

= Stephen Jay Gould =

Stephen Jay Gould (/ ʒuːld / ; September 10 , 1941 ? May 20 , 2002) was an American paleontologist , evolutionary biologist , and historian of science . He was also one of the most influential and widely read writers of popular science of his generation . Gould spent most of his career teaching at Harvard University and working at the American Museum of Natural History in New York . In 1996 Gould was also hired as the Vincent Astor Visiting Research Professor of Biology at New York University , where he divided his time teaching there and at Harvard .

Gould 's most significant contribution to evolutionary biology was the theory of punctuated equilibrium , which he developed with Niles Eldredge in 1972 . The theory proposes that most evolution is characterized by long periods of evolutionary stability , which is infrequently punctuated by swift periods of branching evolution . The theory was contrasted against phyletic gradualism , the popular idea that evolutionary change is marked by a pattern of smooth and continuous change in the fossil record .

Most of Gould 's empirical research was based on the land snail genera *Poecilozonites* and *Cerion* . He also contributed to evolutionary developmental biology , and has received wide praise for his book *Ontogeny and Phylogeny* . In evolutionary theory he opposed strict selectionism , sociobiology as applied to humans , and evolutionary psychology . He campaigned against creationism and proposed that science and religion should be considered two distinct fields (or " magisteria ") whose authorities do not overlap .

Gould was known by the general public mainly from his 300 popular essays in the magazine *Natural History* , and his books written for both the specialist and non @-@ specialist . In April 2000 , the US Library of Congress named him a " Living Legend " .

= = Biography = =

Stephen Jay Gould was born and raised in the community of Bayside , a neighborhood of the northeastern section of Queens in New York City . His father Leonard was a court stenographer and a Navy veteran of World War II . His mother Eleanor was an artist whose parents were Jewish immigrants living and working in the city 's Garment District . When Gould was five years old his father took him to the Hall of Dinosaurs in the American Museum of Natural History , where he first encountered *Tyrannosaurus rex* . " I had no idea there were such things ? I was awestruck , " Gould once recalled . It was in that moment that he decided to become a paleontologist .

Raised in a secular Jewish home , Gould did not formally practice religion and preferred to be called an agnostic . When asked directly if he was an agnostic in *Skeptic* magazine , he responded :

" If you absolutely forced me to bet on the existence of a conventional anthropomorphic deity , of course I 'd bet no . But , basically , Huxley was right when he said that agnosticism is the only honorable position because we really cannot know . And that 's right . I 'd be real surprised if there turned out to be a conventional God . "

Though he " had been brought up by a Marxist father " he stated that his father 's politics were " very different " from his own . In describing his own political views , he has said they " tend to the left of center . " According to Gould the most influential political books he read were C. Wright Mills ' *The Power Elite* and the political writings of Noam Chomsky .

While attending Antioch College in the early 1960s , Gould was active in the civil rights movement and often campaigned for social justice . When he attended the University of Leeds as a visiting undergraduate , he organized weekly demonstrations outside a Bradford dance hall which refused to admit Blacks . Gould continued these demonstrations until the policy was revoked . Throughout his career and writings , he spoke out against cultural oppression in all its forms , especially what he saw as the pseudoscience used in the service of racism and sexism .

Interspersed throughout his scientific essays for *Natural History* magazine , Gould frequently referred to his nonscientific interests and pastimes . As a boy he collected baseball cards and remained a New York Yankees fan throughout his life . As an adult he was fond of science fiction movies , but often deplored their poor storytelling and presentation of science . His other interests

included singing baritone in the Boston Cecilia , and he was a great aficionado of Gilbert and Sullivan operas . He collected rare antiquarian books , possessed an enthusiasm for architecture , and enjoyed city walks . He often traveled to Europe , and spoke French , German , Russian , and Italian . He sometimes alluded ruefully to his tendency to put on weight .

= = = Marriage and family = = =

Gould married artist Deborah Lee on October 3 , 1965 . Gould met Lee while they were students together at Antioch College . They had two sons , Jesse and Ethan , and were married for 30 years . His second marriage in 1995 was to artist and sculptor Rhonda Roland Shearer .

