= Objections to evolution =

Scholars , theologians and lay @-@ people have raised objections to evolution since evolutionary ideas came to prominence in the 19th century . When Charles Darwin published his 1859 book On the Origin of Species , his theory of evolution (the idea that species arose through descent with modification from a single common ancestor in a process driven by natural selection) initially met opposition from scientists with different theories , but eventually came to receive overwhelming acceptance in the scientific community . The observation of evolutionary processes occurring (as well as the modern evolutionary synthesis explaining that evidence) has been uncontroversial among mainstream biologists since the 1940s .

Since then , most criticisms and denials of evolution have come from religious sources , rather than from the scientific community . Although many religions , such as those advocating theistic evolution , have accepted the occurrence of evolution , some religious beliefs reject evolutionary explanations in favor of creationism (the belief that a deity created the universe and life through the application of supernatural processes) . The resultant U.S.-centered creation ? evolution controversy has become a focal point of recent perceived conflict between religion and science .

Modern creationism features movements such as creation science , neo @-@ creationism , and intelligent design , which argue that the idea of life being directly designed by a god or intelligence is at least as scientific as evolutionary theory , and should therefore be taught in public education . Such arguments against evolution have become widespread and include objections to evolution 's evidence , methodology , plausibility , morality , and scientific acceptance . The scientific community , however , does not recognize such objections as valid , citing detractors ' misinterpretations of such things as the scientific method , evidence , and basic physical laws .

= = History = =

Various evolutionary ideas came to prominence around the start of the 19th century , in particular the transmutation of species theory put forward by Jean @-@ Baptiste Lamarck . These were opposed on scientific grounds , most notably by Georges Cuvier , as well as encountering political and religious objections . These ideas that natural laws controlled the development of nature and society gained vast popular audiences with George Combe 's The Constitution of Man of 1828 and the anonymous Vestiges of the Natural History of Creation of 1844 . When Charles Darwin published his 1859 book On the Origin of Species , he convinced most of the scientific community that new species arose through descent through modification in a branching pattern of divergence from common ancestors , but while most scientists accepted that natural selection was a valid and empirically testable hypothesis , Darwin 's view that it was the primary mechanism of evolution was generally rejected .

The earliest objections to Darwinian evolution were both scientific and religious . Darwin 's contemporaries eventually came to accept the transmutation of species based upon fossil evidence ; the X Club was formed to defend evolution against the church and wealthy amateurs , although the specific evolutionary mechanism which Darwin provided ? natural selection ? was actively disputed in favour of alternative theories such as Lamarckism and orthogenesis . Darwin 's gradualistic account was also opposed by saltationism and catastrophism . Lord Kelvin led scientific opposition to gradualism on the basis of his thermodynamic calculations that the Earth was between 24 and 400 million years old , an estimate strongly disputed by geologists . These figures were corrected in 1907 when radioactive dating of rocks showed that the Earth was billions of years old . Kelvin 's own views favoured a version of theistic evolution accelerated by divine guidance . The specific hereditary mechanism Darwin provided , pangenesis , lacked any supporting evidence . Although evolution was unchallenged , uncertainties about the mechanism in the eclipse of Darwinism persisted from the 1880s until the 1930s inclusion of Mendelian inheritance and the rise of the modern evolutionary synthesis . The modern synthesis rose to universal acceptance among biologists with the help of new evidence , such as genetics , which confirmed Darwin 's predictions and refuted the competing theories .

Protestantism , especially in America , broke out in " acrid polemics " and argument about evolution from 1860 to the 1870s ? with the turning point possibly marked by the death of Louis Agassiz in 1873 ? and by 1880 a form of " Christian evolution " was becoming the consensus . In Britain , while publication of The Descent of Man by Darwin in 1871 reinvigorated debate from the previous decade , Sir Henry Chadwick notes a steady acceptance of evolution " among more educated Christians " between 1860 and 1885 . As a result , evolutionary theory was " both permissible and respectable " by 1876 . Frederick Temple 's lectures on The Relations between Religion and Science (1884) on how evolution was not " antagonistic " to religion highlighted this trend . Temple 's appointment as Archbishop of Canterbury in 1896 demonstrated the broad acceptance of evolution within the church hierarchy .

For decades the Roman Catholic Church avoided official refutation of evolution . However , it would rein in Catholics who proposed that evolution could be reconciled with the Bible , as this conflicted with the First Vatican Council 's (1869 ? 70) finding that everything was created out of nothing by God , and to deny that finding could lead to excommunication . In 1950 , the encyclical Humani generis of Pope Pius XII first mentioned evolution directly and officially . It allowed one to enquire into the concept of humans coming from pre @-@ existing living matter , but not to question Adam and Eve or the creation of the soul . In 1996 , Pope John Paul II said that evolution was " more than a hypothesis " and acknowledged the large body of work accumulated in its support , but reiterated that any attempt to give a material explanation of the human soul was " incompatible with the truth about man . "

Muslim reaction ranged from those believing in literal creation from the Quran to many educated Muslims who subscribed to a version of theistic or guided evolution in which the Quran reinforced rather than contradicted mainstream science . This occurred relatively early , as medieval madrasahs taught the ideas of Al @-@ Jahiz , a Muslim scholar from the 9th century , who proposed concepts similar to natural selection . However , acceptance of evolution remains low in the Muslim world , as prominent figures reject evolution 's underpinning philosophy of materialism as unsound to human origins and a denial of Allah . Further objections by Muslim authors and writers largely reflect those put forward in the Western world .

Regardless of acceptance from major religious hierarchies , early religious objections to Darwin 's theory are still used in opposition to evolution . The ideas that species change over time through natural processes and that different species share common ancestors seemed to contradict the Genesis account of Creation . Believers in Biblical infallibility attacked Darwinism as heretical . The natural theology of the early 19th century was typified by William Paley 's watchmaker analogy , an argument from design still used by the creationist movement . Natural theology included a range of ideas and arguments from the outset , and when Darwin 's theory was published , ideas of theistic evolution were presented in which evolution is accepted as a secondary cause open to scientific investigation , while still holding belief in God as a first cause with a non @-@ specified role in guiding evolution and creating humans . This position has been adopted by denominations of Christianity and Judaism in line with modernist theology which views the Bible and Torah as allegorical , thus removing the conflict between evolution and religion .

However , in the 1920s Christian fundamentalists in the United States developed their literalist arguments against modernist theology into opposition to the teaching of evolution , with fears that Darwinism had led to German militarism and was a threat to religion and morality . This opposition developed into the creation ? evolution controversy involving Christian literalists in the United States objecting to the teaching of evolution in public schools . Although early objectors dismissed evolution as contradicting their interpretation of the Bible , this argument was legally invalidated when the Supreme Court ruled in Epperson v. Arkansas in 1968 that forbidding the teaching of evolution on religious grounds violated the Establishment Clause .

