

A review of “Biological Emergences: Evolution by Natural Experiment” written by Robert G.B. Reid, published by The MIT Press ISBN 9780262182577 (2007)

June 30, 2008 · Book Review

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Corning PA, Corning P. A review of “Biological Emergences: Evolution by Natural Experiment” written by Robert G.B. Reid, published by The MIT Press ISBN 9780262182577 (2007). Emergence: Complexity and Organization. 2008 Jun 30 [last modified: 2016 Nov 30]. Edition 1. doi: 10.emerg/10.17357.6b52000f297a1bcc829fe866bceaed47.

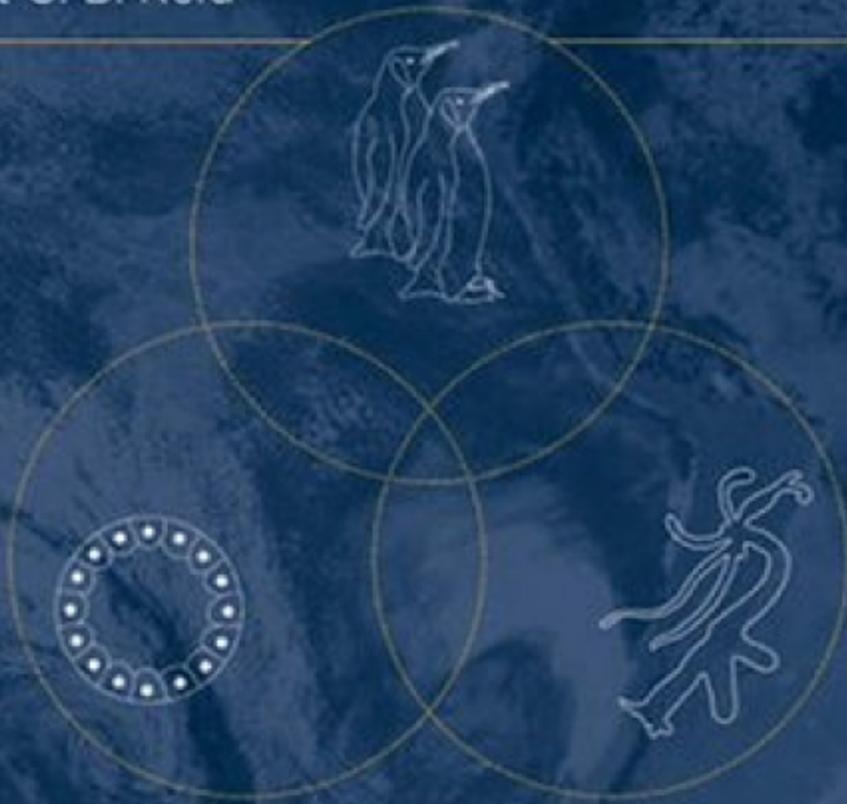
Abstract

The Vienna Series in Theoretical Biology

Biological Emergences

Evolution by Natural Experiment

Robert G. B. Reid



Introduction

Emeritus biologist (University of Victoria, B.C.) Robert Reid's magnum opus—an impressive piece of scholarship in support of a controversial thesis—demonstrates once again that, in scientific debates as in politics, the truth often lies in the middle.

There have been many new books recently that have drawn our attention to the creative role in evolution of emergent phenomena, including symbiosis, epigenetic and developmental influences, and especially behavioral innovations (e.g., the so-called Baldwin Effect). But Reid goes a giant step beyond this in his new book with the provocative claim that emergence has been the principle shaper of “progressive” evolution (meaning greater complexity, adaptability and freedom of choice), and that natural selection has mostly been an obstacle to this trend. In fact, Reid argues that “freedom” from ecological competition and

natural selection is often an important facilitator of emergence, and that the contribution of natural selection to the history of life on Earth has been confined largely to “fine-tuning” and “stabilizing” the innovations that arise from what he characterizes as an internally directed process.

In other words, emergence is where the real action is in evolution, and natural selection has been only a bit player. As Reid puts it, Darwin got it “fundamentally wrong.” Once basic organismal integrity and homeostatic capabilities evolved, evolution could go forward as an “internally driven” process subject only to the “obstructionism” of natural selection, he argues. At best, natural selection is “irrelevant” to the explanation of progressive evolution.