= = = First bout of cancer = = =

In July 1982 , Gould was diagnosed with peritoneal mesothelioma , a deadly form of cancer affecting the abdominal lining and frequently found in people who have been exposed to asbestos or rock dust . After a difficult two @-@ year recovery , Gould published a column for Discover magazine entitled , " The Median Isn 't the Message " , which discusses his stunned reaction to discovering that , " mesothelioma is incurable , with a median mortality of only eight months after discovery . " He then describes the true significance behind this number , and his relief upon realizing that statistical averages are merely useful abstractions , and by themselves do not encompass the full range of variation .

The median is the halfway point , which means that 50 % of people will die before eight months , but the other half will live longer , potentially much longer . He then needed to determine where his personal characteristics placed him within this range . Given that the cancer was detected early , he was young , optimistic , and had the best treatments available , Gould reasoned that he should be in the favorable half of the upper statistical range . After an experimental treatment of radiation , chemotherapy , and surgery , Gould made a full recovery , and his column became a source of comfort for many cancer patients .

Gould was also an advocate of medical cannabis . When undergoing his cancer treatments he smoked marijuana to help alleviate the long periods of intense and uncontrollable nausea . According to Gould , the drug had a " most important effect " on his eventual recovery . He later complained that he could not understand how " any humane person would withhold such a beneficial substance from people in such great need simply because others use it for different purposes . " On August 5 , 1998 Gould 's testimony assisted in the successful lawsuit of HIV activist Jim Wakeford , who sued the Government of Canada for the right to cultivate , possess , and use marijuana for medical purposes .

= = = Final illness and death = = =

Gould survived for 20 years until another cancer ended his life . Gould died on May 20 , 2002 , from a metastatic adenocarcinoma of the lung , a form of cancer which had spread to his brain , liver , and spleen . This cancer was unrelated to his abdominal cancer . He died in his home " in a bed set up in the library of his SoHo loft , surrounded by his wife Rhonda , his mother Eleanor , and the many books he loved . "

= = = Scientific career = = =

Gould began his higher education at Antioch College , graduating with a double major in geology and philosophy in 1963 . During this time , he also studied at the University of Leeds in the United Kingdom . After completing graduate work at Columbia University in 1967 under the guidance of Norman Newell , he was immediately hired by Harvard University where he worked until the end of his life (1967 ? 2002) . In 1973 , Harvard promoted him to professor of geology and curator of invertebrate paleontology at the institution 's Museum of Comparative Zoology .

In 1982 Harvard awarded him the title of Alexander Agassiz Professor of Zoology . The following year , 1983 , he was awarded a fellowship at the American Association for the Advancement of Science , where he later served as president (1999 ? 2001) . The AAAS news release cited his " numerous contributions to both scientific progress and the public understanding of science . " He also served as president of the Paleontological Society (1985 ? 1986) and of the Society for the Study of Evolution (1990 ? 1991) .

In 1989 Gould was elected into the body of the National Academy of Sciences . Through 1996 ? 2002 Gould was Vincent Astor Visiting Research Professor of Biology at New York University . In 2001 , the American Humanist Association named him the Humanist of the Year for his lifetime of work . In 2008 , he was posthumously awarded the Darwin @-@ Wallace Medal , along with 12 other recipients . (Until 2008 , this medal had been awarded every 50 years by the Linnean Society of London .)

= = = Punctuated equilibrium = = =

Early in his career , Gould and Niles Eldredge developed the theory of punctuated equilibrium , according to which evolutionary change occurs relatively rapidly , alternating with longer periods of relative evolutionary stability . Although Gould coined the term " punctuated equilibria " , the idea was first presented in Eldredge 's doctoral dissertation on Devonian trilobites and in an article published the previous year on allopatric speciation . According to Gould , punctuated equilibrium revised a key pillar " in the central logic of Darwinian theory . "

Some evolutionary biologists have argued that while punctuated equilibrium was " of great interest to biology generally , " it merely modified neo @-@ Darwinism in a manner that was fully compatible with what had been known before . Comparisons were made to George Gaylord Simpson 's work in *Tempo and Mode in Evolution* (1941) , which describes the paleontological record as being characterized by mostly gradual change (horotely) , but also included slow (bradytely) or rapid (tachytely) rates of evolution . Other biologists emphasize the theoretical novelty of punctuated equilibrium , and argued that evolutionary stasis had been " unexpected by most evolutionary biologists " and " had a major impact on paleontology and evolutionary biology . " Some critics jokingly referred to the theory of punctuated equilibrium as " evolution by jerks " , which prompted Gould to describe phyletic gradualism as " evolution by creeps . "