Since then creationists have developed more nuanced objections to evolution , alleging variously that it is unscientific , infringes on creationists ' religious freedoms or that the acceptance of evolution is a religious stance . Creationists have appealed to democratic principles of fairness , arguing that evolution is controversial , and that science classrooms should therefore " Teach the Controversy . " These objections to evolution culminated in the intelligent design movement in the

1990s and early 2000s that unsuccessfully attempted to present itself as a scientific alternative to evolution .

= = Defining evolution = =

One of the main sources of confusion and ambiguity in the creation ? evolution debate is the definition of evolution itself . In the context of biology , evolution is genetic changes in populations of organisms over successive generations . However , the word has a number of different meanings in different fields , from evolutionary computation to molecular evolution to sociocultural evolution to stellar and galactic evolution . It can even refer to metaphysical evolution , spiritual evolution , or any of a number of evolutionist philosophies . When biological evolution is conflated with other evolutionary processes , this can cause errors such as the claim that modern evolutionary theory says anything about abiogenesis or the Big Bang .

In colloquial contexts , evolution can refer to any sort of progressive development or gradual improvement , and evolution is understood as a process that results in greater quality or complexity . When misapplied to biological evolution this common meaning leads to frequent misunderstandings . For example , the idea of devolution (" backwards " evolution) is a result of erroneously assuming that evolution is directional or has a specific goal in mind (cf. orthogenesis) . In reality , the evolution of an organism has no " objective " and is only showing increasing ability of successive generations to survive and reproduce in its environment ; and increased suitability is only defined in relation to this environment . Biologists do not consider any one species , such as humans , to be more highly evolved or advanced than another . Certain sources have been criticized for indicating otherwise due to a tendency to evaluate nonhuman organisms according to anthropocentric standards rather than more objective ones .

Evolution also does not require that organisms become more complex . Although the history of life shows an apparent trend towards the evolution of biological complexity ; there is a question if this appearance of increased complexity is real , or if this conclusion comes from neglecting the fact that the majority of life on Earth has always consisted of prokaryotes . In this view , complexity is not a necessary consequence of evolution ; rather , it is a consequence of the specific circumstances of evolution on Earth , which frequently made greater complexity advantageous , and thus naturally selected for . Depending on the situation , organisms ' complexity can either increase , decrease , or stay the same , and all three of these trends have been observed in evolution .

Creationist sources frequently define evolution according to a colloquial , rather than scientific , meaning . As a result , many attempts to rebut evolution do not address the findings of evolutionary biology (see straw man argument) . This also means that advocates of creationism and evolutionary biologists often simply speak past each other .

= = Scientific acceptance = =

Recent objections to evolutionary theory have focused on its scientific validity , or attempting to come up with alternative ideas such as creationism to debate its findings .

= = = Status as a theory = = =

Critics of evolution assert that evolution is " just a theory , " which emphasizes that scientific theories are never absolute , or misleadingly presents it as a matter of opinion rather than of fact or evidence . This reflects a difference of the meaning of theory in a scientific context : whereas in colloquial speech a theory is a conjecture or guess , in science a theory is an explanation whose predictions have been verified by experiments or other evidence . Evolutionary theory refers to an explanation for the diversity of species and their ancestry which has met extremely high standards of scientific evidence . An example of evolution as theory is the modern synthesis of Darwinian natural selection and Mendelian inheritance . As with any scientific theory , the modern synthesis is constantly debated , tested , and refined by scientists , but there is an overwhelming consensus in

the scientific community that it remains the only robust model that accounts for the known facts concerning evolution .

Critics also state that evolution is not a fact . In science , a fact is a verified empirical observation ; in colloquial contexts , however , a fact can simply refer to anything for which there is overwhelming evidence . For example , in common usage theories such as " the Earth revolves around the Sun " and " objects fall due to gravity " may be referred to as " facts , " even though they are purely theoretical . From a scientific standpoint , therefore , evolution may be called a " fact " for the same reason that gravity can : under the scientific definition , evolution is an observable process that occurs whenever a population of organisms genetically changes over time . Under the colloquial definition , the theory of evolution can also be called a fact , referring to this theory 's well @-@ established nature . Thus , evolution is widely considered both a theory and a fact by scientists .

Similar confusion is involved in objections that evolution is " unproven , " since no theory in science is known to be absolutely true , only verified by empirical evidence . This distinction is an important one in philosophy of science , as it relates to the lack of absolute certainty in all empirical claims , not just evolution . Strict proof is possible only in formal sciences such as logic and mathematics , not natural sciences (where terms such as " validated " or " corroborated " are more appropriate) . Thus , to say that evolution is not proven is trivially true , but no more an indictment of evolution than calling it a " theory . " The confusion arises , however , in that the colloquial meaning of proof is simply " compelling evidence , " in which case scientists would indeed consider evolution " proven . "

= = = Degree of acceptance = = =

An objection is often made in the teaching of evolution that evolution is controversial or contentious . Unlike past creationist arguments which sought to abolish the teaching of evolution altogether , this argument makes the weaker claim that evolution should be presented alongside alternative views since it is controversial , and students should be allowed to evaluate and choose between the options on their own .

This objection forms the basis of the " Teach the Controversy " campaign by the Discovery Institute , a think tank based in Seattle , Washington , to promote the teaching of intelligent design in U.S. public schools . This goal was a part of the Institute 's " wedge strategy , " an attempt to gradually undermine evolution and ultimately to " reverse the stifling dominance of the materialist worldview , and to replace it with a science consonant with Christian and theistic convictions . " Several subsequent attempts were made to insert intelligent design or creationism into the U.S. public school curriculum , including the failed Santorum Amendment in 2001 .

Scientists and U.S. courts have rejected this objection on the grounds that science is not based on appeals to popularity , but on evidence . The scientific consensus of biologists , not popular opinion or fairness , determines what is considered acceptable science , and although evolution is controversial in the public arena , it is entirely uncontroversial among experts in the field .

In response , creationists have disputed the level of scientific support for evolution . The Discovery Institute has gathered over 761 scientists as of August 2008 to sign A Scientific Dissent From Darwinism in order to show that there are a number of scientists who dispute what they refer to as " Darwinian evolution . " This statement did not profess outright disbelief in evolution , but expressed skepticism as to the ability of " random mutation and natural selection to account for the complexity of life . " Several counter @-@ petitions have been launched in turn , including A Scientific Support for Darwinism , which gathered over 7 @,@ 000 signatures in four days , and Project Steve , a tongue @-@ in @-@ cheek petition that has gathered the signatures of 1 @,@ 393 (as of May 24 , 2016) evolution @-@ supporting scientists named " Steve " (or any similar variation thereof ? Stephen , Stephanie , Esteban , etc .) .

