

Wonderful Life by Stephen J. Gould. Reviewed by Richard Dawkins in Sunday Telegraph, 25th Feb 1990

If only Stephen Gould could think as clearly as he writes! This is a beautifully written and deeply muddled book. To make unputdownable an intricate, technical account of the anatomies of worms, and other inconspicuous denizens of a half-billion-year-old sea, is a literary tour-de-force. But the theory that Gould wrings out of his fossils is a sorry mess.

The Burgess Shale, a Canadian rock formation dating from the Cambrian, the earliest of the great fossil eras, is a zoological treasury. Freak conditions preserved whole animals, soft parts and all, in full 3-D. You can literally dissect your way through a 530-million-year-old animal. C D Walcott, the eminent palaeontologist who discovered the Burgess fossils in 1909, classified them according to the fashion of his time: he 'shoehorned' them all into modern groups. 'Shoehorn' is Gould's own excellent coining. It recalls to me my undergraduate impatience with a tutor who asked whether the vertebrates were descended from this invertebrate group or that. "Can't you see", I almost shouted, "that our categories are all modern? Back in the Precambrian, we wouldn't have recognized those invertebrate groups anyway. You are asking a non-question." My tutor agreed, and then went right on tracing modern animals back to other modern groups!

That was shoehorning, and that is what Walcott did to the Burgess animals. In the 1970s and 80s, a group of Cambridge palaeontologists returned to Walcott's museum specimens (with some newer collections from the Burgess site), dissected their 3-dimensional structure, and overturned his classifications. These revisionists, principally Harry Whittington, Derek Briggs and Simon Conway Morris, are the heroes of Gould's tale. He milks every ounce of drama from their rebellion against the shoehorn, and at times he goes right over the top: "I believe that Whittington's reconstruction of *Opabinia* in 1975 will stand as one of the great documents in the history of human knowledge."

Whittington and his colleagues realised that most of their specimens were far less like modern animals than Walcott had alleged. By the end of their epic series of monographs they thought nothing of coining a new phylum for a single specimen ('phylum' is the highest unit of zoological classification; even the vertebrates constitute only a sub-category of the Phylum Chordata). These brilliant revisions are almost certainly broadly correct, and they delight me beyond my undergraduate dreams. What is irritating is Gould's grandiloquent and near-disingenuous usage of them. He concludes that the Burgess fauna was demonstrably more diverse than that of the entire planet today, he alleges that his conclusion is deeply shocking to other evolutionists, and he thinks that he has upset our established view of history. He is unconvincing on the first count, clearly wrong on the second two.

In 1958 the palaeontologist James Brough published the following remarkable argument: evolution must have been qualitatively different in the earliest geological eras, because then new phyla were coming into existence; today only new species arise! The fallacy is glaring: every new phylum has to start as a new species. Brough was wielding the other end of Walcott's shoehorn, viewing ancient animals with the misplaced hindsight of a modern zoologist: animals that in truth were probably close cousins were dragooned into separate phyla because they shared key diagnostic features with their more divergent modern descendants. Gould too, even if he is not exactly reviving Brough's claim, is hoist with his own shoehorn.

How should Gould properly back up his claim that the Burgess fauna is super-diverse? He should - it would be the work of many years and might never be made convincing - take his ruler to the animals themselves, unprejudiced by modern preconceptions about 'fundamental body plans' and classification. The true index of how unlike two animals are is how unlike they actually are! Gould prefers to ask whether they are members of known phyla. But known phyla are modern constructions. Relative resemblance to modern animals is not a sensible way of judging how far Cambrian animals resemble one another.

The five-eyed, nozzle-toting *Opabinia* cannot be assimilated to any textbook phylum. But, since

textbooks are written with modern animals in mind, this does not mean that *Opabinia* was, in fact, as different from its contemporaries as the status 'phylum' would suggest. Gould makes a token attempt to counter this criticism, but he is hamstrung by dyed-in-the-wool essentialism and Platonic ideal forms. He really seems unable to comprehend that animals are continuously variable functional machines. It is as though he sees the great phyla not diverging from early blood brothers but springing into existence fully differentiated.

Gould, then, singularly fails to establish his super-diversity thesis. Even if he were right, what would this tell us about 'the nature of history'? Since, for Gould, the Cambrian was peopled with a greater cast of phyla than now exist, we must be wonderfully lucky survivors. It could have been our ancestors who went extinct; instead it was Conway Morris's 'weird wonders', *Hallucigenia*, *Wiwaxia* and their friends. We came 'that close' to not being here.

Gould expects us to be surprised. Why? The view that he is attacking - that evolution marches inexorably towards a pinnacle such as man - has not been believed for 50 years. But his quixotic strawmandering, his shameless windmill-tilting, seem almost designed to encourage misunderstanding (not for the first time: on a previous occasion he went so far as to write that the neo-Darwinian synthesis was 'effectively dead!'). The following is typical of the publicity surrounding *Wonderful Life* (incidentally, I suspect that the lead sentence was added without the knowledge of the credited journalist): "The human race did not result from the 'survival of the fittest', according to the eminent American professor, Stephen Jay Gould. It was a happy accident that created Mankind" (Daily Telegraph, 22nd January 1990). Such twaddle, of course, is nowhere to be found in Gould, but whether or not he seeks that kind of publicity he all too frequently attracts it. Readers regularly gain the impression that he is saying something far more radical and surprising than he actually is.

'Survival of the fittest' means individual survival, not survival of major lineages. Any orthodox Darwinian would be entirely happy with major extinctions being largely a matter of luck. Admittedly there is a minority of evolutionists who think that Darwinian selection chooses between higher-level groupings. They are the only Darwinians likely to be disconcerted by Gould's 'contingent extinction'. And who is the most prominent advocate of higher-level selection today? You've guessed it. Hoist again!

Richard Dawkins