= = = Evolutionary developmental biology = = =

Gould made significant contributions to evolutionary developmental biology , especially in his work *Ontogeny and Phylogeny* . In this book he emphasized the process of heterochrony , which encompasses two distinct processes : neoteny and terminal additions . Neoteny is the process where ontogeny is slowed down and the organism does not reach the end of its development . Terminal addition is the process by which an organism adds to its development by speeding and shortening earlier stages in the developmental process . Gould 's influence in the field of evolutionary developmental biology continues to be seen in such areas as the study of evolution of feathers .

= = = Selectionism and sociobiology = = =

Gould was a champion of biological constraints , internal limitations upon developmental pathways , as well as other non @-@ selectionist forces in evolution . Rather than direct adaptations , he considered many higher functions of the human brain to be the unintended side consequence of natural selection . To describe such co @-@ opted features , he coined the term exaptation with paleontologist Elisabeth Vrba . Gould believed this feature of human mentality undermines an essential premise of human sociobiology and evolutionary psychology .

= = = Against " Sociobiology " = = =

In 1975 , Gould 's Harvard colleague E. O. Wilson introduced his analysis of animal behavior (including human behavior) based on a sociobiological framework that suggested that many social behaviors have a strong evolutionary basis . In response , Gould , Richard Lewontin , and others from the Boston area wrote the subsequently well @-@ referenced letter to The New York Review of Books entitled , " Against ' Sociobiology ' " . This open letter criticized Wilson 's notion of a " deterministic view of human society and human action . "

But Gould did not rule out sociobiological explanations for many aspects of animal behavior , and later wrote : " Sociobiologists have broadened their range of selective stories by invoking concepts of inclusive fitness and kin selection to solve (successfully I think) the vexatious problem of altruism ? previously the greatest stumbling block to a Darwinian theory of social behavior ... Here sociobiology has had and will continue to have success . And here I wish it well . For it represents an extension of basic Darwinism to a realm where it should apply . "

= = = Spandrels and the Panglossian Paradigm = = =

With Richard Lewontin , Gould wrote an influential 1979 paper entitled , " The Spandrels of San Marco and the panglossian paradigm " , which introduced the architectural term " spandrel " into evolutionary biology . In architecture , a spandrel is a curved area of masonry which exists between arches supporting a dome . Spandrels , also called pendentives in this context , are found particularly in Gothic churches .

When visiting Venice in 1978 , Gould noted that the spandrels of the San Marco cathedral , while quite beautiful , were not spaces planned by the architect . Rather the spaces arise as " necessary architectural byproducts of mounting a dome on rounded arches . " Gould and Lewontin thus defined " spandrels " in the evolutionary biology context , to mean any biological feature of an organism that arises as a necessary side consequence of other features , which is not directly selected for by natural selection . Proposed examples include the " masculinized genitalia in female hyenas , exaptive use of an umbilicus as a brooding chamber by snails , the shoulder hump of the giant Irish deer , and several key features of human mentality . "

In Voltaire 's *Candide* , Dr. Pangloss is portrayed as a clueless scholar who , despite the evidence , insists that " all is for the best in this best of all possible worlds " . Gould and Lewontin asserted that it is Panglossian for evolutionary biologists to view all traits as atomized things that had been naturally selected for , and criticised biologists for not granting theoretical space to other causes , such as phyletic and developmental constraints . The relative frequency of spandrels , so defined , versus adaptive features in nature , remains a controversial topic in evolutionary biology . An illustrative example of Gould 's approach can be found in Elisabeth Lloyd 's case study suggesting that the female orgasm is a by @-@ product of shared developmental pathways . Gould also wrote on this topic in his essay " Male Nipples and Clitoral Ripples " , prompted by Lloyd 's earlier work .

= = = Evolutionary progress = = =

Gould favored the argument that evolution has no inherent drive towards long @-@ term " progress " . Uncritical commentaries often portray evolution as a ladder of progress , leading towards bigger , faster , and smarter organisms , the assumption being that evolution is somehow driving organisms to get more complex and ultimately more like humankind . Gould argued that evolution 's drive was not towards complexity , but towards diversification . Because life is constrained to begin with a simple starting point (like bacteria) , any diversity resulting from this start , by random walk , will have a skewed distribution and therefore be perceived to move in the direction of higher complexity . But life , Gould argued , can also easily adapt towards simplification , as is often the case with parasites .