Creationists have argued for over a century that evolution is a " theory in crisis " that will soon be overturned , based on objections that it lacks reliable evidence or violates natural laws . These objections have been rejected by most scientists , as have claims that intelligent design , or any other creationist explanation , meets the basic scientific standards that would be required to make

them scientific alternatives to evolution . It is also argued that even if evidence against evolution exists , it is a false dilemma to characterize this as evidence for intelligent design .

A similar objection to evolution is that certain scientific authorities ? mainly pre @-@ modern ones ? have doubted or rejected evolution . Most commonly , it is argued that Darwin " recanted " on his deathbed , a false anecdote originating from Lady Hope 's story . These objections are generally rejected as appeals to authority .

= = Scientific status = =

A common neo @-@ creationist objection to evolution is that evolution does not adhere to normal scientific standards ? that it is not genuinely scientific . It is argued that evolutionary biology does not follow the scientific method and therefore should not be taught in science classes , or at least should be taught alongside other views (i.e. , creationism) . These objections often deal with the very nature of evolutionary theory , the scientific method , and philosophy of science .

= = = Religious nature = = =

Creationists commonly argue against evolution on the grounds that " evolution is a religion ; it is not a science . " The purpose of this criticism is to undermine the higher ground biologists claim in debating creationists , and to reframe the debate from being between science (evolution) and religion (creationism) to being between two equally religious beliefs ? or even to argue that evolution is religious while intelligent design is not . Those that oppose evolution frequently refer to supporters of evolution as " evolutionists " or " Darwinists . "

The arguments for evolution being a religion generally amount to arguments by analogy : it is argued that evolution and religion have one or more things in common , and that therefore evolution is a religion . Examples of claims made in such arguments are statements that evolution is based on faith , that supporters of evolution revere Darwin as a prophet , and that supporters of evolution dogmatically reject alternative suggestions out @-@ of @-@ hand . These claims have become more popular in recent years as the neo @-@ creationist movement has sought to distance itself from religion , thus giving it more reason to make use of a seemingly anti @-@ religious analogy .

In response , supporters of evolution have argued that no scientist 's claims , including Darwin 's , are treated as sacrosanct , as shown by the aspects of Darwin 's theory that have been rejected or revised by scientists over the years , to form first neo @-@ Darwinism and later the modern evolutionary synthesis . The claim that evolution relies on faith , often based on the creationist belief that evolution has never been observed , is likewise rejected on the grounds that evolution has strong supporting evidence , and therefore does not require faith .

In general , the argument that evolution is religious has been rejected on the grounds that religion is not defined by how dogmatic or zealous its adherents are , but by its spiritual or supernatural beliefs . Evolutionary supporters point out evolution is neither dogmatic nor based on faith , and they accuse creationists of equivocating between the strict definition of religion and its colloquial usage to refer to anything that is enthusiastically or dogmatically engaged in . United States courts have also rejected this objection :

Assuming for the purposes of argument , however , that evolution is a religion or religious tenet , the remedy is to stop the teaching of evolution , not establish another religion in opposition to it . Yet it is clearly established in the case law , and perhaps also in common sense , that evolution is not a religion and that teaching evolution does not violate the Establishment Clause .

A related claim is that evolution is atheistic (see the Atheism section below) ; creationists sometimes merge the two claims and describe evolution as an " atheistic religion " (cf. humanism) . This argument against evolution is also frequently generalized into a criticism of all science ; it is argued that " science is an atheistic religion , " on the grounds that its methodological naturalism is as unproven , and thus as " faith @-@ based , " as the supernatural and theistic beliefs of creationism .

= = = Unfalsifiability = = =

A statement is considered falsifiable if there is an observation or a test that could be made that would demonstrate that the statement is false . Statements that are not falsifiable cannot be examined by scientific investigation since they permit no tests that evaluate their accuracy . Creationists such as Henry M. Morris have claimed that any observation can be fitted into the evolutionary framework , so it is impossible to demonstrate that evolution is wrong and therefore evolution is non @-@ scientific .

However , evolution is considered falsifiable because it can make predictions that , were they contradicted by the evidence , would falsify evolution . Several kinds of evidence could falsify evolution , such as the fossil record showing no change over time , confirmation that mutations are prevented from accumulating , or observations showing organisms being created supernaturally or spontaneously . Many of Darwin 's ideas and assertions of fact have been falsified as evolutionary science has developed and has continued to confirm his central concepts . Despite this , creationism consists largely of unsubstantiated claims that evolution has been falsified . In contrast , creationist explanations involving the direct intervention of the supernatural in the physical world are not falsifiable , because any result of an experiment or investigation could be the unpredictable action of an omnipotent deity .

In 1976 , the philosopher Karl Popper said that " Darwinism is not a testable scientific theory but a metaphysical research programme . " He later changed his mind and argued that Darwin 's " theory of natural selection is difficult to test " with respect to other areas of science .

The most direct evidence that evolutionary theory is falsifiable may be the original words of Charles Darwin who , in chapter 6 of On the Origin of Species wrote : " If it could be demonstrated that any complex organ existed , which could not possibly have been formed by numerous , successive , slight modifications , my theory would absolutely break down . " If empirical evidence supported this instance , it would be affirmation of the creationist argument in favor of irreducible complexity .

In response to the unfalsifiability criticism of evolutionary theory , numerous examples of potential ways to falsify evolution have been proposed . J. B. S. Haldane , when asked what hypothetical evidence could disprove evolution , replied " fossil rabbits in the Precambrian era . " Numerous other potential ways to falsify evolution have also been proposed . For example , the fact that humans have one fewer pair of chromosomes than the great apes offered a testable hypothesis involving the fusion or splitting of chromosomes from a common ancestor . The fusion hypothesis was confirmed in 2005 by discovery that human chromosome 2 is homologous with a fusion of two chromosomes that remain separate in other primates . Extra , inactive telomeres and centromeres remain on human chromosome 2 as a result of the fusion . The assertion of common descent could also have been disproven with the invention of DNA sequencing methods . If true , human DNA should be far more similar to chimpanzees and other great apes , than to other mammals . If not , then common descent is falsified . DNA analysis has shown that humans and chimpanzees share a large percentage of their DNA (between 95 % to 99 @.@ 4 % depending on the measure) . Also , the evolution of chimpanzees and humans from a common ancestor predicts a (geologically) recent common ancestor . Numerous transitional fossils have since been found . Hence , human evolution has passed several falsifiable tests .

