BOOK REVIEW: STEPHEN JAY GOULD'S THE STRUCTURE OF EVOLUTIONARY THEORY

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Darwin's (r)evolutionary ideas impacted on the thinking and working of all biologists to come. In his time, genetics were not known (in fact the word "genetics" didn't even exist). With knowledge of the mechanisms of mutations and the structural basis for variability within species and populations, his concept of The Origin of Species by means of Natural Selection has been modified and adapted over the last 150 years. But has it really been changed? Did all modern science just provide add-ons to his work, with the basis remaining strong, or has evolutionary theory to be re-written?

S.J. Gould's book provides answers to these questions. Not all answers, of course, the future might still hold some surprises, but a thorough view of the "Structure of Evolutionary Theory" from before Darwin to today.

Darwin's Origin of Species is as formidable today as it was at the time of its first publishing in 1859, and it should be a compulsory read for all biologists-to-be. The wealth of examples, the eloquence of its arguments and the immense depth of its ecological consequences will still leave virtually all modern ecologists' work paling into insignificance. However, the re-discovery of Mendelian genetics, the description of the double-helix, the discovery of jumping genes, punctuated equilibrium theory, group selection arguments, and many other "recent" developments have put doubts on Darwin's ingenious ideas in some people's mind, and Gould explores them all.

At the same time, Gould summarizes his life's work and struggle in one volume. Many books has he written and many scientific papers published, some in line with, others in contrast to, generally held views on evolution. Here, he reaches for the final blow against all those, who don't believe in group selection; for the final blow: against those who doubt that punctuated equilibria are real; against those who say history will teach us nothing; and, regrettably, against non-native readers.

Any person with passion for linguistic complexity and abstrusely ancient technical terms, who owns a quiet room and has low sleep requirements, will love this book. The length of sentences is on a par with those of Thomas Mann, and his vocabulary recruits many words from the time of his idol Darwin, which my 1200 page Webster's dictionary can't explain. Sidetracks and side-lines in side sentences, brackets in hyphenated insertions in footnotes, the entire typesetter's nightmare can be found in this book.

But how about the content? Gould's opus does not read as an objective account of the history of evolutionary theory. Too often he refers to the personal history of his reasonings. He dismisses objections, e.g. the notion that Darwin allows for non-individualistic selection in his discussion of altruism. Although Gould is convincing, the reader feels patronized. The impression that we get told only one side of the story persists throughout the book, and even a huge number of citations from old to very recent sources can't calm these doubts.

The structure of the book is as follows: In the introduction Gould sets out what he believes are the three main branches of Darwinian evolution: *agency* (i.e. the level of operation of natural selection is the organism), *efficacy* (i.e. natural selection is

effective enough to drive speciation), and *scope* (i.e. natural selection can explain *all* variation in life). He then claims that all modern changes to Darwinian ideas are "auxiliaries", not modifications of Darwin's original set of ideas. He uses the first part of the book (Chapters 2 to 7) to illustrate the "history of Darwinian logic and debate" in the light of his initial claims. The second part (Chapters 8 to 12) is intended as a "revised and expanded evolutionary theory". Going through all chapters and their twists on the general line of arguments is not possible here, since already their abstract (end of Chapter 1) covers 50 pages.

It soon becomes clear that Gould has his favourite topics in this whole field, and, not surprisingly, it's these he devotes most room to. The two longest chapters (9 and 10) are treatises on punctuated equilibria and on constraints and adaptations. The two words he has created for specific evolutionary phenomena are repeated over and over again: "spandrels", i.e. inevitable, but non-functional, by-products of evolution in other characters; and "exaptation", i.e. adaptive features that arose for one purpose and later adapted to another (e.g. feathers from insulation to flight).

At the same length, but more scattered through the book, you find Gould discussing the various hierarchical levels of selection (or rather selection acting at all possible levels, from alleles to genes to individuals to populations to species to families to ...). This is an intellectually fascinating topic, with charismatic representatives on both sides, with a strong lineage from Lamarck to Dawkins (an opponent of multi-level selection).

Maybe it is just as well that the book is so opulent. The reader needs a good few hundred pages to get into the style, and to learn to extract the relevant information while holding on to the central line. And, as with Darwin's Origin of Species, maybe the book is even better second time round. You can shed all the baggage of scientific formality and simply enjoy the writing. It might take time, but this book is clearly one of the last scientific books written in excursive but competent scientific prose, without caring much for space and didactic clarity. Moreover, the reader will be tempted to read Darwin's Origin again, with eyes opened by Gould.

Discussions on evolutionary theory will still thrive for quite some time on this book. And if you are interested in this field (and haven't read any of Gould's previous books on this topic), then let me repeat Gould's invitation (page 89): "Please read the book!"

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