In a review of *Full House* , Richard Dawkins approved of Gould 's general argument , but suggested that he saw evidence of a " tendency for lineages to improve cumulatively their adaptive fit to their particular way of life , by increasing the numbers of features which combine together in adaptive

complexes By this definition , adaptive evolution is not just incidentally progressive , it is deeply , dyed @-@ in @-@ the @-@ wool , indispensably progressive . "

= = = Cladistics = = =

Gould never embraced cladistics as a method of investigating evolutionary lineages and process , possibly because he was concerned that such investigations would lead to neglect of the details in historical biology , which he considered all @-@ important . In the early 1990s this led him into a debate with Derek Briggs , who had begun to apply quantitative cladistic techniques to the Burgess Shale fossils , about the methods to be used in interpreting these fossils . Around this time cladistics rapidly became the dominant method of classification in evolutionary biology . Inexpensive but increasingly powerful personal computers made it possible to process large quantities of data about organisms and their characteristics . Around the same time the development of effective polymerase chain reaction techniques made it possible to apply cladistic methods of analysis to biochemical and genetic features as well .

= = = Technical work on land snails = = =

Most of Gould 's empirical research pertained to land snails . He focused his early work on the Bermudian genus *Poecilozonites* , while his later work concentrated on the West Indian genus *Cerion* . According to Gould " *Cerion* is the land snail of maximal diversity in form throughout the entire world . There are 600 described species of this single genus . In fact , they 're not really species , they all interbreed , but the names exist to express a real phenomenon which is this incredible morphological diversity . Some are shaped like golf balls , some are shaped like pencils Now my main subject is the evolution of form , and the problem of how it is that you can get this diversity amid so little genetic difference , so far as we can tell , is a very interesting one . And if we could solve this we 'd learn something general about the evolution of form . "

Given *Cerion* 's extensive geographic diversity , Gould later lamented that if Christopher Columbus had only cataloged a single *Cerion* it would have ended the scholarly debate about which island Columbus had first set foot on in America .

= = = Influence = = =

Gould is one of the most frequently cited scientists in the field of evolutionary theory . His 1979 " spandrels " paper has been cited more than 5 @,@ 000 times . In Paleobiology ? the flagship journal of his own speciality ? only Charles Darwin and George Gaylord Simpson have been cited more often . Gould was also a considerably respected historian of science . Historian Ronald Numbers has been quoted as saying : " I can 't say much about Gould 's strengths as a scientist , but for a long time I 've regarded him as the second most influential historian of science (next to Thomas Kuhn) . "

= = = The Structure of Evolutionary Theory = = =

Shortly before his death , Gould published *The Structure of Evolutionary Theory* (2002) , a long treatise recapitulating his version of modern evolutionary theory . In the film *Beauty and Consolation* Gould remarked , " In a couple of years I will be able to gather in one volume my view of how evolution works . It is to me a great consolation because it represents the putting together of a lifetime of thinking into one source . That book will never be particularly widely read . It 's going to be far too long , and it 's only for a few thousand professionals ? very different from my popular science writings ? but it is of greater consolation to me because it is a chance to put into one place a whole way of thinking about evolution that I 've struggled with all my life . "

= = = As a public figure = = =

Gould became widely known through his popular essays on evolution in the Natural History magazine . His essays were published in a series titled This View of Life (a phrase from the concluding paragraph of Charles Darwin 's Origin of Species) starting from January 1974 and ended in January 2001 , amounting to a continuous publication of 300 essays . Many of his essays were reprinted in collected volumes that became bestselling books such as Ever Since Darwin and The Panda 's Thumb , Hen 's Teeth and Horse 's Toes , and The Flamingo 's Smile .

A passionate advocate of evolutionary theory , Gould wrote prolifically on the subject , trying to communicate his understanding of contemporary evolutionary biology to a wide audience . A recurring theme in his writings is the history and development of pre @-@ evolutionary and evolutionary thought . He was also an enthusiastic baseball fan and sabermetrician (analyst of baseball statistics) , and made frequent reference to the sport in his essays . Many of his baseball essays were anthologized in his posthumously published book Triumph and Tragedy in Mudville (2003) .