However radical it may sound to a Darwinian theorist, Reid’s thesis must be taken seriously, first because he marshals a comprehensive treatment of the relevant scientific literature and, second, because he has many sympathizers among a constellation of anti-reductionist, anti-neo-Darwinian, and even anti-selectionist theorists. Indeed, as Reid acknowledges and thoroughly documents, he is resurrecting a two-century-old contrarian theoretical tradition—one that has long championed the idea of autonomous, self-directed, emergent influences in evolution. This tradition can be traced back even to Lamarck (Reid speaks approvingly of Lamarck’s central idea that there is an inherent complexifying trend, or “drive” in evolution), and it includes Herbert Spencer (with his “universal law” of evolutionary complexification), as well as early emergentists like St. George Jackson Mivart, Henry Drummond, Richard Goldschmidt, D’Arcy Thompson, Lancelot Law Whyte, C.H. Waddington, Ludwig von Bertalanffy, and, more recently, Gareth Nelson, Mae-Wan Ho, Brian Goodwin, Stanley Salthe, Stuart Kauffman, John Holland, and others. (Reid also resurrects such controversial concepts as orthogenesis, saltationism, “hopeful monsters,” and even the neo-Lamarckian “inheritance of acquired characters”—though he supports only Waddington’s related concept of genetic assimilation.)

Some of Reid’s criticisms of “classical” neo-Darwinism are certainly well justified. He attacks its reductionist, gene-centered focus, its heavy emphasis on “selfish genes” and ecological competition, its claims for the hegemony of natural selection as a causal agency in evolution, its dogmatic gradualism, and its one-dimensional definition of evolution as a change of gene frequencies in abstract “gene pools.” He is not alone in these criticisms, however, and it is a straw man to paint the diverse contemporary community of evolutionary biologists with such a narrow brush. (For a detailed review of some recent trends in evolutionary theory, see my 2005 book, *Holistic Darwinism: Synergy, Cybernetics and the Bioeconomics of Evolution*)

Worse yet, Reid’s criticisms of the neo-Darwinists have a venomous, ad hominem quality to them. He speaks of “an arrogant elite” with “serious vested interests,” who “connive” to “sustain the unsustainable.” He charges that they make “spurious claims” for natural selection, which is “impoverished” and is “never” the cause of evolution. “The success of the Darwinian tradition has not depended on logic or evidence, but on sophistry, polemic, authoritarianism, me-tooism, and, worst of all, indifference” (p. 421). He calls on his readers to “escape” from this “vortex” and free themselves from “genuflection to the hypostasis of natural selection” (p. 423). (And this is only a sampler.)

So where is the middle-ground to be found in this bitter dispute? In part, it can be found lurking inside a huge blind spot in Reid’s paradigm—a rather surprising case of denial by such a deeply informed physiologist. In effect, Reid assumes away (or implicitly discounts) what I call the “ground-zero” premise of evolutionary biology, namely, that life on Earth is a highly contingent, often precarious ongoing experiment, and that survival and reproduction is an inescapable daily challenge. Life is quintessentially a “survival enterprise” in which an array of “basic needs” must continuously be served, and “differential survival and reproduction” as a result of functional (adaptive) variations (i.e., natural selection) is ubiquitous.

Reid’s core assumption, that homeostasis and organismal “integrity” create an internal “autonomy”—a protected experimental laboratory—is fundamentally flawed. All organisms are inextricably “embedded” in, and interact with, their many diverse (and changeable) environments and, moreover, depend upon an array of external resources (and conditions) to maintain themselves. They are never “free” of these environmental influences. Reid speaks repeatedly of the need for various “generative conditions” as a pre-condition for emergent evolution, but in his formulation a conducive set of environmental conditions is simply taken for granted when in fact it’s a variable. (Reid seems unaware of the fact that Darwin himself made precisely the same point about pre-conditions in *The Descent of Man*. Darwin noted that any evolutionary innovation depends on “many concurrent favorable developments” that are always “tentative”. [1874 edition, p. 150]).

Reid also seems a bit obtuse about the bioeconomics of evolution—the unavoidable costs weighed against the potential (functional) benefits. Indeed, he portrays emergent evolution as a process that is often initiated by the development of non-functional “spandrels” (to borrow Gould and Lewontin’s famous cathedral metaphor) that only become “visible” to natural selection when they miraculously metamorphose into arches. But even spandrels must be paid for. Evolution is never a free lunch.

