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Epistemic values in the Burgess Shale debate

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ABSTRACT

Focusing primarily on papers and books discussing the evolutionary and systematic interpretation of the Cambrian animal fossils from the Burgess Shale fauna, this paper explores the role of epistemic values in the context of a discipline (paleontology) striving to establish scientific authority within a larger domain of epistemic problems and issues (evolutionary biology). The focal point of this analysis is the repeated claims by paleontologists that the study of fossils gives their discipline a unique 'historical dimension' that makes it possible for them to unravel important aspects of evolution invisible to scientists who study the extant biosphere. The first part of the paper explores the shifting of emphasis in the writings of paleontologists between two strategies that employ opposing views on the classical positivist and physicalist ideal of science. The second part analyzes paleontologists' claims of privileged access to life's historical dimension in a situation where a theoretical upheaval occurring independent of the epistemical problem at hand completely shifts the standards for evaluating the legitimacy of various knowledge claims. Though the various strategies employed in defending the privileged historical perspective of paleontology have been disparate and, to an extent contradictory, each impinges on the acceptance of a specific epistemic ideal or set of values and success or failure of each depends on the compatibility of this ideal with the surrounding community of scientists.

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1. Introduction

What role do epistemic values play in science? This question has been a focal point for analyzing scientific practice for more than sixty years. Epistemic values are the criteria by which scientists evaluate whether their findings may be considered to have a sound basis, and to distinguish good science from pseudo-science. As criteria for good scientific conduct, epistemic values purportedly serve an important function in the thinking and actions of scientists and permeate every aspect of the scientific process. Analyses of these normative aspects of science have typically been based on an understanding of epistemic values as being a property of scientific *collectives*.[1] The theoretical framework that has been proposed based on this community level perspective includes such diverse constructs as the *CUDOS*; the *Disciplinary Matrix*; Daston's *Moral economies* or even Ziman's descriptions of the *PLACE norms* for post-academic science.

This is not to say that there has been no recognition of a level of individual choice in the establishment of preferred epistemic value within a scientific community. Perhaps the most important came from Kuhn in his 1969 *Postscript* to the *Structure of scientific revolutions*. Here Kuhn argued for a strong element of individual idiosyncracy in the application of epistemic values when he noted that values such as accuracy or consistency could be understood, applied or prioritized differently among the members of a scientific community. However, defending himself against charges that his position led to a completely relativist and irrational view of science, Kuhn also argued that because these values were shared by the scientific collective, they still had a significant function as guiding principles even when they were not used in a unanimous way. The fact that epistemic values could be applied in various ways did not mean that they could be applied in any manner chosen by the applicant.

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[1] A far from exhaustive list of important texts on this subject include Merton (1942); Kuhn (1996 [1969], 1977); Laudan (1984); Daston (1995); Ziman (2000).

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Though recognizing the important contributions of collectivist approaches to the understanding of the dynamics of epistemic values in scientific practice, this paper takes its departure in the relation between a collective's shared epistemic values and the idiosyncrasies of the individuals who apply them as means to various ends. It explores the role of epistemic values in the context of a discipline (paleontology) striving to establish scientific authority within a larger domain of epistemic problems and issues (evolutionary biology). This analysis focuses on the repeated claim by paleontologists that the study of fossils gives their discipline a unique 'historical dimension' that makes it possible for them to unravel important aspects of evolution invisible to scientists who study the extant biosphere. Focusing primarily on papers and books discussing the evolutionary and systematic interpretation of the Cambrian animal fossils from the Burgess Shale fauna, various strategies of implanting this historical perspective will be explored. As will be clear the strategies employed in defending the privileged historical perspective of paleontology are disparate, and to some extent contradictory. However, these strategies share a common thread: each of them impinges on the acceptance of a specific epistemic ideal or set of values, and their success or failure depends on the compatibility of this ideal with those of the surrounding community of scientists.

This paper is divided in two major parts. The first part ('Paleobiology between nomothetic physicalism and idiographic independence') explores the shift in emphasis within the writings of paleontologists between two strategies that employ opposing views on the classical positivist and physicalist ideal of science. One of them follows an 'appeasement policy' towards this ideal, and attempts to demonstrate that palaeontology has its own set of general 'historical' principles and laws. The other strategy outright reject this ideal, arguing instead the special 'historical perspective' of paleontology lies in its focus on unique historical coincidence.

The second part of this paper ('Neontology and the historical dimension in systematic crossfire') analyzes a polemic related to paleontologist's claim of privileged access to life's historical dimension in a situation, where a theoretical upheaval (in this case within systematics), occurring independently of the epistemic problem at hand, completely shifts the standards for evaluating the legitimacy of various knowledge claims.