Although a proud Darwinist , Gould 's emphasis was less gradualist and reductionist than most neo @-@ Darwinists . He fiercely opposed many aspects of sociobiology and its intellectual descendant evolutionary psychology . He devoted considerable time to fighting against creationism , creation science , and intelligent design . Most notably , Gould provided expert testimony against the equal @-@ time creationism law in McLean v. Arkansas . Gould later developed the term " non @-@ overlapping magisteria " (NOMA) to describe how , in his view , science and religion could not comment on each other 's realm . Gould went on to develop this idea in some detail , particularly in the books Rocks of Ages (1999) and The Hedgehog , the Fox , and the Magister 's Pox (2003) . In a 1982 essay for Natural History Gould wrote :

Our failure to discern a universal good does not record any lack of insight or ingenuity , but merely demonstrates that nature contains no moral messages framed in human terms . Morality is a subject for philosophers , theologians , students of the humanities , indeed for all thinking people . The answers will not be read passively from nature ; they do not , and cannot , arise from the data of science . The factual state of the world does not teach us how we , with our powers for good and evil , should alter or preserve it in the most ethical manner .

The anti @-@ evolution petition A Scientific Dissent From Darwinism spawned the National Center for Science Education 's pro @-@ evolution counterpart Project Steve , which is named in Gould 's honor .

Gould also became a noted public face of science , often appearing on television . In 1984 Gould received his own NOVA special on PBS . Other appearances included interviews on CNN 's Crossfire , NBC 's The Today Show , and regular appearances on the Charlie Rose show . Gould was also a guest in all seven episodes of the Dutch talk series A Glorious Accident , in which he appeared with his close friend Oliver Sacks .

Gould was featured prominently as a guest in Ken Burns 's PBS documentary Baseball , as well as PBS 's Evolution series . Gould was also on the Board of Advisers to the influential Children 's Television Workshop television show 3 @-@ 2 @-@ 1 Contact , where he made frequent guest appearances .

In 1997 he voiced a cartoon version of himself on the television series The Simpsons . In the episode " Lisa the Skeptic " , Lisa finds a skeleton that many people believe is an apocalyptic angel . Lisa contacts Gould and asks him to test the skeleton 's DNA . The fossil is discovered to be a marketing gimmick for a new mall . During production the only phrase Gould objected to was a line in the script that introduced him as the " world 's most brilliant paleontologist " . In 2002 the show paid tribute to Gould after his death , dedicating the season 13 finale to his memory . Gould had died two days before the episode aired .

= = Controversy = =

Gould received many accolades for his scholarly work and popular expositions of natural history , but a number of biologists felt his public presentations were out of step with mainstream evolutionary

thinking . The public debates between Gould 's supporters and detractors have been so quarrelsome that they have been dubbed " The Darwin Wars " by several commentators .

John Maynard Smith , an eminent British evolutionary biologist , was among Gould 's strongest critics . Maynard Smith thought that Gould misjudged the vital role of adaptation in biology , and was critical of Gould 's acceptance of species selection as a major component of biological evolution . In a review of Daniel Dennett 's book Darwin 's Dangerous Idea , Maynard Smith wrote that Gould " is giving non @-@ biologists a largely false picture of the state of evolutionary theory . " But Maynard Smith has not been consistently negative , writing in a review of The Panda 's Thumb that " Stephen Gould is the best writer of popular science now active ... Often he infuriates me , but I hope he will go right on writing essays like these . " Maynard Smith was also among those who welcomed Gould 's reinvigoration of evolutionary paleontology .

One reason for criticism was that Gould appeared to be presenting his ideas as a revolutionary way of understanding evolution , and argued for the importance of mechanisms other than natural selection , mechanisms which he believed had been ignored by many professional evolutionists . As a result , many non @-@ specialists sometimes inferred from his early writings that Darwinian explanations had been proven to be unscientific (which Gould never tried to imply) . Along with many other researchers in the field , Gould 's works were sometimes deliberately taken out of context by creationists as " proof " that scientists no longer understood how organisms evolved . Gould himself corrected some of these misinterpretations and distortions of his writings in later works .

As documented by Kim Sterelny in his book Dawkins vs. Gould , Gould disagreed with Richard Dawkins about the importance of gene selection in evolution . Dawkins argued that evolution is best understood as competition among genes (or replicators) , while Gould advocated the importance of multi @-@ level selection , including selection amongst genes , cell lineages , organisms , demes , species , and clades .