A related claim is that natural selection is tautological . Specifically , it is often argued that the phrase " survival of the fittest " is a tautology , in that fitness is defined as ability to survive and reproduce . However , this phrase , first used by Herbert Spencer in 1864 , is rarely used by biologists . Additionally , fitness is more accurately defined as the state of possessing traits that make survival more likely ; this definition , unlike simple " survivability , " avoids being trivially true .

Similarly , it is argued that evolutionary theory is circular reasoning , in that evidence is interpreted as supporting evolution , but evolution is required to interpret the evidence . An example of this is the claim that geological strata are dated through the fossils they hold , but that fossils are in turn dated by the strata they are in . However , in most cases strata are not dated by their fossils , but by their position relative to other strata and by radiometric dating , and most strata were dated before the theory of evolution was formulated .

In his 1982 book , Abusing Science : The Case Against Creationism , philosopher of science Philip Kitcher specifically addresses the " falsifiability " question by taking into account notable philosophical critiques of Popper by Carl Gustav Hempel and Willard Van Orman Quine that reject his definition of theory as a set of falsifiable statements . As Kitcher points out , if one took a strictly Popperian view of " theory , " observations of Uranus when first discovered in 1781 would have " falsified " Isaac Newton 's celestial mechanics . Rather , people suggested that another planet influenced Uranus ' orbit ? and this prediction was indeed eventually confirmed . Kitcher agrees with Popper that " there is surely something right in the idea that a science can succeed only if it can fail . " But he insists that we view scientific theories as consisting of an " elaborate collection of statements , " some of which are not falsifiable , and others ? what he calls " auxiliary hypotheses , " which are .

According to Kitcher , good scientific theories must have three features ? unity , fecundity , and independent testability of auxiliary hypotheses :

Unity

" A science should be unified .... Good theories consist of just one problem @-@ solving strategy , or a small family of problem @-@ solving strategies , that can be applied to a wide range of problems " (1982 : 47) .

Fecundity

" A great scientific theory , like Newton 's , opens up new areas of research ... Because a theory presents a new way of looking at the world , it can lead us to ask new questions , and so to embark on new and fruitful lines of inquiry ... Typically , a flourishing science is incomplete . At any time , it raises more questions than it can currently answer . But incompleteness is no vice . On the contrary , incompleteness is the mother of fecundity ... A good theory should be productive ; it should raise new questions and presume that those questions can be answered without giving up its problem @-@ solving strategies " (1982 : 47 ? 48) .

Auxiliary hypotheses that are independently testable

" An auxiliary hypothesis ought to be testable independently of the particular problem it is introduced to solve , independently of the theory it is designed to save " (1982 : 46) (e.g. the evidence for the existence of Neptune is independent of the anomalies in Uranus 's orbit) .

Like other definitions of theories , including Popper 's , Kitcher makes it clear that a good theory includes statements that have (in his terms) " observational consequences . " But , like the observation of irregularities in Uranus 's orbit , falsification is only one possible consequence of an observation . The production of new hypotheses is another possible ? and equally important ? observational consequence . Kitcher 's account of a good theory is based not only on his understanding of how physical sciences work . He is also taking into account the way the life sciences work .

From Kitcher 's point of view , Darwinian theory not only meets the three conditions for a good scientific theory ; it is without question an extraordinarily successful theory :

The heart of Darwinian evolutionary theory is a family of problem @-@ solving strategies , related by their common employment of a particular style of historical narrative . A Darwinian history is a piece of reasoning of the following general form . The first step consists in a description of an ancestral population of organisms . The reasoning proceeds by tracing the modification of the population through subsequent generations , showing how characteristics were selected , inherited , and became prevalent . Reasoning like this can be used to answer a host of biological questions .

The same kind of story can be told again and again to answer all sorts of questions about all sorts of living things . Evolutionary theory is unified because so many diverse questions ... can be addressed by advancing Darwinian histories . Moreover , these narratives constantly make claims that are subject to independent check .

Darwin not only provided a scheme for unifying the diversity of life . He also gave a structure to our ignorance . After Darwin , it was important to resolve general issues about the presuppositions of Darwinian histories . The way in which biology should proceed had been made admirably plain , and it was clear that biologists had to tackle questions for which they had , as yet , no answers .

= = Evidence = =

Objections to the evidence that evolution occurs tend to be more concrete and specific , often involving direct analysis of evolutionary biology 's methods and claims .

= = = Lack of observation = = =

A common claim of creationists is that evolution has never been observed . Challenges to such objections often come down to debates over how evolution is defined (see the Defining evolution section above) . Under the conventional biological definition of evolution , it is a simple matter to observe evolution occurring . Evolutionary processes , in the form of populations changing their genetic composition from generation to generation , have been observed in different scientific contexts , including the evolution of fruit flies , mice , and bacteria in the laboratory , and of tilapia in the field . Such studies on experimental evolution , particularly those using microorganisms , are now providing important insights into how evolution occurs , especially in the case of antibiotic resistance .

In response to such examples , creationists specify that they are objecting only to macroevolution , not microevolution : most creationist organizations do not dispute the occurrence of short @-@ term , relatively minor evolutionary changes , such as that observed even in dog breeding . Rather , they dispute the occurrence of major evolutionary changes over long periods of time , which by definition cannot be directly observed , only inferred from microevolutionary processes and the traces of macroevolutionary ones .

However , as biologists define macroevolution , both microevolution and macroevolution have been observed . Speciations , for example , have been directly observed many times , despite popular misconceptions to the contrary . Additionally , the modern evolutionary synthesis draws no distinction in the processes described by the theory of evolution when considering macroevolution and microevolution as the former is simply at the species level or above and the latter is below the species level . An example of this is ring species .

Additionally , past macroevolution can be inferred from historical traces . Transitional fossils , for example , provide plausible links between several different groups of organisms , such as Archaeopteryx linking birds and dinosaurs , or the recently discovered Tiktaalik linking fish and limbed amphibians . Creationists dispute such examples , from asserting that such fossils are hoaxes or that they belong exclusively to one group or the other , to asserting that there should be far more evidence of obvious transitional species . Darwin himself found the paucity of transitional species to be one of the greatest weaknesses of his theory :

Why then is not every geological formation and every stratum full of such intermediate links ? Geology assuredly does not reveal any such finely graduated organic chain ; and this , perhaps , is the most obvious and gravest objection which can be urged against my theory . The explanation lies , as I believe , in the extreme imperfection of the geological record .

