Stephen Jay Gould:
Did He Bring Paleontology to the “High Table”?
A Review of *Stephen Jay Gould: Reflections on His View of Life*
edited by Warren D. Allmon, Patricia H. Kelley, and Robert M. Ross
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In the seven years since Harvard paleontologist Stephen Jay Gould died, there have been only a few assessments of his role in paleobiology and evolutionary theory. Although non-paleontologists still do not realize it, the “punctuated equilibrium” model first proposed by Gould and Niles Eldredge in 1972 has widespread acceptance among paleontologists. Nearly all metazoans show stasis, with almost no good examples of gradual evolution. The most important implication is that fossil species are static over millions of years, even in the face of dramatic climate changes and other environmental selection factors. This widespread stasis cannot be explained by simplistic concepts like “stabilizing selection,” and remains a mystery that neontologists have not fully addressed or successfully explained. Despite the hope that paleontology would reach the “High Table” of evolutionary biology, the fact that most biologists largely do not understand or accept the implications of paleontological concepts such as species sorting and coordinated stasis suggests that paleontology still has not made the impact on evolutionary thinking that it deserves.

KEYWORDS

Evolutionary theory • Paleontology • Punctuated equilibria • Stasis • Stephen Gould

It has been over seven years since the passing of Stephen Jay Gould on May 20, 2002 at age 60. Given the normal slow pace of academic publishing, we are just beginning to see the book-length post-mortems by authors assessing his role as a scientist, scholar, and public figure. The first such books available include David Prindle’s *Stephen Jay Gould and the Politics of Evolution* (Prometheus Books 2009) and the work reviewed here, *Stephen Jay Gould: Reflections on His View of Life*, edited by Warren D. Allmon, Patricia H. Kelley, and Robert M. Ross.

The Prindle book is written by a professor of government who has no background in science and clearly does not appreciate the intricacies of the scientific debates. Instead, it focuses on the political aspects of Gould’s career, which were a tiny part of his total work. The book edited by Allmon, Kelley, and Ross is a compilation of essays by former students and colleagues of Gould. It originated with a memorial symposium held at the Nov. 2, 2003, meeting of the Paleontological Society and the Geological Society of America, and

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then took an additional six years to finally see publication. Many of the speakers at the 2003 symposium contributed chapters to this book, but other chapters are by additional authors who were not at the original memorial. The editors strove to cover the full range of topics of Gould's wide-ranging interests, not only in paleontology and evolutionary biology, but also developmental biology, history of science, geology, creationism, education, and politics. As such, it is probably the most complete assessment of Gould from the perspective of scientists who knew him and his work best, and gives an insider's view on what made him tick, and how the paleontological community regards him.

I should explain to the reader about my personal perspective in this matter. Although I was never formally his student, Gould was a friend and mentor to me while I was at Columbia University and the American Museum of Natural History (AMNH) as a graduate student from 1976-1982. When I arrived at the Columbia/AMNH program, all the graduate students heard the legends of Steve when he was a grad student in the same program two generations earlier. His were enormous shoes to fill, and we all felt his shadow when we were being evaluated as students. I saw him on numerous occasions when I was a graduate student, not only at professional meetings, but also when he came down to the Lamont-Doherty Geological Observatory to see for himself the work that Dave Lazarus and I (Lazarus et al. 1982) were doing on gradual evolution in plankton (he was more open-minded than you would expect), or when fellow student Paul Sereno and I paid a visit to him at Harvard while we were working on a project on allometry and dwarfing in mammals (Prothero and Sereno 1982). Subsequently, he was extremely supportive of my professional career. Thus, I cannot claim to be impartial about Steve, any more than the authors of the Allmon, Kelley and Ross volume can, but I do speak from personal experience and from watching paleontology change over the past 40 years.