Dawkins also said that Gould deliberately played down the difference between rapid gradualism and macromutation in his theory of punctuated equilibrium . Criticism of Gould and his theory of punctuated equilibrium can be found in Dawkins 's The Blind Watchmaker and Unweaving the Rainbow , as well as a chapter in Dennett 's Darwin 's Dangerous Idea .

= = = Cambrian fauna = = =

Gould 's interpretation of the Cambrian Burgess Shale fossils in his book Wonderful Life emphasized the striking morphological disparity (or " weirdness ") of the Burgess Shale fauna , and the role of chance in determining which members of this fauna survived and flourished . He used the Cambrian fauna as an example of the role of contingency in the broader pattern of evolution .

His view was criticized by Simon Conway Morris in his 1998 book The Crucible of Creation . Conway Morris stressed those members of the Cambrian fauna that resemble modern taxa . He also promoted convergent evolution as a mechanism producing similar forms in similar environmental circumstances , and argued in a subsequent book that the appearance of human @-@ like animals is likely . Paleontologist Richard Fortey noted that prior to the release of Wonderful Life , Conway Morris shared many of Gould 's sentiments and views . It was only after publication of Wonderful Life that Conway Morris revised his interpretation and adopted a more progressive stance towards the history of life .

Paleontologists Derek Briggs and Richard Fortey have also argued that much of the Cambrian fauna may be regarded as stem groups of living taxa , though this is still a subject of intense research and debate , and the relationship of many Cambrian taxa to modern phyla has not been established in the eyes of many palaeontologists .

Richard Dawkins also disagreed with Gould 's view that new phyla suddenly appeared in the Cambrian fauna , arguing :

The extreme Gouldian view ? certainly the view inspired by his rhetoric , though it is hard to tell from his own words whether he literally holds it himself ? is radically different from and utterly incompatible with the standard neo @-@ Darwinian model For a new body plan ? a new phylum

? to spring into existence , what actually has to happen on the ground is that a child is born which suddenly , out of the blue , is as different from its parents as a snail is from an earthworm . No zoologist who thinks through the implications , not even the most ardent saltationist , has ever supported any such notion .

= = = Opposition to sociobiology and evolutionary psychology = = =

Gould also had a long @-@ running public feud with E. O. Wilson and other evolutionary biologists concerning the disciplines of human sociobiology and evolutionary psychology , both of which Gould and Lewontin opposed , but which Richard Dawkins , Daniel Dennett , and Steven Pinker advocated . These debates reached their climax in the 1970s , and included strong opposition from groups like the Sociobiology Study Group and Science for the People . Pinker accuses Gould , Lewontin , and other opponents of evolutionary psychology of being " radical scientists " , whose stance on human nature is influenced by politics rather than science . Gould stated that he made " no attribution of motive in Wilson 's or anyone else 's case " but cautioned that all human beings are influenced , especially unconsciously , by our personal expectations and biases . He wrote :

I grew up in a family with a tradition of participation in campaigns for social justice , and I was active , as a student , in the civil rights movement at a time of great excitement and success in the early 1960s . Scholars are often wary of citing such commitments . ? [but] it is dangerous for a scholar even to imagine that he might attain complete neutrality , for then one stops being vigilant about personal preferences and their influences ? and then one truly falls victim to the dictates of prejudice . Objectivity must be operationally defined as fair treatment of data , not absence of preference .

Gould 's primary criticism held that human sociobiological explanations lacked evidential support , and argued that adaptive behaviors are frequently assumed to be genetic for no other reason than their supposed universality , or their adaptive nature . Gould emphasized that adaptive behaviors can be passed on through culture as well , and either hypothesis is equally plausible . Gould did not deny the relevance of biology to human nature , but reframed the debate as " biological potentiality vs. biological determinism . " Gould stated that the human brain allows for a wide range of behaviors . Its flexibility " permits us to be aggressive or peaceful , dominant or submissive , spiteful or generous ? 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 . "

= = = The Mismeasure of Man = = =

Gould was the author of *The Mismeasure of Man* (1981) , a history and inquiry of psychometrics and intelligence testing , generating perhaps the greatest controversy of all his books and receiving both widespread praise and extensive criticism , including claims of misrepresentation . Gould investigated the methods of nineteenth century craniometry , as well as the history of psychological testing . Gould claimed that both theories developed from an unfounded belief in biological determinism , the view that " social and economic differences between human groups ? primarily races , classes , and sexes ? arise from inherited , inborn distinctions and that society , in this sense , is an accurate reflection of biology . " The book was reprinted in 1996 with the addition of a new foreword and a critical review of *The Bell Curve* .