Darwin appealed to the limited collections then available , the extreme lengths of time involved , and different rates of change with some living species differing very little from fossils of the Silurian period . In later editions he added " that the periods during which species have been undergoing modification , though very long as measured by years , have probably been short in comparison with the periods during which these same species remained without undergoing any change . " The number of clear transitional fossils has increased enormously since Darwin 's day , and this problem has been largely resolved with the advent of the theory of punctuated equilibrium , which predicts a primarily stable fossil record broken up by occasional major speciations .

As more and more compelling direct evidence for inter @-@ species and species @-@ to @-@ species evolution has been gathered , creationists have redefined their understanding of what amounts to a " created kinds , " and have continued to insist that more dramatic demonstrations of evolution be experimentally produced . One version of this objection is " Were you there ? , " popularized by young Earth creationist Ken Ham . It argues that because no one except God could directly observe events in the distant past , scientific claims are just speculation or " story @-@

telling . " DNA sequences of the genomes of organisms allow an independent test of their predicted relationships , since species which diverged more recently will be more closely related genetically than species which are more distantly related ; such phylogenetic trees show a hierarchical organization within the tree of life , as predicted by common descent .

In fields such as astrophysics or meteorology , where direct observation or laboratory experiments are difficult or impossible , the scientific method instead relies on observation and logical inference . In such fields , the test of falsifiability is satisfied when a theory is used to predict the results of new observations . When such observations contradict a theory 's predictions , it may be revised or discarded if an alternative better explains the observed facts . For example , Newton 's theory of gravitation was replaced by Albert Einstein 's theory of general relativity when the latter was observed to more precisely predict the orbit of Mercury .

= = = Unreliable evidence = = =

A related objection is that evolution is based on unreliable evidence . This objection goes further than the less substantial " evolution isn 't proven " arguments , claiming that evolution isn 't even well @-@ evidenced . Typically , this is either based on the argument that evolution 's evidence is full of frauds and hoaxes , that current evidence for evolution is likely to be overturned as some past evidence has been , or that certain types of evidence are inconsistent and dubious .

Arguments against evolution 's reliability are thus often based on analyzing the history of evolutionary thought or the history of science in general . Creationists point out that in the past , major scientific revolutions have overturned theories that were at the time considered near @-@ certain . They thus claim that current evolutionary theory is likely to undergo such a revolution in the future , on the basis that it is a " theory in crisis " for one reason or another .

Critics of evolution commonly appeal to past scientific hoaxes such as the Piltdown Man forgery . It is argued that because scientists have been mistaken and deceived in the past about evidence for various aspects of evolution the current evidence for evolution is likely to also be based on fraud and error . Much of the evidence for evolution has been accused of being fraudulent at various times , including Archaeopteryx , peppered moth melanism , and Darwin 's finches ; these claims have been subsequently refuted .

It has also been claimed that certain former pieces of evidence for evolution which are now considered out @-@ of @-@ date and erroneous , such as Ernst Haeckel 's 19th @-@ century comparative drawings of embryos , used to illustrate his recapitulation theory (" ontogeny recapitulates phylogeny ") , were not merely errors but frauds . Molecular biologist Jonathan Wells criticizes biology textbooks by alleging that they continue to reproduce such evidence after it has been debunked . In response , the National Center for Science Education notes that none of the textbooks reviewed by Wells makes the claimed error , as Haeckel 's drawings are shown in a historical context with discussion about why they are wrong , and the accurate modern drawings and photos used in the textbooks are misrepresented by Wells .

= = = Unreliable chronology = = =

Creationists claim that evolution relies on certain types of evidence that do not give reliable information about the past . For example , it is argued that radiometric dating technique of evaluating a material 's age based on the radioactive decay rates of certain isotopes generates inconsistent and thus unreliable results . Radiocarbon dating based on the carbon @-@ 14 isotope has been particularly criticized . It is argued that radiometric decay relies on a number of unwarranted assumptions such as the principle of uniformitarianism , consistent decay rates , or rocks acting as closed systems . Such arguments have been dismissed by scientists on the grounds that independent methods have confirmed the reliability of radiometric dating as a whole ; additionally , different radiometric dating methods and techniques have independently confirmed each other 's results .

Another form of this objection is that fossil evidence is not reliable . This is based on a much wider

range of claims . These include that there are too many " gaps " in the fossil record , that fossil @-@ dating is circular (see the Unfalsifiability section above) , or that certain fossils , such as polystrate fossils , are seemingly " out of place . " Examination by geologists have found polystrate fossils to be consistent with in situ formation . It is argued that certain features of evolution support creationism 's catastrophism (cf . Great Flood) , rather than evolution 's gradualistic punctuated equilibrium , which some assert is an ad hoc theory to explain the fossil gaps .

= = Plausibility = =

Some of the oldest and most common objections to evolution dispute whether evolution can truly account for all the apparent complexity and order in the natural world . It is argued that evolution is too unlikely or otherwise lacking to account for various aspects of life , and therefore that an intelligence , such as God of the Abrahamic religions , must at the very least be appealed to for those specific features .

= = = Improbability = = =

A common objection to evolution is that it is simply too unlikely for life , in its complexity and apparent " design , " to have arisen " by chance . " It is argued that the odds of life having arisen without a deliberate intelligence guiding it are so astronomically low that it is unreasonable not to infer an intelligent designer from the natural world , and specifically from the diversity of life . A more extreme version of this argument is that evolution cannot create complex structures (see the Creation of complex structures section below) . The idea that it is simply too implausible for life to have evolved is often wrongly encapsulated with a quotation that the " probability of life originating on Earth is no greater than the chance that a hurricane , sweeping through a scrapyard , would have the luck to assemble a Boeing 747 " ? a claim attributed to astrophysicist Fred Hoyle and known as Hoyle 's fallacy . Hoyle was a Darwinist , atheist and anti @-@ theist , but advocated the theory of panspermia , in which abiogenesis begins in outer space and primitive life on Earth is held to have arrived via natural dispersion .

Views superficially similar , but unrelated to Hoyle 's , are thus invariably justified with arguments from analogy . The basic idea of this argument for a designer is the teleological argument , an argument for the existence of God based on the perceived order or purposefulness of the universe . A common way of using this as an objection to evolution is by appealing to the 18th @-@ century philosopher William Paley 's watchmaker analogy , which argues that certain natural phenomena are analogical to a watch (in that they are ordered , or complex , or purposeful) , which means that , like a watch , they must have been designed by a " watchmaker " ? an intelligent agent . This argument forms the core of intelligent design , a neo @-@ creationist movement seeking to establish certain variants of the design argument as legitimate science , rather than as philosophy or theology , and have them be taught alongside evolution .