What emerges from the chapters in this book is the incredible complexity of Stephen Jay Gould as a person, as well as his intellectual depth and breadth. Several chapters look at his major contributions to evolutionary biology, particularly arising from punctuated equilibrium theory, species sorting, and his pioneering efforts in developmental biology (decades before "evo devo" became all the rage). Patricia Kelley looks at Gould's attitude toward religion, and how he responded to the creationist threat against science with all his energy (even while battling his first bout with cancer), including testifying at the landmark 1981 Arkansas creationism trial. Geologist Jill Schneiderman discusses how much of Gould's thinking was influenced by his background in geology. Peg Yacobucci explores Gould's ambivalence about the revolution in cladistics that was happening in the profession throughout his career (especially at his alma mater, the AMNH). Warren Allmon, Paul Morris, and Linda Ivany speculate about his surprising disinterest in paleoecology despite its tremendous growth over the past 40 years. Robert Ross looks at Gould's ideas about education and pedagogy, and especially his landmark class at Harvard for general education students, one of the most popular courses taught there during his entire career. Richard Lewontin, Richard Levins, and Philip Kitcher look at Gould's political side, which was not truly "Marxist" as some people claimed, but definitely a part of the progressive activist viewpoint of college students in the 1960s. Gould was never a hippie or a communist, but as an undergrad he did actively protest for civil rights and other social causes. Later, he used his writing to advocate ideas he thought important, or to fight against what he viewed as reactionary abuses of science, such as Social Darwinism, eugenics, and sociobiology, or pseudoscience used to justify racism, sexism, fundamentalism, or oppression of the working classes.

As several of his students and peers noted in this book, Gould was a human, not a saint. With his incredible output of monthly columns for *Natural History* magazine, books, articles and peer-reviewed scientific papers, he was enormously busy and did not tolerate fools or people wasting his time. Nor was he always waiting in his office for students to drop in unannounced. He could be cordial and gracious, especially in a friendly setting with his peers or students, but he could also be curt when in a situation where people were hostile or rude to him, or wasted his energy by arguing and rehashing things that he had long ago explained and clarified. He received hundreds of invitations to speak each year, but justifiably only

accepted a few of them, then charged what his time was worth, since he viewed travel as a huge waste of time. When he got into battles with his scientific opponents, he fought hard and gave as good as he got. And he never disguised his contempt for creationists, who abused his ideas by repeatedly quoting him out of context to mean the opposite of what he actually said, and constantly resorted to dishonest and lowball tactics in their attacks on science.

In many ways, Gould's brilliance and success made him a target for fools and creationists, and turned him from merely a paleontologist into a media celebrity on par with Carl Sagan and Steven Hawking. Like Hollywood celebrities and other high-profile figures, Gould did not have as much privacy as he would have liked, dealt with the constant distraction of people demanding his time and attention, and everything he said or did was scrutinized. Shermer (2002) analyzes some of the criticisms of Gould, and dissects his prodigious volume of writing about his favorite topics, and even the elements of his writing style. Much of the criticism stems from scientific jealousy and the complaint that Gould's writing was *too* popular (the so-called "Sagan Effect"). As Raup (1986) noted, Carl Sagan was denied many honors (such as election to the National Academy of Sciences) in his field and dismissed as more a popularizer of science than a research scientist. However, Shermer debunks this myth by showing that Sagan continued to publish peer-reviewed articles at the same pace, even as he worked on "Cosmos" and wrote trade books. Gould actually published *more* peer-reviewed science than he did books or essays for the general public. Indeed, Gould's productivity in every category (peer-reviewed articles, books, popular essays, book reviews, and the like) outstrips all the prominent scientists of his era, including Carl Sagan, Ernst Mayr, E.O. Wilson, Stephen Hawking, and Jared Diamond. Gould was elected to the National Academy of Sciences, and became one of the most respected scientists in America. He served as president of the American Association for the Advancement of Science (AAAS), the Paleontological Society, and the Society for the Study of Evolution (SSE). Gould received dozens of honorary degrees, and won nearly every award he was eligible for, including the MacArthur Fellowship, the so-called "genius award." As a true measure of his fame across the culture, Gould was portrayed by a cartoon of himself (providing his own voice) on *The Simpsons*. Another episode of the same show that aired the week he died was dedicated to his memory.

Ironically, now people complain that the problem with science literacy in this country is that there are too few popularizers, and too *few* scientists who step out of their ivory towers to convey the importance of science for the general public. These critics include marine biologist Randy Olson, who made a documentary about creationism and scientific arrogance entitled "Flock of Dodos", or Chris Mooney and Sheril Kirshenbaum, authors of *Unscientific America: How Scientific Illiteracy Threatens our Future*. It seems you can't win. You can become a Carl Sagan or Stephen Jay Gould and have your professional peers snipe at you out of jealousy for your popularity, or you can retreat to your lab and let the culture critics complain that scientists are too aloof.

