Stephen Jay Gould: The Dialectical Biologist

Wednesday 15 February 2012, by GASPAR Phil (Date first published: 15 January 2012).

Reviewed by Phil Gaspar: *The Science and Humanism of Stephen Jay Gould* . By: Richard York and Brett Clark. New York, Monthly Review Press, 2011, 223 pp. $16.95.

It has been almost 10 years since the death of the Harvard paleontologist and evolutionary biologist Stephen Jay Gould at the relatively early age of 60. Gould was not only a major figure in the life sciences, he was also one of the great popularizers of science. He wrote a monthly column for *Natural History* magazine from 1974 to 2001, generating exactly 300 essays that explained complex scientific ideas without oversimplifying them. Ten collections of Gould's popular articles, together with several other books aimed at a general audience, were best sellers, making him one of the best-known scientists of his generation. A year before his death, he was named a "living legend" by the U.S. Library of Congress.

What makes Gould of particular interest to readers of this journal is that his scientific views were informed in interesting ways by his radical politics. His parents were New York leftists, probably in or around the Communist Party in the 1930s, and he once boasted that he had learned his Marxism "literally at [my] daddy's knee." Gould's essays often revealed his interest in Marx and Marxism, even though he also made clear that his politics were "very different" from his father's, most likely referring to his own rejection of Stalinism. But Gould remained politically active for left-wing causes during his whole life, including as a member in the 1970s of Science for the People, the most prominent of the radical science organizations that emerged from the antiwar movement.

Richard York and Brett Clark have written an accessible introduction to Gould's work. They divide their book into two parts. In the first four chapters they discuss Gould's contributions to evolutionary theory and his distinctive views about the history of life. In chapters 5 through 8 they look at Gould's views about the human condition, including his critiques of biological determinism and his defense of human equality. However, as the authors point out, there is a lot of overlap between the chapters, because "Gould's ideas … are complexly integrated into a larger worldview, so that it is not easy to examine an idea or theme in isolation… [A]lthough we separate out certain themes into distinct chapters, our discussions inevitably engage the whole of Gould's worldview making the themes bleed together." (20)

As a working scientist, Gould was both the leading expert on the evolution of Bahamian land snails and one of the leading evolutionary theorists in the second half of the twentieth century. Gould made at least four distinctive contributions to evolutionary theory, all of which remain controversial. First is the theory of punctuated equilibrium, which he originally formulated with fellow paleontologist Niles Eldredge in 1972, and which proposes a non-gradual model of evolutionary change. Second was Gould's view that natural selection was importantly limited by structural constraints, with the corollary that the physical and behavioral features of organisms are not necessarily all adaptations that can be explained in terms of the functions they serve. Third is the idea that evolution is a

contingent and directionless process that is not moving to any preordained end. Fourth is the view that selection can take place not only at the level of the individual organism or the level of the gene, but can also take place at the level of groups or even entire species.

Taken together, these four themes illustrate Gould's enthusiasm for thinking about the natural world in dialectical terms — in other words, seeing it as made up of complex and dynamic interactive processes. "Dialectical thinking should be taken more seriously by Western scholars, not discarded because some nations of the second world [the former Soviet Bloc] have constructed a cardboard version as an official political doctrine," Gould wrote. "The issues that it raises are, in another form, the crucial questions of reductionism versus holism, now so much under discussion throughout biology (where reductionist accounts have reached their limits and further progress demands new approaches to process existing data, not only an accumulation of more information)."

"When presented as guidelines for a philosophy of change, not as dogmatic precepts true by fiat, the three classical laws of dialectics [formulated by Engels] embody a holistic vision that views change as interaction among components of complete systems, and sees the components themselves…as both products of and inputs to the system. Thus the law of"interpenetrating opposites"records the inextricable interdependence of components: the"transformation of quantity to quality"defends a systems-based view of change that translates incremental inputs into alterations of state; and the"negation of negation"describes the direction given to history because complex systems cannot revert exactly to previous states."

