Scenarios of Paleontology

Wonderful Life. The Burgess Shale and the Nature of History. STEPHEN JAY GOULD. Norton, New York, 1989. 347 pp., illus. $19.95.

Wonderful Life deals basically with the central significance of contingency in history and the historical sciences. Its title pays abbreviated, but appropriate, homage to Frank Capra's 1946 film *It's a Wonderful Life*, in which Jimmy Stewart's guardian angel, Clarence Odbody, averts Stewart's suicide and then, to pep him up, shows him how different life in Bedford Falls might have been without him. In so doing, Odbody demonstrates that the course of history can be mightily and unpredictably influenced by small and seemingly insignificant changes.

Gould, whose goal in *Wonderful Life* is to become an "insider's McPhee," makes the case for contingency in an admittedly roundabout way. First, he considers the history of discovery of the Middle Cambrian Burgess Shale biota; then, in a chapter that makes up nearly half the book, he contrasts the weird and wonderful animals that Walcott visualized from his studies of the Burgess Shale fossils with those reconstructed by Whittington, Briggs, Bruton, Conway Morris, Collins, and several others (including Hutchinson, Størmer, and Simonetta) from the same or similar materials. Whittington and his colleagues, of course, gradually concluded in a series of remarkable papers that many of the Burgess Shale fossils represent animals for which there is no place in a taxonomic framework based on the modern biota. In short, their work (and that of several others) suggests that a much larger number of basic body plans than now exists may have characterized the Cambrian radiation and that this early disparity, rather than having been maintained from Cambrian to present times, may have been reduced by subsequent decimation.

The long third chapter of *Wonderful Life* is followed by one in which Charles Doolittle Walcott (in Gould's view "America's greatest paleontologist and scientific administrator") is carefully dissected to expose his reasons for assigning so many of the enigmatic Burgess Shale species to otherwise familiar animal classes and phyla. In this analysis, Walcott, as a taxonomist, is seen as an advocate of the "shoehorn" and, in his role of evolutionary historian, as a devotee of the "cone of diversity." Gould suggests several reasons for Walcott's views. On the one hand, Walcott may have been too busy as a scientific administrator to have grasped the messages of the Burgess Shale biota seen by Whittington and his colleagues. On the other, he might not have been prepared socially or philosophically to accept that message, even had he perceived it. That is, Walcott was a conservative, politically and socially, and a devout Presbyterian, to whom (Gould asserts) a belief in a complete progression of life forms, from simple to highly complex, would have come quite naturally. That Walcott shared such a belief with most of his scientific contemporaries is amply documented by what he wrote. Thus the Burgess Shale biota, in Walcott's view, was composed of the simple ancestors of a few primary divisions, all represented in much greater diversity and complexity of form in the modern biota. From this, of course, the shoehorn and the cone of diversity came quite naturally.

The principal message of *Wonderful Life*, however, is embedded in a 14-page section at the end of the "Walcott" chapter entitled "the Burgess Shale and the nature of history." In that section Gould re-emphasizes the central significance of contingency in the historical sciences and identifies it as both the watchword and the lesson of the new interpretation of the Burgess Shale biota, which is succinctly summarized as "a fantastic explosion of early disparity followed by decimation, perhaps by lottery."

After summarizing in his final chapter the general patterns that illustrate contingency, Gould proceeds to examine a number of "what if's" in a fascinating attempt to see what might have happened at various stages in the history of life if the scenario had been only slightly modified.

Wonderful Life is Gould at his best. To be sure, the book is peppered with long, discursive footnotes, jammed with hyperbole, and characterized by a writing style that might be described as "elephantine levity." However, it is also suffused with hope and a contagious, uncontained excitement, which is maintained from the first sentence of the preface to the last one of the final chapter. The message, that the historical sciences differ profoundly from the others, is not new, but it cannot be emphasized too often in a world dominated by physicists and chemists, whose views of the world need not allow for historical contingency and whose generalizations may thus be based on a sampling program that is highly concentrated in space and time. The message of history is superbly conveyed in *Wonderful Life*, which is recommended reading for scientists and nonscientists of all persuasions.

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Fiberworks

Science and Civilisation in China. JOSEPH NEEDHAM. Vol. 5, part 9, Textile Technology: Spinning and Reeling. DIETER KUHN. Cambridge University Press, New York, 1988. xxxiv, 520 pp., illus. $110.

Dieter Kuhn has prepared an encyclopedic account of spinning and reeling in China as part of Joseph Needham's project to investigate science and civilization in that country. He presents the history of yarn preparation from Neolithic times to the 19th century. His account ranges from the nature of the fibers employed to the dimensions of the implements developed to the myths and customs associated with all of this. So thorough is his research, and so

Steaming of cocoons, A.D. 1313, as depicted in the treatise *Nung Shu* (Book on Agriculture), 1530 edition. In order to preserve cocoons for reeling out of season when labor and reeling apparatus were less in demand, silkworm breeders steamed them in baskets over a mixture of salt, oil, and water, shifting the baskets to control the process. If the cocoons were steamed too much the fibers softened, if too little the moths could perforate them. [From *Science and Civilisation in China*, vol. 5, part 9]