But the area where Gould is best known and most controversial is his lifelong quest to expand evolutionary biology and bring paleontology to the "High Table" of that discipline. As Gould (1983) himself pointed out, paleontology was virtually irrelevant to evolutionary theory from Darwin's time until the 1940s. During the start of the Modern Synthesis in the 1930s and 1940s, Gould (1983) argued that paleontology became subservient to evolutionary genetics, especially due to the work of paleontologist George Gaylord Simpson and his book *Tempo and Mode in Evolution* (1944). Although that book debunked many false notions held by earlier paleontologists, it also reduced all of the fossil record to just examples of gradual change and simple natural selection. Nonetheless, paleontology was in on the ground floor of the Modern Synthesis. When the Society for the Study of Evolution was founded in 1947 (with Simpson as first president), paleontological papers were published alongside those of geneticists in their flagship journal, *Evolution*.

By the time Gould's generation of paleontologists came of age in the 1960s, paleontology was truly subservient to genetics. Few paleontology papers were published in *Evolution* any more. Both Gould and Niles Eldredge remarked that they came to the Columbia/AMNH program to study with Norman Newell

and document evolutionary patterns in the fossil record, and found to their surprise that the expected pattern of gradual evolution was extremely unusual. As they detail in several places (Gould 2002; Eldredge 1985a), the famous 1972 “punctuated equilibrium” paper was accidentally assigned to them by editor Tom Schopf, who wanted a review of speciation theory, not an area that Gould had worked on at that point. The “punctuated equilibrium” hypothesis led to the realization that paleontologists who had long been trying to document gradualism had not kept up with implications of the allopatric speciation model developed 30 years earlier by Ernst Mayr and others during the Modern Synthesis.

Once “punctuated equilibrium” became a hot topic, it dominated the journals and scientific debates. I vividly remember sessions at each professional meeting during the 1970s as knock-down drag-out fights between the old-guard gradualists and the “Young Turks” led by Gould, Eldredge, and Steve Stanley. Gould and Eldredge (1977) effectively answered most of the early criticisms of the “punctuated equilibria.” By the mid-1980s, a consensus had emerged within the paleontological community that nearly all metazoans (vertebrate and invertebrate, marine and terrestrial) show stasis and punctuated speciation through millions of years of geologic time and strata, with only minor possible examples of gradual anagenetic change in size (Geary 2009; Princehouse 2009; Hallam 2009; Jablonski 2000, 2008). That has been the accepted view of paleontologists for more than 20 years now.

Yet one would never know this by looking at the popular accounts of the debate written by non-paleontologists, who still think it is a controversial and unsettled question. Even more surprising is the lack of response, or complete misinterpretation of its implications, by evolutionary biologists. Since the famous battle at the 1980 macroevolution conference in Chicago, neontologists have persisted in misunderstanding the fundamental reasons why paleontologists regard punctuated equilibrium as important. Many have claimed that people like Simpson (1944) and others were thinking along the same lines, or that gradual change on the neontological time scale would look punctuated on a geologic time scale. They miss the point of the most important insight to emerge from the debate: *the prevalence of stasis*. Before 1972, paleontologists did try to overemphasize examples of gradual evolution, and they expected organisms to gradually change through geologic time, as they do on neontological time scales. But the overwhelming conclusion of the data collected since 1972 shows that gradual, slow, adaptive change to environments *almost never* occurs in the fossil record. The prevalence of stasis is still, in my mind, the biggest conundrum that paleontology has posed for evolutionary biology, especially when we can document whole faunas that *show absolutely no change despite major changes in their environments* (Prothero and Heaton 1996; Prothero 1999; Prothero et al. 2009). That fact alone rules out the “stabilizing selection” cop-out, such as the effort by Estes and Arnold (2007) to invoke stabilizing selection to explain stasis, with no mention of the fact that the fossil record shows much stasis in the face of climatic change. For years now paleontologists and neontologists alike have struggled to find (unsuccessfully, in my opinion) a good explanation for why virtually all organisms are static over millions of years despite huge differences in their adaptive regime. The gradual adaptation of fruit flies and Galapagos finches may be good examples of short-term microevolutionary change, but they simply do not address what the fossil record has shown for over a century. This only became apparent when Gould, Eldredge, Stanley and others began to talk about species sorting, decoupling microevolution from macroevolution, and the importance of hierarchical thinking in evolutionary biology. Many neontologists appear to maintain a relentlessly reductionist attitude for no apparent reason. Meanwhile, the hierarchical expansion of evolutionary theory has enjoyed widespread support among philosophers as well as paleontologists (Salthe 1985; Eldredge 1985b; Okasha 2006; Wilson and Wilson 2007; Jablonski 2000, 2007, 2008a).