This objection is fundamentally an argument by lack of imagination , or argument from incredulity : a certain explanation is seen as being counterintuitive , and therefore an alternate , more intuitive explanation is appealed to instead . Supporters of evolution generally respond by arguing that evolution is not based on " chance , " but on predictable chemical interactions : natural processes , rather than supernatural beings , are the " designer . " Although the process involves some random elements , it is the non @-@ random selection of survival @-@ enhancing genes that drives evolution along an ordered trajectory . The fact that the results are ordered and seem " designed " is no more evidence for a supernatural intelligence than the appearance of complex natural phenomena (e.g. snowflakes) . It is also argued that there is insufficient evidence to make statements about the plausibility or implausibility of abiogenesis , that certain structures demonstrate poor design , and that the implausibility of life evolving exactly as it did is no more evidence for an intelligence than the implausibility of a deck of cards being shuffled and dealt in a certain random order .

It has also been noted that arguments against some form of life arising " by chance " are really

objections to nontheistic abiogenesis , not to evolution . Indeed , arguments against " evolution " are based on the misconception that abiogenesis is a component of , or necessary precursor to , evolution . Similar objections sometimes conflate the Big Bang with evolution .

Christian apologist and philosopher Alvin Plantinga , a supporter of intelligent design , has formalized and revised the improbability argument as the evolutionary argument against naturalism , which asserts that it is irrational to reject a supernatural , intelligent creator because the apparent probability of certain faculties evolving is so low . Specifically , Plantinga claims that evolution cannot account for the rise of reliable reasoning faculties . Plantinga argues that whereas a God would be expected to create beings with reliable reasoning faculties , evolution would be just as likely to lead to unreliable ones , meaning that if evolution is true , it is irrational to trust whatever reasoning one relies on to conclude that it is true . This novel epistemological argument has been criticized similarly to other probabilistic design arguments . It has also been argued that rationality , if conducive to survival , is more likely to be selected for than irrationality , making the natural development of reliable cognitive faculties more likely than unreliable ones .

= = = Unexplained aspects of the natural world = = =

Biochemist Michael Behe has argued that current evolutionary theory cannot account for certain complex structures , particularly in microbiology . On this basis , Behe argues that such structures were " purposely arranged by an intelligent agent . "

In addition to complex structures and systems , among the phenomena that critics variously claim evolution cannot explain are consciousness , hominid intelligence , instincts , emotions , metamorphosis , photosynthesis , homosexuality , music , language , religion , morality , and altruism (see altruism in animals) . Most of these , such as hominid intelligence , instinct , emotion , photosynthesis , language , and altruism , have been well @-@ explained by evolution , while others remain mysterious , or only have preliminary explanations . However , supporters of evolution contend that no alternative explanation has been able to adequately explain the biological origin of these phenomena either .

Creationists argue against evolution on the grounds that it cannot explain certain non @-@ evolutionary processes , such as abiogenesis , the Big Bang , or the meaning of life . In such instances , evolution is being redefined to refer to the entire history of the universe , and it is argued that if one aspect of the universe is seemingly inexplicable , the entire body of scientific theories must be baseless . At this point , objections leave the arena of evolutionary biology and become general scientific or philosophical disputes .

Astronomers Fred Hoyle and Chandra Wickramasinghe have argued in favor of cosmic ancestry , and against abiogenesis and evolution .

= = Impossibility = =

This class of objections is more radical than the above , claiming that a major aspect of evolution is not merely unscientific or implausible , but rather impossible , because it contradicts some other law of nature or is constrained in such a way that it cannot produce the biological diversity of the world .

= = = Creation of complex structures = = =

Living things have fantastically intricate features ? at the anatomical , cellular and molecular level ? that could not function if they were any less complex or sophisticated . The only prudent conclusion is that they are the products of intelligent design , not evolution .

Modern evolutionary theory posits that all biological systems must have evolved incrementally , through a combination of natural selection and genetic drift . Both Darwin and his early detractors recognized the potential problems that could arise for his theory of natural selection if the lineage of organs and other biological features could not be accounted for by gradual , step @-@ by @-@ step changes over successive generations ; if all the intermediary stages between an initial organ

and the organ it will become are not all improvements upon the original , it will be impossible for the later organ to develop by the process of natural selection alone . Complex organs such as the eye had been presented by William Paley as exemplifying the need for design by God , and anticipating early criticisms that the evolution of the eye and other complex organs seemed impossible , Darwin noted that :

[R] eason tells me , that if numerous gradations from a perfect and complex eye to one very imperfect and simple , each grade being useful to its possessor , can be shown to exist ; if further , the eye does vary ever so slightly , and the variations be inherited , which is certainly the case ; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life , then the difficulty of believing that a perfect and complex eye could be formed by natural selection , though insuperable by our imagination , can hardly be considered real .

Similarly , ethologist and evolutionary biologist Richard Dawkins said on the topic of the evolution of the feather in an interview for the television program The Atheism Tapes :

There 's got to be a series of advantages all the way in the feather . If you can 't think of one , then that 's your problem not natural selection 's problem ... It 's perfectly possible feathers began as fluffy extensions of reptilian scales to act as insulators ... The earliest feathers might have been a different approach to hairiness among reptiles keeping warm .

Creationist arguments have been made such as " What use is half an eye ? " and " What use is half a wing ? " . Research has confirmed that the natural evolution of the eye and other intricate organs is entirely feasible . Creationist claims have persisted that such complexity evolving without a designer is inconceivable , however , and this objection to evolution has been refined in recent years as the more sophisticated irreducible complexity argument of the intelligent design movement , formulated by Michael Behe .

Irreducible complexity is the idea that certain biological systems cannot be broken down into their constituent parts and remain functional , and therefore that they could not have evolved naturally from less complex or complete systems . Whereas past arguments of this nature generally relied on macroscopic organs , Behe 's primary examples of irreducible complexity have been cellular and biochemical in nature . He has argued that the components of systems such as the blood clotting cascade , the immune system , and the bacterial flagellum are so complex and interdependent that they could not have evolved from simpler systems .

In fact , my argument for intelligent design is open to direct experimental rebuttal . Here is a thought experiment that makes the point clear . In Darwin 's Black Box (Behe 1996) I claimed that the bacterial flagellum was irreducibly complex and so required deliberate intelligent design . The flip side of this claim is that the flagellum can 't be produced by natural selection acting on random mutation , or any other unintelligent process . To falsify such a claim , a scientist could go into the laboratory , place a bacterial species lacking a flagellum under some selective pressure (for mobility , say) , grow it for ten thousand generations , and see if a flagellum--or any equally complex system--was produced . If that happened , my claims would be neatly disproven .

