medical community to heed his message and correct the problem. Though we are not convinced that the observations uniquely support Ewald's interpretations, we do believe that his arguments and cited observations provide more than enough justification for testing these hypotheses in depth.

We share Ewald's conviction that evolutionary biology may have much to offer in the war against infectious diseases. Indeed, one may question whether the antibiotic era would have incurred its current failures so quickly if we had heeded equally simple concepts about the evolution of antibiotic resistance. This book nonetheless has a couple of limitations that will lessen its impact. One is that the different predictions are derived only superficially. The basic model is extremely simple, proposing that the evolution of virulence can be understood without reference to parasite genetics, the cellular and molecular biology of virulence, or even the interaction between the parasite and the host immune system. Yet this simplification leads to ambiguity as to why some factors enter into the prediction and others are left out. Even readers familiar with mathematical models for the evolution of virulence may have difficulty understanding some predictions (mathematical models for the evolution of virulence, which have recently become specific about the mechanisms of virulence, are given virtually no consideration in this book). The question is thus whether the predictions on which the book is based will be borne out upon closer inspection.

A second problem with the book is that, for the most part, it is a work of advocacy. It champions rather than tests the adaptationist framework, and in most cases it favors single hypotheses instead of evaluating multiple alternatives. The book does begin with a general discussion of how adaptationist thinking might contribute to medicine, focusing on fever as the ailment to be (or not to be) treated. This discussion is relatively balanced and explores many possible intricacies of evaluating such a question. For example, Ewald begins with the now not-uncommon view that fever functions to