Thus, over 35 years after the original 1972 paper, we have a different kind of “two cultures” phenomenon of people with different mindsets talking past one another. Paleontologists have agreed for decades now that the prevailing message of the fossil record is stasis despite big changes in the environment. Based on the literature (Sepkoski and Ruse 2009), there has been a “paleobiological revolution” with a less

subservient approach to evolutionary biology. Most paleontologists are in agreement with Gould's cry for the importance of species as entities, species sorting, and a hierarchical approach to macroevolution. As Gould and Eldredge wrote in 1977, "why be a paleontologist if we are condemned only to verify what students of living organisms can propose directly?" Although Gould was the loudest voice for paleontology's claim to an important role at the evolutionary High Table, any review of the books, papers, and presentations that paleontologists are releasing shows a non-Modern Synthesis, more pluralistic approach to evolutionary theory, especially when it comes to concepts like evolutionary paleoecology, mass extinction theory, and coordinated stasis.

There have been signs of a more pluralistic approach, especially when one realizes the implications of "evo devo" for the relentlessly reductionist approach of many neontologists (Mitchell and Dietrich 2006; Love 2006; Müller 2007; Carroll 2008; Pigliucci 2007, 2009). Yet, when I (Prothero 2003) wrote a review of two recent evolutionary biology textbooks, it was apparent that the authors had no clue about the implications of punctuated equilibria, species sorting, and the stability of species despite environmental changes. Instead, their approach to the topic revealed a profound misunderstanding of the important points, distortions of what is being claimed and what is not, and pointless critiques of old outdated arguments and trivial side issues, as if they were still reading the debate as it stood in the 1970s. Now and then you find concessions, such as Mayr (1992, 2001) admitting that the prevalence of stasis is a puzzle that has no simple answer, but by and large the neontological community still "doesn't get it." Paleontologists have been trying to communicate their distinctive perspective for a generation, culminating with Gould's (2002) magnum opus, published just as he was dying. Yet the harsh reviews of that book by neontologists showed that they were still rehashing issues that had been resolved by paleontologists 30 years ago. The journal *Evolution* continues to publish almost no contributions by paleontologists, and the meetings of the SSE I have attended just reinforced how large the culture gap has grown. If these bellwethers are representative of the relationship between paleontologists and neontologists, then it seems clear that paleontology has still not claimed its rightful seat at the "High Table."

I'm not sure why this is so. It could be because of a huge conceptual and culture gap between paleontologists and neontologists, and how the differences in time scale shape their thinking. It could be an artifact of academic Balkanization, where paleontologists are still largely in geology departments and rarely meet with evolutionary biologists. It could be professional territoriality. If Gould (1980, 2002) is right and the best way to understand macroevolution comes from the fossil record, then a lot of fruit fly research is much less relevant than it is usually portrayed to be. Even Simpson (1944) made this point: "Experimental biology . . . may reveal what happens to a hundreds rats in the course of ten years under fixed and simple conditions, but not what happened to a billion rats in the course of ten million years under the fluctuating conditions of natural history. Obviously, the latter problem is more important."

In May 1984, the evolutionary biologist John Maynard Smith wrote in *Nature*, "The paleontologists have too long been missing from the high table. Welcome back." But judging from the way in which paleontology is presented in biology textbooks, the lack of paleontology papers in *Evolution*, and the harsh response to Gould's (2002) final work, I think this welcome was premature. Now that the most articulate spokesman for paleontology has been gone for seven years, I doubt that this will change any time soon.

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