In the years since Behe proposed irreducible complexity , new developments and advances in biology , such as an improved understanding of the evolution of flagella , have already undermined these arguments . The idea that seemingly irreducibly complex systems cannot evolve has been refuted through evolutionary mechanisms , such as exaptation (the adaptation of organs for entirely new functions) and the use of " scaffolding , " which are initially necessary features of a system that later degenerate when they are no longer required . Potential evolutionary pathways have been provided for all of the systems Behe used as examples of irreducible complexity .

= = = = Cambrian explosion complexity argument = = = =

The Cambrian explosion was the relatively rapid appearance around 542 million years ago of most major animal phyla as demonstrated in the fossil record , and many more phyla now extinct . This was accompanied by major diversification of other organisms . Prior to the Cambrian explosion most organisms were simple , composed of individual cells occasionally organized into colonies . Over the following 70 or 80 million years , the rate of diversification accelerated by an order of magnitude and

the diversity of life began to resemble that of today , although they did not resemble the species of today .

The basic problem with this is that natural selection calls for the slow accumulation of changes , where a new phyla would take longer than a new class which would take longer than a new order , which would take longer than a new family , which would take longer than a new genus would take longer than emergence of a new species but the apparent occurrence of high @-@ level taxa without precedents is perhaps implying unusual evolutionary mechanisms .

There is general consensus that many factors helped trigger the Cambrian explosion , but there is no generally accepted consensus about the combination and the Cambrian explosion continues to be an area of controversy and research over why so rapid , why at the phylum level , why so many phyla then and none since , and even if the apparent fossil record is accurate .

An example of opinions involving the commonly cited rise in oxygen Great Oxidation Event from biologist PZ Myers summarizes : " What it was was environmental changes , in particular the bioturbation revolution caused by the evolution of worms that released buried nutrients , and the steadily increasing oxygen content of the atmosphere that allowed those nutrients to fuel growth ; ecological competition , or a kind of arms race , that gave a distinct selective advantage to novelties that allowed species to occupy new niches ; and the evolution of developmental mechanisms that enabled multicellular organisms to generate new morphotypes readily . " The increase in molecular oxygen (O2) also may have allowed the formation of the protective ozone layer (O3) that helps shield Earth from lethal UV radiation from the Sun .

= = = Creation of information = = =

Another new , and increasingly common , objection of creationists to evolution is that evolutionary mechanisms such as mutation cannot generate new information . Creationists such as William A. Dembski , Werner Gitt , and Lee Spetner have attempted to use information theory to dispute evolution . Dembski has argued that life demonstrates specified complexity , and that evolution without an intelligent agent cannot account for the generation of information that would be required to produce specified complexity .

These claims have been widely rejected by the scientific community ; new information is regularly generated in evolution , whenever a novel mutation or gene duplication arises . Dramatic examples of entirely new , unique traits arising through mutation have been observed in recent years , such as the evolution of nylon @-@ eating bacteria , which developed new enzymes to efficiently digest a material that never existed before the modern era . In fact , when an organism is considered together with the environment it evolved in , there is no need to account for the creation of information . The information in the genome forms a record of how it was possible to survive in a particular environment . It is not created , but rather gathered from the environment through research ? by trial and error , as mutating organisms either reproduce or fail .

A related argument against evolution is that most mutations are harmful . However , the vast majority of mutations are neutral , and the minority of mutations which are beneficial or harmful are often situational ; a mutation that is harmful in one environment may be helpful in another .

= = = Violation of the second law of thermodynamics = = =

Another objection is that evolution violates the second law of thermodynamics . Though the law applies to all systems , in the case of a closed one it states , " the entropy of an isolated system not in equilibrium will tend to increase over time , approaching a maximum value at equilibrium " . In other words , an ideal isolated system 's entropy (a measure of the dispersal of energy in a physical system so that it is not available to do mechanical work) will tend to increase or stay the same , not decrease . Creationists argue that evolution violates this physical law by requiring a decrease in entropy , or disorder , over time .

This claim is based on a manifestation of the law only applicable to isolated systems , which do not exchange matter or energy with their surroundings . Organisms , in contrast , are open systems , as

they constantly exchange energy and matter with their environment : for example animals eat food and excrete waste , and radiate and absorb heat . Similarly , the Earth absorbs energy from the Sun and emits energy back into space . The Sun @-@ Earth @-@ space system does not violate the second law , because the enormous increase in entropy due to the Sun and Earth radiating into space dwarfs the local decrease in entropy caused by the existence and evolution of self @-@ organizing life .

Since the second law of thermodynamics has a precise mathematical definition , this argument can be analyzed quantitatively . This was done by physicist Daniel F. Styer , who concluded : " Quantitative estimates of the entropy involved in biological evolution demonstrate that there is no conflict between evolution and the second law of thermodynamics . "

In a published letter to the editor of The Mathematical Intelligencer titled " How anti @-@ evolutionists abuse mathematics , " mathematician Jason Rosenhouse stated :

The fact is that natural forces routinely lead to local decreases in entropy . Water freezes into ice and fertilised eggs turn into babies . Plants use sunlight to convert carbon dioxide and water into sugar and oxygen , but [we do] not invoke divine intervention to explain the process [...] thermodynamics offers nothing to dampen our confidence in Darwinism .

= = Moral implications = =

Other common objections to evolution allege that evolution leads to objectionable results , including bad beliefs , behaviors , and events . It is argued that the teaching of evolution degrades values , undermines morals , and fosters irreligion or atheism . These may be considered appeals to consequences (a form of logical fallacy) , as the potential ramifications of belief in evolutionary theory have nothing to do with its objective empirical reality .

= = = Humans as animals = = =

In biological classification humans are animals , a basic point which has been known for more than 2 @,@ 000 years . The creationist J. Rendle @-@ Short asserted in Creation magazine that if people are taught evolution they can be expected to behave like animals : since animals behave in all sorts of different ways , this is meaningless . In evolutionary terms , humans are able to acquire knowledge and change their behaviour to meet social standards , so humans behave in the manner of other humans .

= = = Social effects = = =

In 1917 , Vernon Kellogg published Headquarters Nights : A Record of Conversations and Experiences at the Headquarters of the German Army in France and Belgium , which asserted that German intellectuals were totally committed to might @-@ makes @-@ right due to " whole @-@ hearted acceptance of the worst of Neo @-@ Darwinism , the Allmacht of natural selection applied rigorously to human life and society and Kultur . " This strongly influenced the politician William Jennings Bryan , who saw Darwinism as a moral threat to America and campaigned against evolutionary theory ; his campaign culminated in the Scopes Trial , which effectively prevented teaching of evolution in most public schools until the 1950s .