Gould and Eldredge's theory of punctuated equilibrium claims that evolutionary development isn't gradual, as Charles Darwin supposed, but takes place in concentrated bursts, followed by long periods of stasis. Gould freely admitted that he was attracted to the idea of punctuated equilibrium because of his knowledge of the dialectical theories of Hegel and Marx. "The dialectical laws are explicitly punctuational. They speak, for example, of the 'transformation of quantity into quality.' This … suggests that change occurs in large leaps following a slow accumulation of stresses that a system resists until it reaches breaking point. Heat water and it eventually boils. Oppress the workers more and more and bring on the revolution."

At the same time Gould and Eldredge suggested that the traditional, gradualist view of evolution was "the translation into biology of the order, harmony, and continuity that European rulers [in the nineteenth century] hoped to maintain in a society already assaulted by calls for fundamental social change." They added, "We mention this not to discredit Darwin in any way, but merely to point out that even the greatest scientific achievements are rooted in their cultural contexts—and to argue that gradualism was part of the cultural context, not of nature." But if Gould and Eldredge are correct, then on this point at least, Darwin has been discredited, for their argument is that he allowed his judgment to be shaped by his cultural context rather than by the available evidence.

But wasn't Gould's view also a result of cultural context and political preconceptions? Gould denied this. While his political background made him open to an idea he might otherwise have overlooked, he emphasized that he accepted the theory because of the data, not because it matched his political views. He and Eldredge first proposed the idea to explain the fact that there is little direct evidence in the fossil record for the gradual transformation of one species into another. Most species appear to remain the same for millions of years, then abruptly disappear to be replaced by new ones. If evolutionary change takes place in relatively short bursts compared to the average lifetime of a species (thousands of years compared to millions), this is exactly what we would expect, since the chances of intermediate forms being preserved as fossils would be quite small. Punctuated Equilibrium remains a controversial idea, but in *The Structure of Evolutionary Theory* published shortly before his death, Gould made a strong case that the punctuational view of evolution provides a better overall account of the evidence than gradualism. Others have suggested that Gould's

demonstration that many species remain relatively unchanged for long periods of time was his single most important scientific contribution—something that other biologists had ignored until Gould and Eldredge published their 1972 paper on the subject.

Gould's view that natural selection is limited by structural constraints represents another dialectical theme in his thought — the idea that organisms are complex wholes whose various parts cannot be understood in isolation, because they interact with and influence each other. As York and Clark note, "Gould's advocacy for recognizing the important role structural forces play in evolution is in large part a critique of the hyper-functionalism and extreme reductionism of ultra-Darwinians who identify all traits of organisms as adaptations." In a famous paper written with his Harvard colleague, and fellow dialectical biologist, Richard Lewontin, Gould argued that many features of organisms are the result of structural constraints, rather than adaptive advantage — accidental byproducts of evolutionary change, brought about because natural selection acts on existing structures. Here Lewontin and Gould were rejecting the "tendency to divide an organism into separate traits, assuming that natural selection acts on each trait individually, optimizing it." Lewontin and Gould were also rejecting the practice of many biologists to look for "just so" stories, "constructing tales of how each and every trait served some function, regardless of whether sufficient evidence existed to support these claims." (56)

York and Clark provide a nice example of one piece of research that Gould conducted to demonstrate the importance of structure. This involved the now extinct Irish Elk, which grew extremely large antlers. "After the discover of fossils of the Irish Elk, debate generally focused on ascertaining what function such large antlers had for the deer, in order to explain why they were developed." Picking up an idea that had been proposed earlier by Julian Huxley, Gould compared the body size and antler size of 81 Irish Elk and showed that "among deer, antlers grow at a faster rate than body size, so that simply increasing the body size of a deer without altering the relative growth rates of different parts will lead to an animal with very large antlers." (57) Natural selection seems to have favored larger deer, and exceptionally large antlers came along as a byproduct of increased body size, not because they had any adaptive significance themselves.