Reid fully recognizes the functional (adaptive) properties of living systems. He speaks repeatedly of “adaptation,” and “adaptability” and “functionality” (physiology is all about functions, tells us), and “workability” and “does it work?” He also acknowledges that symbiosis is a relationship that enhances adaptation. More important, emergence is portrayed by him as a process that by its very nature improves adaptability. Emergent innovations facilitate survival and reproduction, he says. (He quotes *ad nauseam* the bowdlerized modern version of Aristotle’s famous observation in the *Metaphysics*: the whole is greater than the sum of its parts.)

Reid also recognizes that experimentation has been a fundamental feature of the evolutionary process. “Evolution by natural experiment” is the subtitle of his book, after all. He notes, for example: “In all probability there were multiple initial experiments in emergent life forms. Some were insufficiently robust to survive environmental contingencies, and some may have pooled their resources symbiotically” (p. 162). And again: “Given a choice among similar individuals, those whose wholes are slightly greater than the sum of their parts will out compete those whose wholes are slightly less” (p. 197). In other words, there will be differential survival, and failure is always an option. Nevertheless, Reid claims that natural selection has played no significant role in producing these remarkable biological properties. Natural selection is merely a “Looking Glass” reflection of a self-directed process. Natural selection is “redundant” because the causal dynamics are all internal, he asserts.

How can it be that natural selection was not a party to this trial-and-error dynamic? In fact it was, but Reid disguises its role by re-defining the term so that it refers only to (external) ecological competition and predation. In other words, natural selection was really a key player after all, but Reid hides its vital role in emergent evolution by fiat. Some of the most important members of Reid’s rogues’ gallery of neo-Darwinists (such as Julian Huxley, Theodosius Dobzhansky and Ernst Mayr) fully appreciated that internal selection (as Huxley characterized it) is an important subset of natural selection, insofar as it results in differential survival and reproduction as a consequence of survival-relevant functional variations. (Despite the sometimes flagrant rhetoric of evolutionary biologists, who should know better, natural selection is not a causal “mechanism”. It’s a metaphor—in effect a “place-holder” for the specific causes—both internal and external—of differential survival and reproduction in any given context.)

So, the question is: can the evolution of complexity be attributed to emergence or to natural selection? The answer, of course, is both. The middle-ground in this debate can perhaps be found in Ernst Mayr’s characterization of evolution as a “two-step, tandem process,” meaning (1) innovations from whatever source (from genes to ecosystems), coupled with (2) differential survival and reproduction based on the functional consequences of these innovations. Indeed, both the organism and its environment, and the interactions between them (their relationships), are intimately involved in determining the outcomes.

Reid asserts that his version of emergence theory is the dialectical “thesis” and natural selection theory is the “antithesis.” I would argue that he got it backwards. His theory of complexity in evolution is the antithesis, whereas a Darwinian theory of complexity, such as the “Synergism Hypothesis,” represents a candidate (at least) for a middle-ground synthesis. According to this theory, it is synergistic functional effects of various kinds and their consequences for differential survival and reproduction that have been the “common denominator” in the evolution of complexity over time. I characterize this theory as “Holistic Darwinism.”

After spending 434 dense and frequently repetitive pages abusing Darwin’s central idea and attributing its staying power to a misguided conspiracy, Reid ends his book with a quote from *The Origin of Species* in which Darwin explicitly recognized the multifarious causes of evolution within a framework of variation, contingency and differential success and failure:

A grand and almost untrodden field of inquiry will be opened, on the causes and laws of variation, on correlation, on the effects of use and disuse, on the direct action of external conditions, and so forth (Modern Library Edition, p. 372).

Reid would have been better served had he used Darwin’s own broad view of evolution as his starting point. I’m reminded of Voltaire’s apothegm: “It is with books as with men. A very small number are destined to play a great part; the rest are lost in the multitude.” Had Reid set for himself the “mission” (as he put it) of being a synthesizer rather than a polarizer, what certainly remains an important book could have been a landmark book. Instead, it will likely be judged as just another sad chapter in what Mayr (after Darwin) called “one long argument.”