Some creationists claim that perceived social ills like crime , teenage pregnancies , homosexuality , abortion , immorality , wars , and genocide are caused by a belief in evolution . R. Albert Mohler , Jr . , president of the Southern Baptist Theological Seminary in Louisville , Kentucky , wrote August 8 , 2005 , in NPR 's Taking Issue essay series , that " Debates over education , abortion , environmentalism , homosexuality and a host of other issues are really debates about the origin ? and thus the meaning ? of human life . ... evolutionary theory stands at the base of moral relativism and the rejection of traditional morality . "

Henry M. Morris , engineering professor and founder of the Creation Research Society and the Institute of Creation Research , claims that evolution was part of a pagan religion that emerged after

the Tower of Babel , was part of Plato 's and Aristotle 's philosophies , and was responsible for everything from war to pornography to the breakup of the nuclear family .

Rev. D. James Kennedy of The Center for Reclaiming America for Christ and Coral Ridge Ministries claims that Darwin was responsible for Adolf Hitler 's atrocities . In Kennedy 's documentary , and the accompanying pamphlet with the same title , Darwin 's Deadly Legacy , Kennedy states that " To put it simply , no Darwin , no Hitler . " In his efforts to expose the " harmful effects that evolution is still having on our nation , our children , and our world , " Kennedy also states that , " We have had 150 years of the theory of Darwinian evolution , and what has it brought us ? Whether Darwin intended it or not , millions of deaths , the destruction of those deemed inferior , the devaluing of human life , increasing hopelessness . " The Discovery Institute 's Center for Science and Culture fellow Richard Weikart has made similar claims , as have other creationists . The claim was central to the documentary film Expelled : No Intelligence Allowed (2008) promoting intelligent design creationism . The Anti @-@ Defamation League describes such claims as outrageous misuse of the Holocaust and its imagery , and as trivializing the " ... many complex factors that led to the mass extermination of European Jewry . Hitler did not need Darwin or evolution to devise his heinous plan to exterminate the Jewish people , and Darwin and evolutionary theory cannot explain Hitler 's genocidal madness . Moreover , anti @-@ Semitism existed long before Darwin ever wrote a word . "

Young Earth creationist Kent Hovind blames communism , socialism , World War I , World War II , racism , the Holocaust , Stalin 's war crimes , the Vietnam War , and Pol Pot 's Killing Fields on evolution , as well as the increase in crime , unwed mothers , and other social ills . Hovind 's son Eric Hovind claims that evolution is responsible for tattoos , body piercing , premarital sex , unwed births , sexually transmitted diseases (STDs) , divorce , and child abuse .

Supporters of evolution dismiss such criticisms as counterfactual , and some argue that the opposite seems to be the case . A study published by the author and illustrator Gregory S. Paul found that religious beliefs , including belief in creationism and disbelief in evolution , are positively correlated with social ills like crime . The Barna Group surveys find that Christians and non @-@ Christians in the U.S. have similar divorce rates , and the highest divorce rates in the U.S. are among Baptists and Pentecostals , both sects which reject evolution and embrace creationism .

Michael Shermer argued in Scientific American in October 2006 that evolution supports concepts like family values , avoiding lies , fidelity , moral codes and the rule of law . He goes on to suggest that evolution gives more support to the notion of an omnipotent creator , rather than a tinkerer with limitations based on a human model , the more common image subscribed to by creationists . Careful analysis of the creationist charges that evolution has led to moral relativism and the Holocaust yields the conclusion that these charges appear to be highly suspect . Such analyses conclude that the origins of the Holocaust are more likely to be found in historical Christian anti @-@ Semitism than in evolution .

Evolution has been used to justify Social Darwinism , the exploitation of " lesser breeds without the law " by " superior races , " particularly in the nineteenth century . Strong , typically European , nations successfully expanded their empires , and as such , these strong nations could be said to have " survived " in the struggle for dominance . With this attitude , Europeans , with the exception of Christian missionaries , seldom adopted the customs and languages of local people under their empires .

= = = Atheism = = =

Another charge leveled at evolutionary theory by creationists is that belief in evolution is either tantamount to atheism , or conducive to atheism . It is commonly claimed that all proponents of evolutionary theory are " materialistic atheists . " On the other hand , Davis A. Young argues that creation science itself is harmful to Christianity because its bad science will turn more away than it recruits . Young asks , " Can we seriously expect non @-@ Christians to develop a respect for Christianity if we insist on teaching the brand of science that creationism brings with it ? " However , evolution neither requires nor rules out the existence of a supernatural being . Philosopher Robert T.

Pennock makes the comparison that evolution is no more atheistic than plumbing . H. Allen Orr , professor of biology at University of Rochester , notes that :

Of the five founding fathers of twentieth @-@ century evolutionary biology ? Ronald Fisher , Sewall Wright , J. B. S. Haldane , Ernst Mayr , and Theodosius Dobzhansky ? one was a devout Anglican who preached sermons and published articles in church magazines , one a practicing Unitarian , one a dabbler in Eastern mysticism , one an apparent atheist , and one a member of the Russian Orthodox Church and the author of a book on religion and science .

In addition , a wide range of religions have reconciled a belief in a supernatural being with evolution . Molleen Matsumura of the National Center for Science Education found that " of Americans in the twelve largest Christian denominations , 89 @.@ 6 % belong to churches that support evolution education . " These churches include the " United Methodist Church , National Baptist Convention USA , Evangelical Lutheran Church in America , Presbyterian Church (USA) , National Baptist Convention of America , African Methodist Episcopal Church , the Roman Catholic Church , the Episcopal Church , and others . " A poll in 2000 done for People for the American Way found that 70 % of the American public felt that evolution was compatible with a belief in God . Only 48 % of the people polled could choose the correct definition of evolution from a list , however .

One poll reported in the journal Nature showed that among American scientists (across various disciplines) , about 40 percent believe in both evolution and an active deity (theistic evolution) . This is similar to the results reported for surveys of the general American public . Also , about 40 percent of the scientists polled believe in a God that answers prayers , and believe in immortality . While about 55 % of scientists surveyed were atheists , agnostics , or nonreligious theists , atheism is far from universal among scientists who support evolution , or among the general public that supports evolution . Very similar results were reported from a 1997 Gallup Poll of the American public and scientists .

Traditionalists still object to the idea that diversity in life , including human beings , arose through natural processes without a need for supernatural intervention , and they argue against evolution on the basis that it contradicts their literal interpretation of creation myths about separate " kinds . " However , many religions , such as Catholicism , have reconciled their beliefs with evolution through theistic evolution .