Gould's third distinctive contribution to evolutionary theory was his insistence that evolutionary development is a contingent process with no pre-ordained goal. The history of life on earth is dependent on "quirks, chance events, and unpredictable twists and turns," so that "history could have turned out other than it did." Gould rejected the metaphor of evolution as a ladder in which there is an ascent from lower to higher life forms. Instead, "Gould argued that we should see evolution as a bush, frequently branching, with some twigs dying, while others flourish—an image that suggests no overall direction or judgment of higher or lower, better or worse." (22) Gould was right to reject the idea that life must evolve along a single path and the view that human beings have somehow emerged as the inevitable outcome of this process. But it is also important to note that this does not mean there are no discernible evolutionary patterns, or that evolutionary history is nothing more than a series of accidents. Just as in human history, determinism and randomness do not exhaust the possibilities. There can be recognizable trends in historical processes even if no particular outcomes are inevitable.

Finally, Gould rejected the reductionist view of evolutionary change in which natural selection acts only on individual organisms, and the even more reductionist view—associated with Richard Dawkins and others—that selection acts only on genes. In this respect Gould was returning to the views of Darwin, who also held that natural selection could operate at higher-levels—on groups of organisms and on whole species, rather than only on individuals. Here too we see a dialectical theme—the idea "that there are emergent characteristics at different levels of aggregation, and thus evolution cannot be understood solely by examining processes occurring at the level of individual organisms or genes." (23)

As York and Clark go on to show in the second half of their book, all of the themes that are central to Gould's theoretical contributions to the study of evolution informed his discussions of the relevance (or otherwise) of the biological sciences to understanding human behavior and human society. Gould devoted a considerable amount of his time to combating scientific racism, biological determinism and other attempts to misuse biology to justify social inequality and the status quo. The claim that existing social hierarchies are the inevitable outcome of biological facts goes back to the nineteenth century, reappearing in new guises whenever it is needed to support the idea that progressive social change is impossible.

Biological determinism resurfaced in the United States as a response to the social movements of the 1960s, just as Gould was completing his PhD and becoming a faculty member at Harvard. In 1969, Arthur Jensen, a Stanford Education professor, argued that IQ differences between Whites and Blacks are genetically based and unalterable. Two years later, Harvard psychologist Richard Herrnstein claimed that socioeconomic status is a direct function of inherited intelligence and that the "tendency to be unemployed" would soon run in families just like the "tendency to have bad teeth." Then in 1975, to great media fanfare, Gould's prominent Harvard colleague Edward Wilson published his book *Sociobiology*, which argued that traits such as aggression and xenophobia are genetically based. In an article published in the *New York Times Magazine*, Wilson claimed, "the genetic bias is intense enough to cause a substantial division of labor even in the most free and egalitarian of future societies. Thus, even with identical education and equal access to all professions, men are likely to play a disproportionate role in political life, business, and science." If we attempt to create a more egalitarian society, Wilson continued, we will "place some personal freedoms in jeopardy."

Gould and other members of Science for the People responded by rejecting these ideas as simply the latest version of a scientifically bankrupt biological determinism. "The reason for the survival of these recurrent determinist theories," they wrote in a letter to the *New York Review of Books*, "is that they consistently tend to provide a genetic justification for the status quo and of existing privileges for certain groups according to class, race, or sex." Gould pointed out that there was no scientific evidence for any of these claims and that changes in human society are far too rapid to be explained in biological terms.

In opposition to determinism, Gould emphasized the enormous flexibility of human behavior.