2. Paleobiology between nomothetic physicalism and idiographic independence

The discipline of paleontology has traditionally led a difficult life in evolutionary biology. Darwin saw the virtual absence of intermediate forms as a problem for his theory of descent and he dedicated an entire chapter in *On the origin of species* to this problem, arguing that the available fossil remains were too insufficient to provide a reasonably accurate picture of biological evolution. Since then, this view has troubled palaeontologists who attempted to join discussions in evolutionary theory.[2]

Another stumbling block for paleontogists wishing to enter evolutionary debates has been the classic positivist ideal of science, which played an important role in the unification attempts within biology that ultimately led to the establishment of the modern synthesis.[3] There are several historical sources for this ideal, which can be found more or less explicitly in papers and other forms of public statements from scientists and philosophers of science in the nineteenth and twentieth centuries. It forms in part the attempts of Auguste Comte to create the framework for a unified science, where the common goal (whether in physics or sociology) is the creation of general laws, and his famous hierarchy of the sciences, where physics was hailed as a discipline generating the highest degree of certain knowledge. Perhaps the clearest articulation of this ideal came from Kant, for whom the physicist Isaac Newton epitomized the exemplary model for how science should be performed, and accordingly declared that any doctrine about the natural world only contains true and valuable science to the extent that is contains mathematics. Similar claims can be found in the writings of physicists, perhaps most notoriously in the famous remark by the physicist Ernest Rutherford that there exists but one kind of science, this being physics, while the rest is 'stamp collecting'.[4]

In the classical positivist conception of the hierarchy of sciences disciplines paleontology and geology are hardly mentioned at all.[5] But there is hardly any doubt that, if asked, the proponents of this view of science would place paleontology (and perhaps geology[6]) far down the list and definitely below biology. In the controversy over the great mass extinction at the Cretaceous–Tertiary boundary, the physicist Louis Alvarez, founder of the meteorite impact theory, took every opportunity to use this hierarchy against his paleontologist opponents. In an interview with the New York Times he accordingly characterized them as 'stamp collectors', obviously hinting that their arguments were not truly 'scientific'.[7]

Lacking a prominent status as a biological discipline in its own right, palaeontologists have been compelled to view themselves as belonging to a sub-discipline of geology. Here paleontology has especially contributed to the development of methods for correlating stratigraphical layers at different localities.[8]

Since the late 1960s, a growing dissatisfaction with this situation has emerged amongst paleontologists. Several were involved in attempts to establish a stronger platform for their discipline within evolutionary biology.[9] These efforts came primarily from Anglo-Saxon palaeontologists—initially American, but later also British scientists—and they correlate in time both with a number of rather successful attempts to make palaeontology more visible in the eyes of the general public (such as dinosaur research) and with the financial cuts that hit American science under the Nixon administration in the 1970s and British natural science under Thatcher in the 1980s.[10] Being already placed at the lower end of the scientific hierarchy and, before the blooming 'dinosaur industry', with very limited commercial assets, the threat of cutting positions and funds must have been most strongly felt in paleontology and must accordingly have been a motivating factor in trying to change the status of the discipline.[11]

From a sociological perspective, these efforts can be seen as political strategies to counter the threat of budget cuts. Central in these efforts has been the claim that the study of fossils gave paleontologists a unique 'historical perspective' on life that makes it possible for them to discover important aspects of evolution that were otherwise invisible to scientists focusing on the extant biosphere. As will be clear from the following however, very different

[2] Darwin (1859), pp. 279 ff.; Stanley (1979), p. 4.

[3] See Smocovitis (1995), pp. 97–171, for a thorough analysis of the relationship between the positivistic ideal of science and the establishment of the modern synthesis.

[4] Comte (1971 [1865]), p. 24; Kant (1988 [1790]); Zammito (1992), p. 191, p. 207. Rutherford's quote about stamp collecting can be found in Blackett (1962), p. 108.

[5] In fact, in Comte's own version of this hierarchy the sequence is physics, chemistry, biology, sociology (Comte, 1972).

[6] This characterization of geology as a 'soft science' may be somewhat misleading, as geology also contains the 'harder' subdisciplines of sedimentology and petrology.

[7] Gould (1989), p. 281.

[8] Stanley (1979), p. 5.

[9] See Gould (1992), pp. 54–84, for an elaboration of this point.

[10] See Walsh (1970) for a comment on the US budget cuts during the Nixon administration and Turney (1987) for a comment on the UK budget cuts during the Thatcher administration.

[11] See Kesling (2009) for an example of the impact of budget cuts during this period for the Museum of Paleontology at the University of Michigan.