In 2011 , a study conducted by six anthropologists reanalyzed Gould 's claim that Samuel Morton unconsciously manipulated his skull measurements , and concluded that Gould 's analysis was poorly supported and incorrect . They praised Gould for his " staunch opposition to racism " but concluded , " we find that Morton 's initial reputation as the objectivist of his era was well @-@ deserved . " Ralph Holloway , one of the co @-@ authors of the study , commented , " I just didn 't trust Gould I had the feeling that his ideological stance was supreme . When the 1996 version of ' *The Mismeasure of Man* ' came and he never even bothered to mention Michael 's study , I just felt he was a charlatan . "

The group 's paper was reviewed in the journal Nature , which recommended a degree of caution , and notes that " because they couldn 't measure all the skulls , they do not know whether the average cranial capacities that Morton reported represent his sample accurately . " The journal stated that Gould 's opposition to racism may have biased his interpretation of Morton 's data , but also noted that " Lewis and his colleagues have their own motivations . Several in the group have an association with the University of Pennsylvania , and have an interest in seeing the valuable but understudied skull collection freed from the stigma of bias . "

The group 's paper was critically reviewed in the journal Evolution & Development by philosopher of science Michael Weisberg , also of the University of Pennsylvania . Weisberg argues that " most of Gould 's arguments against Morton are sound . Although Gould made some errors and overstated his case in a number of places , he provided prima facie evidence , as yet unrefuted , that Morton did indeed mismeasure his skulls in ways that conformed to 19th century racial biases . " Biologists and philosophers Jonathan Kaplan , Massimo Pigliucci , and Joshua Banta also published a critique of the groups 's paper , arguing that many of its claims were misleading and the re @-@ measurements were " completely irrelevant to an evaluation of Gould 's published analysis . " They also argue that both Morton and Gould 's statistical methods on which skulls to include and which to exclude , and how they computed averages , " were both inappropriate . "

= = Non @-@ overlapping magisteria = =

In his book Rocks of Ages (1999) , Gould put forward what he described as " a blessedly simple and entirely conventional resolution to ... the supposed conflict between science and religion . " He defines the term magisterium as " a domain where one form of teaching holds the appropriate tools for meaningful discourse and resolution . " The non @-@ overlapping magisteria (NOMA) principle therefore divides the magisterium of science to cover " the empirical realm : what the Universe is made of (fact) and why does it work in this way (theory) . The magisterium of religion extends over questions of ultimate meaning and moral value . These two magisteria do not overlap , nor do they encompass all inquiry . " He suggests that " NOMA enjoys strong and fully explicit support , even from the primary cultural stereotypes of hard @-@ line traditionalism " and that NOMA is " a sound position of general consensus , established by long struggle among people of goodwill in both magisteria . "

However , this view has not been without criticism . For example , in his book The God Delusion , Richard Dawkins argues that the division between religion and science is not as simple as Gould claims , as few religions exist without claiming the existence of miracles , which " by definition , violate the principles of science . " Dawkins also opposes the idea that religion has anything meaningful to say about ethics and values , and therefore has no authority to claim a magisterium of its own . He goes on to say that he believes Gould is disingenuous in much of what he says in Rocks of Ages . Similarly , humanist philosopher Paul Kurtz argues that Gould was wrong to posit that science has nothing to say about questions of ethics . In fact , Kurtz claims that science is a much better method than religion for determining moral principles .

= = Publications = =

= = = Articles = = =

Gould 's publications were numerous . One review of his publications between 1965 and 2000 noted 479 peer @-@ reviewed papers , 22 books , 300 essays , and 101 " major " book reviews . A select number of his papers are listed online .

= = = Books = = =

The following is a list of books either written or edited by Stephen Jay Gould , including those

published posthumously , after his death in 2002 . While some books have been republished at later dates , by multiple publishers , the list below comprises the original publisher and publishing date .