"*The central feature of our biological uniqueness also provides the major reason for doubting that our behaviors are directly coded by specific genes. That feature is, of course, our large brain.... [M]arkedly increased brain size in human evolution ... added enough neural connections to convert an inflexible and rather rigidly programmed device into a labile organ, endowed with sufficient logic and memory to substitute non-programmed learning for direct specification as the ground of social behavior. Flexibility may well be the most important determinant of human consciousness....*

Violence, sexism, and general nastiness are biological since they represent one subset of a possible range of behaviors. But peacefulness, equality, and kindness are just as biological—and we may see their influence increase if we can create social structures that permit them to flourish."

Gould continued the critique of biological determinism in his award-winning 1981 book, *The Mismeasure of Man*, one of the best arguments against scientific racism and the idea that intelligence is genetically fixed. Fifteen years later, after Herrnstein and Charles Murray attempted to revive these ideas in *The Bell Curve* in order to provide pseudo-scientific support for slashing social spending and ending affirmative action, Gould took them on again. He issued a revised and expanded edition of his book with new material showing how Herrnstein and Murray omitted facts and misused statistical methods to reach their racist conclusions.

Gould's book is still raising sharp debate. In one chapter, Gould concluded that the nineteenth-century physician Samuel George Morton—who claimed that, on average, whites have bigger brains than blacks—had unconsciously biased his measurements of skulls from around the world. In an article published last June, six anthropologists claim that Morton got his measurements right and that Gould's remeasurement over a century later "is likely the stronger example of bias influencing results."

Was Gould himself guilty of the kind of bias of which he accused Morton? The Scientific American blogger John Horgan raises some important caveats about this critique:

"First of all, [the paper's authors] analyzed fewer than half of the skulls in Morton's collection. Second, their analysis, far from being"straightforward,"was highly technical and based on many judgment calls, as were those of Gould and Morton. The divergent results depend in part on whether to include or exclude certain skulls that could unduly skew estimates of brain sizes. Third, neither Morton nor [the new paper's authors] corrected their measurements for age, gender or stature, all of which are correlated with brain size."

Horgan also notes that one of the researchers, Ralph Holloway of Columbia University, "is obviously biased against Gould." In an interview with the *New York Times*, Holloway called Gould a "charlatan" and admitted, "I just didn't trust Gould. I had the feeling that his ideological stance was supreme."

Horgan himself offers a more balanced judgment:

"Maybe Gould was wrong that Morton misrepresented his data, but he was absolutely right that biological determinism was and continues to be a dangerous pseudoscientific ideology..."

Biological determinism is a blight on science. It implies that the way things are is the way they must be. We have less choice in how we live our lives than we think we do. This position is wrong, both empirically and morally. If you doubt me on this point, read *Mismeasure*, which, even discounting the chapter on Morton, abounds in evidence of how science can become an instrument of malignant ideologies.

In exposing the social roots of scientific ideas, Gould followed in the footsteps of one of his intellectual heroes, Karl Marx's close collaborator Friedrich Engels. Gould praised Engels' 1876 pamphlet *The Part Played by Labor in the Transition from Ape to Man*. In it, Engels correctly rejected the claim that "our evolution was propelled by an enlarging brain" (brain enlargement began only after upright posture first freed the hands for manual work) and offered a "perceptive analysis of the political role of science and of the social biases that must affect all thought." In class societies, Engels argued, physical labor has low status while mind is seen as dominating and noble. This deep-seated bias explains why, despite the lack of evidence, most biologists until the 1920s wrongly assumed brain development must have come first. But in placing science in its social context, Gould (also like Engels) was careful to reject the claim of relativists who abandon the idea of objective truth altogether. "I share the credo of my colleagues," he wrote. "I believe that a factual reality exists and that science, though often in an obtuse and erratic manner, can learn about it."

York and Clark's short book is a clear and lively introduction to this and other aspects of Gould's work. If it encourages a new generation of political activists to engage with Gould's own writings it will have served a worthwhile purpose.

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P.S.

* From New Politics, Winter 2012, Vol:XIII-4, Whole #: 52:
http://newpolitics.mayfirst.org/node/581